July 14, 1942. J. C. WILSON 2,289,948

VIDEO-FREQUENCY SIGNAL-TRANSLATING SYSTEM FOR TELEVISION RECEIVERS

Filed July 23, 1940 2 Sheets-Sheet 1

FIG. 1.

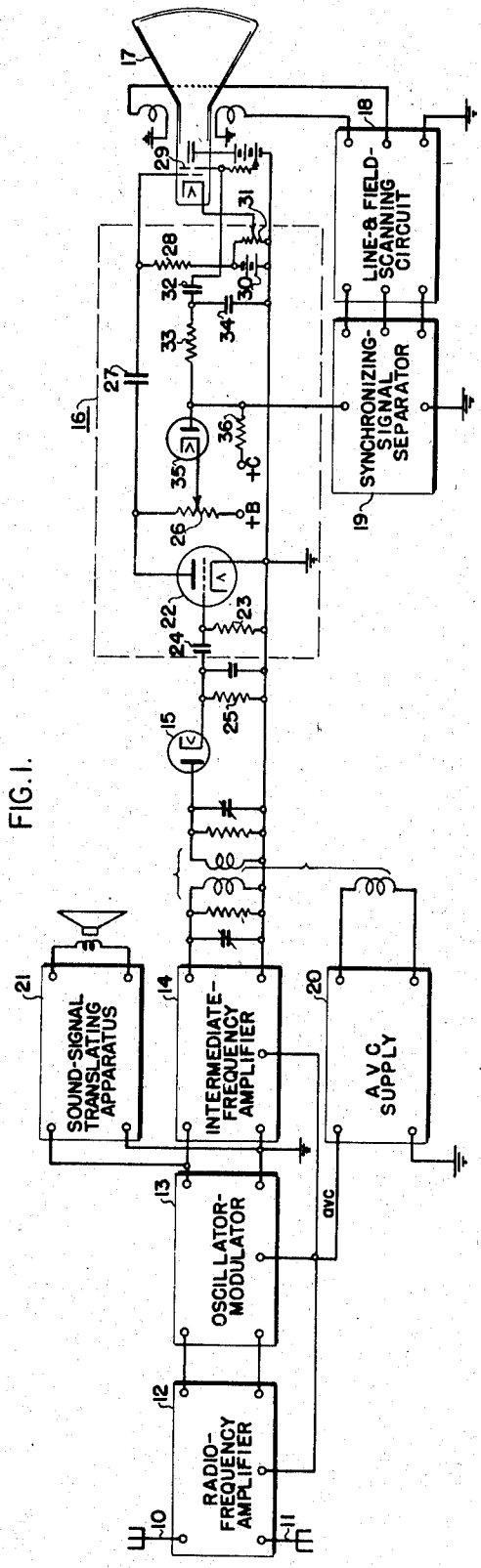
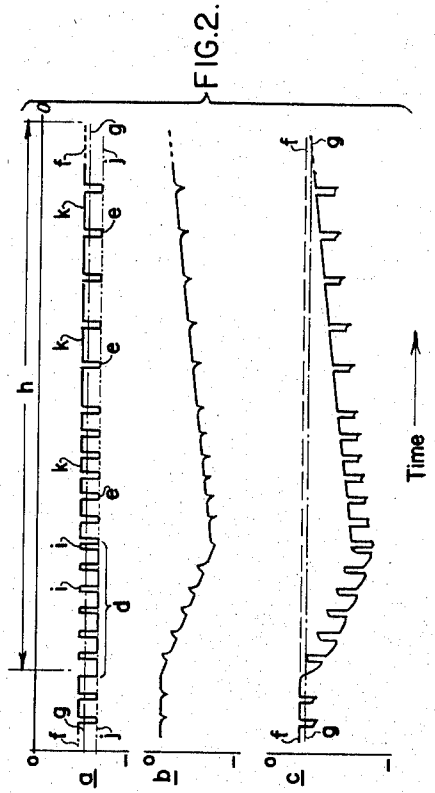


FIG. 2.



INVENTOR
JOHN C. WILSON

BY Laurence B. Dodds
ATTORNEY

July 14, 1942. J. C. WILSON 2,289,948

VIDEO-FREQUENCY SIGNAL-TRANSLATING SYSTEM FOR TELEVISION RECEIVERS

Filed July 23, 1940 2 Sheets-Sheet 2

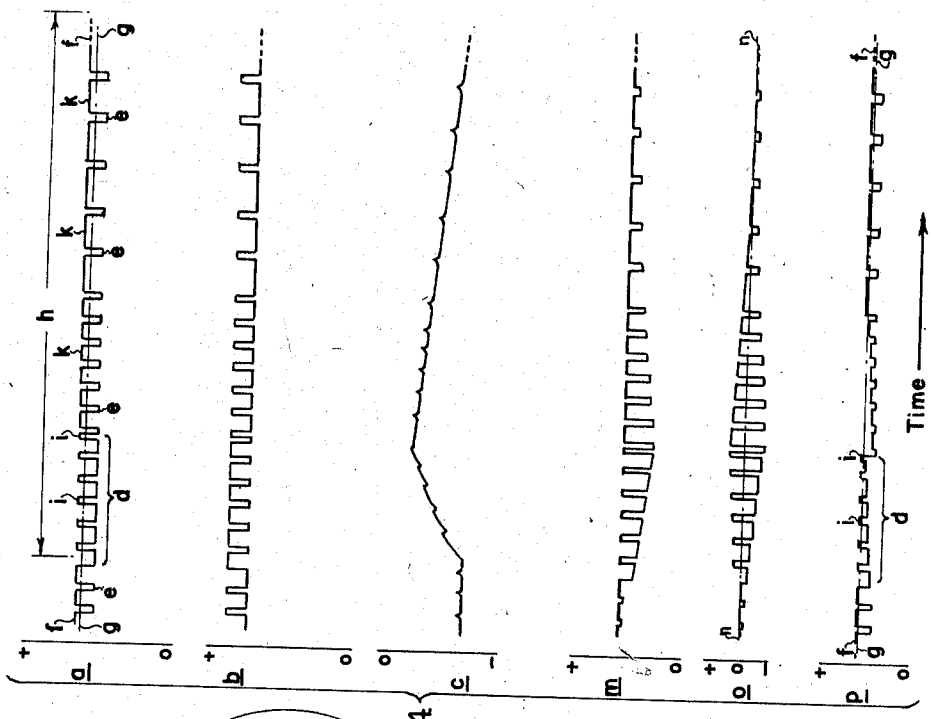


FIG. 4

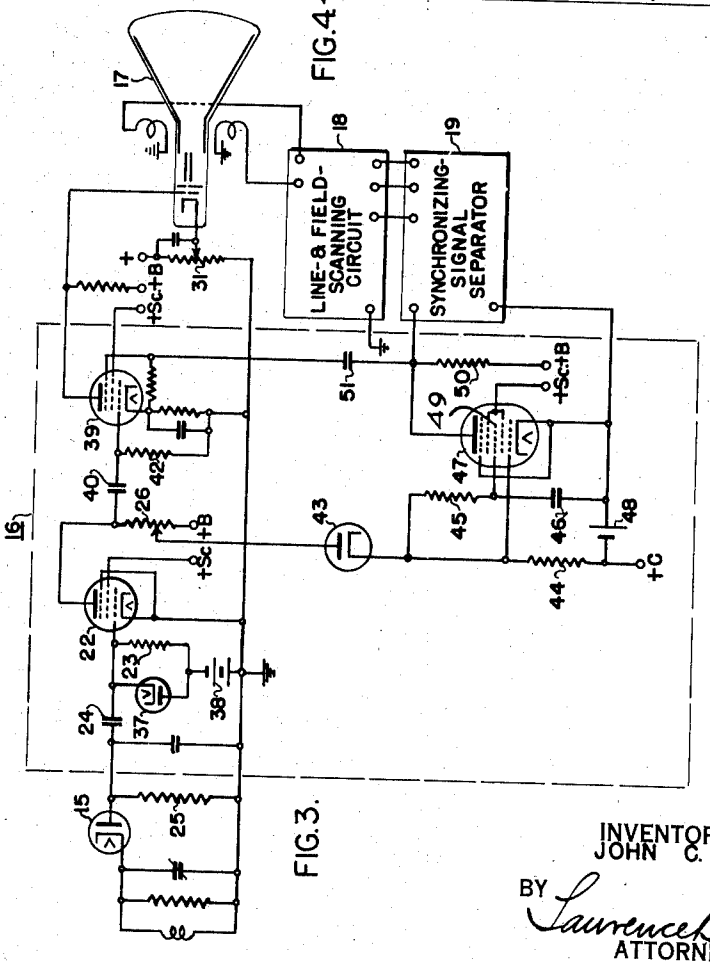


FIG. 3.

INVENTOR
JOHN C. WILSON
BY Lawrence B. Dodds
ATTORNEY

Patented July 14, 1942

2,289,948

UNITED STATES PATENT OFFICE

2,289,948

VIDEO-FREQUENCY SIGNAL-TRANSLATING SYSTEM FOR TELEVISION RECEIVERS

John C. Wilson, Bayside, N. Y., assignor to Hazeltine Corporation, a corporation of Delaware

Application July 23, 1940, Serial No. 346,907

13 Claims. (Cl. 178—7.5)

This invention relates to an improved video-frequency signal-translating system for television receivers and, more particularly, to a system for translating a composite television signal including video-signal components and synchronizing-signal components.

The electronic television receiver of the present day conventionally employs a cathode-ray tube having a screen upon which the television image is reproduced by a signal-modulated cathode-ray beam as it progressively scans the surface of the screen in a predetermined pattern of lines. This pattern of lines is composed of a series of spaced parallel trace lines, which form the visible image, and an intervening series of spaced parallel retrace lines normally invisible. The receiver conventionally is provided with a manually adjustable brightness control by which the average brightness of the reproduced image may be adjusted. While this control may be so positioned on the receiver as to be readily accessible to the user whereby the user is able to adjust the brightness to suit his individual taste, it is occasionally positioned for adjustment from the rear of the receiver where it is not readily accessible to the user, the control normally being adjusted only upon the initial installation of the receiver and remaining thus adjusted over a long period of receiver operation. In the event that the brightness control is adjusted either initially if inaccessible, or by the user if accessible, so as to bring out more detail in the darker portions of the reproduced image than the transmission will allow or, having once been properly adjusted, becomes improperly adjusted due to changed operating conditions of the receiver, it frequently happens that the reproduced image is marred by the appearance of the undesired and normally invisible retrace lines, usually fragmentary, which occur during the intervals between the synchronizing pulses of each retrace period, the synchronizing pulses usually being of such polarity and amplitude as to suppress the scanning beam for their durations. Even though the retrace lines are not sufficiently bright seriously to impair the reproduced image, they are a distinct annoyance when no image is being reproduced. The appearance of these retrace lines is especially prevalent in the cheaper television receivers in which no attempt is made to stabilize a television signal by reinsertion of the unidirectional background components. The objectionable appearance of the retrace lines may occur, however, even in those more elaborate television receivers which are provided with an automatically operating brightness control.

In accordance with the prior art practice, it has been proposed automatically to eliminate the retrace lines under all conditions of adjustment of the brightness control, whether such control be of the automatic or manually adjustable type, by feeding to the video-frequency signal-translating circuit, during each retrace interval, a pulse from the scanning system of the receiver through an auxiliary amplifier, or a pulse from an auxiliary oscillator especially provided for the purpose, thereby to extinguish the cathode ray of the picture tube during the entire retrace intervals. In the event that the pulse is supplied from the scanning system through an auxiliary amplifier, the latter tends to be greatly overloaded by the high voltage pulses derived from the scanning system and further tends to load the video-frequency circuit of the receiver capacitively, thereby impairing the video-frequency response of the system and producing serious distortion of the reproduced image. The use of an auxiliary oscillator for the purpose of extinguishing the retrace lines involves added expense and the addition of certain apparatus which not only involves certain additional adjustments but also tends to complicate the receiver design.

In accordance with another prior art arrangement, it has been proposed that the cathode ray be extinguished during the retrace intervals by magnetically coupling energy from the scanning system of the receiver into the cathode-ray tube input circuit. This has the very serious disadvantage that it greatly affects the uniformity of the video-frequency response of the system, thereby impairing the quality of the reproduced image.

It is an object of the present invention, therefore, to provide a new and improved video-frequency signal-translating system which avoids one or more of the above-mentioned disadvantages of the prior art arrangements.

It is a further object of the present invention to provide a signal-translating system wherein the effect of the synchronizing-signal components of the television signal in extinguishing the retrace lines is greatly increased during a large portion of the field-retrace intervals.

It is an additional object of the invention to provide a signal-translating system wherein that level of the composite television signal which corresponds to black in the transmitted image is altered during at least a portion of the field-

retrace intervals to aid the television signal in suppressing the retrace lines during the field-retrace intervals.

In accordance with one embodiment of the invention, a video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprises a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by the image reproducer. There is provided integrating means responsive primarily to the field-synchronizing pulses of the synchronizing-signal components for deriving a control potential during at least a portion of each field-retrace period, and means for utilizing the control potential for effectively changing with respect to the cutoff point of the image reproducer that level of the composite signal which corresponds to black in the transmitted image to suppress the cathode ray of the reproducer only during the aforesaid portion of the field-retrace period. In accordance with one specific embodiment of the invention, there is included means for repeating the synchronizing-signal components, means responsive primarily to the field-synchronizing pulses of the synchronizing-signal components for increasing the repeating ratio of the repeating means during at least a portion of each field-retrace period, and means for combining the repeated synchronizing-signal components with the composite signal to suppress the cathode ray of the reproducer during the aforesaid portion of the field-retrace period.

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 now to the drawings, Fig. 1 is a circuit diagram, partly schematic, of a complete television receiver embodying the invention; Fig. 2 is a graph representing certain related potential variations occurring at different points of the receiver and is used in explaining the operation of the invention; Fig. 3 is a circuit diagram of a portion of a television receiver embodying a modified form of the invention; and Fig. 4 is a graph representing certain related potential variations occurring at different points in the circuit arrangement of the Fig. 3 modification.

Referring more particularly to Fig. 1, the system there represented comprises a television receiver of the superheterodyne type including an antenna system 10, 11 connected to a radio-frequency amplifier 12, to which are connected in cascade, in the order named, an oscillator-modulator 13, an intermediate-frequency amplifier 14, a detector 15, a video-frequency signal-translating system 16, and a cathode-ray image reproducer 17. A field-frequency and line-frequency scanning unit 18 is also coupled to the output of the video-frequency signal-translating system through suitable synchronizing-signal separating apparatus 19.

An automatic amplification control or A. V. C. system 20 is coupled to the output circuit of the intermediate-frequency amplifier 14 and the output circuit of the A. V. C. system is connected to the input circuits of one or more of the tubes of the radio-frequency amplifier 12, the oscillator-modulator 13, and the intermediate-frequency amplifier 14 in conventional manner.

Sound-signal translating and reproducing apparatus 21 is also connected to the output of the oscillator-modulator 13 and may include, connected in cascade in the order named, one or more stages of intermediate-frequency amplification, a detector, one or more stages of audio-frequency amplification, and a sound-reproducing device.

It will be understood that the various units thus far described may, with the exception of the video-frequency signal-translating system 16, be of a conventional construction and operation, the details of which are well known in the art, rendering further description thereof unnecessary. Considering briefly the operation of the receiver as a whole, however, and neglecting for the moment the operation of the video-freqency signal-translating system 16 presently to be described, a vision-signal modulated-carrier wave is intercepted by the antenna system 10, 11, selected and amplified in the radio-frequency amplifier 12, and applied to the oscillator-modulator 13 wherein it is converted to an intermediate-frequency signal. The vision-signal modulated intermediate-frequency carrier signal is, in turn, selectively amplified in the intermediate-frequency amplifier 14 and is detected by the detector 15 to derive the modulation components thereof. The modulation components, which comprise a composite television signal including synchronizing-signal components and video-signal components, are applied to the video-frequency signal-translating system 16 for amplification and are thereafter applied in the usual manner to a brilliancy-control electrode of the cathode-ray image reproducer 17 to modulate the intensity of the electron beam of the tube 17 in accordance with the video-signal components.

The automatic amplification control or A. V. C. bias derived from the A. V. C. system 20 is effective to control the amplification of one or more of the units 12, 13, and 14 to maintain the signal input to the detector 15 within a relatively narrow range for a wide range of received signal intensities.

The sound-signal modulated-carrier wave accompanying the desired vision-signal modulated-carrier wave is also intercepted by the antenna system 10, 11, selected and amplified in the radio-frequency amplifier 12, and applied to the oscillator-modulator 13 wherein it is converted to a sound-signal modulated intermediate-frequency signal and applied to the input of the sound-signal translating apparatus 21. Here the sound-signal modulated intermediate-frequency carrier signal is, in turn, amplified and detected to derive the modulation components which are further amplified and reproduced by the sound-reproducing device of the apparatus 21.

The synchronizing-signal components are separated from the video-signal components of the composite television signal, in a manner presently to be considered in detail, and applied to the inter-synchronizing-signal separating apparatus 19. The field-synchronizing and the line-synchronizing pulses are effectively separated from each other by the separating apparatus 19 and are applied to the respective field-frequency and line-frequency scanning systems of the scanning unit 18. The field-frequency and line-frequency scanning systems generate periodic scanning currents of saw-tooth wave form, the frequencies of which are controlled

by the respective field-frequency and line-frequency synchronizing components of the received television signal. These scanning currents are applied to the scanning elements of the cathode-ray tube 17 to produce electric scanning fields, thereby to deflect the video-signal modulated cathode ray in two directions normal to each other in a series of traces and retraces to form a predetermined scanning pattern of parallel lines on the screen of the tube, thereby to reproduce the transmitted image.

Referring now more particularly to the portion of the system embodying the present invention, the video-frequency signal-translating system 16 comprises a video-frequency amplifier tube 22 having an input circuit, which includes a grid-leak resistor 23, coupled through a condenser 24 to the load resistor 25 of the detector 15. The tube 22 has an anode which is connected through a load resistor 26 to the positive terminal of a source of operating potential +B. The anode of tube 22 is also coupled through a blocking condenser 27 to the ray-control electrode of the cathode-ray image reproducer 17. Connected in series between the ray-control electrode and cathode of the cathode-ray tube 17 is a resistor 28 and a source of biasing potential 30, a potentiometer 31 being connected across the biasing potential 30 to provide a manually adjustable brilliancy control. Connected between an adjustable tap on the resistor 26 and ground is a series circuit comprising, in the order named, a rectifier 35 which may be of the diode vacuum-tube type, a resistor 33, and a condenser 34, the cathode of the diode rectifier being connected to the adjustable tap on the resistor 26. The anode of the diode rectifier 35 is also connected through a resistor 36 to the positive terminal of a source of bias potential +C. The voltage developed across the condenser 34 is applied through a coupling condenser 32 to an anode 29 of tube 17. This anode may be the suppressor electrode of a pentode type of cathode-ray tube and is effective to modulate the cathode-ray beam of tube 17 in accordance with potentials applied to the anode.

In considering the operation of the circuit just described, it will be assumed that a composite television signal, a portion of the field-synchronizing component of which is illustrated graphically by curve *a* of Fig. 2, is applied from the diode load resistor 25 of the detector 15 through the video-frequency amplifier 22 to the ray-control electrode of the cathode-ray tube 17. This composite television signal includes video-signal components, not shown in Fig. 2, and synchronizing-signal components comprising field-synchronizing pulses *d* and line-synchronizing pulses *e*.

The condenser 24 and resistor 23 in the input circuit of the amplifier tube 22 provide an operating bias for tube 22 by peak-grid rectification of the synchronizing-signal components of the composite television signal applied from the detector 15 to the input circuit of tube 22 and thus stabilize the peaks of the synchronizing-signal components at a uniform level of the television signal, represented by the broken line *j, j* of Fig. 2, in the output circuit of tube 22 even though different television signals, or even the same television signals, may vary somewhat in the intensity with which they are received.

The stabilized signal output of tube 22 is applied directly to the control grid of image-reproducing tube 17 through the relatively large coupling condenser 27. Assuming that the image to be reproduced has substantial areas of white therein, the composite television signal has large amplitude values in the white direction and the level of the television signal corresponding to black consequently is considerably displaced on the opposite side of the electrical or equal-area axis *o—o* of the signal, as indicated in curve *a* of Fig. 2, the black level being indicated at *f—f*. If the manual brightness control 31 is adjusted to bias the cathode-ray tube 17 to cutoff at the level *f, f* of the television signal, the video-signal components modulate the cathode-ray beam during the trace intervals, whereby the cathode-ray tube reproduces the transmitted image, while the synchronizing-signal components *d, e* bias the tube beyond cutoff, thereby to extinguish the cathode ray both during the line-retrace and frame-retrace intervals. In using the manually adjustable brightness control 31, however, it is difficult accurately to ascertain the optimum adjustment for best definition in the reproduced image and the control frequently is adjusted to operate the cathode-ray tube 17 to cutoff at a level of the television signal which provides a brighter image as, for example, that level indicated by the broken line *g, g* of Fig. 2. Thus, during the field-retrace interval *h* between the completion of one field and the beginning of a successive field, the cathode ray, as it moves from the bottom toward the top of the fluorescent screen of the tube, or vice versa, produces a visible illuminated spot upon the occurrence of each serration *i* of the field-synchronizing pulses *d* and a visible fragmentary retrace line during each interval *k* between successive line-synchronizing pulses *e*. This is especially true in the cheaper television receivers which, as in the arrangement of Fig. 1, do not attempt to reinsert the unidirectional background components of the television signal, thereby to apply the television signal to the ray-control electrode of the cathode-ray tube 17 with the peaks of the synchronizing pulses stabilized at a uniform level, but rather apply the television signal to the ray-control electrode as an unstabilized alternating potential varying above and below its electrical axis.

In order to eliminate this effect, the anode of the diode rectifier 35 is so biased with relation to the potential of the tap on the resistor 26 to which the cathode is connected that current flows through the diode rectifier only during the occurrence of synchronizing pulses. The synchronizing-signal components are thus separated from the composite television signal by "clipping" the synchronizing pulses at a predetermined level on the stabilized television signal displaced from the peaks of the pulses, whereby only the synchronizing-signal components appear in the anode circuit of the diode rectifier. These synchronizing-signal components are applied to an integrating means responsive primarily to the duration of the field-synchronizing pulses and comprising the resistor 33 and the condenser 34 to produce across the condenser 34 a negative unidirectional control potential during at least a portion of each field-retrace period following each group of field-synchronizing broad pulses which varies in accordance with curb *b* of Fig. 2. The time constant of this integrating circuit is so proportioned that the potential across the condenser 34 rises rapidly to its maximum value during each group of field-synchronizing broad pulses. The time constant of the condenser discharge circuit, comprising the resistors 33 and 36,

is so proportioned that the potential appearing across the condenser **34** from the integration of the synchronizing-signal components decays more slowly, whereby at least two and preferably five or six line-scanning periods elapse after the termination of the field-synchronizing broad pulses before the potential of the condenser **34** returns to the relatively constant value of the potential of the source +C.

Since the potential of the condenser **34** is applied through the condenser **32** to the anode **29** of the cathode-ray tube **17**, the resultant instantaneous potential effective to modulate the cathode-ray beam during the field-retrace period is the combined potentials applied to the ray-control electrode and to anode **29** as represented by curve *c*. It is at once evident that the potential developed across the condenser **34** primarily from the field-synchronizing pulses of the synchronizing-signal components effectively changes, insofar as the modulation of the cathode-ray beam is concerned, that level of the composite television signal which corresponds to black in the transmitted image. The above-mentioned control potential is thus utilized for effectively changing or increasing in the black direction with respect to the cutoff point of the image reproducer **17** that level of the composite signal which corresponds to black in the transmitted image to suppress the cathode ray of the image reproducer only during the above-mentioned portion of the field-retrace period. The cathode ray of the cathode-ray image reproducer **17** is thus effectively suppressed during the greater portion of the field-retrace period even though the manual brightness control **31** may have been improperly adjusted to a level which, were it not for the effectively changed black level of the composite television signal, otherwise would permit the appearance of the fragmentary retrace lines during the field-retrace interval.

While it was assumed in the foregoing description of the operation of the Fig. 1 arrangement that the image to be reproduced had appreciable areas of white therein, the operation of this modification of the invention is essentially the same in the case where the image to be reproduced contains only areas of grey and black. In this event, the voltage developed across the condenser **34** from the broad field-synchronizing pulses still has the same value, as represented by the curve *b* of Fig. 2, and is effective to suppress the cathode ray of the image reproducer **17** during the greater portion of the field-retrace period.

A modification of the video-frequency signal-translating system of the invention is represented in Fig. 3 in which circuit elements corresponding to similar circuit elements of Fig. 1 are designated by similar reference characters. In this modification, the composite television signal is applied to the input circuit of the video-frequency amplifier **22** with negative polarity and it is, therefore, necessary to provide across the input circuit of the amplifier a stabilizing system comprising a rectifier **37**, which may be of the diode vacuum-tube type, and a source of biasing potential **38** for the purpose of stabilizing at a uniform level the peaks of the synchronizing pulses of the composite television signal appearing in the output circuit of tube **22**. A second video-frequency amplifier **39** is connected between the output circuit of the video-frequency amplifier **22** and the input circuit of the cathode-ray image reproducer **17**. This amplifier is direct-connected to the ray-control electrode of the cathode-ray tube **17** and includes in its input circuit a coupling condenser **40** and a grid-leak resistor **42** which reinsert the unidirectional background-illumination component of the composite television signal.

Connected to an adjustable tap on the resistor **26** is the anode of a diode rectifier tube **43** the cathode of which is connected through a resistor **44** to a source of positive-bias potential +C. Connected across the resistor **44** is an integrating circuit comprising a resistor **45** and a condenser **46**. The input circuit of a vacuum-tube repeater **47** is connected across the resistor **44**, a source of biasing potential **48** providing a normal operating bias for the control electrode. Connected to the junction between the resistor **45** and the condenser **46** is an auxiliary control electrode **49** of the repeater tube **47**. Operating potentials are applied from a source of operating potential +B through a load resistor **50** to the anode of tube **47** and to the screen from the source +Sc. The anode of tube **47** is coupled through a condenser **51** to an auxiliary control electrode of the video-frequency amplifier tube **39**.

In considering the operation of this modification of the invention, it will be assumed that a composite television signal is applied from the detector **15** through the video-frequency amplifiers **22** and **39** to the input circuit of the cathode-ray tube **17** and would appear therein, were it not modified in a manner presently to be considered, as a potential having the wave form graphically illustrated by curve *a* of Fig. 4. As in Fig. 2, this composite signal includes video-signal components, not shown, and synchronizing-signal components *d* and *e*.

The composite television signal is applied to the input circuit of the video-frequency amplifier **22** with negative polarity and appears in the output circuit thereof with positive polarity as represented by the curve *b* of Fig. 4. The diode rectifier **43** is so biased by the positive potential applied through the resistor **44** that the synchronizing-signal components are separated from the video-signal components by the diode rectifier **43** and the synchronizing-signal components are applied to an integrating circuit comprising the resistor **45** and condenser **46**. The integrating circuit integrates the synchronizing-signal components to produce across the condenser **46** a unidirectional potential represented by curve *c* of Fig. 4. The time constant of the integrating circuit is so proportioned that the potential developed across the condenser **46** increases in a positive direction to a maximum value during each group of field-synchronizing broad pulses *d*. The condenser subsequently discharges through the resistor **44** which is so proportioned that the circuit comprising this resistor, the resistor **45**, and the condenser **46** has a relatively long time constant equal to at least two and preferably five or six line periods, whereby the potential developed across the condenser **46** persists over a relatively long time interval following each group of field-synchronizing broad pulses.

The synchronizing-signal components are likewise applied directly to the control grid of the vacuum-tube repeater **47** from resistor **44**. The amplification or repeating ratio of this tube, however, is controlled by the potential appearing across the condenser **46** and applied to its auxiliary control electrode and is thus responsive primarily to the synchronizing-signal components, the amplification increasing during at least a portion of each field-retrace period as the poten-

tial across the condenser 46 increases in a positive direction. Thus, the amplified synchronizing-signal components appearing in the output circuit of the vacuum-tube repeater 47 have larger amplitudes during, and shortly after the occurrence of, each group of field-synchronizing broad pulses as represented by curve *m* of Fig. 4.

The amplified synchronizing-signal components are applied through the condenser 51 to the auxiliary control electrode of the video-frequency amplifier 39, the condenser 51 causing the synchronizing-signal wave to center about its alternating current axis *n*, *n* as represented by curve *o* of Fig. 4. The amplified synchronizing-signal components applied to the auxiliary control electrode of tube 39 (curve *o*) are electronically added to or combined with the composite television signals applied to the input circuit thereof (curve *b*) and, after reversal of their polarity by amplifier 39, there is thus applied to the ray-control electrode of the cathode-ray tube 17 a composite television signal of modified wave form as represented by curve *p* of Fig. 4, wherein that level of the composite signal which corresponds to black in the transmitted image has been altered by increasing the black level in the black direction. It is evident that the ray-control electrode of the cathode-ray image reproducer 17 is biased beyond cutoff, and the cathode ray thereby extinguished, by the changed black level of the composite television signal during the greater portion of the field-retrace interval even though the brightness control 31 may have been improperly adjusted to the level of the television signal at which the retrace lines otherwise would appear. While the intervals *i* of the television signal between the field-synchronizing broad pulses *d* may produce luminous spots during the field-retrace interval, the spots are either out of the picture field or are near one edge thereof and, therefore, are not objectionable.

Instead of electronically adding or combining in tube 39 the composite signals and the amplified synchronizing-signal components, substantially the same result can be accomplished by effecting the addition or combination directly in the input circuit of tube 17 as by applying with proper polarity the amplified synchronizing-signal components across a resistor positioned in the cathode circuit of tube 17.

While there have been described what are at present considered to be the preferred embodiments 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 video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, integrating means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for deriving a control potential during at least a portion of each field-retrace period, and means for utilizing said control potential for effectively changing with respect to the cutoff point of said image reproducer that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

2. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, integrating means responsive primarily to the duration of the field-synchronizing pulses of said synchronizing-signal components for deriving a control potential during at least a portion of each field-retrace period, and means for utilizing said control potential for effectively changing with respect to the cutoff point of said image reproducer that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

3. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, integrating means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for deriving a control potential during an interval of each field-retrace period equivalent to several line periods following each group of field-synchronizing broad pulses, and means for utilizing said control potential for effectively changing with respect to the cutoff point of said image reproducer that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said interval of said field-retrace period.

4. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, integrating means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for deriving a control potential during at least a portion of each field-retrace period, and means for utilizing to said control potential for effectively increasing in the black direction that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

5. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, means for integrating said synchronizing-signal components to derive primarily from the field-synchronizing pulses of said synchronizing-signal components a control potential during at least

a portion of each field-retrace period, and means for utilizing said control potential for effectively changing with respect to the cutoff point of said image reproducer that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

6. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, means for integrating said synchronizing-signal components to derive primarily from the field-synchronizing pulses of said synchronizing-signal components a control potential during at least a portion of each field-retrace period, said means comprising an energy-storage element, a charging circuit for said element having a time constant short compared to the duration of said field-synchronizing pulses, a discharge circuit for said element having a time constant long compared to the period of line-synchronizing pulses of said synchronizing-signal components, and means for utilizing said control potential for effectively changing with respect to the cutoff point of said image reproducer that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

7. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, integrating means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for deriving a control potential during at least a portion of each field-retrace period, and means for combining said control potential and said composite signal effectively to change with respect to the cutoff point of said image reproducer that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

8. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, means for stabilizing at a predetermined signal level the peaks of the field-synchronizing pulses of said synchronizing-signal components, means for clipping at a second predetermined signal level said field-synchronizing pulses to separate said pulses from said composite signal, integrating means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for deriving a control potential during at least a portion of each field-retrace period, and means for utilizing said control potential for effectively changing with respect to the cutoff point of said image reproducer that level of said composite signal which corresponds to black in the transmitted image to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

9. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, integrating means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for deriving a unidirectional potential during at least a portion of each field-retrace period, and means for applying said composite signal and said derived potential to ray-control electrodes of said image reproducer effectively to suppress the cathode ray of said reproducer only during said portion of said field-retrace period.

10. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, means for repeating said synchronizing-signal components, means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for increasing the repeating ratio of said repeating means during at least a portion of each field-retrace period, and means for combining said repeated synchronizing-signal components with said composite signal to suppress the cathode ray of said reproducer during said portion of said field-retrace period.

11. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, means for repeating said synchronizing-signal components, means for integrating said synchronizing-signal components to derive a control potential during at least a portion of each field-retrace period, means responsive to said control potential for increasing the repeating ratio of said repeating means during said portion of said field-retrace period, and means for combining said repeated synchronizing-signal components with said composite signal to suppress the cathode ray of said reproducer during said portion of said field-retrace period.

12. A video-frequency signal-translating system for a television receiver comprising, a cathode-ray image reproducer having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, means for repeating said synchronizing-signal components, means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for increasing the repeating ratio of said repeating means during at least a portion of each field-retrace period, and means for applying to said input circuit repeated synchronizing-signal components to suppress the cathode

ray of said reproducer during said portion of said field-retrace period.

13. A video-frequency signal-translating system for a television receiver including a cathode-ray image reproducer comprising, a video-frequency signal-translating device having an input circuit adapted to have applied thereto a composite signal including synchronizing-signal components and video-signal components to be visually reproduced by said image reproducer, means for repeating said synchronizing-signal components, means responsive primarily to the field-synchronizing pulses of said synchronizing-signal components for increasing the repeating ratio of said repeating means during at least a portion of each field-retrace period, and means for combining said composite signal with said repeated synchronizing-signal components the polarity of which is opposite to that of corresponding components of said composite signal, thereby to suppress the cathode ray of said reproducer during said portion of said field-retrace period.

JOHN C. WILSON.