

Sept. 1, 1942.

J. C. WILSON

2,294,820

COLOR TELEVISION SIGNAL-TRANSLATING SYSTEM

Filed April 28, 1941

2 Sheets-Sheet 1

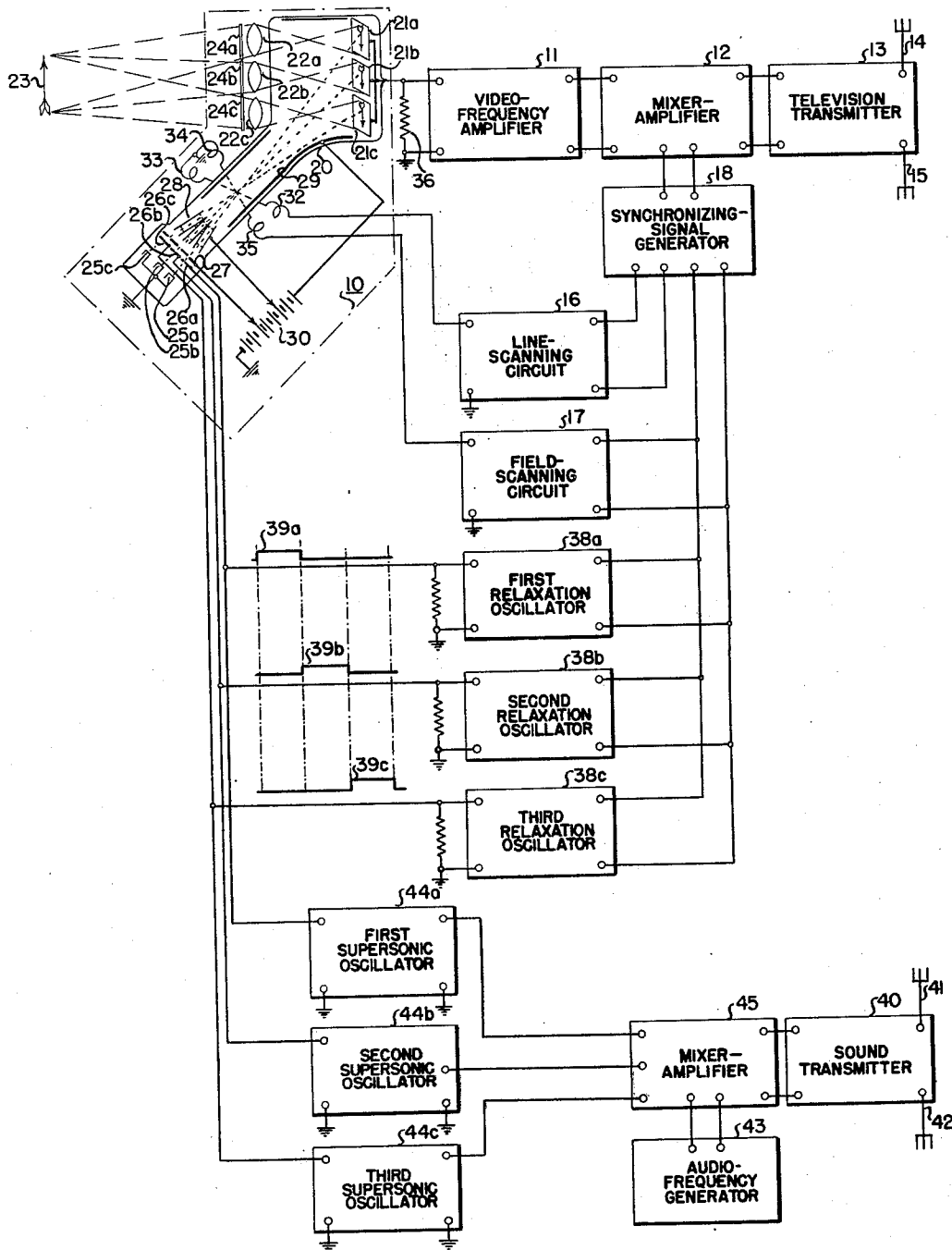


FIG. 1.

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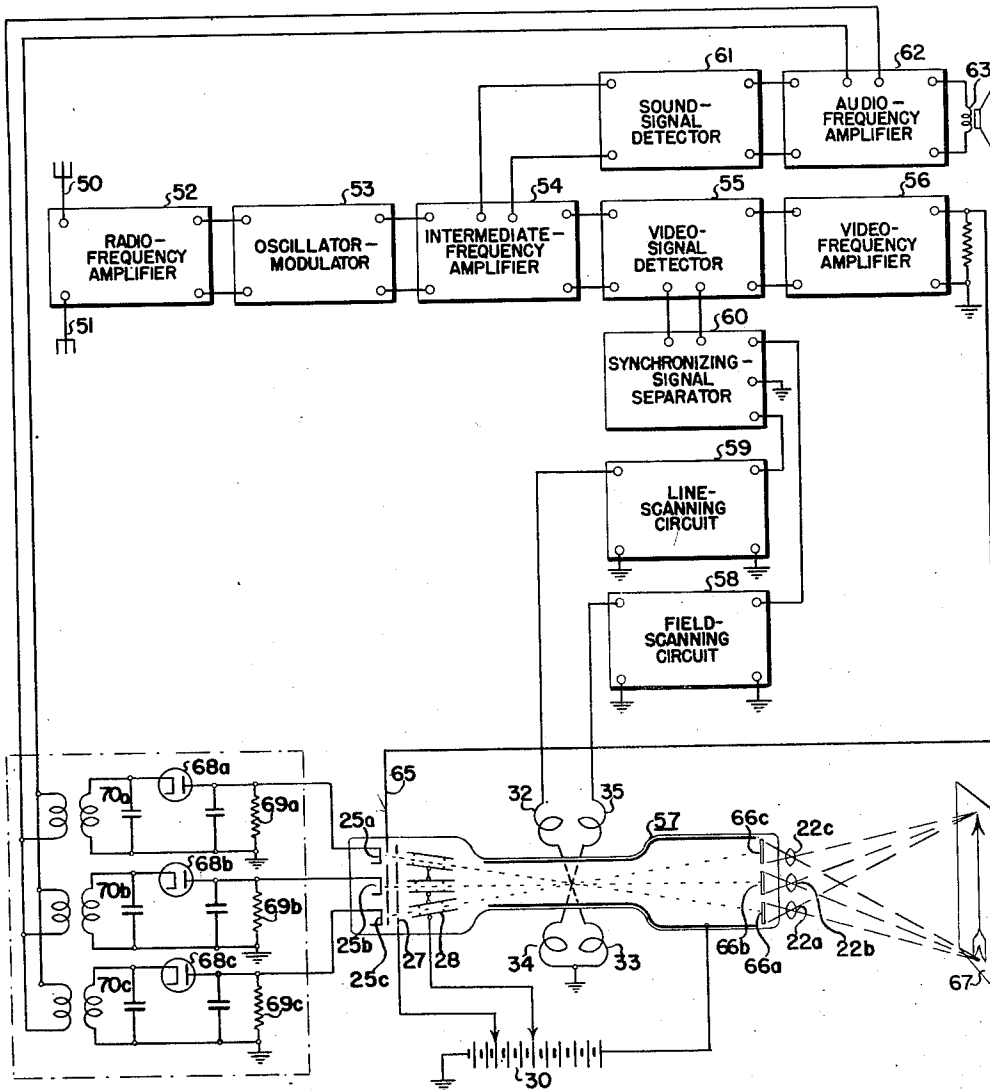


FIG. 2.

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2,294,820

COLOR TELEVISION SIGNAL-TRANSLATING SYSTEM

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Application April 28, 1941, Serial No. 390,717

14 Claims. (Cl. 178—5.2)

This invention relates to color television signal-translating system and particularly to such systems of a type including a cathode-ray tube and beam-deflecting means for scanning in two directions a plurality of targets in the tube.

In color television systems it has been proposed to translate a plurality of images, each representative of a complete color field of the image to be transmitted and to superpose the reproduced images by an optical arrangement to reproduce a color image. However, such arrangements of the prior art have an undesirable characteristic which renders them almost completely inoperative when cathode-ray signal-generating or signal-reproducing tubes are used in the system. For example, unless the separate images combined to develop a color picture are in exact registration, intolerable color mixing and distortion result. Many factors contribute to faulty registration of the reproduced images, the most detrimental factor being variations in the separate scanning fields which are used in such systems. Thus variations, as between the separate scanning fields of such a system, of only a fraction of one per cent. of the instantaneous values thereof are sufficient to produce the undesirable results mentioned above. Various arrangements have been proposed for eliminating undesirable effects of the type mentioned. However, the only acceptable arrangements which have so far been devised are those in which at least one of the required scanning operations is effected by mechanical scanning devices. However, the use of mechanical scanning devices results, in general, in further limitations on the system, as is well understood by those skilled in the art.

It is an object of the invention, therefore, to provide an improved color television signal-translating system not subject to one or more of the above-mentioned disadvantages of prior art arrangements.

It is a further object of the invention to provide an improved color television signal-translating system in which the problem of registration of translated images of different colors is minimized.

It is still another object of the invention to provide an improved color television signal-translating system including a cathode-ray tube and beam-deflecting means for scanning in two directions any of a plurality of targets in the tube in which the above-described difficulty of inexact registration is avoided.

In accordance with the invention, a color television signal-translating system comprises, a cathode-ray tube effectively including a plurality of targets each of which is adapted to be included in an optical path translating a complete color field of the image translated by the sys-

tem. The system also comprises means for projecting upon each of the targets a cathode-ray beam which passes through a restricted region within the cathode-ray tube, and beam-deflecting means disposed adjacent this restricted region and effective to scan in two directions any of the targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of the targets.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

Referring to the drawings, Fig. 1 is a circuit diagram, partly schematic, of a complete television and sound transmitting system including a color television signal-generating arrangement in accordance with the invention, while Fig. 2 is a circuit diagram, partly schematic, of a complete television and sound reproducing system including a color television signal-reproducing arrangement in accordance with the invention.

Referring now more particularly to Fig. 1 of the drawings, the color television translating system illustrated comprises a television transmitting system which includes a cathode-ray signal-generating unit 10 having connected thereto in cascade, in the order named, a video-frequency amplifier 11, a mixer-amplifier 12, a television signal transmitter unit 13, and an antenna system 14, 15. There is also provided a line-scanning circuit 16 and a field-scanning circuit 17 having output circuits connected to scanning elements of signal-generating unit 10 and adapted to be synchronized by pulses from a synchronizing-signal generator 18. An output circuit of synchronizing-signal generator 18 is also coupled to the mixer-amplifier 12 to supply thereto synchronizing signals for transmission with the radiated carrier wave.

The signal-generating unit 10 comprises a cathode-ray signal-generating tube 20 including a plurality of photosensitive targets or target electrodes 21a, 21b, and 21c, each adapted to be included in an optical path for translating a complete color field of the image translated by the system; that is, lenses 22a, 22b, and 22c are provided for targets 21a, 21b, and 21c, respectively, in order to focus an image of the object 23 to be televised upon the several targets. Color screens 24a, 24b, and 24c, each adapted to transmit light of a different color, are included in the optical paths of the targets 21a, 21b, and 21c, respectively, so that the targets are adapted to be excited by light of different colors.

The signal-generating unit 10 also comprises means for projecting upon each of the targets

21a, 21b, and 21c a cathode-ray beam which passes through a restricted region within the tube 20. Specifically, three separate electron guns comprising cathodes 25a, 25b, and 25c are provided for supplying a separate electron beam to each of targets 21a, 21b, and 21c, respectively, the cathodes and targets being so disposed within the tube that the electron beams cross at the above-mentioned restricted region within the cathode-ray tube, as indicated in the drawings. Separate control grids 26a, 26b, and 26c are provided for cathodes 25a, 25b, and 25c, respectively, while suitable first and second accelerating anodes 27 and 28, respectively, are common to all of the cathodes. A common collector anode 29 is also provided for the targets 21a, 21b, and 21c and suitable operating potentials for the tube 20 are supplied thereto from a unidirectional source 30.

Beam-deflecting means is disposed adjacent the above-mentioned restricted region within the tube 20 and is effective to scan in two directions any of the targets with the cathode-ray beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of the targets. This beam-deflecting means may be of either the electrostatic or magnetic type but is shown as of the magnetic type comprising line-scanning windings 32, 33 and field-scanning windings 34, 35 coupled, respectively, to units 16 and 17 so that the single set of windings for each direction of deflection is adapted to deflect all of the beams within the tube 20. Preferably the tube 20 is so constructed that targets 21a, 21b, and 21c are laterally displaced in tube 20 in a direction corresponding to the line-scanning direction of the system, the displacement shown in the drawings being, for convenience, in a vertical direction. Also, each target is preferably disposed at right angles with the axis of its respective optical path. A suitable load resistor 36 is provided for cathode-ray tube 20, one end thereof being coupled to each of target electrodes 21a, 21b, and 21c.

The transmitting arrangement of Fig. 1 also comprises a means for cyclically suppressing the beams to the several targets 21a, 21b, and 21c in such manner that a beam is incident on only one of the targets at any particular time. This last-mentioned means includes pulse-generating means for developing a plurality of pulse waves, each having pulses the timing and duration of which correspond to one field period. Specifically, there is provided a plurality of relaxation oscillators 38a, 38b, and 38c, adapted to be synchronized by pulses derived from synchronizing-signal generator 18, for generating signals of the wave forms illustrated at 39a, 39b, and 39c, respectively. The wave of curve 39a comprises a positive pulse during the first field-scanning period of each frame. This wave is applied to control grid 26a to cause cathode 25a to supply an electron beam to target 21a only during the first field-scanning period of each frame. Similarly, the cathode-ray beam to the target 21b is adapted to be cut off except during the second field-scanning interval of each frame and that to target 21c is adapted to be cut off except during the third field-scanning interval of each frame.

The transmitter of Fig. 1 also includes an associated sound transmitting system which comprises a sound-signal transmitter 40 coupled to an antenna system 41, 42. In order to provide suitable field-keying signals for the television receiver, which may be transmitted with the sound-carrier signal generated by the transmitter of 75

Fig. 1, there are provided first, second, and third supersonic oscillators 44a, 44b, and 44c, respectively, adapted to be modulated by the signal outputs of the relaxation oscillators 38a, 38b, and 38c tuned to generate signal outputs of different supersonic frequencies. The output signals of oscillators 44a, 44b, and 44c, as well as audio-frequency signals generated in unit 43, are mixed in mixer-amplifier 45 and supplied to the sound-signal transmitting means 40 for transmission with the sound signals of the system.

The apparatus just described, includes, in general, the elements of a conventional television transmitting system. The general construction and operation of such a system being well known in the art, a detailed description thereof is deemed unnecessary herein. In brief, however, in the operation of the system described, images of the scene to be transmitted are caused to develop at the output circuit of signal-generating unit 10 a video-frequency voltage which is proportional to the variation of light and shade of the image of the scene to be translated. This voltage is amplified in video-frequency amplifier 11 and translated by mixer-amplifier 12 to apparatus 13 where it is caused to modulate a carrier wave which is broadcast from the antenna system 14, 15 in the usual manner. Line-scanning circuit 16 and field-scanning circuit 17 provide currents of saw-tooth wave form in the line-scanning windings 32, 33 and field-scanning windings 34, 35, respectively, thereby producing magnetic scanning fields for signal-generating unit 10.

Coming now to the operation of the portion of the system involving the present invention, an image representative of a particular color field of the scene to be transmitted is focused by each of the lens systems 22a, 22b, and 22c and its associated one of the color screens 24a, 24b, and 24c on one of the targets 21a, 21b, and 21c, respectively. The electrons generated, accelerated, and developed into beams by the electron gun structures of the tube 20 are focused on the respective targets 21a, 21b, and 21c causing secondary electron emission from successive elementary areas thereof in accordance with their illumination in a manner well understood in the art. The currents of saw-tooth wave form supplied to the scanning windings of the signal generator 10 produce magnetic fields which deflect each beam in a given direction at the line-scanning frequency of the system and in a direction normal thereto at the field-scanning frequency of the system causing it to scan fields or series of parallel lines on its respective target in the usual manner. There is thereby developed in the output circuit of the tube 20 a video-frequency voltage. Due to the action of relaxation oscillators 38a, 38b, and 38c, however, only one of the targets 21a, 21b, and 21c is effective, during any particular field, to develop a video-signal output for the system so that the signal output of tube 10 corresponds to frames of three fields, each corresponding to a different color field of the translated image. It will be understood that suitable means are provided for ensuring the proper phase of the signal outputs of oscillators 38a, 38b, and 38c. This may be done by a manual adjustment or by designing the oscillators and tuning circuits therefor to ensure the proper phase relationships. The signals represented by the wave forms of 39a, 39b, and 39c are also transmitted on the sound-carrier wave of the system at different supersonic frequencies, due to the action of oscillators 44a, 44b, and 44c.

It is thus seen that the color television signal-transmitting system of Fig. 1 is one in which the problem of registration of translated images of different color is minimized due to the fact that it is only necessary to provide a single scanning field for the three images of different color which are translated. Due to this fact, variations of the scanning field have a like effect on each color field and the registration of the system is not adversely affected thereby.

Referring now more particularly to Fig. 2, the color television signal-translating system there represented comprises a receiver of the super-heterodyne type, adapted to receive the signals transmitted by the arrangement of Fig. 1, and includes an antenna system 50, 51 connected to a radio-frequency amplifier 52 to which are connected in cascade, in the order named, an oscillator-modulator 53, an intermediate-frequency amplifier 54, a video-signal detector 55, a video-frequency amplifier 56, and an image-reproducing device 57. A field-scanning circuit 58 and a line-scanning circuit 59 are coupled to the output circuit of detector 55 through a synchronizing-signal separator 60, the field-scanning circuit 58 and the line-scanning circuit 59 being coupled to scanning elements of image-reproducing device 57 in a manner to be hereinafter more fully described. A sound-receiving system is provided which comprises a sound-signal detector 61 and associated audio-frequency amplifier 62 and loudspeaker 63 coupled to an output circuit of intermediate-frequency amplifier 54 in order to translate and reproduce the sound signals accompanying the received television program. The stages or units 50-56, inclusive, and 58-63, inclusive, may all be of conventional well-known construction so that detailed illustrations and descriptions thereof are deemed unnecessary herein.

Referring briefly, however, to the operation of the system described above, television and accompanying sound signals, intercepted by antenna circuit 50, 51, are selected and amplified in radio-frequency amplifier 52 and translated to the oscillator-modulator 53 wherein they are converted into intermediate-frequency signals which, in turn, are selectively amplified in the intermediate-frequency amplifier 54, the television carrier signals being supplied to the detector 55. The television modulation components of the signal are derived by the detector 55 and are supplied to the video-frequency amplifier 56 wherein they are amplified and from which they are supplied in the usual manner to a brightness-control electrode of the image-reproducing device 57. Television modulation components derived in detector 55 are also supplied, through synchronizing-signal separator 60, to the synchronizing-control elements of field-scanning circuit 58 and line-scanning circuit 59. The intensity of scanning rays of device 57 is thus modulated or controlled, in a manner to be hereinafter more fully described, in accordance with the video-signal voltages impressed upon the input circuits of unit 57. Scanning waves are generated by the field-scanning circuit 58 and the line-scanning circuit 59, which are controlled by synchronizing-voltage pulses supplied from the detector 55 through synchronizing-signal separator 60, and applied to scanning elements of image-reproducing device 57 to reproduce electric scanning fields, thereby to deflect the scanning rays in two directions normal to each other

to reconstruct the transmitted image in a manner to be hereinafter more fully described. The sound signals accompanying the television signals are detected in detector 61, amplified in amplifier 62, and reproduced by loudspeaker 63 in a conventional manner.

Referring now more particularly to the portion of the system of Fig. 2 embodying the present invention, unit 57 comprises a cathode-ray signal-reproducing unit operating upon principles analogous to those described above in connection with the description of the operation of signal-generating unit 10. Elements which are similar in the two units have identical reference numerals. The unit 57 differs from unit 10 in that there is provided a single control or signal input electrode 65 common to the cathodes 25a, 25b, and 25c, and in that targets 66a, 66b, and 66c of fluorescent material are substituted for the photo-sensitive targets 21a, 21b, and 21c of Fig. 1 and are adapted, when an electron beam is incident thereon, to provide light of a color corresponding to light transmitted by color screens 24a, 24b, and 24c, respectively, of the system of Fig. 1. An optical means comprising the lens system 22a, 22b, and 22c of Fig. 2 serves to superpose the images developed on the targets 66a, 66b, and 66c upon a screen 67 in exact registration to produce a visible color picture.

In order cyclically to suppress the beam to each of the targets of signal-reproducing unit 57 in such manner that a beam is incident on only one of the targets at any particular time, detectors 68a, 68b, and 68c are provided having load resistors 69a, 69b, and 69c, respectively, effectively by-passed for supersonic frequencies by condensers. Rectifiers 68a, 68b, and 68c are energized through signal selectors 70a, 70b, and 70c, respectively, from audio-frequency amplifier 62 so that these rectifiers are respectively responsive only to the supersonic signals generated by oscillators 44a, 44b, and 44c of Fig. 1. Thus, it may be seen that means are included in the receiver for deriving a supersonic signal from the sound system. There is also included in the receiver means responsive to the supersonic signal for cyclically suppressing the beam to each of the targets in such a manner that a beam is incident on only one of the targets at any particular time. To this end the load circuits of rectifiers 68a, 68b, and 68c are respectively connected in the cathode circuits of cathodes 25a, 25b, and 25c.

It is believed that the operation of the signal-reproducing unit 57, which is analogous to the operation of signal generator 10, will be sufficiently clear to those skilled in the art so that a detailed description of the operation is unnecessary. In brief, however, the signal outputs of rectifiers 68a, 68b, and 68c, which correspond in form to curves 39a, 39b, and 39c of Fig. 1, serve cyclically to bias the cathodes 25a, 25b, and 25c, respectively, to suppress the respective beams to fluorescent screens 66a, 66b, and 66c so that a beam is incident on only one of the targets at any particular time. The beam-deflecting means of signal reproducer 57 is disposed adjacent the cross-over point of the cathode-ray beams of the tube and is effective to scan in two directions normal to each other any one of the targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of the targets. Therefore, during the first field of each frame fluorescent screen 66a only is effective to pro-

vide an output image corresponding to that translated by target electrode 21a of Fig. 1, while during the second and third fields fluorescent screens 66b and 66c, respectively, are similarly effective. The optical means including lenses 22a, 22b, and 22c serves to superpose the images produced on targets 66a, 66b, and 66c on the screen 67.

It will be understood that the color television signal-translating system of the invention is not limited to an arrangement in which the cathode-ray beams of the signal-translating tube have a cross-over point at a restricted region within the tube. It is only necessary that the separate electron guns be individually so disposed that the beams for all of the targets pass through a relatively restricted region so that they can be deflected by a common scanning field.

Furthermore, it will be understood that, while three separate target electrodes have been illustrated in the modification of the invention of Fig. 1, a single enlarged target electrode can be used if the images associated with a particular field are restricted to predetermined portions thereof and that such an embodiment of the invention can be said effectively to comprise a plurality of targets. It has been found in practice that this modification of the invention has certain advantages due to the fact that most mosaic targets provide a signal-generating effect at the edges thereof which is somewhat different than that over other portions thereof.

Also, it will be understood that the signal-reproducing device of the invention may comprise a single fluorescent screen for developing light of a particular color if the images associated with the particular fields are restricted to separate portions of the fluorescent screen and suitable color filters analogous to filters 24a, 24b, and 24c of Fig. 1 are provided in the system to develop images of the desired colors on screen 67.

Also, it will be understood that suitable oscillators, synchronized by the received synchronizing signals and analogous to oscillators 38a, 38b, and 38c of Fig. 1, may be used at the receiver of Fig. 2 to provide the keying pulses for signal reproducer 57 and that in such an arrangement it is unnecessary to receive and reproduce the supersonic signals as described for keying the signal reproducer 57.

Furthermore, it will be understood that, in place of the keying signals of the type described for the cathode-ray beams of tubes 20 and 57, each beam can be normally operative in the absence of a synchronizing signal and suitable keying signals may be provided for suppressing the beams in the proper order.

While there have been described what are at present considered to be the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets, each of said targets being adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting upon each of said targets a cathode-ray

beam which passes through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

2. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets, each of said targets being adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting on each of said targets a separate cathode-ray beam which passes through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

3. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets, each of said targets being adapted to be included in an optical path translating a complete color field of the image translated by the system, a separate electron gun for each of said targets for projecting upon each of said targets a cathode-ray beam and individually disposed so that all of the beams pass through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

4. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets, each of said targets being adapted to be included in an optical path translating a complete color field of the image translated by the system, a separate electron gun for each of said targets for projecting upon each of said targets a cathode-ray beam and individually disposed so that the paths of all beams cross within a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

5. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets, each of said targets adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, means for cyclically suppressing the beam to each of said targets in such manner that a beam is incident on only one of said targets at any particular time, and beam-deflecting means disposed in said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

6. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets, each of said targets adapted to be included in an optical path translating a complete color field of the image trans-

lated by the system, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, means for developing a plurality of pulse waves, each having pulses the timing and duration of which correspond to one field period, means including said last-mentioned means for cyclically suppressing the beam of each of said targets in such manner that a beam is incident on only one of said targets at any particular time, and beam-deflecting means disposed in said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

7. A color television signal-translating system comprising, a cathode-ray tube effectively including three targets, each of which is adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting upon each of the targets a cathode-ray beam which passes through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

8. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets, each of said targets being adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in a line-scanning direction and a field-scanning direction any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

9. A color television signal-translating system comprising, a cathode-ray tube effectively including a plurality of targets laterally displaced in a given direction in said tube, each of said targets adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan any of said targets in said given direction at the line-scanning frequency of said system and in a direction normal thereto at the field-scanning frequency of said system with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

10. A color television signal-translating system comprising, a cathode-ray signal-reproducing tube effectively including a plurality of fluorescent targets, each of said targets being adapted to produce light of a different color when an electron beam is incident thereon, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substan-

tially identical scanning effect for corresponding portions of each of said targets.

11. A color television signal-translating system comprising, a cathode-ray signal-reproducing tube effectively including a plurality of fluorescent targets, each of said targets being adapted to produce light of a different color when an electron beam is incident thereon, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon, and optical means for superimposing the images produced on said fluorescent screens to provide a visible color picture in response to a substantially identical scanning effect for corresponding portions of each of said targets.

12. A color television signal-transmitting system comprising, a cathode-ray signal-generating tube effectively including a plurality of photosensitive targets, each of said targets being adapted to be excited by light of a different color corresponding to a complete color field of the image translated by the system, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, and beam-deflecting means disposed adjacent said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

13. A color television signal-receiving system comprising, a cathode-ray signal-reproducing tube effectively including a plurality of targets, each of said targets being adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, an associated sound-receiving system, means for deriving a supersonic signal from said sound system, means responsive to said supersonic signal for cyclically suppressing the beam to each of said targets in such manner that a beam is incident on only one of said targets at any particular time, and beam-deflecting means disposed in said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

14. A color television signal-transmitting system comprising, a cathode-ray signal-generating tube effectively including a plurality of targets, each of said targets adapted to be included in an optical path translating a complete color field of the image translated by the system, means for projecting upon each of said targets a cathode-ray beam which passes through a restricted region within said tube, an associated sound-transmitting system, pulse-generating means, means for transmitting the generated pulses in said sound-transmitting system, means responsive to said pulse-generating means for cyclically suppressing the beam to each of said targets in such manner that the beam is incident on only one of said targets at any particular time, and beam-deflecting means disposed in said region and effective to scan in two directions any of said targets with the beam incident thereon in response to a substantially identical scanning effect for corresponding portions of each of said targets.

JOHN C. WILSON.

CERTIFICATE OF CORRECTION.

Patent No. 2,294,820.

September 1, 1942.

JOHN C. WILSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 2, for "system" read --systems--; second column, line 27, for "translating" read --signal-translating--; page 5, second column, lines 16 to 19 inclusive, claim 11, strike out "in response to a substantially identical scanning effect for corresponding portions of each of said targets" and insert the same after "thereon" and before the comma in line 14, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of March, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.