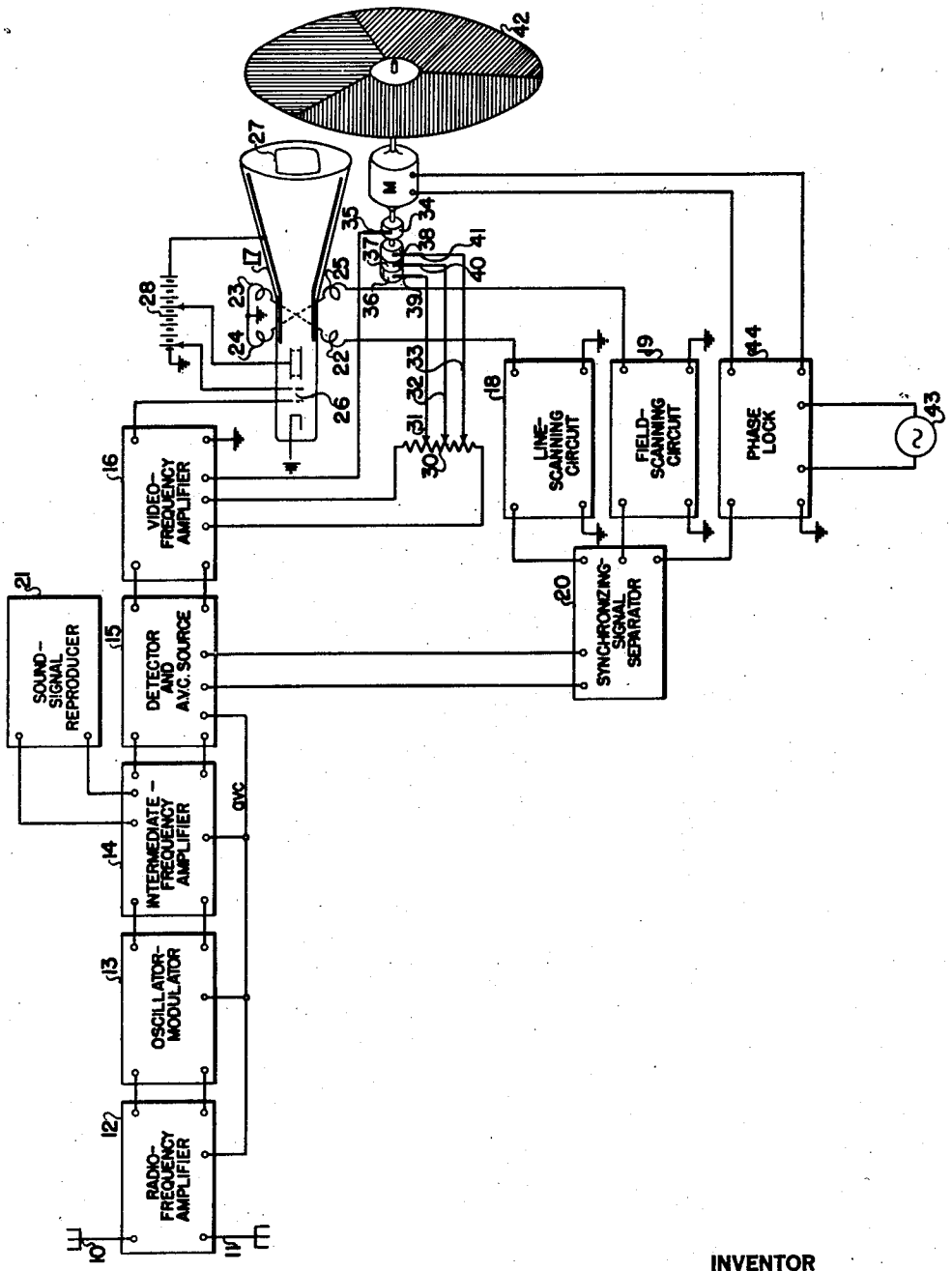
Dec. 31, 1946. J. C. WILSON 2,413,423

COLOR TELEVISION SIGNAL-TRANSLATING SYSTEM

Filed May 2, 1941



INVENTOR
JOHN C. WILSON
BY Laurence B. Dodds
ATTORNEY

Patented Dec. 31, 1946 2,413,423

UNITED STATES PATENT OFFICE

2,413,423

COLOR TELEVISION SIGNAL-TRANSLATING SYSTEM

John C. Wilson, Bayside, N. Y., assignor, by mesne assignments, to Hazeltine Research, Inc., Chicago, Ill., a corporation of Illinois

Application May 2, 1941, Serial No. 391,480

11 Claims. (Cl. 178—5.4)

1

This invention relates generally to color television signal-translating systems and, particularly, to such systems of the type having a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated and including provisions for modifying the color balance of the signal representative of the translated image.

In any color television signal-translating system it is desirable to effect an over-all color balancing in the reproduced image. It has formerly been proposed in color television receivers to effect this color balance in the reproduced image by means of color filters of fixed characteristics in separate optical paths, so that only light of the desired color is transmitted in each optical path, and then to adjust the relative amount of light transmitted in the optical paths by means of additional neutral-tint filters or wedges. This process of adjustment of the relative amounts of light transmitted for the several colors tends to be both inaccurate and cumbersome. This is particularly true where compensation at the receiver must be made for various tyes of light sources at the transmitter or studio, or where the same received signal is used with various types of light sources at the receiver, that is, where receiving tubes individually having luminescent screens of different spectral distribution are involved.

It has also been proposed to provide a separate signal-translating channel in a television system for signals corresponding to light of each color and to adjust the relative gains of such channels, thereby to adjust the relative amount of light produced at the receiver for each color. However, this procedure has not been possible in a system in which a single signal-translating channel is provided for translating a plurality of signals individually corresponding to particular colors of the image being translated, as is generally preferred for reasons of simplicity and economy.

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

It is another object of the invention to provide a color television signal-translating system in which the operating characteristic of a single signal-translating channel, which translates a plurality of signals individually corresponding to

2

particular colors of the image being translated, is changed in accordance with the color corresponding to the signal being translated.

It is another object of the invention to provide a color television signal-translating system in which the color balance is modified in a single signal-translating channel which translates a plurality of signals individually corresponding to particular colors of the image being translated.

In accordance with the invention, a color television signal-translating system comprises a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated. The system also comprises means for adjusting an operating characteristic, for example, the gain of the signal-translating channel, and means for cyclically controlling the adjusting means to effect an individual predetermined operating characteristic in the channel for each of the plurality of signals. The arrangement is effective to control the color balance in the signal representative of the translated image when the operating characteristic which is controlled is the gain of the receiver.

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 drawing and its scope will be pointed out in the appended claims.

The single figure of the drawing is a circuit diagram, partly schematic, of a complete television receiver of the superheterodyne type embodying a color television signal-translating system in accordance with the invention.

Referring now more particularly to the drawing, the system illustrated comprises a receiver of the superheterodyne type including an antenna system 10, 11 connected to a radio-frequency amplifier 12 of one or more stages, to which is connected in cascade, in the order named, an oscillator-moduator 13, an intermediate-frequency amplifier 14 of one or more stages, a detector and A. V. C. source 15, a video-frequency amplifier 16 of one or more stages, and an image-reproducing device 17. A line-scanning circuit 18 and a field-scanning circuit 19 are coupled to the output circuit of detector 15 through a synchronizing-signal separator 20 and have output circuits coupled, respectively, to line-scanning windings 22, 23 and field-scanning windings 24, 25 of signal-reproducing device 17. Image-reproducing device 17 includes a conventional electron gun structure 26

and fluorescent screen 27 and is provided with a suitable source of unidirectional current 28 therefor, as illustrated. An automatic amplification control potential, derived from unit 15, is applied to one or more of the tubes in radio-frequency amplifier 12, oscillator-modulator 13, and intermediate-frequency amplifier 14 in a conventional manner. A sound-signal reproducer 21 of conventional design is coupled to an output circuit of intermediate-frequency amplifier 14. The stages or units 10—21, inclusive, may all be of conventional well-known construction so that detailed illustration and description thereof are deemed unnecessary herein.

Referring briefly to the operation of the system described above, television signals intercepted by antenna circuit 10, 11 are selected and amplified in radio-frequency amplifier 12 and coupled to the oscillator-modulator 13, wherein they are converted into intermediate-frequency signals which, in turn, are selectively amplified in the intermediate-frequency amplifier 14 and delivered to the detector 15. The modulation components of the signal are derived by the detector 15 and are supplied to the video-frequency amplifier 16 wherein they are amplified and from which they are supplied, in the usual manner, to a brilliancy-control electrode of the image-reproducing device 17. The modulation components of the signal derived by detector 15 are also supplied to synchronizing-signal separator 20 wherein synchronizing signals are derived and applied to synchronizing-control elements of circuits 18 and 19. The intensity of the scanning ray of device 17 is thus modulated or controlled in accordance with the video-frequency voltages impressed upon its control grid in the usual manner. Scanning waves are developed in the line-scanning circuit 18 and field-scanning circuit 19 and applied to the scanning elements of the image-reproducing device 17 to produce electric scanning fields, thereby to deflect the scanning ray in two directions normal to each other so as to trace a rectilinear pattern on the screen and thereby reconstruct the transmitted image. Sound signals accompanying the received television signals are reproduced in unit 21 in a conventional manner and the bias derived from unit 15 and applied to the preceding receiver stages serves to maintain the signal-input amplitude to detector 15 within a relatively narrow range for a wide range of received signal intensities.

Referring now more particularly to the portion of the system of Fig. 1 embodying the invention, there is provided an adjustable gain control for video-frequency amplifier 16 which comprises a potential-dividing resistor 30 having adjustable taps 31, 32, and 33 for adjusting the gain of the signal-translating channel of the receiver. The adjustable gain control also comprises means including a motor M for cyclically controlling the adjusting means comprising resistor 30 to effect an individual predetermined amplification in the signal-translating channel of the receiver for each of a plurality of television signals which individually correspond to particular colors of the image being transmitted, thereby to modify the color balance in the signal representative of the transmitted image. In order to effect this type of operation, there is mounted on the shaft of motor M a commutating arrangement including a slip ring 34 and co-operating brush 35, as well as commutator segments 36, 37, and 38 having cooperating brushes 39, 40, and 41, respectively. The commutator segments 36, 37, and 38 are so designed that during successive thirds of a complete revolution of the shaft of motor M connections are successively made between brush 35 and brushes 39, 40, and 41, respectively. In this way, tap 31 is effective to adjust or determine the gain of amplifier 16 during the first one-third revolution of the shaft of motor M, tap 32 is effective during the next one-third revolution, and tap 33 is effective during the remaining one-third revolution.

A color screen having red, green, and blue filter sectors is also mounted on the shaft of motor M and is so disposed with respect to the fluorescent screen 27 of the cathode-ray reproducing device 17 that the screen may be viewed through the filter in any suitable manner. A source of alternating current 43 is provided for motor M and, in order to synchronize the motor M with corresponding color-changing apparatus at the transmitter, there is provided a phase-locking device 44 adapted to be synchronized by a synchronizing signal derived from synchronizing-signal separator 20.

In considering the operation of the portion of the system of Fig. 1 constituting the present invention, it will be assumed that a triple-interlaced color television signal of conventional form is being received, the signals of each field corresponding to a predetermined color field of the translated image. The stages 12—17, inclusive, therefore, constitute a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated. The motor M is synchronized with corresponding color-changing apparatus at the transmitter and its phase is so controlled by phase-locking unit 44 that the red filter is in the effective optical path of the receiver when television signals corresponding to red are being received, etc. Therefore, it is possible by manually adjusting the taps 31, 32, and 33 of resistor 30 to adapt the receiver to provide a predetermined gain for the signal corresponding to the color being translated. That is, the commutating arrangement on the shaft of motor M is effective to cause tap 31 to be effective during one field-scanning period, tap 32 to be effective during the succeeding field-scanning period, and tap 33 to be effective during the last field-scanning period of each frame interval and, therefore, comprises a means for cyclically controlling the adjusting means including resistor 30 to effect an individual predetermined amplification in video-frequency amplifier 16 for each of the translated plurality of signals corresponding to the three color fields, thereby to modify the color balance in the signal representative of the translated image.

If a different cathode-ray signal-reproducing device is substituted in the receiver of Fig. 1, it will probably be desirable to change the settings of the various taps on resistor 30 in order to effect a satisfactory color balance in the reproduced image. Also, if the television receiver is tuned to a different transmitter it will probably be found desirable to readjust the color balance.

While there has been illustrated a commutator means of a mechanical type driven by motor M and responsive to the synchronizing signals of the system, it will be understood that other equivalent types of controlling arrangements may be used for adjusting the gain of the receiver in accordance with the invention. Thus, a local oscillator may be provided to develop suitable keying signals for a gain-control means. Fur-

thermore, it will be understood that the invention is not limited to the specific type of gain-control means illustrated but may utilize other equivalent forms, such as an automatic amplification control system the effect of which is adjusted in accordance with the color corresponding to the particular signal being received.

While there has been described what is at present considered to be the preferred embodiment of this 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 single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting an operating characteristic of said signal-translating channel, and means for cyclically controlling said adjusting means to effect an individual predetermined operating characteristic in said channel for each of said plurality of signals.

2. A color television signal-translating system comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain of said signal-translating channel, and means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

3. A color television signal-translating system comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain of said signal-translating channel, and means for cyclically controlling said adjusting means in synchronism with said cyclically-translated television signals to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the balance in the signal representative of the translated image.

4. A color television signal-translating system comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for manually adjusting the gain of said signal-translating channel, and means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

5. A color television signal-translating system comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain of said signal-translating channel for each of said plurality of signals, and means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

6. A color television signal-translating system comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular color fields of the image being translated, means for adjusting the gain of said signal-translating channel, and means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

7. A color television signal-translating system comprising, a single signal-translating channel for successively and cyclically translating three television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain of said signal-translating channel, and means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

8. A color television signal receiver comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain of said signal-translating channel, means for changing the color of light in the signal reproduction for each of said plurality of television signals, and means operated synchronously with said last-mentioned means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

9. A color television signal receiver comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain of said signal-translating channel, means for changing the color of light in the signal reproduction for each of said plurality of television signals, and means responsive to said last-mentioned means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

10. A color television signal-translating system comprising, a single signal-translating channel for successively and cyclically translating each of a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain of said signal-translating channel, and commutator means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

11. A color television signal receiver compris-

ing, a single signal-translating channel for successively and cyclically translating a plurality of television signals which individually correspond to particular colors of the image being translated, means for adjusting the gain in said signal-translating channel, means for synchronizing the operation of said receiver with a received signal, and

means responsive to said synchronizing means for cyclically controlling said adjusting means to effect an individual predetermined amplification in said channel for each of said plurality of signals to control the color balance in the signal representative of the translated image.

JOHN C. WILSON.