May 4, 1943. P. C. GOLDMARK 2,317,989

TELEVISION

Filed Feb. 24, 1941 2 Sheets-Sheet 1

Fig. 1.

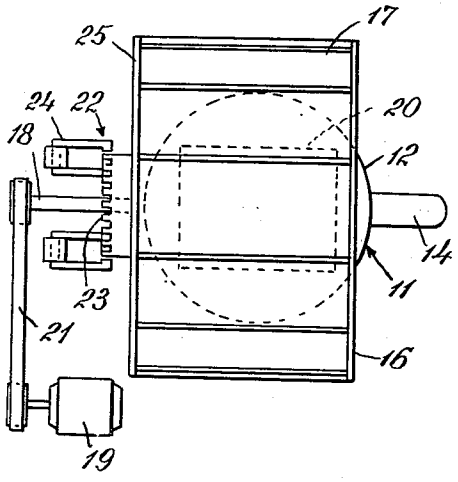


Fig. 3.

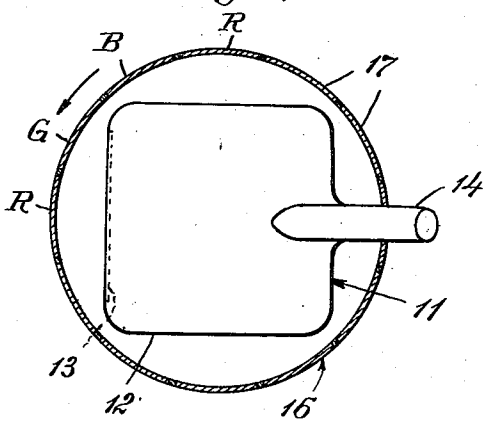


Fig. 2.

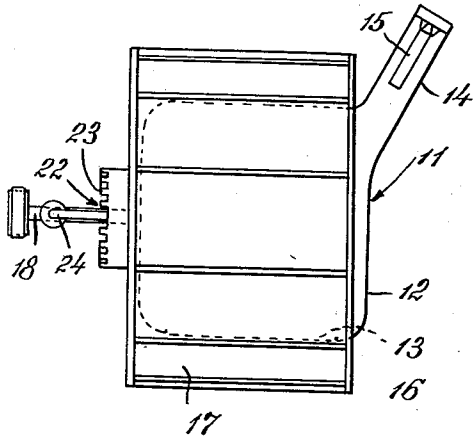
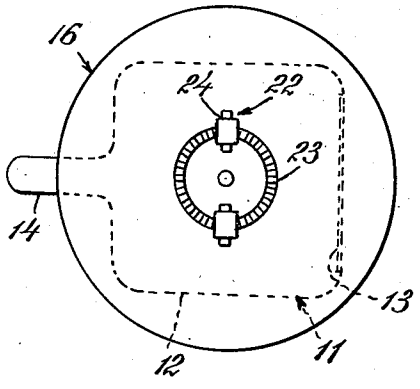


Fig. 4.



INVENTOR
Peter C. Goldmark
BY
Dennis, Davis, Marin & Edmonds
ATTORNEYS

May 4, 1943. P. C. GOLDMARK 2,317,989

TELEVISION

Filed Feb. 24, 1941 2 Sheets-Sheet 2

Fig. 5,

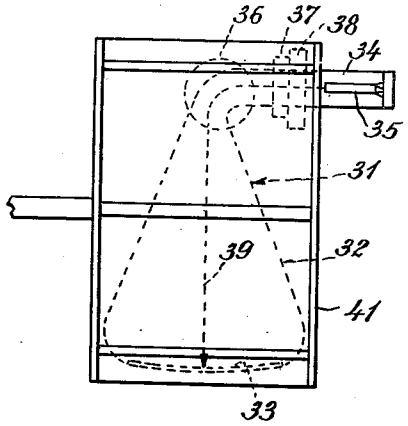


Fig. 6,

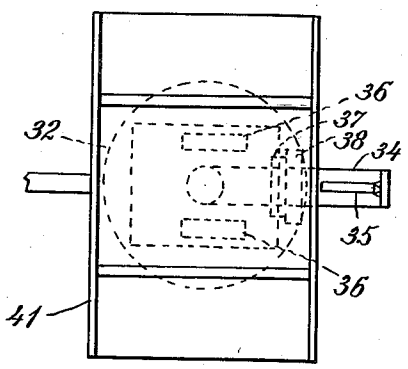
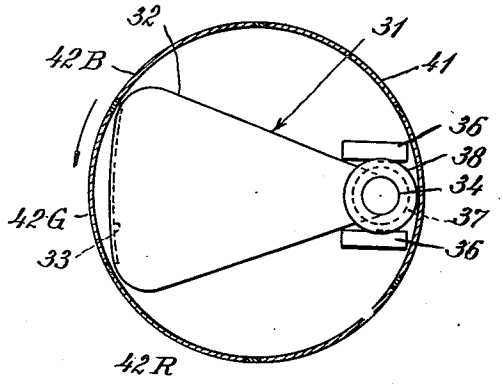


Fig. 7.



INVENTOR
Peter C. Goldmark
BY
Dennis, Davis, Mann & Edwards
ATTORNEYS

Patented May 4, 1943

2,317,989

UNITED STATES PATENT OFFICE

2,317,989

TELEVISION

Peter C. Goldmark, New York, N. Y., assignor to Columbia Broadcasting System, Inc., New York, N. Y., a corporation of New York

Application February 24, 1941, Serial No. 380,144

7 Claims. (Cl. 178—5.2)

This invention relates to television, especially to television in natural colors.

In an application entitled "Television," filed concurrently herewith, John N. Dyer has disclosed apparatus for color television in which a moving endless band, such as a rotating drum, encircles part or all of a scanning device, thus facilitating the design and construction of a compact color television receiver.

The present application is directed mainly to the provision of improvements in the foregoing apparatus for facilitating the use of relatively small elements.

In accordance with one aspect of the invention, a cathode-ray receiver tube is constructed with a bulbous portion having a luminescent screen at one end thereof and an elongated neck extending from the opposite end thereof at an angle with respect to the normal to the luminescent surface. An electron gun structure is arranged within the elongated neck and the tube is provided with suitable deflecting means for causing the cathode ray to scan the luminescent screen. The rotating filter drum is arranged around the bulbous portion of the tube but does not encircle the elongated neck. Thus the drum may be made smaller than would be the case if it were required to encircle both the bulbous portion and the neck of the tube.

In one specific embodiment the elongated neck is substantially at right angles to the normal to the luminescent surface, and the electron beam is bent through approximately 90° so as to permit it to scan the luminescent surface. This further facilitates the use of a drum of relatively small diameter.

To insure proper phasing of the drum segments with respect to the scanning beam, and to further minimize the space required for the drum and its driving mechanism, the invention provides a phonic motor having its armature secured directly to the drum. In this manner, by originally assembling the armature and the drum segments in proper phase relationship, subsequent correct phasing is insured.

The invention will be more fully understood by reference to the specific embodiments illustrated in the drawings and the following description thereof. In the drawings:

Fig. 1 is a front elevation of a specific embodiment of the invention;

Fig. 2 is a plan view thereof;

Figs. 3 and 4 are right and left side elevations, respectively, of the embodiment of Fig. 1; and

Figs. 5, 6 and 7 are plan, front and side views, respectively, of another specific embodiment.

Referring to Figs. 1–4, a cathode-ray receiver tube 11 is shown having a bulbous portion 12 at one end of which is located a luminescent screen 13. In this specific embodiment the bulbous portion is approximately cylindrical, but may be any other desired shape. At the other end of the bulbous portion, and toward one side thereof, extends an elongated neck 14 containing an electron gun structure 15. The electron beam from this gun is deflected horizontally and vertically in the usual manner by suitable deflecting means (not shown). The dimensions of the tube and the angle which the elongated neck makes with the normal to the luminescent surface are selected so that the cathode ray can scan the desired scanning area 20 of the luminescent screen. Generally, the scanning area 20 will be scanned in horizontal laterally extending side-by-side lines, interlaced or non-interlaced, at field scanning frequency, and successive field scansions will correspond to successive colors.

Encircling the bulbous portions of the cathode-ray tube is the drum 16 having a plurality of different color filter segments 17 arranged around the peripheral surface thereof. For three-color reproduction one or more groups of three red, green and blue filter segments may be employed. In the specific embodiment illustrated, twelve segments are employed, but this number may be changed if desired.

The color filter drum 16 is rotated about the axis 18 by any suitable driving means. In the specific embodiment illustrated, an asynchronous motor 19 drives the drum through the belt 21 and supplies the main portion of the driving power. In order to maintain the drum in proper synchronism with the successively reproduced images, a phonic motor 22 is provided. In accordance with the present invention, the teeth 23 of the phonic motor are attached directly to the filter drum and project outwardly therefrom. In the construction shown, a plate 25 forms one end of the filter drum 26 and the ring of teeth 23 is secured thereto.

The number of teeth employed is selected to yield the desired synchronous speed. For example, with images reproduced at the rate of 120 fields per second, and with a 120-cycle synchronizing wave supplied to the phonic motor, 24 teeth will yield the proper synchronous speed for a 12-segment drum. For other conditions, the number of teeth may be changed in accordance with considerations well known in the art.

The synchronizing wave is supplied to the field coils of yokes 24, and may be obtained in any desired manner, for example, from the vertical synchronizing pulses or scanning wave. The specific embodiment shown employs a pair of yokes, but this number may be increased if desired.

By attaching the armature of the phonic motor directly to the filter drum in proper orientation with respect to the filter segments, the proper phasing of the drum with respect to the scanning of the image is facilitated.

It will be observed that by constructing the scanning tube so that the elongated neck extends at an angle with respect to the scanning area, the drum need encircle only the bulbous portion of the tube to be in proper position with respect to the scanning area. Thus the peripheral surface of the drum may pass closely adjacent the scanning area and substantially parallel thereto (in the horizontal plane), and yet may be of smaller diameter than if it were required to encircle the entire tube. This permits a substantial saving in space in the receiver, a consideration which is of considerable importance.

In operation, the number of segments of the drum and the circumferential length thereof may be selected as desired. For example, they may be chosen so that the filter segments traverse the scanning area in a vertically (low frequency) direction at substantially the same speed as that at which lines are scanned. Or, the height of the filter segments may be made less than that of the scanning area, in accordance with the considerations disclosed in the application of John N. Dyer, supra. In general it is considered advantageous to orient the axis of the drum so that the front edge of the drum extends generally parallel to the scanning area in a lateral direction, as shown in Fig. 2.

Referring now to the specific embodiments of Figs. 5–7, a cathode-ray receiver tube 31 is shown having a bulbous portion 32, a fluorescent screen 33 and an elongated neck 34 in which is positioned the electron gun 35. In this tube the neck is approximately at right angles with respect to the normal to the fluorescent screen 33, and a coil 36 is provided to bend the electrons in the scanning beam through an angle of approximately 90° so as to impinge on the fluorescent screen. Coil 36 may be an electro-magnet energized by a suitable source of direct current, as desired. Deflecting and focussing coils 37 and 38 are provided to cause the cathode-ray beam 39 to scan the fluorescent screen in the usual manner.

Encircling the bulbous portion of the cathode-ray tube is drum 41 having arranged around the peripheral surface thereof six color filter segments comprising two sets of red, green and blue filters denoted 42R, 42G and 42B. Instead of six filter segments, twelve segments may be employed, or any other desired number.

It will be observed that by bending the neck at right angles to the normal to the fluorescent surface, and by having the drum closely encircle the tube, a very compact assembly is obtained. It will be understood that although the scanning area of the cathode-ray receiver tube is commonly not flat, it is sufficiently close to being flat so that the term "normal" can be employed with adequate clearness.

In the embodiment of Figs. 5–7 the neck projects beyond the boundaries or confines of the drum in the axial direction, while in Figs. 1–4 it also projects beyond the peripheral surface.

The operation of the apparatus of Figs. 5–7 is similar to that of Figs. 1–4. It will be understood that the number of colors, number of segments, speed of rotation, etc. may be chosen as desired in view of the particular scanning system employed.

It will be understood that the present invention is not limited to the mere details of construction and arrangement of the parts disclosed, since many modifications may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. In color television, apparatus which comprises an electronic scanning device comprising an envelope having a bulbous portion and an elongated neck extending therefrom, a two-dimensional scanning area positioned within said bulbous portion with the normal thereto at a substantial angle with respect to said neck, an electron gun structure within said neck, and a rotatable filter drum having a plurality of filter segments arranged around the peripheral surface thereof, said drum encircling said bulbous portion and being positioned so that as the drum rotates said filter segments successively traverse said scanning area, said elongated neck extending beyond the boundaries of said drum.

2. In color television, apparatus which comprises an electronic scanning device comprising an envelope having a bulbous portion and an elongated neck extending therefrom, a two-dimensional scanning area positioned within said bulbous portion with the normal thereto at a substantial angle with respect to said neck, an electron gun structure within said neck for generating an electron beam for scanning said area, and a rotatable filter drum having a plurality of filter segments arranged around the peripheral surface thereof, said drum encircling said bulbous portion and being positioned so that as the drum rotates said filter segments successively traverse said scanning area, the diameter of said drum being less than the length of said scanning device and said elongated neck extending beyond the periphery of said drum.

3. In a color television receiver, apparatus which comprises a cathode-ray receiver tube comprising an envelope having a bulbous portion and an elongated neck extending therefrom, a luminescent screen positioned within said bulbous portion with the normal to the screen at a substantial angle with respect to said neck, an electron gun structure within said neck, means for scanning a two-dimensional area of said screen with an electron beam from said gun to reproduce images thereon, and a rotatable filter drum having a plurality of filter segments arranged around the peripheral surface thereof, said drum encircling said bulbous portion and being positioned so that as the drum rotates said filter segments successively traverse said luminescent screen to thereby exhibit images thereon successively in different colors, said elongated neck extending beyond the confines of said drum.

4. In a color television receiver, apparatus which comprises a cathode-ray receiver tube comprising an envelope having a bulbous portion and an elongated neck extending therefrom, a luminescent screen positioned within said bulbous portion with the normal to the screen at a substantial angle with respect to said neck, an electron gun structure within said neck, means for scanning a two-dimensional area of said screen with an electron beam from said gun in a plu-

rality of side-by-side lines to reproduce images thereon, and a rotatable substantially cylindrical filter drum having a plurality of filter segments arranged around the peripheral surface thereof, said drum encircling said bulbous portion and being positioned to rotate about an axis substantially parallel with the image area so that said filter segments successively traverse said scanning area, said elongated neck extending beyond the boundaries of said drum.

5. In a color television receiver, apparatus which comprises a cathode-ray receiver tube comprising an envelope having a bulbous portion and an elongated neck extending therefrom, a luminescent screen positioned within said bulbous portion with the normal to the screen at a substantial angle with respect to said neck, an electron gun structure within said neck, means for producing a magnetic field positioned between said electron gun and said screen to produce a substantially constant angular deviation of the electron beam from said gun to cause said beam to impinge the screen, means for deflecting said electron beam to scan a two-dimensional area of said screen to reproduce images thereon, and a rotatable filter drum having a plurality of filter segments arranged around the peripheral surface thereof, said drum encircling said bulbous portion and being positioned so that as the drum rotates said filter segments successively traverse said luminescent screen to thereby exhibit images thereon successively in different colors.

6. In color television, apparatus which comprises an electronic scanning device comprising an envelope having a bulbous portion and an elongated neck extending therefrom, a two-dimensional scanning area positioned within said bulbous portion with the normal thereto at a substantial angle with respect to said neck, an electron gun structure within said neck for generating an electron beam for scanning said area, means for deflecting said electron beam to scan said scanning area in a plurality of laterally extending side-by-side lines, and a rotatable filter drum having a plurality of filter segments arranged around the peripheral surface thereof, said drum encircling said bulbous portion and being positioned with the front edge thereof extending generally parallel to said scanning area in a lateral direction so that as the drum rotates said filter segments successively traverse said scanning area in substantially the low-frequency direction, the diameter of said drum being less than the length of said scanning device and said elongated neck extending beyond the periphery of said drum.

7. In a color television receiver, apparatus which comprises a cathode-ray receiver tube comprising an envelope having a bulbous portion and an elongated neck extending therefrom, a luminescent screen positioned within said bulbous portion adjacent the envelope thereof with the normal to the screen at a substantial angle with respect to said neck, an electron gun structure within said neck, means for scanning a two-dimensional area of said screen with an electron beam from said gun in a plurality of laterally extending side-by-side lines to reproduce images thereon, and a rotatable filter drum having a plurality of filter segments arranged around the peripheral surface thereof, said drum encircling said bulbous portion and being positioned with the front edge thereof extending generally parallel to said scanning area in a lateral direction so that as the drum rotates said filter segments successively traverse said luminescent screen in substantially the low-frequency direction to thereby exhibit images thereon successively in different colors, said elongated neck extending beyond the confines of said drum.

PETER C. GOLDMARK.