Jan. 8, 1952 H. G. DE FRANCE ET AL 2,582,014

SCANNING DEVICE FOR TELEVISION TRANSMITTERS

Filed May 4, 1949 2 SHEETS—SHEET 1

Fig. 1.

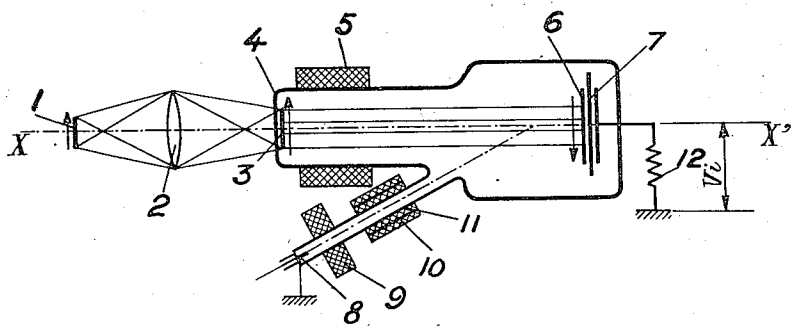

Fig. 2

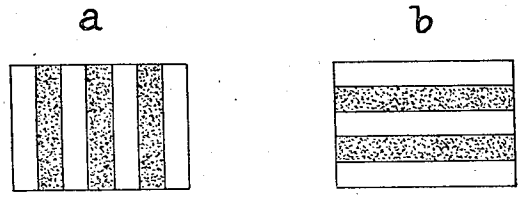

Fig. 3.

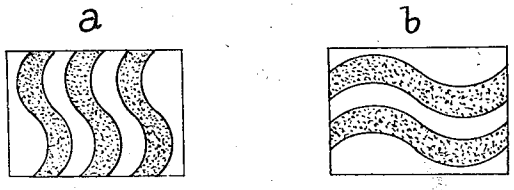

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Fig. 4.

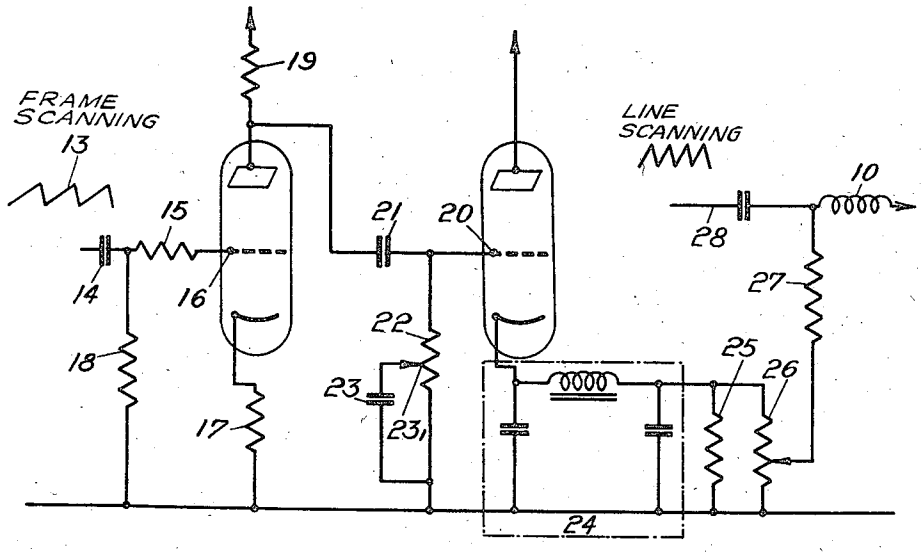
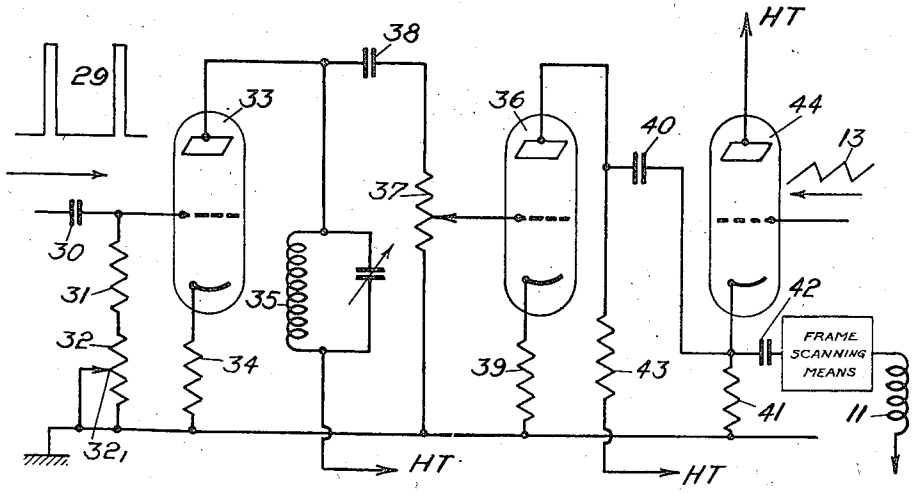


Fig. 5.



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SCANNING DEVICE FOR TELEVISION TRANSMITTERS

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6 Claims. (Cl. 315—24)

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Our invention relates to electron scanning devices for television transmitters.

Its chief object is to provide a device of this kind which is better adapted to meet the requirements of practice than those used up to this time for the same purpose.

It consists chiefly in providing devices of the kind in question with correcting means capable of modifying the direction of the scanning beam in order to correct defects of the image to be analyzed.

Preferred embodiments of our invention will be hereinafter described, with reference to the accompanying drawings, given merely by way of example, and in which:

Fig. 1 shows, in diagrammatic section, a television analyzer tube to which the invention may be applied;

Fig. 2 shows, at *a* and *b*, vertical and horizontal strips belonging to the picture to be reproduced;

Fig. 3 shows, at *a* and *b*, the same strips subjected to the deformation effect which the invention is to eliminate.

Figs. 4 and 5 show embodiments of means for correcting scanning in a tube of this kind shown by Fig. 1.

The analyzer tube shown by Fig. 1 is of conventional construction. An image of the object to be televised is projected through an optical system 2 onto a photocathode 3 included in tube 4. This photocathode releases electrons proportionally to illumination, and the resulting emission is focused by electron means 5 upon a target 6 where the coil image thus formed produces a charge image with respect to a metal plate 7 through a process of secondary emission.

This target 6 is subjected to the action of a scanning beam produced by a hot cathode 8, concentrated through other coil means 9 and deflected by two deflecting coils 10, 11 in the horizontal and vertical directions respectively. This beam gives back to each element the number of electrons lost through secondary emission and thus produces a corresponding current through resistance 12 across the terminals of which the useful image voltage V_1 is collected.

Now, it has been found that the path of travel of the electrons issued from photocathode 3 is not truly parallel to axis XX', but is helicoidal, so that the whole of the image on target 6 is rotated through about 45° with reference to that produced by photocathode 3. The angle of rotation depends upon the field of focusing coil 5. Besides, this angle is not the same for all the points, and varies according as the point that is being considered is more or less remote from the center of image, i. e. from axis XX'. Thus two

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vertical (Fig. 2, *a*) or horizontal (Fig. 2, *b*) strips are deformed into sinuous shapes such as disclosed by Fig. 3, at *a* and *b*. In the remainder of the description and in the claims, this will be called S distortion.

In order to remedy this drawback, according to our invention, scanning of the electron image is performed in accordance with the deformation thereof, so as to permit of creating, at the output of the tube, the same voltages as if this deformation did not exist.

For this purpose, we may proceed, among other advantageous ways, as follows.

Concerning first the deformations of the vertical strips or lines (Fig. 3, *a*), that is to say deformations taking place in the horizontal direction, or direction of the scanning lines, the desired correction can be obtained by superimposing on the line scanning deflecting voltages or currents an approximately sinusoidal voltage or current of a frequency equal to the frame scanning frequency, say 50 periods per second.

Concerning the deformations of the horizontal strips (Fig. 3, *b*), i. e. deformations taking place in the vertical direction, in order to obtain the desired correction, that is to say to obtain a line scanning not along straight lines but along sinuous lines, substantially sinusoidal voltages or currents of a frequency equal to line scanning frequency should be superimposed on the frame scanning deflecting voltages or currents.

Besides, it should be well understood that these correcting voltages or currents may be applied either to the existing deflecting coils 10, 11 or to coils, or other deflecting means, distinct from coils 10, 11.

The means for obtaining the correcting voltages or currents may be devised in many ways, advantageously by making use of the scanning saw teeth which are modified in suitable circuits so as to transform them into sinusoidal voltages, in particular as follows.

In order to correct the defect of Fig. 3, *a*, we start from the frame scanning saw tooth, which is deformed and brought out of phase so as to obtain therefrom a more or less distorted sinusoid according to the cut-off frequency of a low-pass filter or the like.

Thus, according to the embodiment of Fig. 4, the frame scanning saw-tooth signal 13 is supplied through a coupling capacitor 14 and a high resistor 15 to the grid of a tube 16 which is biased for instance by a cathode resistor 17 and a grid leak resistor 18. Resistor 15 rounds off the shape of the saw tooth, whereby a somewhat sinusoidal signal is obtained across a load resistor such as 19. This signal is applied to tube 20 through a

phase changing system 21, 22, 23, advantageously adjustable at 23_1.

The plate of this tube 20 is connected with the high voltage whereas there is inserted on the cathode a low-pass filter 24 which determines the necessary rate of harmonics. The circuit of this tube is closed on cathode resistor 25, and a potentiometer 26 of high resistance permits of coupling the value of the voltage thus obtained.

This correction voltage is then injected for instance in series with a leak resistor 27 belonging to the line scanning 28 (not shown).

According to the embodiment of Fig. 4, in order to correct the defect of Fig. 3*b*, we make use, for instance, of line scanning synchronizing pulses 29, which are applied to a tube 35 through a derivation cell 30, 31, 32, advantageously adjustable at 32_1.

The plate of this cell is connected with a circuit 35 tuned to the line frequency.

There is thus obtained across the terminals of this circuit a sinusoidal voltage at line scanning frequency and out of phase, the phase position of which with respect to the line pulses is variable according to the degree of derivation in cell 30, 31, 32. This derivation permits of obtaining a fine phase adjustment.

The sinusoidal voltage thus obtained is amplified in a tube 36 and a potentiometer 37 permits of adjusting its value. A condenser 38 acts as connection and a resistor 39 supplies bias.

At the output of tube 36, the useful plate voltage is obtained across a low load resistor 41 which is advantageously constituted by the cathode resistor of the amplifier tube 44 of the frame saw tooth 13.

The frame scanning tube is then subjected to the action of the cathode of said tube 44, through a capacitor 42. It should be noted that capacitor 40 acts as a connection whereas resistor 43 serves to the supply of the plate of tube 36.

Our device has the advantage of making it possible to avoid S distortion.

In a general manner, while we have, in the above description, disclosed what we deem to be practical and efficient embodiments of the present invention, it should be well understood that we do not wish to be limited thereto as there might be changes made in the arrangements, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What we claim is:

1. In combination with a television camera tube including a photocathode, a target, electron optics means for directing the electrons released by said photocathode onto said target to form an electron image thereon, and an electron beam scanning device including means for deflecting the electron beam in the horizontal direction, means for deflecting the electron beam in the vertical direction and means for supplying each of said deflecting means with respective periodically varying voltages, means for superimposing on the voltage supplied to the means for deflecting the beam in one of said directions in at least substantially sinusoidal correcting voltage of a frequency equal to that of the voltage supplied to the means for deflecting the beam in the other direction and of a phase adjusted to obtain at least partial compensation of the S distortion of said electron image.

2. In combination with a television camera tube including a photocathode, a target, electron optics means for directing the electrons released by said photocathode onto said target to form an electron image thereon and an electron beam scanning device including line scanning means, frame scanning means and means for producing saw-tooth voltage variations to operate each of said scanning means respectively, means responsive to one of said saw-tooth voltage variations for producing a substantially sinusoidal voltage variation and superimposing it on the other saw-tooth voltage variation in correct phase relation to compensate for S distortion of said electron image.

3. In combination with a television camera tube including a photocathode, a target, electron optics means for directing the electrons released by said photocathode onto said target to form an electron image thereon and an electron beam scanning device including line scanning means, frame scanning means and means for producing saw-tooth voltage variations to operate each of said scanning means respectively, means responsive to frame scanning saw-tooth voltage variations for producing a substantially sinusoidal voltage variation and superimposing it on the line scanning saw-tooth voltage variation in correct phase relation to compensate for S distortion of said electron image.

4. A combination according to claim 3 in which the last mentioned means include a capacitor and resistor device for flattening the saw-tooth signal wave-form, a tube connected with the output of said device so as to receive on its grid said flattened signal and means connected with said tube for changing the phase of the substantially sinusoidal signal supplied by said tube.

5. In combination with a television camera tube including a photocathode, a target, electron optics means for directing the electrons released by said photocathode onto said target to form an electron image thereon and an electron beam scanning device including line scanning means, frame scanning means, means for producing voltage pulses to control said line scanning means, and means for producing said tooth voltage variations to operate said frame scanning means, means responsive to said pulses for producing a substantially sinusoidal voltage variation and superimposing it on said saw tooth voltage variation in correct phase relation to compensate for S distortion of said electron image.

6. A combination according to claim 5 in which the last mentioned means include derivation means for deforming said line pulse signals, a tube connected with the output of said derivation means to amplify said deformed signals and a potentiometer for adjusting the voltage obtained.

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