March 24, 1936. T. NAKASHIMA ET AL 2,034,704

TELEVISION RECEIVING SYSTEM

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Fig. 1.

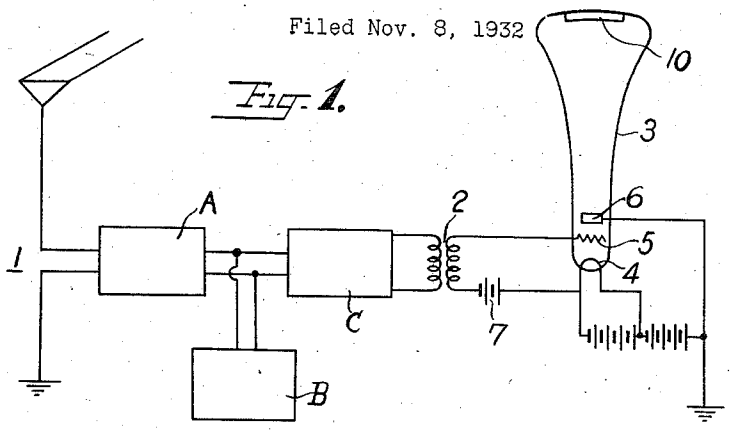


Fig. 2.

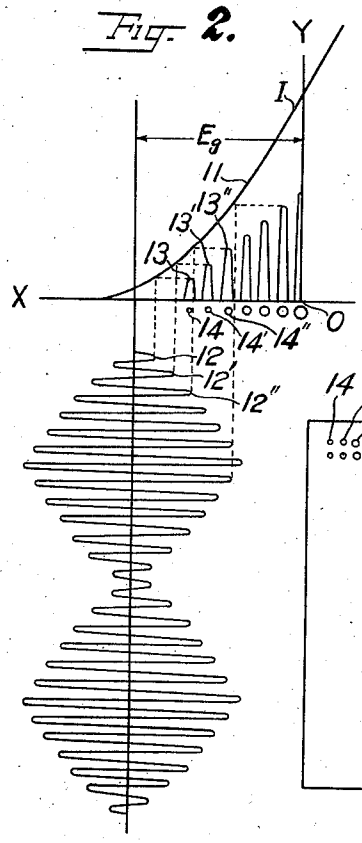
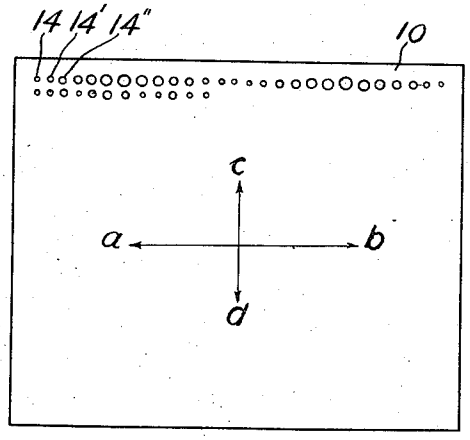


Fig. 3.



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TELEVISION RECEIVING SYSTEM

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3 Claims. (Cl. 178—6)

Our invention relates to improvements in television receiving systems, and more particularly to the system specified in which a cathode-ray tube or Braun tube is utilized for reproduction of received images.

In the television receiving system of the kind specified, the intensity of cathode ray of the Braun tube at a receiving station represents the brilliancy of successive view- or picture-points scanned by a light-beam at a sending station, and the position of each view-element on the televised view is determined on the screen of the Braun tube by suitable deflections of the cathode ray, as is well-known in the art.

Heretofore, the reproduced images on the screen of Braun tube include streaks, straight or arcuate, corresponding to the scanning lines of the cathode ray, due to the fact that the intensity of cathode ray changes in substantially a continuous manner between successive view-elements, while the ray moves continuously on the screen. Such streaks are not desirable for received images, because they obstruct clear perception of the received images.

It is therefore an object of our invention to provide means for so reproducing the image on the Braun-tube screen that there is no such undesirable streaks perceived on the image.

It is another object of our invention to obtain means for causing the cathode ray to have an intensity representative of the brilliancy of the corresponding view-element at the sending station, and in the form of a point at such a position only on the Braun-tube screen that corresponds to the said picture points.

A further object of our invention is to provide a television receiving system wherein received carrier-waves of radio-frequency with image-modulation are transformed to mid-frequency waves with the same modulation for controlling the intensity of cathode ray. The mid-frequency corresponds to number of picture points scanned per second.

There are other objects and particularities of our invention, which will be apparent from the following description of a preferred embodiment of our invention, with reference to the accompanying drawing, wherein:—

Fig. 1 is a schematic diagram of a television receiving system embodying our invention.

Fig. 2 is a curve diagram illustrative of the principle underlying our invention.

Fig. 3 is a schematic representation of a constitution of the improved image on the Braun-tube screen.

Referring to Fig. 1, the system comprises an antenna system 1 for receiving radio-frequency carrier-waves with image-modulation, transmitted from a sending station, not shown. The received waves are amplified by an amplifying device A. The output terminals of the amplifier A is associated with a local oscillator B to obtain a beat frequency corresponding in number of cycles per second to the number of picture points scanned per second at the sending station, say two hundred-thousand cycles per second.

It will be understood that the size of each picture point corresponds to the sectional area of the scanning spot light or light-beam, and the number of picture points scanned per second may be assumed to be the ratio of the area scanned per second to the sectional area of the scanning light spot.

The resultant beat-frequency or beat-frequency waves have the same image-modulation with the received radio-frequency waves, and are amplified by an amplifying device C.

The devices A, B and C, per se, may be of any well-known construction and operation, and it will not be necessary to describe or illustrate the details thereof. The beat-frequency wave from the device C is applied through a transformer 2 to the grid circuit of a Braun-tube 3.

The Braun tube 3 comprises, as usual, a thermionic cathode 4, a control electrode or grid 5, an anode 6, and a fluorescence screen 10. The tube also comprises two sets of deflecting devices, not shown, for respectively deflecting the cathode ray from the cathode 4 in one direction, or in the direction *a*—*b* in Fig. 3, at the so-called scanning-frequency, and in the other direction vertical to the former, or in the direction *c*—*d* in Fig. 3, at the so-called framing-frequency. The deflecting devices themselves are well-known in the art, and any further description or illustration will not be necessary.

The potential of the grid 5 consists of two components, that is, the normal negative-biasing potential of a battery 7 and the secondary potential of the beat-frequency transformer 2.

As is well-known, the Braun tube 3 has a rectifying action, and if the normal negative-biasing potential E_g is suitably selected in accordance with the rectifying function imposed on the Braun tube, only the half waves of the beat-frequency oscillation act to control the electron stream in conjunction with the battery 7.

Referring to Fig. 2, the grid potential of the Braun tube 3 is plotted on the abscissa O—X, and the ordinate measures the intensity I of

cathode ray from the cathode 4. The grid 5 has a normal negative-biasing potential E_g, and as the negative potential of the grid decreases, the cathode-ray current I increases according to the characteristic curve 11.

The secondary potential of the transformer 2 is added to the normal biasing potential E_g, and owing to the characteristic curve 11, the negative half waves of the secondary potential cannot control the intensity I, but the positive half waves control the cathode-ray current I or the brilliancy of the Braun-tube screen 10, according to the image-modulation.

The secondary potential of the transformer 2 consists of spaced successive waves 12, 12', 12'', _ _ _, with image-modulation, and their number of occurrence per second is equal to the number of picture points scanned per second at the sending station, and the cathode-ray current occurs intermittently as shown by curves 13, 13', 13'', _ _ _ _, with intensity and at uniform intervals, corresponding to the intensity and period of the waves 12, 12' 12'', _ _ _, respectively, and the Braun-tube screen 10 is caused to fluoresce at successively spaced spots, while the cathode ray is being deflected, as schematically shown by circles 14, 14', 14'', _ _ _ _, the diameters of which appropriately represent the brilliancy of the corresponding spots, respectively.

Thus, according to our invention, the image on the screen 10 is constructed by series of spot-brilliance 14, 14', 14'', _ _ _, as shown in Fig. 3, with substantial mutual separation, and perception of undesirable lines is obviated.

While we have shown only one embodiment of our invention, it will be recognized that this is only by way of illustration of general principles and that our invention is not limited to the particular means illustrated, but various changes, modifications and alterations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

We claim as our invention:—

1. A television receiving system, comprising an antenna system for receiving radio-frequency waves with image-modulation consisting of a number of picture points, a local oscillation-generator so associated with said antenna system as to produce local beat frequency oscillation with the same image-modulation, said beat frequency being equal to the number of picture points per second, a cathode-ray producing device having a control electrode, a negative bias for said control electrode to give said device rectifying feature, and means for supplying said beat frequency oscillation to said control electrode whereby no streak is perceived on the image.

2. A television receiving system, comprising an antenna system for receiving radio-frequency waves with image-modulation consisting of a number of picture points, an amplifying device energized from said antenna system, a local oscillation-generator so associated with said amplyfying device as to produce local beat frequency oscillation with the same image-modulation, said beat frequency being equal to the number of picture points per second, amplifying devices for said beat frequency waves, a Braun tube having a control electrode, a negative bias for said control electrode to give said Braun tube rectifying feature, and means for applying said beat frequency oscillation to said control electrode whereby no streak is perceived on the image.

3. A television receiving system, comprising an antenna system for receiving radio-frequency waves with image-modulation consisting of a number of picture points, a local oscillation-generator so associated with said antenna system as to produce local beat frequency oscillation with the same image-modulation, said beat frequency being equal to the number of picture points per second, an amplifying device for said beat frequency oscillation, a Braun tube having a control electrode, a negative bias for said electrode to give said Braun tube rectifying feature, and means for adding the effect of said beat frequency oscillation to said bias in the opposite sense thereto whereby no streak is perceived on the image.

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