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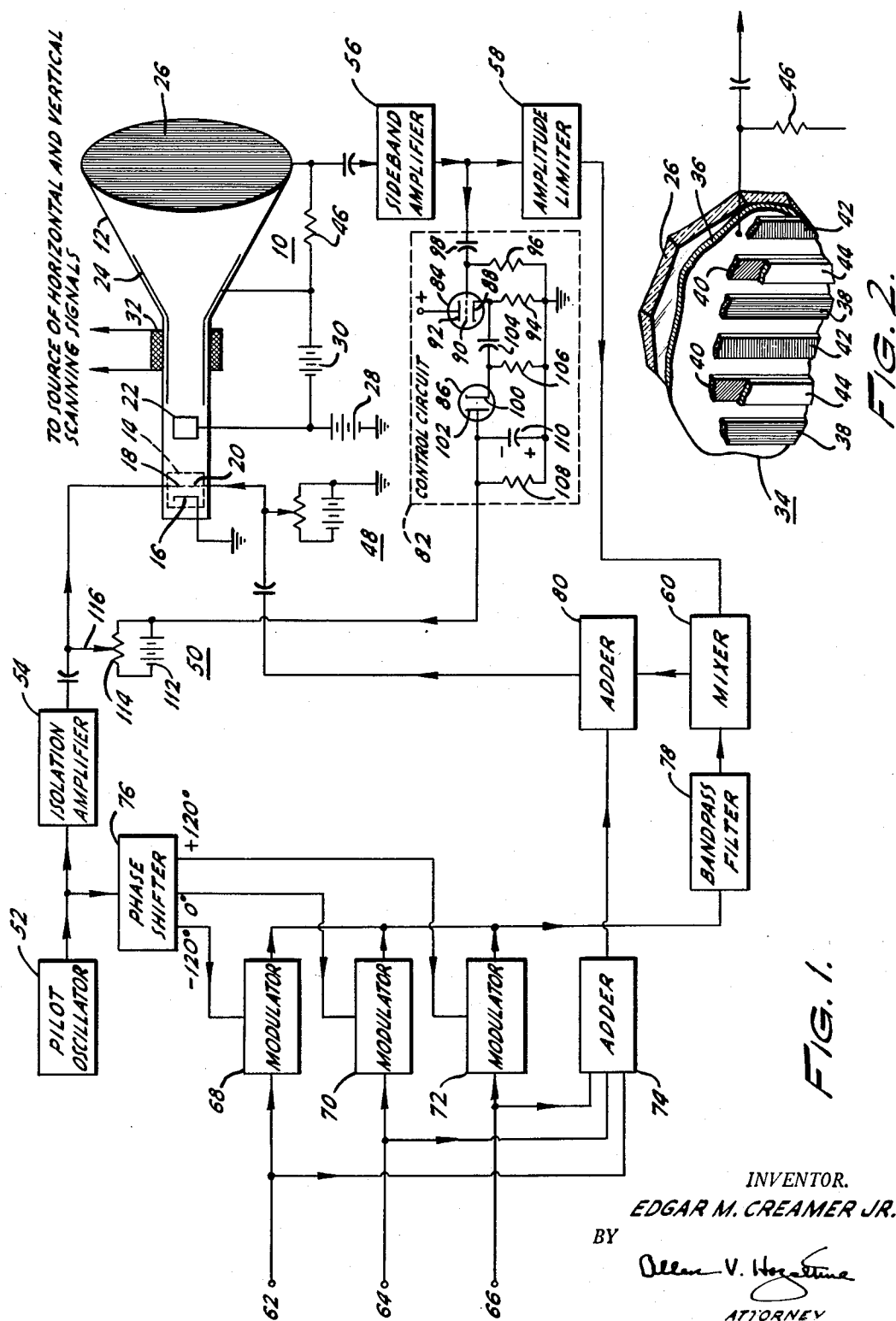


FIG. 1.

FIG. 2.

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BEAM CURRENT REGULATORS FOR CATHODE RAY TUBES

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The present invention relates to electrical systems and more particularly to cathode-ray tube systems comprising a beam-intercepting structure and indexing means arranged in cooperative relationship with the beam-intercepting structure and adapted to produce a signal whose time of occurrence is indicative of the position of the cathode-ray beam.

The invention is particularly adapted for, and will be described in connection with, a color television image presentation system utilizing a single cathode-ray tube having a beam-intercepting, image-forming screen member comprising vertical stripes of luminescent materials. These stripes are preferably arranged in laterally displaced color triplets, each triplet comprising three vertical phosphor stripes which respond to electron impingement to produce light of three different primary colors. The order of arrangement of the stripes may be such that normal horizontally scanning cathode-ray beam produces red, green and blue light successively. From a color television receiver there may then be supplied three separate video signals, each indicative of a different primary color component of the televised scene, which signals are utilized sequentially to control the intensity of the cathode-ray beam. For proper color rendition, it is then required that, as the phosphor stripes producing each of the primary colors of light are impinged by the cathode-ray beam, the intensity of the beam shall be simultaneously controlled in response to the contemporaneous value of the video signal representing the corresponding color component of the televised image. However, since the rate at which the beam scans across the phosphor stripes of the screen may vary, for example because of non-linearity of the beam deflecting signal or because of a non-uniform distribution of the color triplets on the screen surface, the times at which the several video color signals should be applied to the tube will generally not occur exactly periodically. To obtain proper synchronism between the application of a given color signal and the impingement of the beam on a corresponding color stripe of the screen, it is desirable to derive signals indicative of the instantaneous position of the cathode-ray beam upon the image-forming screen, and to utilize these indexing signals to control the application of the several color signals to the cathode-ray tube. The said indexing signals may be derived from a plurality of stripe members disposed in a geometric configuration indicative of the geometric configuration of the color triplets. In one form, these indexing stripe members may be arranged on the beam-intercepting screen structure so that, as the beam scans the screen, the indexing stripes are excited in spaced time sequence corresponding to the scanning of the color triplets and a series of pulses is generated in a suitable output electrode system of the cathode-ray tube.

The indexing stripes may comprise a material having secondary-emissive properties which differ from the secondary-emissive properties of the remaining portions of the beam intercepting structure. For example, the in-

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dexing stripes may consist of a high atomic number material such as gold, platinum or tungsten or may consist of oxides, such as cesium oxide or magnesium oxide. Alternatively, the screen structure may be provided with a surface layer of a material such as magnesium oxide, having a uniform inherent secondary emissivity and an underlying layer the different portions of which have different electrical conductivity values thereby correspondingly modifying the effective electron emissivity of the surface layer. Such an arrangement is described and claimed in the copending application of William E. Bradley and Meier Sadowsky (11-439-A). The indexing stripes may also consist of a fluorescent material, such as zinc oxide, having a spectral output in the non-visible light region and the indexing signals may be derived from a suitable photo-electric cell arranged, for example, in a side wall portion of the cathode-ray tube, out of the path of the cathode-ray beam and facing the beam-intercepting surface of the screen structure.

In the copending application of Melvin E. Partin, Serial No. 242,264, filed August 17, 1951 and assigned to the assignee of the present application, there is described a system in which a well-defined indexing signal indicative of the position of the cathode-ray beam may be readily obtained. As described in the said copending application, the beam-intercepting structure is simultaneously scanned by means of two electron beams, the intensities of which are individually controllable by appropriate individual signals applied to the intensity-varying systems of the beams. One of the beams is intensity-modulated by a first signal constituting the image information, while the other beam, hereinafter termed an indexing beam, is varied in intensity by a second signal having a frequency which is widely separated from the frequency spectrum of the first signal. Thus, when this beam impinges upon the indexing stripes, there is produced, at an appropriate output electrode of the tube, an indexing signal having a frequency determined by the frequency of the second signal and by the rate of scanning of the indexing stripes.

Because of the simultaneous deflection of the beams, the position of one beam indicates the position of the other beam, so that indexing information produced by one of the beams is indicative of the position of the other beam. Since the frequency spectrum of the indexing signal so produced is widely separated from the spectrum of the other signals generated by the actions of the electron beams, the indexing signal is readily selected from such other signals by relatively simple filtering means. The indexing signal so derived is appropriately amplified and amplitude-limited, and is then mixed with the video information signal in a manner such as to vary the phase of the video information signal impressed on the electrode of the cathode-ray tube controlling the image reproducing beam, thereby to correlate the video information signal with the appropriate phosphor stripe.

As a rule, the amplitude of the indexing signal produced by the indexing beam is determined by the intensity of the indexing beam. However, since the indexing beam also impinges on the phosphor stripes during the scanning of the screen, it is necessary to limit the illumination produced thereby to a relatively low value in order to prevent desaturation of the colors of the reproduced image. It has been proposed to achieve an indexing signal of the required intensity and, simultaneously, to maintain the illumination produced by the indexing beam at a low level, by adjusting the operating conditions of the indexing beam control system and the amplitude of the applied signal which varies the intensity of the indexing beam, so that the beam current exhibits large, short-time periodic peak values and only a small average value. This may be achieved by operating the control electrode system of the indexing beam at a bias voltage considerably more negative

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than its cut-off value, and by applying a sufficiently large signal to the control electrode.

I have found that, in some instances, the beam intensity control system may undergo changes in its beam-current versus control-electrode-voltage characteristic and, more particularly, may undergo changes in the cut-off voltage value. Since the cut-off voltage generally has a large value, a small percentage change thereof represents a large change in absolute voltage value, so that the difference between the applied biasing voltage and the cut-off voltage value changes at a rate considerably greater than the percentage change of the cut-off voltage. Since this voltage difference establishes the ratio of the peak-to-average currents of the indexing beam, it will be understood that a relatively small change in cut-off voltage produces a large change in the current ratio, so that a small positive-going change in cut-off voltage value may be sufficient to reduce the indexing signal generated to an unusably low value, whereas a small negative-going change in the cut-off voltage value may be sufficient to raise the average current of the indexing beam to a value at which the beam causes severe desaturation of the colors of the image produced by the image-forming beam.

It is an object of the invention to provide an improved cathode-ray tube system of the type in which the position of the electron beam relative to a beam-intercepting member is indicated by a signal derived from an indexing member arranged in cooperative relationship with the beam-intercepting member.

Another object of the invention is to provide an improved cathode-ray tube system of the type in which the position of the electron beam is indicated by a signal derived from an indexing member, and in which a clearly defined indexing signal is generated.

An additional object of the invention is to provide a cathode-ray system of the type in which the position of the electron beam is indicated by a signal derived from an indexing member and in which the amplitude of the indexing signal produced is maintained at a substantially constant value notwithstanding changes in the operating characteristics of the cathode-ray tube.

A still further object of the invention is to provide a cathode-ray tube system of the type in which the position of the electron beam is indicated by a signal derived from an indexing member, and in which the desaturation of the image colors normally produced by the indexing beam is maintained at a predetermined desirably low value.

A specific object of the invention is to provide a cathode-ray tube system of the type in which the position of the electron beam is indicated by a signal derived from an indexing member, in which the intensity of the indexing beam is kept at a substantially constant value irrespective of changes in the operating characteristics of the cathode-ray tube, in which a clearly defined indexing signal is generated, and in which desaturation of the colors of the image produced is kept at a predetermined desirably low level.

In accordance with the invention, in a cathode-ray tube system having a cathode-ray beam specifically adapted to generate an indexing signal indicative of the position of the beam, the said beam undergoing changes in the ratio of the peak-to-average current values thereof because of changes in the operating characteristic of the tube, the foregoing objects are achieved by deriving from the generated indexing signal a control quantity proportional to the amplitude of the said signal and by modifying the operating potentials applied to the cathode-ray tube in a sense to compensate for the change in the operating characteristics thereof.

More specifically, in accordance with the invention, changes in the absolute magnitude of the peak current, and in the ratio of peak-to-average current values of the indexing beam, brought about by changes in the cut-off characteristic of the tube, are corrected by deriving from the generated indexing signal a control signal having a

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value determined by the amplitude of the indexing signal, and by varying the operating bias voltage of the intensity control system of the indexing beam in a manner proportional to the value of the control signal. By so varying the bias voltage of the intensity control system, the peak current value of the beam is maintained substantially constant and the ratio of the peak-to-average current values is similarly maintained substantially constant.

The invention will be described in greater detail with reference to the appended drawings forming part of the specification and in which:

Figure 1 is a block diagram, partly schematic, showing one form of a cathode-ray system in accordance with the invention; and

Figure 2 is a perspective view of a portion of one form of an image-reproducing screen structure suitable for cathode-ray systems of the invention.

The cathode-ray tube system shown in Figure 1 comprises a cathode-ray tube 10 containing, within an evacuated envelope 12, a dual beam generating and intensity control system 14 comprising a cathode 16, a first control electrode 18 for one beam, and a second control electrode 20 for the other beam. Suitable forms for the dual beam generating system are described in the aforementioned Partin application, and a further description of such systems herein is believed to be unnecessary. The tube 10 further comprises a focussing electrode 22 and a beam accelerating electrode 24, the latter of which may consist of a conductive coating applied to the inner wall of the envelope and terminating at a point spaced from the end-face 26 of the tube in conformity with well-established practice. Electrodes 22 and 24 are maintained at their desired operating potentials by suitable voltage sources shown as batteries 28 and 30, the battery 28 having its positive pole connected to the anode 22 and its negative pole connected to a point at ground potential, and the battery 30 being connected with its positive pole to electrode 24 and its negative pole to the positive pole of battery 28.

A deflection yoke 32, coupled to horizontal and vertical sweep generating circuits of conventional design (not shown), is provided for simultaneously deflecting the dual electron beams across the face-plate 26 of the tube to form a raster thereon.

The end face-plate 26 of the tube 10 is provided with a beam-intercepting structure 34, one suitable form of which is shown in Figure 2. In the arrangement shown in Figure 2, the structure 34 is formed directly on the face-plate 26; however, it should be well understood that the structure 34 may be formed on a suitable light-transparent base which is independent on the face-plate 26 and may be spaced therefrom. In the arrangement shown, the face-plate 26, which, in practice, consists of glass having, preferably, substantially uniform transmission characteristics for the various colors of the visible spectrum, and having a light-transparent conductive coating 36 which may be constituted of stannic oxide or of a metal such as silver, and which has a thickness only sufficient to achieve the desired conductivity, is provided with a plurality of parallelly arranged stripes 38, 40 and 42 of phosphor materials which, upon impingement of the cathode-ray beam, fluoresce to produce light of three different primary colors. For example, the stripe 38 may consist of a phosphor such as zinc phosphate containing manganese as an activator, which upon electron impingement produces red light; the stripe 40 may consist of a phosphor such as zinc orthosilicate, which produces green light, and the stripe 42 may consist of a phosphor such as calcium magnesium silicate containing titanium as an activator, which produces blue light. Other suitable materials which may be used to form the phosphor stripes 38, 40 and 42 are well known to those skilled in the art, as well as methods of applying the same to the face-plate 26, and further details concerning the same are believed to be unnecessary.

Each of the groups of stripes may be termed a color triplet, and, as will be noted, the sequence of the stripes is repeated in consecutive order over the area of the structure 34.

Arranged over consecutive stripes 40 are indexing stripes 44 consisting of a material having a secondary-emissive ratio detectably different from that of the remainder of the structure 34. The stripes 44 may be of gold or of other high atomic number metals such as platinum or tungsten, or of an oxide such as cesium oxide or magnesium oxide, as previously pointed out.

The beam-intercepting structure so constituted is connected to a positive pole of battery 30 through a load impedance 46 by means of a suitable connection to the conductive coating 36 thereof. The intensity control electrode 18 is maintained at a desired operating bias voltage value in a manner to be described more fully below, whereas electrode 20 is maintained at its operating bias voltage value by a bias supply system 48. The control electrode 18 is energized by a pilot carrier wave derived from a pilot oscillator 52 through an isolation amplifier 54, whereas the control electrode 20 is energized by a video color wave as is later more fully described, whereby the beam under the control of electrode 20 undergoes intensity variations as determined by the video color signal. The two beams, so varied in intensity, are simultaneously scanned, under the influence of the common deflection yoke 32, across the surface of the beam intercepting structure 34 (see Figure 2) formed on the face-plate 26.

In its horizontal travel across the beam intercepting structure, the beam under the control of electrode 18 impinges on the successive indexing stripes 44, and generates, across the load resistor 46, an indexing signal made up of a carrier component at the pilot carrier frequency and sideband components representing the sum and difference frequencies of the pilot frequency and the rate at which the indexing stripes are scanned by the cathode-ray beam. In a typical case, the pilot carrier variations of the intensity of the beam under the control of electrode 18 may occur at a frequency of approximately 38.5 mc./sec. When the rate of scanning of the indexing stripes 44 is approximately 7 million per second, as determined by the horizontal scanning rate and the number of indexing stripes impinged per scanning period, there is produced, across load resistor 46, a modulated carrier signal at a frequency of 38.5 mc./sec having sidebands at approximately 31.5 and 45.5 mc./sec. Changes in the rate of scanning of the indexing stripes 44, due to nonlinearities of the beam deflection and/or non-uniformities of the spacing of the indexing stripes, will produce corresponding changes in the frequencies of the sidebands. Therefore, the signal produced by the beam under the control of electrode 18, or a sideband of this signal, may be used as an indexing signal indicative of the position of the beam on the surface of the beam-intercepting structure 34.

In the arrangement specifically shown in Figure 1, the lower sideband, i. e., the sideband at approximately 31.5 mc./sec., is utilized as the indexing signal, and accordingly, this signal is separated from the signals generated across load resistor 46 by a sideband amplifier 56, the output of which is coupled through an amplitude limiter 58 to a mixer 60. Amplifier 56 is of conventional design, and is characterized by a passband response which transmits and amplifies only signals having a frequency in the range of the above-noted lower sideband. The amplitude limiter stage 58 may be provided to remove any amplitude modulation appearing on the signal, and the amplifier 56 and the amplitude limiter 58 may be adapted to transmit the desired signal without any phase distortion.

For the reproduction of a color image on the face-plate of the cathode-ray tube, there are provided color signal input terminals 62, 64 and 66 which are supplied,

from a television receiver (not shown), with separate signals indicative of the red, green and blue components of the televised scene, respectively. The system then operates to convert these three color signals into a wave having the color information arranged in time reference sequence so that the red information occurs when the cathode-ray beam under the control of electrode 20 impinges the red stripe 38 of the beam-intercepting structure 34, the green information occurs upon impingement of the green stripe 40 and the blue information occurs when the blue stripe 42 is impinged.

The conversion of the color signals into a wave having the color information arranged in time reference sequence may be achieved by means of a modulation system suitably energized by the respective color signals and by appropriately phase-related modulating signals. In the arrangement specifically shown, the desired conversion is effected by means of sine-wave modulators 68, 70 and 72, in conjunction with an adder 74. Modulators 68, 70 and 72 may be of conventional form and may each consist, for example, of a dual grid thermionic tube, to one grid of which is applied the color signal from the respective terminals 62, 64 and 66, and to the other grid of which is applied a modulation signal. The modulating signals are derived from the pilot oscillator 52 through a phase shifter 76, the latter being adapted to produce, by means of suitable phase shifting networks, three modulating voltages appropriately phase displaced. In the arrangement specifically described, wherein the phosphor stripes 38, 40 and 42 (see Figure 2) are uniformly distributed throughout the width of each color triplet, the modulating voltages from the phase shifter 76 bear a 120° phase relationship as shown.

The individual waves produced at the outputs of the modulators will be sine waves, each amplitude-modulated by the color signal applied to the respective modulator and each having a phase relationship determined by the particular modulating signal applied. The three modulators are coupled with their outputs in common, whereby the three waves are combined to produce a resultant color wave having a frequency corresponding to that of the oscillator 52 and having amplitude and phase variations proportional to the relative amplitudes of the color signals. A band-pass filter 78, having a central frequency as determined by the frequency of the modulating signals applied to the modulators, may be arranged in the common output of the modulators to suppress undesired modulation components.

The resultant wave, at the common output circuit of modulators 68, 70 and 72, is applied to the mixer 60 together with the indexing signal derived from the amplifier 56 and amplitude limiter 58, to produce a heterodyne difference signal having amplitude and phase variations as determined by the relative amplitudes of the color signals at the terminals 62, 64 and 66, and having further phase and/or frequency variations as determined by the variations in the rate at which the index stripes of the beam intercepting structure of the cathode-ray tube are scanned. It will be noted that, since the variations of the intensity of the cathode-ray beam under the control of electrode 18 and the modulation of the color signals applied at terminals 62, 64 and 66 are of the same frequency, the heterodyne difference signal produced by mixer 60 will have a central frequency equal to the average rate of scanning of the indexing stripes, so that each successive color triplet of the structure 34 will be energized by successive cycles of the said difference signal.

Each of the color signals supplied to the input terminals of modulators 68, 70 and 72 will, in general, include a reference level component definitive of brightness. While each modulator may be constructed so as to transmit this reference level component to its output, in practice this is generally not done. Preferably, the three color signals are combined, in proper proportions, in the adder 74 to yield a single signal representative of the overall bright-

ness of the image to be reproduced, and this signal is in turn applied to an adder 80 where it is combined with the signal produced in the output of mixer 60.

The signal at the output of the adder 80 thus comprises a first component establishing the brightness information of the image to be reproduced and a modulated component establishing the chromaticity of the image. This signal is applied to the control electrode 20 of the cathode-ray tube to vary the intensity of the corresponding cathode-ray beam in time sequence with the scanning of the beam over consecutive phosphor stripes of the beam-intercepting structure.

In order to control accurately the time reference sequence of the image signals applied to the control electrode 20, the indexing signal generated by the beam under the control of the electrode 18 should be clearly defined and exhibit a predetermined minimum value. While the amplitude of the indexing signal may be increased by increasing the peak intensity of the indexing beam, in practice it is found that, beyond a certain peak intensity value, the average current of the indexing beam is increased to a value producing undesirable background lighting of the image, thereby impairing the saturation of the colors thereof. Accordingly, there will be an optimum peak current at which a satisfactory indexing signal amplitude is achieved without noticeable deterioration of the image.

As previously pointed out, the ratio of the peak current to the average current of the beam is established by the intensity of the pilot carrier signal, the amount of bias applied to the control electrode 18, and the cut-off voltage value of this electrode. As a rule, the former two parameters can readily be maintained substantially constant throughout the operating life of the system. Due to aging of the tube, however, the cut-off characteristic thereof may change, in some instances in an unpredictable manner. This change in cut-off voltage correspondingly changes the ratio of peak-to-average current so that the above-noted optimum current ratio is no longer maintained and the image reproduced on the face-plate of the cathode-ray tube is deleteriously affected by this deviation from the optimum ratio.

In accordance with the invention, the change in the cut-off characteristic is compensated by a change in operating bias as determined by a control quantity having an amplitude proportional to the intensity of the generated indexing signal. As shown in Figure 1, this control quantity is derived from the indexing signal by means of a control circuit 82 comprising an amplifier tube 84 and a rectifier tube 86. The tube 84 may be a triode vacuum tube of conventional design having a cathode 88, a control grid electrode 90 and an anode 92. The cathode 88 is connected to a point at ground potential through a load resistance element 94; the anode 92 is connected to a source of positive potential (not shown), and the control electrode 90 is connected to a point at ground potential through a resistance element 96, the resultant network constituting a familiar cathode-follower circuit. Additionally, the control electrode 90 of the discharge tube 84 is coupled through a capacitor 98 to the output of sideband amplifier 56, from which is derived the indexing signal prior to amplitude limiting by the limiter 58, so that the input signal to amplifier 84 is proportional to the intensity of the indexing signal generated by the cathode-ray tube 10. The cathode-follower serves both as an isolating stage, by means of which the indexing signal is derived from the sideband amplifier 56 without appreciably disturbing the latter circuit, and as a low impedance source of the indexing signal for diode 86.

Diode 86, comprising a cathode 100 and an anode 102, is coupled to the cathode-follower by means of a capacitor 104 and a resistor 106, and serves as a half-wave rectifier for the indexing signal to develop, across the resistance-capacitance network 108—110, a D.-C. control voltage which is proportional to the amplitude of the indexing

signal and has a polarity as indicated in the drawing. The network 108—110 is connected to a biasing network 50, comprising a battery 112 which is shunted by a potentiometer 114 having a movable connection 116 connected to the control grid 18 of cathode-ray tube 10. The network 108—110 and the network 50 are interconnected so that the voltage applied between the cathode 16 and the grid 18 of the cathode-ray tube is equal to the sum of the control voltage developed across the resistance-capacitance network 108—110 and the voltage established by the arm 116 of potentiometer 114.

When a positive-going change in the cut-off value of the intensity control system of the indexing beam occurs, the intensity value of the beam is decreased. This decrease produces a diminution of the amplitude of the indexing signal appearing at the output of amplifier 56, which, in turn causes a decrease in the absolute value of the control voltage generated across resistance-capacitance network 108—110. This decrease in the value of the control voltage makes the biasing voltage applied to the indexing beam control system less negative, so that the peak value of the indexing beam current is increased in a sense such as to compensate for the change in the cut-off characteristic. Similarly, a negative-going change in cut-off value of the intensity control system of indexing beam increases the intensity of the beam. The latter increase produces an increase in the amplitude value of the indexing signal appearing at the output of amplifier 56, which in turn causes an increase in the absolute value of the control voltage generated across resistance-capacitance network 108—110. This increase in the value of the control voltage correspondingly makes the biasing voltage applied to the indexing beam control system more negative so that the peak value of the indexing beam current is decreased in a sense such as to compensate for the change in the cut-off characteristic.

The aforementioned changes in the cut-off characteristic of the cathode-ray tube are generally long-time changes, and accordingly the time-constant of the resistance-capacitance network 108—110 may have a large value, e. g., a time-constant several times larger than the frame scanning interval of the image produced. In a typical case, this constant may be of the order of 0.1 second.

Although the system of the invention has been described above with particular reference to its effect in compensating for changes in the cut-off characteristic of the cathode-ray tube, it is clear that the system will, in general, act to maintain constant the amplitude value of the indexing signal despite variation in the values of other parameters of the system. Thus the system is capable of compensating for changes in the amplitude value of the indexing signal for a given indexing beam intensity value, occasioned by the long-time variations in the secondary emission characteristics of the indexing stripes 44. The system also compensates for changes in the amplitude value produced by variations in the amplitude of the pilot signal applied to control electrode 18 by isolation amplifier 54 and by variations in the value of the bias voltage applied to electrode 18 by network 50.

While I have described my invention by means of specific examples and in a specific embodiment, I do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of my invention.

What I claim is:

1. A cathode-ray tube system comprising a cathode-ray tube having a member adapted to intercept charged particles, means for generating charged particles and for directing the same in beam formation toward said intercepting member and means for varying the intensity of flow of said charged particles, said intercepting member comprising first portions arranged in a first given geometric configuration and having a first response characteristic

upon impingement by said charged particles, said member further comprising second portions arranged in a second geometric configuration indicative of said first configuration and having a second given response characteristic, a source of a first signal having first frequency and amplitude values, means for applying said signal to said intensity-varying means, means for scanning said charged particles in beam formation across said intercepting member at a given rate thereby to energize said first and second portions, a signal-generating element positioned in cooperative relationship with said intercepting member and adapted to produce a signal quantity having amplitude variations as determined by variations in the intensity of energization of the said second portions by said beam of charged particles, means coupled to the said signal-generating element for deriving from said signal quantity a second signal having a second frequency value determined by the said first frequency value and by the rate of scanning of said second portions and having an amplitude value dependent on the amplitude value of the said variations of the intensity of flow of the said charged particles, and means responsive to the said amplitude value of the said second signal to regulate the amplitude value of the said last-named intensity variations.

2. A cathode-ray tube system according to claim 1 wherein said intercepting member comprises a plurality of spaced, substantially parallel longitudinal elements.

3. A cathode-ray tube system according to claim 1 in which said means responsive to the said amplitude value of the said second signal comprises rectifying means coupled to the said signal-generating element and further comprises energy-storage and energy-dissipating means intercoupling the said rectifying means and the said means for varying the intensity of flow of the said particles.

4. A cathode-ray tube system according to claim 1 wherein said means responsive to the said amplitude value of the said second signal maintains substantially constant the amplitude value of the said variations of the intensity of flow of the said charged particles.

5. A cathode-ray tube system comprising a cathode-ray tube having a member adapted to intercept charged particles, means for generating charged particles and for directing the same in beam formation toward said intercepting member and means for varying the intensity of flow of said charged particles, said intercepting member comprising first portions arranged in a given geometric configuration and having a first response characteristic upon impingement by said charged particles, said member further comprising second portions arranged in a second geometric configuration indicative of said first configuration and having a second response characteristic upon impingement by said particles different from said first characteristic, a source of a first signal having a frequency spectrum extending to a given maximum frequency value and being indicative of desired variations of the response of the said first portions, means for applying said signal to said means for varying the intensity of flow of said charged particles, a source of a second signal having a given amplitude value and having a second frequency value greater than the said maximum frequency value of said first signal, means for applying said second signal to said means for varying the intensity of flow of said charged particles, means for scanning said charged particles in beam formation across said intercepting member at a given rate thereby to energize said first and second portions, a signal-generating element positioned in cooperative relationship with said intercepting member and adapted to produce a signal quantity having amplitude variations as determined by variations of the intensity of energization of the said second portions by said beam of charged particles, means coupled to the said signal-generating element for deriving from said signal quantity a third signal having a third frequency value greater than said maximum frequency value, said third frequency value being determined by the said second frequency value and

by the said rate of scanning of the said beam-intercepting member and said third signal having an amplitude value dependent on the amplitude value of the said variations of the intensity of flow of the said charged particles and on the said second response characteristic, and means responsive to the said amplitude value of the said third signal to regulate the amplitude value of the said last-named intensity variations produced in response to the said second signal.

6. A cathode-ray tube system according to claim 5 in which said means for deriving said third signal having a third frequency value comprises an amplifier adapted to transmit only signals having substantially said third frequency value.

7. A cathode-ray tube system comprising a cathode-ray tube having a member adapted to intercept charged particles, means for generating charged particles and for directing the same in beam formation toward said intercepting member and means for varying the flow of said particles from said generating means, said intercepting member comprising consecutively arranged portions, each of said portions comprising a plurality of stripes of fluorescent material, each of said stripes producing light of a different color in response to impingement of said charged particles, said member further comprising second portions spaced apart and arranged substantially parallel in a geometric configuration indicative of the position of the said color stripes and comprising a material having a given response to impingement of said charged particles different from the response of said first portions, means for periodically deflecting said charged particles in beam formation at a given nominal rate thereby to energize said first and second portions, a source of a first signal having a frequency spectrum extending to a given maximum frequency value and being indicative of desired variations of the response of the said first portions, means for applying said signal to said means for varying the flow of said particles, a source of a second signal having a given amplitude value and having a second frequency value greater than the said maximum frequency value of the said first signal, means for applying said second signal to the said means to vary the flow of the said particles, means for deriving from said second portions of said intercepting member a third signal having a third frequency value greater than said maximum frequency value, said third frequency value being determined by the said second frequency value and by the rate of scanning of the said second portions and said third signal having an amplitude value dependent on the amplitude value of the said variations of the flow of the said charged particles as determined by the said second signal and on the said given response of the said second portions, and means responsive to the said amplitude value of the said third signal to regulate the amplitude value of the said variations produced in response to the said second signal, said latter means comprising rectifying means coupled to the said third signal deriving means and further comprising a resistor-capacitor network having a time constant greater than the said scanning rate and interconnecting the said rectifying means and the said means to vary the flow of the said charged particles.

8. A cathode-ray tube system comprising a cathode-ray tube having means to generate first and second cathode-ray beams, first means adapted to vary the intensity of the first of the said beams, second means adapted to vary the intensity of the second of said beams and to cut off the said second beam upon application to the said second means of a negative voltage of given amplitude value, a beam-responsive member arranged in the path of the said beams and comprising first and second portions, said first portions being arranged in a first given geometric configuration and having a first response characteristic upon impingement by said cathode-ray beams and said second portions being arranged in a second given geometric configuration indicative of the

said first given configuration and having a second given response characteristic upon impingement by the said cathode-ray beams, means to scan said first and second beams simultaneously and at a given rate across the said beam-responsive member, means to apply to the said first intensity-varying means a first signal having variations indicative of desired variations of the said first given response and having a frequency spectrum extending to a given maximum frequency value, means to apply to said second intensity-varying means a negative bias voltage having an amplitude value greater than the said given amplitude value of the first-named negative voltage, means to apply to said second intensity-varying means a second signal having a second frequency value greater than said maximum frequency value and having an amplitude greater than the difference between the said negative voltage of given value and the said negative bias voltage thereby to produce amplitude variations having a given peak value of the current intensity of the said second beam, means to derive from the said second portions of the said beam-intercepting structure a third signal having a third frequency value greater than said maximum frequency value, said third frequency value being determined by the said second frequency value and by the said given rate of scanning of the said second portions and said third signal having an amplitude value dependent on the said peak current intensity value of the said second beam and on the said second response characteristic, and means responsive to the said amplitude value of the said third signal to vary the bias voltage applied to the said second intensity-varying means so as to regulate the said peak current intensity value of the said second cathode-ray beam.

9. A cathode-ray tube system according to claim 8 in which the said beam-responsive member comprises a plurality of spaced, substantially parallel longitudinal elements.

10. A cathode-ray tube system according to claim 8 in which said means to derive said third signal comprises an amplifier adapted to transmit only signals having substantially said third frequency value.

11. A cathode-ray tube system according to claim 8 in which the said means responsive to the said amplitude value of the said third signal to vary the said bias voltage comprises amplitude-measuring means coupled to the said means to derive said third signal and further comprises an impedance network intercoupling said amplitude-measuring means and said second intensity-varying means.

12. A cathode-ray tube system according to claim 11 in which the said means responsive to the said amplitude value of the said third signal further comprises an isolating amplifier intercoupling said amplitude-measuring means and said means to derive said second signal, and in which said amplitude-measuring means comprises a unidirectional conductor.

13. A cathode-ray tube system according to claim 8 in which the said means responsive to the said amplitude value of the said third signal maintains substantially constant the amplitude value of the said variations produced in response to the said second signal.

14. A cathode-ray tube system according to claim 11 in which the said means to scan the said first and second cathode-ray beams simultaneously and at a given rate across the said beam-responsive member further comprises means to scan the said beam-responsive member so as periodically and in a given time-interval to form a raster thereon, and in which the said impedance network has a time constant substantially greater than said given time-interval.

15. A cathode-ray tube system comprising a cathode-ray

tube having means to generate first and second cathode-ray beams, first means adapted to vary the intensity of the first of the said beams, said means being adapted to vary the intensity of the second of said beams and to cut off the said second beam upon application to the said second means of a negative voltage of given amplitude, a beam responsive member arranged in the path of the said beams and comprising consecutively arranged parallel first portions, each comprising three stripes of fluorescent material, each of said stripes being adapted to produce light of a different color in response to cathode-ray impingement, said beam-responsive member further comprising second stripe portions spaced apart and arranged substantially parallel in a configuration indicative of the positions of the said color stripes and comprising a material having a given response characteristic different from the response of said first portions upon electron impingement, means to scan the said first and second beams simultaneously and at a given rate across the said beam-responsive member and further means to scan the said beam-responsive member so as periodically and in a given time-interval to form a raster thereon, means to apply to the said first intensity-varying means a video information signal having variations indicative of desired variations of the said response of the said fluorescent stripes and having a frequency spectrum extending to a given maximum frequency value, means to apply to said second intensity-varying means a negative bias voltage having an amplitude value greater than the said given amplitude value of the first-named negative voltage, means to apply to said second intensity-varying means a second signal having a second frequency value greater than said maximum frequency value and having an amplitude value greater than the difference between the said negative voltage of given value and the said negative bias voltage thereby to produce amplitude variations of the current intensity of the said second beam having a given peak value, means to derive from the said beam-responsive member a third signal having a third frequency value greater than the said maximum frequency value, said third frequency value being determined by the said second frequency value and by the said rate of scanning of the said second stripes and said third signal having an amplitude value dependent on the said peak current intensity value of the said second beam and on the said response characteristic of the said second stripe portions, said means comprising an amplifier coupled to the said beam-responsive member and adapted to transmit only signals having substantially said second frequency value, an isolating amplifier coupled to said first-named amplifier, means to derive a D.-C. control voltage having negative-going values proportional to the said amplitude value of the said third signal, said latter means comprising rectifier means coupled to the said isolating amplifier and a resistor and capacitor connected in shunt relationship, said resistor-capacitor network having a time-constant substantially greater than the said given time interval, being coupled to the said rectifier means, and the said control voltage being developed thereacross, and means to apply the said control voltage to the said second intensity-varying means in series relationship with the said negative bias voltage so as to regulate the peak current intensity value of the said second cathode-ray beam.

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