

Dec. 3, 1940.

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TELEVISION APPARATUS

2,223,983

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2 Sheets-Sheet 1

FIG. 1.

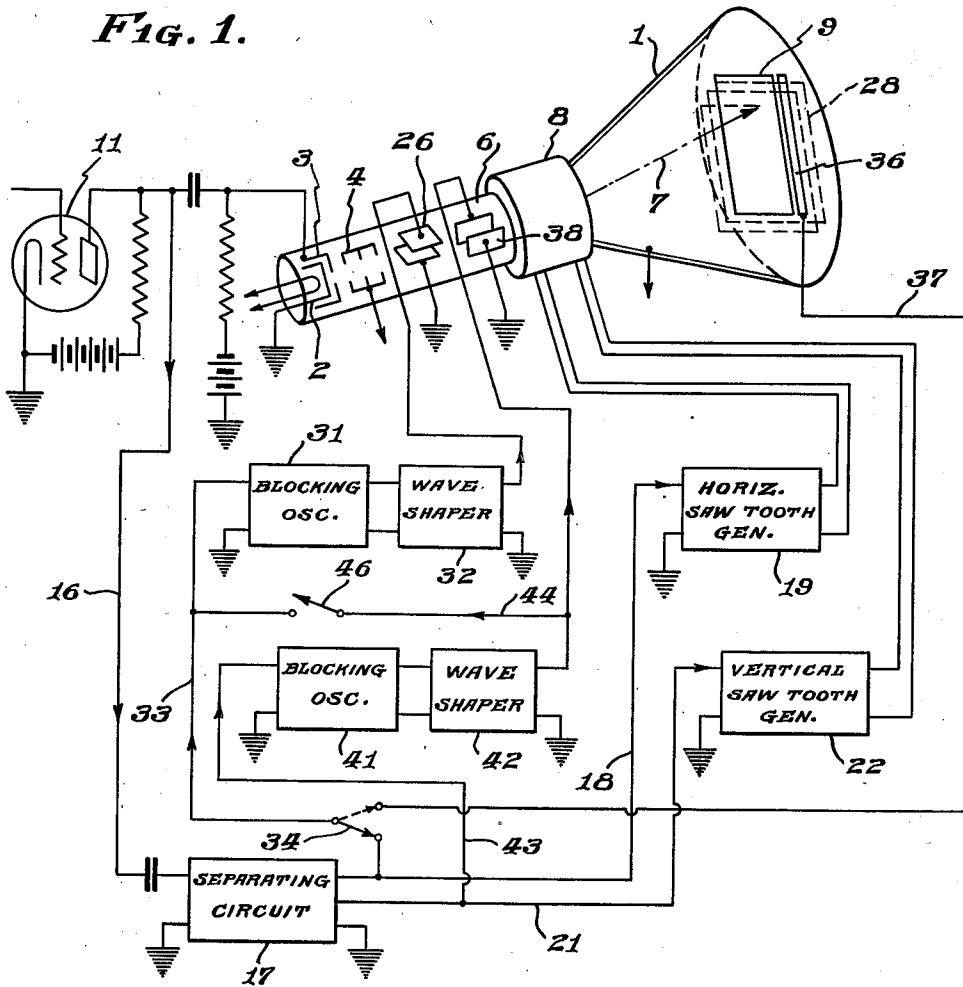


FIG. 2.

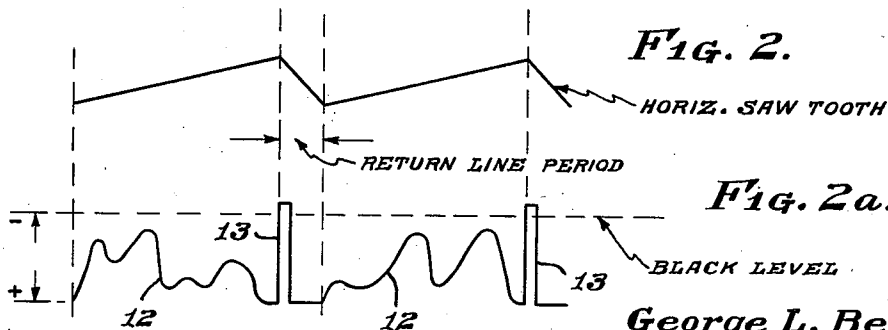


FIG. 2a.

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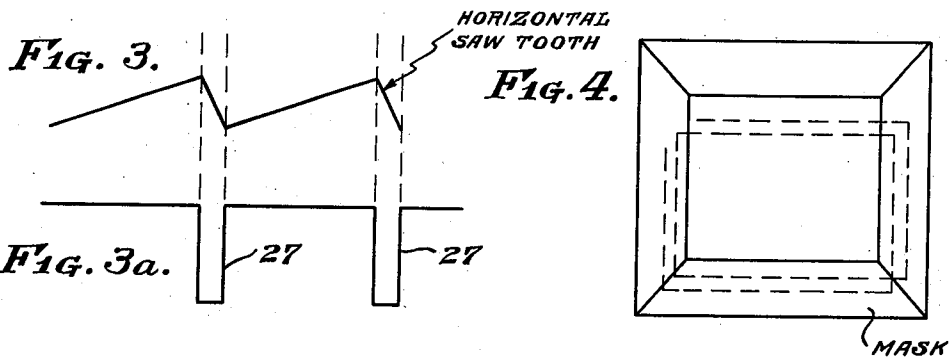
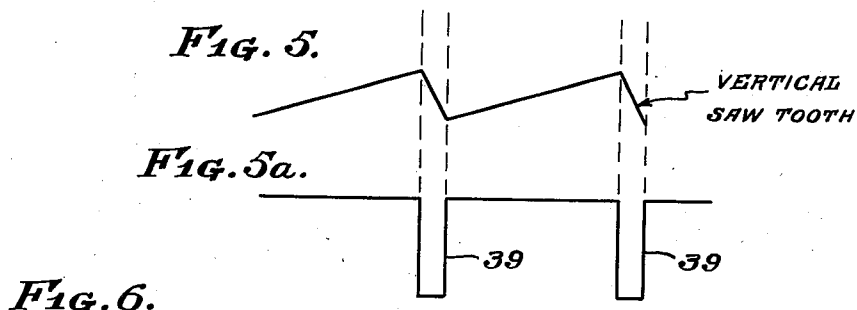
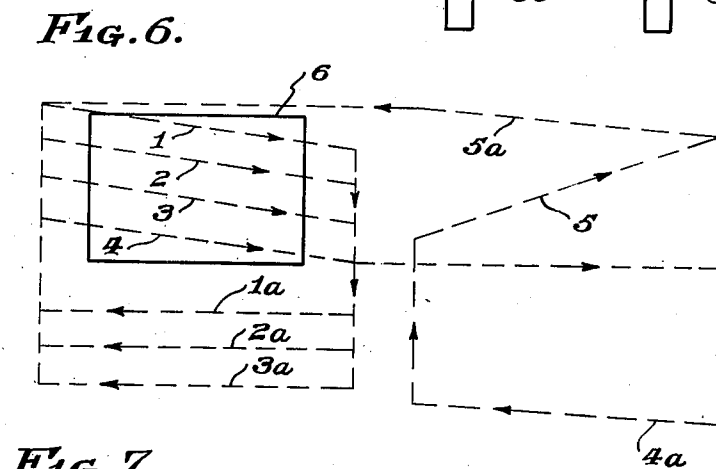
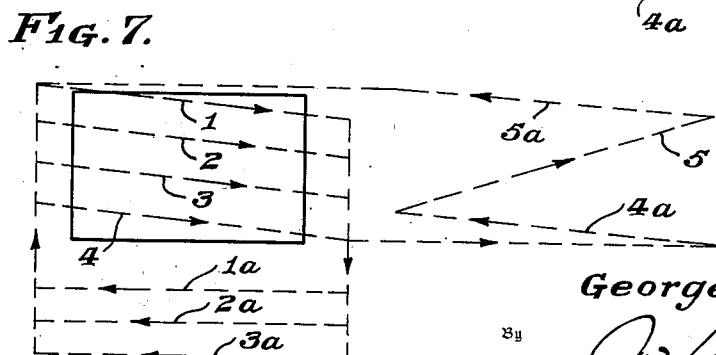
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2 Sheets-Sheet 2



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2,223,983

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Application May 28, 1938, Serial No. 210,587

4 Claims. (Cl. 178—7.7)

My invention relates to cathode ray tube apparatus and more particularly to television transmitters and receivers of the type utilizing cathode ray tubes.

5 In television transmitters and receivers, in particular, it is the practice to deflect a cathode ray horizontally at a high frequency and vertically at a comparatively low frequency whereby the screen surface such as the mosaic of the transmitter tube or the fluorescent screen of the receiver tube is scanned. Preferably, both the horizontal deflection and the vertical deflection are effected by means of saw-tooth waves.

10 Regardless of the shape of the deflecting waves, there are produced on the screen surface undesirable return traces for both the horizontal and the vertical deflection unless suitable precautions are taken.

15 It is, accordingly, the object of my invention to provide a novel method of and means for eliminating the above-mentioned return traces.

20 In practicing my invention, the cathode ray, after it has been deflected across the screen surface, is deflected away from the immediate vicinity of the screen surface during the return line period whereby the return trace is off the screen. This may be accomplished by providing the cathode ray tube with additional deflecting means such as deflecting plates and supplying special
25 deflecting waves such as rectangular deflecting waves to such deflecting means.

30 The invention will be better understood by referring to the following description taken in connection with the accompanying drawings in which

35 Figure 1 is a schematic diagram showing one embodiment of my invention,

Figures 2, 2a, 3 and 3a are curves which are referred to in explaining the invention,

40 Figure 4 is a view showing how the return traces may be masked off,

Figures 5 and 5a are other curves which are referred to in explaining the invention,

45 Figure 6 is a view showing the scanning pattern produced by one embodiment of my invention, and

Figure 7 is a view showing the scanning pattern produced by another embodiment of my invention.

50 Referring to Fig. 1, my invention is shown applied to a television receiver comprising a cathode ray tube 1 which preferably is of the highly evacuated type having therein an indirectly heated cathode 2, a control electrode 3, a first anode 4 and a second anode 6. The cathode ray

indicated at 7 preferably is electrostatically focused in a well known manner.

The cathode ray tube is provided with a suitable deflecting yoke 8 whereby the cathode ray 1 may be caused to scan a screen surface such as a fluorescent screen 9 on the end of the tube envelope.

Picture signals and synchronizing impulses are supplied to the control electrode 3 through an amplifier tube 11. It may be assumed for the purpose of illustration that this composite signal comprising picture signals and synchronizing impulses has been generated in accordance with the teachings of the Vance British Patent 395,499. A signal of this type is illustrated in Fig. 2a where the picture signals are indicated at 12 and the horizontal synchronizing impulses at 13.

In Fig. 2a the vertical synchronizing or framing impulses are not illustrated but it will be understood that horizontal synchronizing impulses 13 are transmitted at the end of each scanning line and that the framing impulses are transmitted at the end of each picture frame. The horizontal synchronizing impulses and the framing impulses have substantially the same amplitude (an amplitude corresponding to "blacker than black," for example), the framing impulses being of longer duration than the horizontal synchronizing impulses to facilitate frequency separation of the two groups of synchronizing impulses. It may be noted at this point, however, that my invention is especially applicable to a system in which the synchronizing impulses have a polarity in the direction of "white."

The composite signal is also supplied over a conductor 16 to a suitable separating circuit 17 which removes the picture signals from the synchronizing impulses and which also separates the horizontal synchronizing impulses from the vertical synchronizing impulses. The separating circuit may be of the type described and claimed in Patent No. 2,207,839, issued July 16, 1940, in the name of William A. Tolson and assigned to Radio Corporation of America.

The horizontal synchronizing impulses are supplied over a conductor 18 to a suitable saw-tooth generator 19 which supplies saw-toothed deflecting current to the horizontal deflecting coils included in the yoke 8. Likewise, vertical synchronizing impulses are supplied over a conductor 21 to a suitable saw-tooth generator 22 which supplies comparatively low frequency saw-tooth current to the vertical deflecting coils included in the yoke 8. The saw-tooth generators 19 and 22 may be of any suitable type such as that

described in Tolson et al. Patent 2,101,520, dated December 7, 1937.

The yoke 8 preferably is of the type described and claimed in Patent No. 2,167,379, issued July 25, 1939, in the name of William A. Tolson and assigned to Radio Corporation of America.

By referring to Figs. 2 and 2a, it will be seen that it is proposed to omit blanking signals from the composite signal whereby the cathode ray tube will not be driven to cut-off to block the cathode ray during the return line period; that is, comparing the curves of Figs. 2 and 2a where the curve in Fig. 2 represents the horizontal deflecting saw-tooth wave, it will be seen that the synchronizing impulses 13 last for only a fraction of the return line period whereby only a small part or none of the return trace on the fluorescent screen 9 is eliminated.

In accordance with my invention, the return trace may be completely eliminated without the use of the so-called blanking signals by providing the cathode ray tube with auxiliary deflecting means such as the deflecting plates 26 and by supplying a deflecting impulse to this additional deflecting means. The additional deflecting impulse, where the deflecting means 26 is a pair of deflecting plates, preferably is an impulse voltage 27 such as shown in Fig. 3a. This impulse occurs during the return line period as will be seen by comparing the curves of Figs. 3 and 3a, the curve in Fig. 3 representing the horizontal saw-tooth deflecting wave. As a result, the cathode ray 7 is caused to trace a path of a character indicated by the dotted lines 28 on the end of the cathode ray tube.

Referring to the dotted line trace 28, it will be seen that at the end of each scanning line the cathode ray 7 is deflected below the bottom of the fluorescent screen 9 whereby the return trace is below the screen surface. At the end of the return trace, the cathode ray is deflected upwardly to the proper position to begin the next scanning line. Thus, it will be evident that there is no return trace on the screen surface.

The auxiliary deflecting impulse 27 may be generated in a variety of ways but since, for a cathode ray tube of the type illustrated, it should be of rather large amplitude, it preferably is generated by means of a blocking oscillator 31 and a suitable wave-shaping circuit indicated at 32. The blocking oscillator 31 may be designed as taught in the above identified Tolson et al. patent. Preferably, the grid circuit of the blocking oscillator is connected through a conductor 33 and a switch 34 to the conductor 18 which supplies horizontal synchronizing impulses. With this circuit connection, the horizontal synchronizing impulses trigger off the blocking oscillator whereby voltage impulses of great amplitude appear in its output circuit. These impulses are passed through the wave-shaper 32 which reshapes the blocking oscillator impulses to produce the rectangular impulses 27. It will be understood that the wave shaper 32 may include clipping tubes and any other circuit elements necessary for producing the rectangular impulses 27 as is well known in the art.

As indicated in Fig. 4, a mask may be placed over the end of the cathode ray tube 1 to mask off the lines caused by the return line traces of the cathode ray 7 in the event that the fluorescent material covers the entire end of the cathode ray tube envelope instead of being confined to the area indicated by the reference numeral 9. As a matter of fact, the return deflection is so

fast that the return line trace will be faint as compared with the scanning lines.

Instead of controlling the blocking oscillator 32 by means of the horizontal synchronizing impulses it may be preferred to utilize a conducting strip 36 which is struck by the cathode ray at the end of each scanning line. Each time the cathode ray strikes the strip 36 an electrical impulse is transmitted over the conductor 37 and through the switch 34, which now is in the dotted line position, to the blocking oscillator 31 whereby the impulse 27 is produced to deflect the cathode ray below the screen surface during the return line period.

So far there has been described only the means for eliminating the return line trace caused by the horizontal deflection. The return line trace of the vertical deflection may be eliminated in a similar manner by employing deflecting means such as the deflecting plates 38 which are positioned to deflect the cathode ray at right angles to the deflection caused by the plates 26. The deflecting plates 38 have applied thereto rectangular voltage impulses occurring at the frequency rate of the vertical deflection. Such impulses are indicated at 39 in Fig. 5a.

As shown by a comparison of the curves in Figs. 5 and 5a (the curve in Fig. 5 representing the vertical saw-tooth), the impulses 39 occur during the vertical return line period. They may be produced at the proper frequency by means of a blocking oscillator 41 and a wave-shaping circuit 42, these units preferably being of a design corresponding to the design of units 31 and 32, respectively.

The blocking oscillator 41 is connected through a conductor 43 to the conductor 21 whereby vertical synchronizing impulses are supplied thereto for the purpose of triggering off the blocking oscillator at the end of each picture frame whereby the cathode ray is deflected to one side of the screen 9 during the vertical return period. As a practical matter, the deflection caused by the plates 38 during the vertical return period would probably be sufficient to deflect the cathode ray 7 against the neck or side of the cathode ray tube envelope. If this were not the case, however, and if, also, the cathode ray were not deflected against the neck of the tube by the plates 26, as would probably be the case, the complete pattern traced by the cathode ray would be as shown in Fig. 6. For the purpose of simplifying the diagram, only four scanning lines have been indicated. It will be seen that the first scanning line, line No. 1, moves to the right across the screen 9 and is then deflected vertically and downwardly where it is held during the return line trace 1a. This action is repeated for successive scanning lines, the lines 2, 3 and 4 representing the additional scanning lines and the lines 2a, 3a and 4a representing the corresponding return line traces. It will be seen that at the end of the picture frame, that is, at the end of the scanning line 4, the cathode ray is deflected to one side of the screen 9, whereby the vertical return line traces 4a, 5 and 5a are off the screen surface.

In the diagram shown in Fig. 6, the deflecting plates 26 continue to be effective during the return line trace. There is no objection to this but it can be avoided by feeding the impulse 39 which appears in the output of the wave-shaper 42 through a conductor 44 and a switch 45 to the grid of the blocking oscillator 31 whereby it is blocked or rendered inactive during the vertical

return line portion. When this is done, the pattern traced by the cathode ray 7 is that shown in Fig. 7.

It will be understood that the apparatus illustrated in Fig. 1 may be modified in various ways without departing from the spirit and the scope of the invention. For example, the deflecting plates 26 and 38 may be replaced by suitable electromagnetic deflecting means. If desired, such deflecting means may be combined with the deflecting yoke 8. Or, if preferred, deflecting plates corresponding to plates 26 and 38 may be incorporated in the cathode ray tube as part of the gun structure whereby the deflecting voltages applied thereto may be of relatively small amplitude. It should be understood that my invention applies equally well to television transmitter tubes where, in place of a fluorescent screen 9, there is a mosaic of photoelectric elements, or the like.

It should also be understood that my invention is especially adapted for use in a system where the picture signals and the synchronizing signals are transmitted over separate channels. In such a system the picture signals only would be applied to the control electrode 3 of the cathode ray tube while the synchronizing signals would be applied to a circuit corresponding to the separating circuit 17. Where a composite signal consisting of picture signals and synchronizing impulses is transmitted, my invention makes it possible to reverse the polarity of the synchronizing impulses with respect to the polarity shown in Fig. 2a. In other words, the synchronizing impulses may be impressed upon the control grid with a positive polarity and the return line traces still avoided in accordance with my invention.

It will be apparent that various other modifications may be made in my invention without departing from the spirit and scope thereof and I desire therefore that only such limitations shall be placed thereon as are necessitated by the prior art and are set forth in the appended claims.

I claim as my invention:

1. In combination, a cathode ray tube having therein a certain screen area to be scanned and including means for producing a cathode ray, a deflecting device for deflecting said ray horizontally, a deflecting device for deflecting said ray vertically, means for impressing a deflecting wave upon said first deflecting device to produce a useful deflection and a return deflection, means for impressing a comparatively low frequency deflecting wave upon said second deflecting device to produce a useful deflection and a return deflection, an additional deflecting device for deflecting said ray vertically, a second additional deflecting device for deflecting said ray horizontally, means for impressing a deflecting wave upon said first additional deflecting device during each horizontal return deflection, and

means for impressing a deflecting wave upon said second additional deflecting device during each vertical return deflection, said last two deflecting waves having sufficient amplitude to hold said ray off said screen area during said return deflections.

2. In combination, a cathode ray tube having therein a certain screen area to be scanned and including means for producing a cathode ray, a deflecting device for deflecting said ray in one direction, means for impressing a deflecting wave upon said deflecting device to produce a useful deflection and a return deflection, an additional deflecting device for deflecting said ray in a direction substantially at right angles to said one direction, and means for impressing a deflecting wave upon said additional deflecting device during each return deflection, said last deflecting wave having sufficient amplitude to hold said ray off said screen area during said return deflection, wherein said first deflecting wave has a sawtooth wave form and wherein the deflecting wave impressed upon said additional deflecting device is approximately rectangular in shape.

3. In combination, a cathode ray tube having therein a certain screen area to be scanned and including means for producing a cathode ray, a deflecting device for deflecting said ray in one direction, an auxiliary deflecting device for deflecting said ray in a direction substantially at right angles to said one direction, means comprising a deflecting wave generator for impressing a deflecting wave upon said first deflecting device to produce a useful deflection and a return deflection, means comprising a blocking oscillator for impressing a deflecting wave upon said additional deflecting device during said return deflection, and means for impressing synchronizing impulses upon both said deflecting wave generator and said blocking oscillator.

4. In combination, a cathode ray tube having therein a certain screen area to be scanned and including means for producing a cathode ray, a deflecting device for deflecting said ray in one direction, an auxiliary deflecting device for deflecting said ray in a direction substantially at right angles to said one direction, means comprising a deflecting wave generator for impressing a deflecting wave upon said first deflecting device to produce a useful deflection and a return deflection, means comprising a blocking oscillator for producing a deflecting wave and impressing it upon said auxiliary deflecting device, a conducting strip adjacent to said screen area, and means comprising a connection from said conducting strip to said blocking oscillator for causing said blocking oscillator to produce the second mentioned deflecting wave during said return deflection.

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