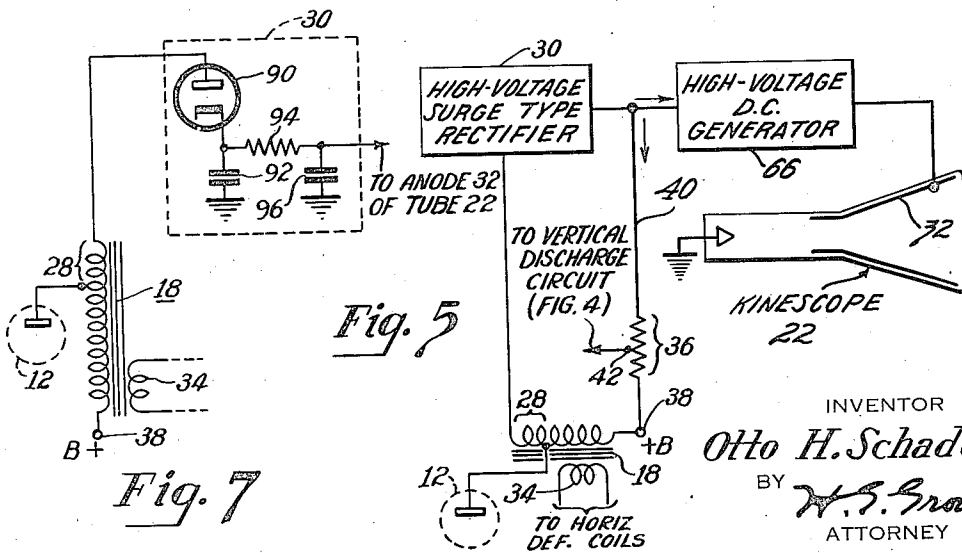
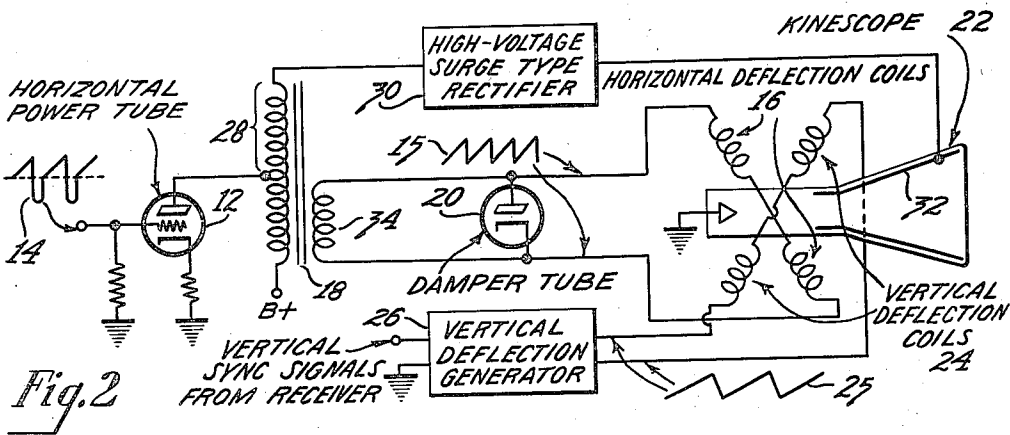
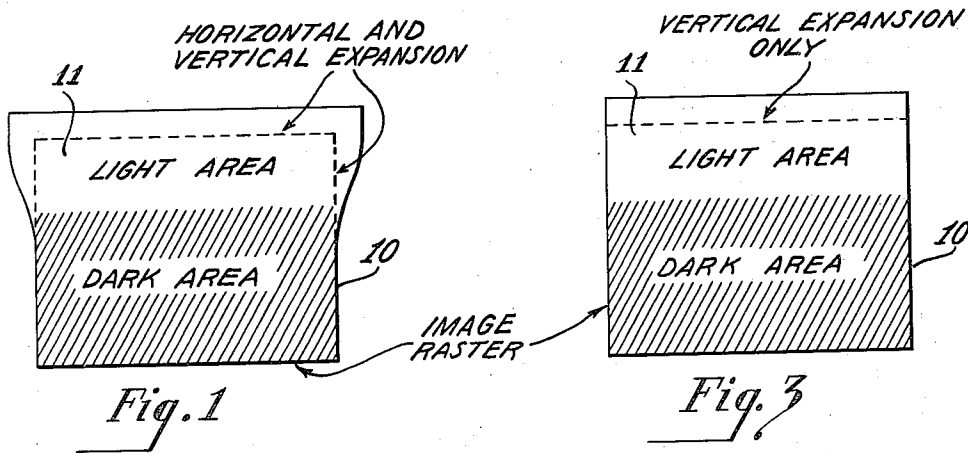


May 4, 1948.

2,440,787



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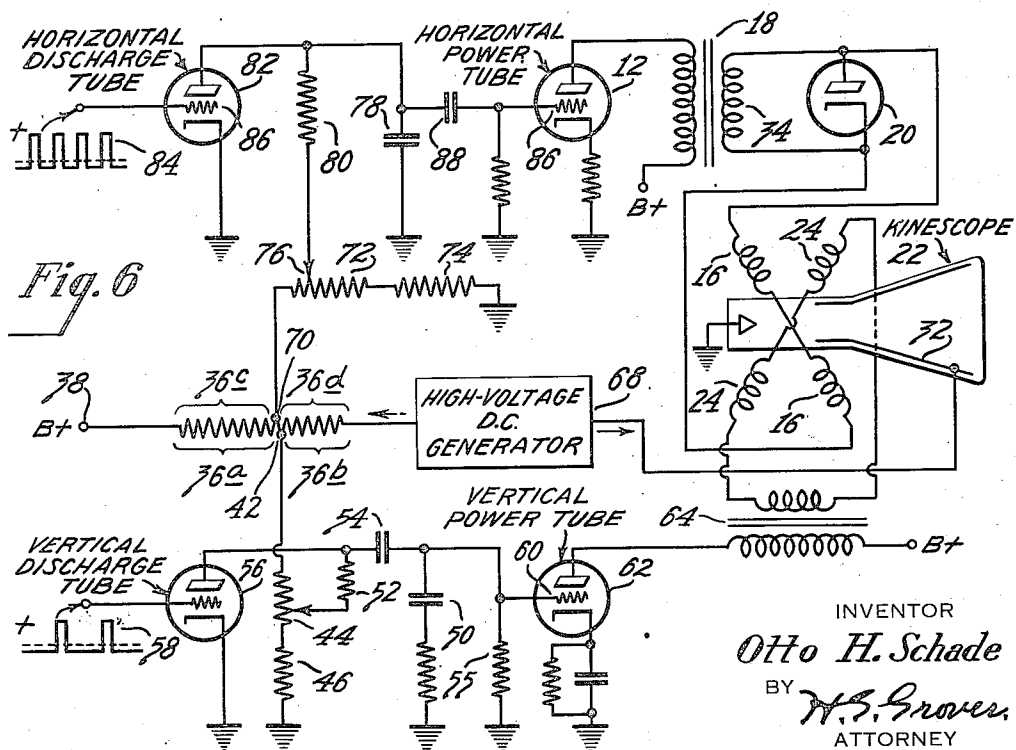
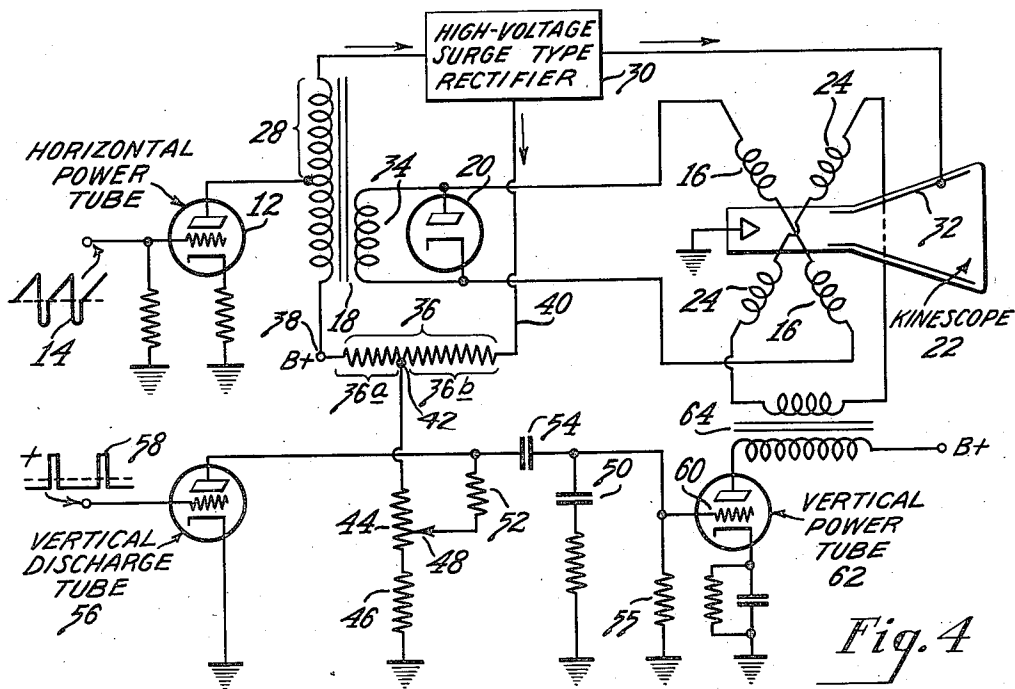
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2,440,787

TELEVISION TUBE CONTROL SYSTEM HAVING INTERCONNECTED
DEFLECTING COIL AND ACCELERATING ELECTRODE

Filed Aug. 9, 1945

2 Sheets-Sheet 2



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2,440,787

TELEVISION TUBE CONTROL SYSTEM HAVING INTERCONNECTED DEFLECTING COIL AND ACCELERATING ELECTRODE

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Application August 9, 1945, Serial No. 609,889

19 Claims. (Cl. 315—22)

1

The present invention relates to television receiving systems of the type in which the scanning beam developed in a cathode ray tube is controlled in such a manner as to effect the electro-optical reproduction of an image. The invention more particularly relates to means for maintaining an image raster of substantially predetermined selected size and shape in the face of fluctuations in the energizing voltage applied to the cathode ray tube.

The accelerating potential on the second anode of the kinescope commonly employed in present-day television receivers may rise to a value in the order of 30,000 volts, for example. While such a high potential may be derived from the relatively low-voltage alternating-current power input to the receiver, this procedure requires components, such as transformers and filters, which are not only expensive but which, in addition, increase the size and weight of the television apparatus.

An alternative expedient for deriving an energizing voltage for the cathode ray tube resides in the use of a vacuum tube oscillation generator, which may be designed as a separate high-voltage direct-current power supply system, or which may be the sawtooth generator forming part of the horizontal or line deflection circuit. In either case, such high voltage supplies have the disadvantage of relatively poor regulation, one reason for which is set forth below.

The anode circuit of the image-reproducing cathode ray tube, or kinescope, constitutes a load the average impedance of which varies in accordance with the average value of the video signal appearing on the control electrode of the kinescope. In other words, if a video signal supplied from the television receiver to the control electrode of the kinescope is such, at any instant, as to cause the fluorescent screen of the cathode ray tube to be devoid of illumination, then the kinescope constitutes a high-impedance load, since no space current is drawn from the high-voltage supply by the anodes of the cathode ray tube when the scanning beam is extinguished. On the other hand, when the video signal from the television receiver to the control electrode of the kinescope is such as to cause the screen of the cathode ray tube to be brightly illuminated, then the tube is a lower-impedance load, since the space current drawn from the high-voltage supply system by the anodes of the tube is relatively large.

Accordingly, the anode potential of the cathode ray tube would normally vary in accordance with

2

the video-frequency changes in tube impedance resulting from modulation of the scanning beam by the video signal. The power supply system of the television receiver is usually designed, however, so that the time constant of the power supply filter condensers is sufficiently large to smooth out any voltage variations which do not extend over a period in excess of several line-scanning intervals.

In certain instances, however, as, for example, in the reproduction of a landscape scene in which a substantial proportion of the image raster is brightly illuminated to represent a clear or a white sky, the time constant of the filter condensers of the power supply is exceeded. The voltage on the accelerating electrodes of the cathode ray tube, under these conditions, undergoes an appreciable drop.

Such a drop in tube accelerating voltage in conventional television systems results in distortion of the image raster. The reason for this will be appreciated when it is considered that the angle of deflection of the cathode ray scanning beam depends both upon the velocity of the beam and upon the strength of the deflecting field. Hence in any television receiver in which the deflecting field strength is maintained substantially uniform at a predetermined level, variations in the accelerating potential on the cathode ray tube will cause corresponding variations in the size of the image raster scanned by the beam. For example, under the conditions above set forth in which a landscape scene having a relatively large "sky" portion is reproduced, then the lower anode voltage caused by the increased space current during the extended period of brilliant screen illumination results in a lower scanning beam velocity. The same deflecting field intensity, acting upon the lower-velocity scanning beam, deflects it through a larger angle, so that during this period of highlight reproduction the image raster is expanded in an objectionable manner, as exemplified in Figure 1 of the drawings.

One object of the present invention, therefore, is to provide, in a television system employing an image-reproducing cathode ray tube, means for maintaining an image raster of substantially predetermined size and shape in the face of fluctuations in the accelerating potential delivered to the electrodes of the cathode ray tube.

Another object of the present invention is to provide, in a television system employing an image-reproducing cathode ray tube, means for causing either or both the line and field deflec-

tion potentials applied to the cathode ray tube to vary in accordance with variations in the accelerating potentials applied to the tube, whereby changes which would otherwise occur in the size of the image raster are automatically compensated for.

Other objects and advantages will be apparent from the following description of preferred forms of the invention and from the drawings, in which:

Fig. 1 illustrates an image raster as formed by the scanning action of the beam of a cathode ray tube, showing the highlight area distortion existent in present conventional types of television systems;

Fig. 2 illustrates a circuit in accordance with the present invention for correcting the horizontal highlight distortion only;

Fig. 3 illustrates the manner in which the circuit of Fig. 2 corrects the horizontal highlight distortion in the image raster shown in Fig. 1;

Fig. 4 illustrates a circuit in accordance with the present invention for correcting both horizontal and vertical highlight distortion;

Fig. 5 is a modification of Fig. 4 with the addition of a separate power supply;

Fig. 6 is a circuit diagram of an alternative arrangement showing a separate power supply energizing both the horizontal and vertical discharge circuits; and

Figure 7 illustrates one type of high-voltage surge-type rectifier that might be utilized in the circuits of Figs. 2, 4 and 5.

Referring first to Fig. 1, there is illustrated an image raster 10, such as formed by the scanning action of the beam of a cathode ray tube included in a conventional television receiver. As shown, both horizontal and vertical expansion occur when the accelerating potential on the anodes of the cathode ray tube is decreased as a result of a relatively large highlight area 11 in the reproduced image.

A television circuit for correcting only horizontal highlight distortion is shown in Fig. 2. This circuit includes a horizontal, or line, power output tube 12 having at least an anode, a cathode, and a control electrode. Tube 12 is adapted to deliver, when voltage variations having a waveform such as indicated by the reference character 14 are applied to the control electrode thereof, cyclically varying current, a portion of each cycle of which varies in a substantially linear manner with respect to time, as shown by the current waveform 15 (a showing which is not to scale but merely to show general wave configuration and amplitude as the ordinate and time as the abscissa), to a pair of horizontal or line cathode ray beam deflection coils 16 through a coupling step-down transformer 18. A damper tube 20 is connected across the secondary winding of transformer 18. This tube prevents oscillations in the circuit by acting as a switch which closes at the end of the return, or snapback, portion of each cycle of the current wave 15, or, in other words, at the beginning of each horizontal or line deflection cycle. The switching operation of tube 20 causes a current to flow therethrough which is of such waveform as to assist the power tube 12 in causing the desired linear current flow through the deflection coils 16. The operation of such a damper tube is set forth in applicant's Patent No. 2,309,672, and hence will not herein be described in detail.

The horizontal, or line, cathode ray beam deflection coils 16 preferably form part of a yoke

assembly encircling the neck of an image-reproducing cathode ray tube or kinescope 22. Included in the yoke assembly is a pair of vertical, or field, deflection coils 24, the latter being energized in a conventional manner by sawtooth current, which may have a waveform such as represented by the reference character 25 (which wave merely exemplifies the general form but is not to scale and which plots current as the ordinate and time as the abscissa) from a vertical deflection generator 26 synchronized by vertical sync (also termed synchronizing) signals derived from the composite television signal appearing in the input circuit of the television receiver. This input circuit, as well as other portions of the complete television receiver not necessary to an understanding of the present invention, have been omitted from the drawings for the sake of clarity.

The primary winding of coupling transformer 18 is provided with a stepped-up portion 28. The voltage appearing across the stepped-up primary winding of transformer 18 is applied to a surge type high-voltage rectifier 30, which may be of any suitable type designed to deliver a relatively smooth D.-C. potential to the accelerating electrode 32 of kinescope 22. The rectifying means 30 may also include means for doubling, quadrupling or otherwise increasing the value of the voltage output thereof, in accordance with the potential requirements of the image-reproducing tube 22. One voltage-increasing means of the type mentioned is disclosed in applicant's copending application Serial No. 578,678, filed February 19, 1945 now Patent No. 2,439,223 issued April 6, 1948.

As above stated, the kinescope 22 acts as a variable-impedance load. When space current is drawn by the anodes of tube 22 from the rectifier 30 due to extended highlight areas in the reproduced image, this, in effect, constitutes an increase in the load on the stepped-up primary winding of transformer 18. Consequently, less power is supplied to the secondary winding 34 of transformer 18, and the peak amplitude of the sawtooth scanning current 15 flowing through the horizontal deflection coils 16 decreases.

By a proper choice of circuit constants, the decrease in scanning amplitude may be made to just compensate for the decrease in accelerating potential, so that horizontal expansion of the image raster is substantially eliminated, as shown in Fig. 3. The vertical deflection generator 26, however, still delivers a vertical deflection current 25 of a substantially constant peak amplitude through the vertical deflection coils 24. Hence, vertical expansion still is present, the correct or undistorted contours for the image raster 10 being indicated in Figs. 1 and 3 by the broken lines.

A circuit for correcting both horizontal and vertical expansion is illustrated in Fig. 4, the circuit components in this figure corresponding to those in Fig. 2 being identified by the same reference characters. A relatively high-resistance bleeder resistor 36 has one end connected to the positive terminal 38 of a source of relatively steady D.-C. potential (not shown). The source of potential connected to terminal 38 may, if desired, be the same one that supplies plate voltage for the horizontal power tube 12 through a portion of the primary winding of coupling transformer 18.

The other end of bleeder resistor 36 is connected to the high-voltage rectifier 30 by means of a lead 40 in such a manner that the voltage supplied to the resistor 36 by the rectifier 30 may be

either the full voltage output of the rectifier 30 as applied to the accelerating electrode 32 of kinescope 22, or it may be a portion of the full voltage output of the rectifier 30. In any event, related fluctuations occur in the voltage output of rectifier 30 as applied both to the kinescope anode 32 and to one end of the bleeder resistor 36 over lead 40.

An adjustable tap 42 on resistor 36 is connected to ground through a potentiometer 44 and a relatively high resistor 46. From the slider 48 of potentiometer 44 energy is derived to charge a condenser 50 through a charging resistor 52 and a coupling condenser 54.

A vertical discharge tube 56 is connected to ground in parallel with charging condenser 50. Discharge tube 56 is normally cut off, and is rendered conductive to discharge condenser 50 when one of a series of positive sync pulses, which may have a waveform such as indicated by the reference character 58, is received on the control electrode thereof. The voltage variations thus developed across condenser 50, which will be of substantially sawtooth configuration, are applied to the control electrode 60 of a vertical power tube 62.

Vertical power tube 62 is adapted to deliver cyclically varying current having a waveform of substantially sawtooth configuration, as a result of the voltage waveform of substantially sawtooth configuration received on the control electrode thereof, to the vertical or field deflection coils 24 through coupling transformer 64. As will now be shown, the peak amplitude of the cyclically varying current flowing through the vertical deflection coils 24 will change as a function of changes in the voltage output of rectifier 30.

When the voltage on the accelerating electrode 32 of kinescope 22 decreases as a result of extended highlights in the reproduced image, it has been shown that the peak amplitude of the deflecting energy should likewise decrease in order that the configuration of the image raster scanned by the cathode ray beam should remain substantially unaltered. This change in peak amplitude of the deflecting current should be approximately as the square root of changes in tube anode potential, and for small percentage changes, this value will be in the order of one-half.

An anode potential-scanning amplitude relationship, such as set forth above, is readily obtained in the circuit of Fig. 4. It will be observed that the bleeder resistor 36 acts as a mixer of: (1) the relatively steady D.-C. voltage from the terminal 38, and (2) the voltage from the rectifier 30, which varies synchronously with changes in potential of kinescope anode 32. Hence by adjustment of the tap 42, any desired mixing proportions may be achieved. For example, moving tap 42 to the right (in the drawing) to increase resistor portion 36a and decrease resistor portion 36b will increase the compensation, since a greater amount of varying voltage and a lesser amount of steady voltage is caused to appear across potentiometer 44. Conversely, moving tap 42 to the left decreases the compensation, since more steady voltage and less varying voltage is supplied to potentiometer 44. It will be appreciated that there is one position for tap 42 at which correct compensation may be obtained, this correct compensation being readily determinable by viewing the image reproduced on the screen of the kinescope 22 during adjustment of tap 42.

A desired amount of the voltage appearing across potentiometer 44 is applied to charge con-

denser 50 through resistor 52 and coupling condenser 54. Adjustment of slider 48, by varying the charging potential applied to condenser 50, acts as a vertical size control, as will be readily understood by those skilled in the art. Periodic conduction of discharge tube 56, as a result of voltage variations 58 being received on the control electrode thereof, results in a substantially sawtooth voltage wave to be applied to the control electrode 60 of vertical power tube 62, which is thus controlled to deliver cyclically varying sawtooth current to the vertical deflection coils 24.

By placing the coupling condenser 54 in the circuit so that it and condenser 50 are charged in series through resistor 52, and by making it of relatively small capacity, as, for example, .015 mf., it is possible to avoid the large D.-C. transients on the control electrode 60 of power tube 62 that occur when large coupling condensers are employed. It should also be noted that by this method of placement of coupling condenser 54, the grid resistor 55 of power tube 62 does not shunt a parallel combination of condensers 50 and 54 as occurs in conventional arrangements.

The circuits of both Figs. 2 and 4 include a high-voltage surge type rectifier 30 connected to the stepped-up primary winding of transformer 18. This rectifier 30 will deliver a relatively smooth D.-C. output voltage which is sufficiently high in many instances to be suitable as an accelerating potential for the second anode 32 of kinescope 22. However, in some cases, such as in projection type television receivers, an energizing potential is necessary or desirable which is greater than can be conveniently or practically supplied by a high-voltage rectifier of the surge type. In such receiving systems, a separate high voltage D.-C. generator 66 may be added to supply voltage for the anode 32 of kinescope 22 in series with the high-voltage rectifier 30, as shown in Fig. 5. In such an event, the total voltage on the kinescope anode 32 will be substantially the sum of the outputs of the power supply devices 30 and 66, and variations in the output of rectifier 30 as a result of kinescope impedance changes will be applied through generator 66 to the kinescope anode 32 in a relative proportion determined in part by the circuit constants of the respective power supply devices.

In certain television receiver arrangements, a separate power supply for the kinescope second anode is employed which is not associated with the horizontal or line deflection system, as is the surge type rectifier 30 in the circuits of Figs. 2, 4 and 5. Such a system is illustrated in Fig. 6, in which a high-voltage D.-C. generator 68 is employed to supply an accelerating potential for the second anode 32 of kinescope 22. Generator 68 may, under certain conditions, be similar to the generator 66 of Fig. 5.

Since an increase in space current drawn from the generator 68 by the anode of kinescope 22, under extended high-light conditions, does not place a greater load on the horizontal power transformer 18 in the circuit of Fig. 6 to thereby result in a decrease in horizontal peak scanning amplitude, other means must be provided for bringing about this result. It will be noted that the means for producing a decrease in vertical peak scanning amplitude by automatically decreasing the charging potential applied to condenser 50 is identical in both Figs. 4 and 6, and hence a discussion of the vertical size regulating characteristics of the invention will not be repeated.

To give automatic horizontal size control in connection with the separate power supply 68 of Fig. 6, a second tap 70 is provided on bleeder resistor 36. Tap 70 is connected to ground through a potentiometer 72 and a relatively high resistance 74 in substantially the same manner that tap 42 is connected to ground through potentiometer 44 and resistor 46.

From the slider 76 of potentiometer 72 energy is derived to charge a condenser 78 through a charging resistor 80. It will be appreciated that adjustment of slider 76 acts to vary the charging potential applied to condenser 78, and hence acts as a horizontal size control.

A horizontal discharge tube 82, which is normally biased to cut-off by any suitable means, is rendered conductive when one of a series of positive sync pulses, such as indicated by the waveform 84, is received on the control electrode 86 thereof. This results in a discharge of condenser 78, and hence a voltage waveform of substantially sawtooth configuration is applied to the control electrode 86 of horizontal power tube 12 through coupling condenser 88.

It will now be appreciated that the position of tap 70 on bleeder resistor 36 determines the degree of compensation for the horizontal deflection circuit, when changes in kinescope anode potential occur, in the same manner that the position of tap 42 determines the degree of compensation for the vertical deflection circuit. That is, an increase of resistor portion 36c, with a corresponding decrease of resistor portion 36d, will increase the compensation, since a greater amount of varying voltage from generator 68 and a lesser amount of steady voltage from terminal 38 is caused to appear across potentiometer 72. Conversely, an increase in resistor portion 36d with a corresponding decrease in resistor portion 36c decreases the compensation. It has been found that once proper positions for taps 42 and 70 have been determined, any change in these positions is usually unnecessary as long as the constants of the remaining components of the circuit remain substantially the same.

Fig. 7 illustrates one type of high-voltage surge-type rectifier illustrated by block diagram and identified by the reference numeral 30 in Figs. 2, 4 and 5. A rectifier of this general nature is illustrated and described in the applicant's above-mentioned copending application, Serial No. 578,678, and hence will not be set forth in detail herein. However, this rectifier 30 may include a rectifier tube 90 the anode of which is connected to the step-up winding 28 of transformer 18 as shown. The cathode of rectifier tube 90 is connected to ground through a capacitor or other energy storage device 92. During the retrace intervals of the cathode ray scanning beam of the kinescope 22, pulses of positive polarity will be applied to the anode of rectifier tube 90. This will render tube 90 conductive to charge capacitor 92. Since the latter is chosen to be of relatively high value, a substantially smooth D.-C. potential will be developed thereon during operation of the deflection circuit, and this potential is filtered by means of a resistor 94 so as to produce across an output capacitor 96 a potential which is sufficiently stable for application to the anode 32 of kinescope 22. Although one particular type of high-voltage surge-type rectifier circuit has been given in Fig. 7 as an example, it will be appreciated that any other suitable type of recti-

fier circuit 30 may be employed in place thereof, if desired.

Having thus described my invention, I claim:

1. In a cathode ray beam deflection circuit including a line power output tube adapted to supply cyclically varying current, a portion of each cycle of which varies in a substantially linear manner with respect to time, through a coupling transformer to a pair of cathode ray beam line deflection coils encircling the neck of a cathode ray image-reproducing tube also having a pair of field deflection coils encircling the neck thereof and at least one accelerating electrode, and in which the voltage developed across at least one winding of said coupling transformer, as a result of the flow of said cyclically varying current therethrough, is fed to a rectifying device and then a portion of the voltage output of said rectifying device applied as a D.-C. energizing potential to said accelerating electrode of said cathode ray tube, whereby the voltage output of said rectifying device varies in value in accordance with the characteristics of the image reproduced by said cathode ray tube, the combination of a source of relatively stable D.-C. potential, means for mixing all or a portion of said relatively stable D.-C. potential with a portion of the voltage output of said rectifying device, an energy storage element, means for applying the energy output of said mixing means to charge said energy storage element, means for periodically discharging said energy storage element, a field power output tube having a control electrode, and means for applying the resultant fluctuating charge on said energy storage element to the control electrode of said field power output tube so that the peak value of the current output of said field power output tube, as supplied to said pair of cathode ray beam field deflection coils, and hence the magnitude of the field deflection of said cathode ray beam, will vary as a function of variations in the voltage output of said rectifying device.

2. A cathode ray beam deflection circuit in accordance with claim 1, further including means for varying the relative proportions of said relatively stable D.-C. potential and said portion of the voltage output of said rectifying device which are present in the output of said mixing means.

3. A cathode ray beam deflection circuit in accordance with claim 1, in which said means for mixing said relatively stable D.-C. potential with a portion of the voltage output of said rectifying device includes a resistor, one end of which is connected to said source of relatively stable D.-C. potential, and the other end of which is connected to said rectifying device, said resistor being provided with an adjustable tap for deriving output energy for application to said energy storage element.

4. In a cathode ray beam deflection circuit, an image-reproducing cathode ray tube having at least one accelerating electrode and at least one beam deflection coil associated therewith, a power output tube, a transformer coupling said power output tube to said beam deflection coil, a rectifier connected to one winding of said transformer, a D.-C. generator, and means for applying a portion of the output of said rectifier and the output of said D.-C. generator in series to the accelerating electrode of said cathode ray tube.

5. A cathode ray beam deflection circuit in accordance with claim 4, further comprising

an additional beam deflection coil associated with said image-reproducing cathode ray tube, a source of relatively stable D.-C. potential, means for combining all or a portion of said relatively stable D.-C. potential with a portion of the voltage output of said rectifier so as to establish a control variation, means for generating a cyclically varying current for application to said additional beam deflection coil, and means for applying said control variation to regulate the peak amplitude of the current output of said generating means.

6. In a cathode ray beam deflection circuit, an image-reproducing cathode ray tube having at least one accelerating electrode and both line and field cathode ray beam deflection coils associated therewith, a line power output tube, a transformer coupling said line power output tube to said line cathode ray beam deflection coil, a rectifier connected to one winding of said transformer, means for applying a portion of the output of said rectifier to the accelerating electrode of said cathode ray tube, means for combining relatively stable D.-C. potential from a source with a portion of the energy output of said rectifier so as to establish a control variation which varies as a function of variations in the value of the output of said rectifier, means for generating a cyclically varying current for application to said field cathode ray beam deflection coil, and means for applying said control variation to regulate the peak amplitude of the current output of said generating means.

7. A cathode ray beam deflection circuit in accordance with claim 6, in which said means for generating a cyclically varying current for application to said field cathode ray beam deflection coil includes a condenser, means for applying said control variation to charge said condenser, and means for periodically discharging said condenser.

8. A cathode ray beam deflection circuit in accordance with claim 6, further including means for varying the relative amounts of said relatively stable D.-C. potential and of the energy output of said rectifier which together comprise said control variation.

9. A cathode ray beam deflection circuit in accordance with claim 6, in which said means for generating a cyclically varying current for application to said field cathode ray beam deflection coil includes a coupling condenser, a charging resistor, a charging condenser, means for applying said control variation to charge said coupling condenser and said charging condenser in series through said charging resistor, and means for periodically discharging said charging condenser so as to develop recurrent voltage variations thereacross.

10. In a cathode ray beam deflection circuit, an image-reproducing cathode ray tube having at least one accelerating electrode and with both line and field cathode ray beam deflection coils associated therewith, a D.-C. generator, means for applying a portion of the energy output of said D.-C. generator to the accelerating electrode of said cathode ray tube, a line power output tube having a control electrode and adapted to deliver cyclically varying current to said line cathode ray beam deflection coil, means, including a condenser, for generating a cyclically varying voltage for application to the control electrode of said line power output tube, means for combining relatively stable D.-C. voltage from a source with a portion of

the energy output of said D.-C. generator so as to establish a control potential which varies as a function of variations in the value of the energy output of said D.-C. generator, means for applying said control potential to charge said condenser, whereby the peak amplitude of the said cyclically varying voltage applied to the control electrode of said line power output tube will vary as a function of variations in said control potential, a field power output tube having a control electrode and adapted to deliver cyclically varying current to said field cathode ray beam deflection coil, means, including a second condenser, for generating a cyclically varying voltage for application to the control electrode of said field power output tube, means for establishing a second control potential from said relatively stable D.-C. voltage combined with a portion of the energy output of said D.-C. generator, and means for applying said second control potential to charge said second condenser, whereby the peak amplitude of the cyclically varying voltage applied to the control electrode of said field power output tube will vary as a function of variations in the value of the energy output of said D.-C. generator.

11. In a cathode ray beam deflection circuit, an image-reproducing cathode ray tube having at least one accelerating electrode and both line and field cathode ray beam deflection coils associated therewith, a D.-C. generator, means for applying a portion of the energy output of said D.-C. generator to the accelerating electrode of said cathode ray tube, means for applying another portion of the energy output of said D.-C. generator to one end of a resistor element, means for applying a relatively stable D.-C. potential to the other end of said resistor element, a line power output tube adapted to supply cyclically varying current to said line cathode ray beam deflection coils, a discharge circuit, including a condenser, for said line power output tube, means connecting the condenser of said discharge circuit to a point on said resistor element, a field power output tube adapted to supply cyclically varying current to said field cathode ray beam deflection coils, a discharge circuit, including a second condenser, for said field power output tube, and means for connecting said second condenser to a point on said resistor element.

12. In a cathode ray beam deflection circuit, including an image-reproducing cathode ray tube having at least one accelerating electrode and at least one coil for deflecting the cathode ray scanning beam of said cathode ray tube, said cathode ray beam deflection circuit also including means for generating a cyclically varying current and for supplying said current to said cathode ray beam deflection coil through a coupling transformer, and in which energy is supplied to the accelerating electrode of said cathode ray tube from a D.-C. generator, means for compensating for changes in the configuration of the image raster scanned by the cathode ray beam of said cathode ray tube as a result of highlight areas in the reproduced image, said means including means for rectifying the energy developed across at least one winding of said coupling transformer, and means for applying said rectified energy to the accelerating electrode of said cathode ray tube in series with the energy output of said D.-C. generator.

13. In a cathode ray beam deflection circuit including an image-reproducing cathode ray

tube having at least one accelerating electrode and both line and field deflection coils for deflecting the cathode ray scanning beam of said cathode ray tube when cyclically varying current is passed therethrough, said cathode ray beam deflection circuit also including means for generating a first cyclically varying current and for supplying said current to said line cathode ray beam deflection coil through a coupling transformer, the energizing potential for the accelerating electrode of said cathode ray tube being obtained by rectifying the energy developed across at least one winding of said coupling transformer and applying a portion of said rectified energy to the accelerating electrode of said cathode ray tube, means for compensating for changes in the configuration of the image raster scanned by the cathode ray beam of said cathode ray tube as a result of highlight areas in the reproduced image, said means including means for mixing a portion of said rectified energy with a relatively stable D.-C. potential, means for generating a further cyclically varying current and for supplying said further cyclically varying current to said field cathode ray beam deflection coil, and means for applying the output of said mixing means to control the generation of said further cyclically varying current.

14. In a television system in which the substantially predetermined configuration of the image raster scanned by the beam of an image-reproducing cathode ray tube is subject to vertical distortion as a result of changes in the energizing potential applied to said cathode ray tube caused by extended highlight areas in the reproduced image, said energizing potential being derived from the cyclic reactive energy developed as a result of the periodic horizontal deflection of the cathode ray scanning beam, the novelty of means for correcting said vertical distortion, said correcting means including means for deriving energy which changes as a function of changes in the value of the energizing potential applied to said cathode ray tube, and means for applying the energy so derived to regulate the vertical scanning action of said cathode ray scanning beam.

15. In a cathode ray beam deflection circuit, an image-reproducing cathode ray tube having at least one accelerating electrode and both line and field cathode ray beam deflection coils associated therewith, a circuit wherein line deflecting voltages for deflecting the cathode ray beam at line-scanning frequency are developed, said line deflecting voltage developing circuit being coupled to said line cathode ray beam deflection coil, a rectifier connected to rectify at least a portion of the voltage developed across said line cathode ray beam deflection coil, a circuit for applying a portion of the output of said rectifier to the accelerating electrode of said cathode ray tube, a further circuit for combining relatively stable D.-C. potential from a source with a portion of the energy output of said rectifier so as to establish a control variation which varies as a function of variations in the value of the output of said rectifier, a still further circuit wherein field deflecting voltages for deflecting the cathode ray beam at field-scanning frequency are developed, said field deflecting voltage developing circuit being coupled to said field cathode ray beam deflection coil, and a connection for applying said control variation to said field deflecting voltage developing circuit so as

to regulate the peak amplitude of said field deflecting voltage.

16. In a cathode ray beam deflection circuit including an image-reproducing cathode ray tube having at least one accelerating electrode and both line and field deflection coils for deflecting the cathode ray scanning beam developed within said cathode ray tube relating to a selected target area when cyclically varying current is passed therethrough, a first sawtooth wave generating circuit for developing a first cyclically varying current at substantially line-scanning frequency, a coupling transformer connection for supplying said current to said line cathode ray beam deflection coil, a rectifier connected across at least one winding of said coupling transformer to produce from the pulse energy in the transformer a D.-C. energizing potential for the accelerating electrode of said cathode ray tube, a second sawtooth wave generating circuit for developing a cyclically varying current at substantially field-scanning frequency, a circuit connection for supplying said further cyclically varying current to said field cathode ray beam deflection coil, a circuit for mixing a portion of said rectified energy with a relatively stable D.-C. potential in such proportions as to compensate for changes in the configuration of the image raster scanned by the cathode ray beam of said cathode ray tube as a result of continued periods when the beam current exceeds a predetermined average value, and a further circuit connection for applying the output of said mixing circuit to the second sawtooth wave generating circuit so as to control the development of said further cyclically varying current.

17. In a television system in which the substantially predetermined configuration of the image raster traced on a cathode ray device by a cathode ray beam moving in relatively rapid line traces and in relative slow mutually perpendicular field traces, where distortion in the direction of relatively slow beam motion comes about as a result of changes in the energizing potential applied to said cathode ray tube during periods when relatively long continued high beam currents are drawn by the tube during the scanning, and in a system wherein the said energizing potential is derived from the cyclic reactive energy developed as a result of the periodic line deflection of the cathode ray scanning beam, the combination of a circuit for deriving energy which changes as a function of changes in the value of the energizing potential applied to said cathode ray tube, and a connection from the reactive energy developing circuit to apply a portion of the energy thus derived to modify the field scanning action of said cathode ray scanning beam in a manner to compensate for raster distortion in the field scanning direction.

18. In a television system in which the substantially predetermined configuration of the image raster traced on a cathode ray device by a cathode ray beam moving in relatively rapid line traces and in relatively slow mutually perpendicular field traces, where distortion in the direction of relatively slow beam motion comes about as a result of changes in the energizing potential applied to accelerate the developed cathode ray beam in the direction of the target area during periods when relatively long continued high beam currents are drawn by the tube during the scanning, and in a system wherein

said energizing potential is derived from the cyclic reactive energy developed as a result of the periodic line deflection of the cathode ray scanning beam, the method of correcting distortion of the raster in the field scanning direction which comprises the steps of deriving energy which is substantially proportional in magnitude to a selected function of the changes in the value of the derived energizing potential applied to accelerate the developed cathode ray beam in the direction of the impact target area, and applying the energy thus derived to so regulate the field scanning pattern of said cathode ray scanning beam as to compensate for said introduced pattern distortion.

19. In a cathode ray beam deflection circuit including an image-reproducing cathode ray tube having at least one accelerating electrode and both line and field deflection coils for deflecting the cathode ray scanning beam developed within said cathode ray tube relative to a selected target area when cyclically varying current is passed therethrough, and in which the normally substantially smooth D.-C. potential supplied to the said accelerating electrode of said cathode ray tube is derived from the cyclic reactive energy developed as a result of the cyclically varying current passing through said line cathode ray beam deflection coils, the method of compensating for changes in the configuration of the image

raster traced on the target area by the cathode ray beam as a result of variations in the value of said normally substantially smooth D.-C. potential caused by continued high beam current of the scanning cathode ray beam which comprises developing a first cyclically varying current, supplying said first cyclically varying current to deflect the said cathode ray beam in its line traces, developing a second cyclically varying current, supplying said second cyclically varying current to deflect the said cathode ray beam in its field traces, combining a part of the said varying D.-C. potential derived from the cyclic reactive energy with a stable D.-C. potential in such proportions as to correct for distortion in image raster configuration which results from continued high beam current conditions, and applying said combined potentials to control the development of said second cyclically varying current.

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The following references are of record in the file of this patent:

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