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TELEVISION SYSTEM

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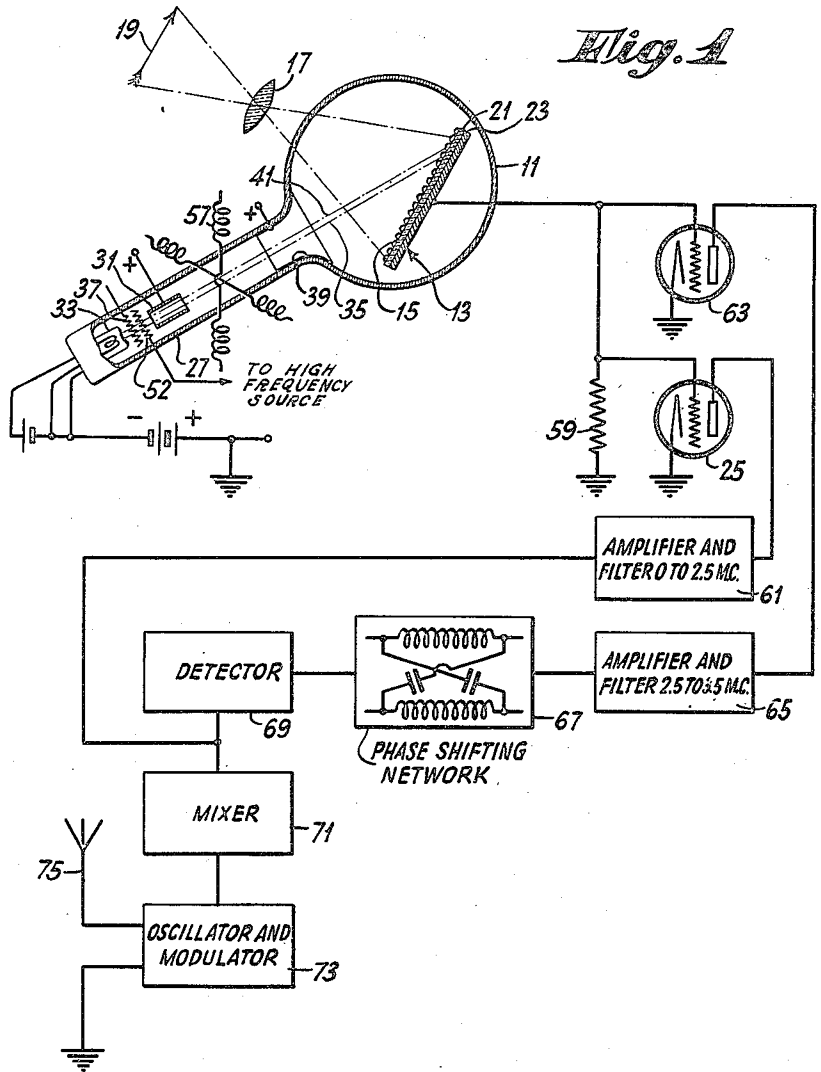

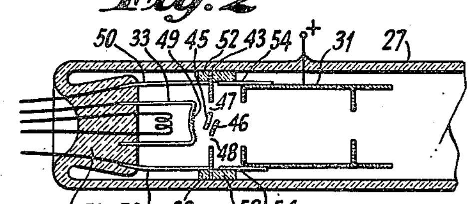

INVENTOR
HARLEY A. IAMS
BY H. S. Grover
ATTORNEY

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TELEVISION SYSTEM

Harley A. Iams, Berkeley Heights, N. J., assignor to Radio Corporation of America, a corporation of Delaware

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This invention relates to television apparatus and principally to television transmitting systems utilizing electronic translation devices. The invention is more particularly directed to ways and means for compensating for distortions introduced into the produced television signals in transmission. These distortions which arise are due, in part, to the inherent characteristics of electronic types of transmitter scanning systems, and arise particularly with the use of those electronic types of scanning devices which are known in the art as the "storage" type.

In the past it has been one of the established practices in television transmission to provide electronic television tubes, for example, tubes of the type known by the trade names "Iconoscope" and "Iconotron", as the so-called "electric eye" of the system. When using tubes of this nature for the translation, by a suitable scanning operation, of an optical image into a series of electric signalling impulses which are reproduced at receiving points to reconstruct an electro-optical replica of the image at the point of transmission, it has been found that certain distortions and failures to represent with complete accuracy the exact light values of different portions of the optical image result at the receiver. Such distortions and inaccuracies, naturally, may be of several general types and degrees but the present invention relates principally to overcoming that type of distortion which may be considered as substantially a second order effect and which effect has become known in the art as "black spot" or "dark spot" distortion.

Electronic image transmitting devices of the type to which this invention relates are, it will be appreciated, capable of producing satisfactory image signals to produce reasonably good quality electro-optical images at receiving points since first order distortions are substantially non-existent. However, with the approach of demand for ultra-high definition and high fidelity television transmission systems it is necessary to provide ways and means for avoiding and/or compensating all second order effects producing distortion or inaccuracies and hence it is this type of distortion and defect which is to be considered herein.

The so-called "black spot" distortion manifests itself in the receiver apparatus by producing across the luminescent viewing screen (particularly at the corners) of the cathode ray receiver device dark shadings which are non-existent in the optical image initially projected on the transmitter electronic image scanning tube. One method which has been utilized for overcoming such "black spot" distortion and which has been used with some degree of success involves the injection of compensating signal energy into the resultant signals produced for transmission by scanning the mosaic electrode of the image translating tube. The compensating signals may have either saw-tooth, sine wave, or other suitable wave form and characteristics and recur with a frequency and position suitable for compensation. This method of correction or compensation however is not purely automatic but is usually under the control of a monitoring operator who makes the adjustments manually and thereby varies the amount of compensation provided by the compensating signals. A form of "black spot" compensation of such character as has been disclosed, for example, by the co-pending patent application of Alda V. Bedford S. N. 750,055 filed October 26, 1934.

When television images are to be transmitted and the so-called "storage" type of image translating and transmitting tubes are utilized in the system an optical image of the object which is to be reconstructed at receiving points is projected through a suitable optical system upon the mosaic electrode of the transmitter scanning tube.

The transmitter scanning tube, as is well known, includes a suitable electron gun (comprising at least an electron emitting cathode and an anode, with control electrodes interposed therebetween where desired) for developing (with the application of suitable voltages thereupon) a concentrated beam of electrons or cathode ray which may be projected along a predetermined path and deflected during its projection by suitable electromagnetic or electrostatic means (or a combination of both electrostatic or electromagnetic means) to sweep the electron beam across a predetermined pattern or target. The target which is swept by the cathode ray beam under deflection is known, insofar as the transmitting tube is concerned, as the mosaic electrode. This mosaic electrode comprises a signal plate and an adjacent insulating layer or sheet upon which latter element is carried a multiplicity of electrically isolated and mutually insulated photoelectric elements each of minute size. The mosaic electrode may be prepared in accordance with teachings in United States Patents No. 2,065,570 granted on December 29, 1936 and No. 2,020,305 granted on November 12, 1935 and assigned to Radio Corporation of America. Each of the photoelectric particles of the mosaic electrode is subjected both to illumination by the image being projected thereon by the optical system and to scansion by the cathode ray beam impinging thereupon. Whenever a light image is projected upon the mosaic electrode photoelectrons having a density per elemental area proportional to the light image intensity at the same area are released. The release of photoelectrons results in an electrostatic charge image of the light image being developed between the minute photoelectric particles and the signal plate and across the insulating layer or dielectric element. This produced electrostatic charge is released or neutralized during scansion and thus functions to initiate or produce the resulting television signal.

However, during scansion of the photoelectric particles of the mosaic by the scanning beam, not only is the electrostatic charge which has been produced and stored in accordance with the intensity of the projected light image released to produce the television signal, but there is also released from the mosaic electrode secondary electrons because of the impact effect of the scanning beam upon the mosaic target electrode. Thus, during scansion of the mosaic electrode it has been found that the signals which are produced by the release of the stored electrostatic charges by the scanning action of the cathode ray beam and which appear in the input circuit of an amplifier connected to the signal plate of the mosaic electrode are not always completely accurate representations of the actual optical image intensities projected on the mosaic electrode due to the aforesaid phenomena of "black spot". Some of the causes of "black spot" will hereinafter be set forth in more detail in order to appreciate more fully the nature of the present invention.

One of the causes from which it is thought the so-called "black spot" phenomena results is the non-uniform velocity of scanning of the photoelectric element of the mosaic electrode by the scanning beam. For instance, the scanning beam velocity may not always be entirely constant as it traverses each elemental strip of the mosaic electrode. This variance in velocity of the scanning beam may be particularly evident if the length of the scanning path is varied because, as can be well appreciated, the wave form of the deflection oscillator output energy might change slightly with a change in amplitude of the output energy and thus cause a change in the scanning velocity.

Another cause from which it is thought the "black spot" phenomena results is due to the location of the various minute isolated photoelectric particles of the mosaic relative to the electron beam source (the electron gun and the tube second anode, as well) and to each other. As will be appreciated from a knowledge of the prior art, the mosaic electrode including the insulating support member and the signal plate is positioned within the scanning tube substantially perpendicularly with respect to the direction of the in-falling light of the image cast thereupon by the optical system but at an acute angle with respect to the electron beam source so that one edge of the mosaic electrode is considerably nearer the electron beam source than is the other edge. This angular positioning, naturally, results in the different distances abovementioned and this causes a varying electrical field between different portions of the mosaic and the tube electrodes.

A further cause from which it is thought the "black spot" phenomena results is due to the varying electrical field distributions across the surface of the mosaic electrode. These varying electrical fields may be either of electromagnetic or electrostatic nature and, for instance, the electrical field distribution across the mosaic electrode may vary not only in accordance with the location of the transmitting tube from time to time but also in accordance with the degree of shielding of the scanning tube from stray fields which is provided.

Still a further cause of the "black spot" phenomena appears to involve the very action of scanning itself which causes a certain degree of distortion. It will be apparent that because of the release of secondary electrons when scanning takes place and because electrostatic charges are being built up between the different photoelectric elements of the mosaic electrode are at different potentials relative to a desired optimum "floating" potential for the electrode. Consequently, when scanning action of the photoelectric particles by the scanning beam takes place and secondary electrons are released from the photoelectric particles the individual photoelectric particles successively come under the scanning beam. Certain of the released secondary electrons, due to some positions of the scanning beam, will be attracted to portions of the mosaic electrode which are instantaneously at a positive potential relative to other points on the mosaic electrode. This results in the portions of the mosaic electrode to which the secondary electrons are attracted acquiring potentials, and therefore a resulting electrostatic charge, which is not an accurate or portional representation of the intensity of light and shadow of the optical image projected at the particular point of the mosaic electrode by the optical system.

The foregoing explanations suggest briefly some of the causes from which the undesirable "black spot" phenomena results. These causes which make for this signal resulting from scanning being other than a faithful reproduction of the actual light value of the related elemental area of the optical image indicate the need and desirability of providing ways and means for compensating for such distortions. Accordingly, it is one of the primary objects of the present invention to provide a suitable arrangement by which any inherent inaccuracies or defects, so to speak, in the transmitting system which would result in an unnatural type of reproduced electro-optical image may be reduced, overcome or compensated.

It is a further object of the present invention to provide suitable ways and means by which "black spot" can be overcome in the transmission of image signals. Other objects of the invention are to provide a system for compensating for "black spot" which is relatively simple in its arrangement and functioning and which can be used as a part of presently known types of transmission equipment with a minimum difficulty in order to provide substantially increased efficiency transmission. Other objects and advantages of the present invention will naturally suggest themselves to those skilled in the art from a reading from the following specification and claims in connection with the accompanying drawing wherein the single figure thereof shows one schematic form the invention may assume.

By copending applications filed on even date herewith other forms of "black spot" or "dark spot" correction systems have been described among which are included an arrangement by which the deflection voltage applied to the deflecting system changes in accordance with varying electron beam velocities (D–31,205). Also another form of "black spot" or "dark spot" compensation has been proposed wherein impulses to compensate for the shading are automatically developed and controlled so that the output level of the amplifier connected with the electronic transmitting tube may be varied in accordance with the presence and/or absence of the "black spot" (D-13,202). There has been proposed for this purpose also an arrangement wherein there has been provided a record of the dark face of the image reproducing tube from which is produced a replica of the "dark" or "black spot" signal provided with a carbon ink upon a conducting sheet which may be the back of the signal plate and which has a higher secondary emission ratio than the carbon (D-13,306).

The present invention is directed to ways and means for compensating for the above types of "black spot" distortion, and is predicated upon the development of a signal representation of the conditions of the target surface, insofar as the production of "black spot" distortion is concerned, and the utilization of this supplementary signal as a compensating means for nullifying or neutralizing any signal due to "black spot".

It has been found that with prior art arrangements wherein there is introduced certain manually controlled voltages which are synchronized with the deflection circuits that it is not always possible to produce with a limited number of circuits (as, for example, by the method described by application Serial No. 750,055, supra) shading which is entirely uniform. Therefore, according to the present invention provision has been made by way of an electronic scanning tube for the generation within that tube, not only of the video or image signals representative of the optical image, but also the generation of a "black spot" compensating signal which is characteristic of the image scanning tube producing the video signals. For this purpose there are developed within the image scanning tube two separate electron scanning beams. One of these scanning beams scans the mosaic electrode upon which the optical image has been projected for the purpose of developing the video signals in the same manner by which the video signals are produced according to the known prior art. This first scanning beam is, however, supplemented by a second electron scanning beam which also scans the mosaic target but trails behind the first scanning beam which is used to produce the video signal by a very slight distance. The second scanning beam developed is preferably modulated at high frequency, where the modulating frequency is higher than the maximum video frequency developed from scanning. The output from the signal plate of the image scanning tube is then fed to two separate amplifiers, one of which is arranged to pass all video frequencies representing the image which vary from a minimum, which could correspond to the frame frequency or even to zero frequency up to the maximum video frequency developed, while the other amplifier passes only those signals which are of a frequency higher than any developed by the image in scanning. The output from the amplifier which amplifies the frequencies higher than those resulting from scanning the electrostatic version of the optical image is rectified and combined with the output of the video amplifier but in opposite phase so that there is introduced into the output signal from the video amplifier a compensating signal.

From the foregoing it will be appreciated that it is an object of the present invention to develop a system for compensating for "black spot" distortion which shall be simple in its nature and operation, easy to combine with presently existing types of transmission systems and which shall, at the same time, be efficient in its operation.

Other objects of the invention are naturally those of providing for "black spot" corrections of the types above enumerated as being existent in television apparatus.

Still other objects of the invention will be appreciated from reading the following specification and claims in connection with the accompanying drawing wherein Fig. 1 diagrammatically represents one form of apparatus for accomplishing the above objects and Fig. 2 diagrammatically represents an electron gun structure for use in an image scanning tube of the character shown by Fig. 1.

According to the present invention there is provided an image scanning tube 11 of the character above mentioned which comprises a mosaic electrode 13 upon the photo-sensitized surface 15 of which there is projected through the adjustable optical system 17 the image of a subject 19. The optical image falls upon a series of mutually isolated minute and substantially microscopic size photoelectric elements which are carried upon an insulating support member 21. The insulating support member 21 is, in turn, carried upon a conducting plate member 23, known as a signal plate, which is connected to the external or load circuit of the video amplifier 25.

In the neck portion 27 of the tube 11, there is developed from an electron gun 29 by the application suitable voltage differences between the anode 31 and cathode 33 thereof a first electron scanning beam 35 which is controlled by means of a control electrode element or grid 37 interposed between the cathode and anode. At the end of the neck portion of the tube, adjacent that part of the tube wall where the tube becomes of rounded shape to accommodate the mosaic electrode, there is usually provided a metallic coating 39 on the interior surface of the tube wall and to this coating there is applied also a high potential relative to the cathode. The potential applied to the coating 39 is usually of the order of 4 to 5 times that applied to the first anode 31. This coating then serves as a second anode of the tube and the electrostatic field developed between the first and second anode provides an electron lens which serves to focus the developed electron stream issuing from the gun to a sharply defined spot on the mosaic electrode 13. In addition, the second anode serves as a means for increasing the velocity of the electron beam.

In addition to the gun structure of the character above defined which has been known in the art, the arrangement herein described comprises a system for forming not only a signal producing electron beam 35 which will issue from the gun structure and be projected longitudinally of the neck of the tube to impinge upon the mosaic electrode as an impact target, but also provides for the development of a second electron scanning beam 41. This is accomplished by providing in the space intermediate the cathode 33 and the first anode 31 which is apertured as indicated by Fig. 2 a grid structure 4 which is defined in two parts 45 and 46 and is substantially in the form of two plate members each having apertures 47 and 48 and interposed between the cathode and first anode from opposite directions.

As indicated by Fig. 2, the plane of each aperture in the divided grid member is identical so that the electron stream issuing from the heated cathode surface 49 which may be a direct or indirectly heated cathode, but preferably of flat or concave formation, is caused to pass through these apertures in the two separate grid members and to follow a path between the cathode and the mosaic electrode which is indicated schematically by the dotted lines of Figure 1.

It will be noted that where the two ends of the divided grid member come adjacent to each other that these ends have been bent over. The ends may, where desired, be attached to suitable insulating members for the purpose of providing a more rigid support or the ends may be left free and supported from the wall of the neck portion of the tube, as indicated by the drawing. In the form shown these members are carried by conducting support members 50 embedded in the electrode press 51 and spaced and positioned by insulating spacing rings 52, 53 fitted tightly to the tube wall. The same spacing rings may serve to position the anode 31 by support wires 54.

As the electron beams 35 and 41 developed within the neck portion 27 of the tube are projected toward the mosaic electrode as the target upon which each is to impinge, the electron beams may be caused by the deflecting means to follow each other in direction and with the desired separation and thus each beam is caused to traverse the target in two mutually perpendicular directions by the application of suitable voltages and/or currents to the deflecting electrode system 52 located about the neck of the tube. Where electromagnetic deflection is desired suitably positioned electromagnetic coils may be mounted to surround the neck portion of the tube and where electrostatic deflection is desired it is usually customary and desirable to position deflecting electrode plates within the neck portion of the tube in order to increase the sensitivity of deflection. In some instances a combination of both electrostatic and electro-magnetic deflection can be used.

When the tube is in operation and an optical image of a subject is focussed by means of the optical system upon the photo-sensitive elements of the mosaic electrode and scanning action of the mosaic electrode by the scanning beams takes place, it will be appreciated that the accumulated electrostatic charges developed between the photoelectric elements 15 and the signal plate 23 are released to the external circuit under the scanning of the first electron beam 35, that is, the electron beam shown lowermost in the neck of the tube, assuming top to bottom scanning of the mosaic. These signals then produce a voltage drop across the resistor 59 connected with the signal plate and the resultant voltage drop is transferred to the grid of the first amplifying stage of the video signal amplifier 25. This video signal amplifier has its output connected with a suitable filter and amplifier 61 arranged, for instance, as shown diagrammatically, to pass frequencies varying between zero frequency and two and one-half megacycles. Simultaneously with the scanning of the mosaic electrode by the scanning beam 35 for the release of the electrostatic charges representing the video signals, the mosaic electrode is traversed by the second scanning beam 41 and to the grid section aperture 47 of the tube through which the developed electron beam passes there is applied a modulating potential of the order of 3 megacycles, while the other grid section through whose aperture 48 the second beam passes is unmodulated.

It can now be seen that if the two electron beams 35 and 41 are arranged to impinge upon the same mosaic electrode structure and subjected to the same electrical fields within the tube the two electron scanning beams when subjected to the action of the same deflecting fields within the neck of the tube will trace identical paths across the mosaic electrode but the time at which the second scanning beam 41 will traverse an element of the mosaic electrode 13 previously traversed by the first scanning beam 35 will be a function of the special separation of the two electron beams at the point in which they impinge and are focused upon the mosaic electrode 13.

According to present practice it is desirable that the gun structure, together with the two grids, be so arranged that the electron beam 41 subjected to modulation shall fall at a point on the mosaic electrode directly above that electron beam 35 (used for the release of the electrostatic impulses which has been stored upon the mosaic) with a separation of approximately 0.1 inch.

It can be appreciated from what has been above mentioned that with the modulation frequency of approximately 3 megacycles applied to the trailing electron beam 41 there will be released from the mosaic electrode 13, due to impact of the second electron beam, a signal which is a function of the "dark spot" condition of the mosaic electrode surface but modulated at a frequency corresponding to the modulation frequency applied to the control electrode or for controlling the second electron beam. This modulation signal also appears across the resistor 59 connected to the signal plate and is applied with the video signal to the grid circuit of the first amplifier tube 25 of the video amplifier but cannot pass beyond the filter 61 connected with the output of this amplifier tube because of the cut-off characteristic of the filter to frequencies higher than 2.5 megacycles which for the purpose of illustration has been assumed herein as the maximum frequency of the developed video signals. Both the video signals and the assumed 3 megacycles modulated signal which would measure the condition of "dark spot" on the surface of the mosaic at times of impact of the second scanning beam are also passed to the input circuit of an amplifying tube of a compensating amplifier 63, and the output of this first amplifying tube of the compensating amplifier has connected to it a second filter and amplifier 65 arranged to pass frequencies greater than the maximum frequency assumed to result from video signals so that the video signals are attenuated in this amplifier as were the compensating signals in the first amplifier, but the compensating signals are passed through substantially the amplifier 65 without attenuation.

The output energy from the compensating amplifier is passed through a phase delay or advance network 67 and a detecting stage 69 and the output from this detector is combined 180° out of phase with the ouput of the video signal amplifier. The combined output in which the "dark spot" signal accompanying the video signal output is compensated by the "dark spot" signal produced under the second scanning beam, modulated at three megacycles is then directed to a suitable mixing tube 71 of known character, modulator 73 and transmitter 75 for transmission to various receiving stations.

The specific form of the phase shifting network 67 included in the circuit with the amplifier 65 arranged to accept the frequency band between 2.5 and 3.5 megacycles does not per se constitute part of the present invention except insofar as the complete combination of elements is concerned. However, one form of a suitable phase-shifting network for accomplishing the aims and objectives of the present invention has been diagrammatically sketched on the drawing and comprises two inductance members cross connected by way of capacity elements as indicated. Various forms of such delay networks are known in the art but reference may be made to a group of such networks described in an article entitled "Distortion correction in electrical circuits with constant resistance recurrent networks" which appears on pages 438 et seq. of the "Bell System Technical Journal" for July, 1928, with particular reference with respect to delay networks particularly suitable for use in connection with the present invention being found set forth by pages 529 through 533 inclusive.

While no specific illustration has been herein made of th fact that more than one phase delay network may at times be desirable, depending upon the time of delay required, it is of course contemplated that this invention may embody one, two or more of such networks. In addition, the drawing has not specifically shown any type of filter system for selecting on the one hand between the video signals accompanying a frequency spectrum between zero and two and one-half megacycles, nor for the selection of the compensating modulations produced in accordance with the three megacycle modulation of the compensating electron beam. However, the band pass filters capable of selecting within the aforesaid band widths are so well known in the art as to require no specific illustration except to point out with the video amplifier those signals above two and one-half megacycles are to be attenuated and all signals below two and one-half megacycles are to be readily acceptable while on the other hand, for the compensating amplifier, the band pass filter is such that all signals below two and one-half megacycles are substantially fully attenuated and signals within the range of two and one-half megacycles to three and one-half megacycles are accepted.

While the foregoing has suggested that the video signal modulation shall occupy a portion of the frequency spectrum between zero and two and one-half megacycles, it is of course to be appreciated that this modulation range is suggested merely by way of example and for the purpose of making a disclosure of one form of the invention. However, it will be appreciated that with higher definition systems of television, such for example as systems of the type known as the 441 line transmission system may require a portion of the frequency spectrum greater than the assumed band width for the video amplifier. In such event, the video amplifier, for example, may be made to accept signals from between zero and three megacycles and by choosing the modulation frequency of the compensating electron beam, at, say, four megacycles, the compensating amplifier may be made receptive to a frequency spectrum varying between three megacycles and five megacycles.

Further, in connection with the specific form of tube shown to provide for the production of the two separate and distinct scanning beams for tracing the mosaic electrode it will be appreciated that various forms of grid structures may be used. For instance, the grid may be in the form of a single disk, having two half sections thereof separated by an insulating strip and a grid aperture positioned within each separate grid section, or where desired, as has already been described in pending application of Richard T. Orth and I. G. Maloff, Serial Numbers 673,572 and 716,684 filed May 30, 1933, and March 21, 1934, respectively, there may be provided longitudinally of the tube a dividing strip for separating the emitter into two distinct portions, and by way of pins extending through the emitter as described and claimed in the said Orth application, suitable control may be provided for modulating one of the electron beams or by way of a suitable wire stretched across in front of the emitter as described and claimed in the Maloff application suitable control of the modulated electron beam may be provided.

Other modifications will naturally suggest themselves, and at once become apparent to those skilled in the art, and therefore it is believed that all such modifications may be made provided they fall fairly within the spirit and scope of the claims hereinunder appended.

Having now described the invention, what is claimed and desired to be secured by Letters Patent is the following:

1. An electronic scanning tube comprising a mosaic electrode including a signal plate, a dielectric and a plurality of minute electrically isolated photoelectric particles coating the surface of the dielectric opposite the signal plate, means for developing a plurality of scanning beams within the tube, a plurality of independently acting control electrodes for controlling the intensity of each of the beams, means to modulate one of the beams, and means to deflect each developed electron beam over the mosaic electrode in synchronism and with a substantially constant spacing between the beams.

2. An electronic tube comprising a target electrode, an electron emitting electrode and an accelerating electrode positioned intermediate the target electrode and the electron emitting electrode, a plurality of control electrodes intermediate the accelerating electrode and the electron emitting electrode for dividing the emitted electron stream into a plurality of separated electron beams adapted to be focused upon the target electrode in spaced relationship, means to modulate one of the control electrodes at a high frequency, and means for sweeping each developed electron beam substantially synchronously and co-phasally across the target.

3. An electron tube comprising a target electrode, an electron emitting means, an accelerating electrode positioned intermediate the target electrode and the electron emitting means for causing electrons from the emitter to impinge upon the target, electrode means intermediate the accelerating electrode and the electron emitting source for forming the emitted electron stream into a plurality of separated electron beams adapted to be focused upon the target electrode in slightly spaced relationship, means for separately controlling the intensity of each beam and for modulating one of the beams at a high frequency, and means for sweeping each developed electron beam substantially synchronously and co-phasally across the target, the unmodulated beam preceding the modulated beam in the scanning of the target electrode.

4. An electron tube comprising a light responsive target electrode, means for developing a plurality of scanning beams within the tube and for focusing and directing said beams upon the target in slightly spaced relationship, a plurality of independently acting control electrodes for separately controlling each developed electron

beam, means for modulating one of the beams, means for substantially synchronously and cophasally scanning said target by the developed beams to produce a plurality of separate series of signals, and means to combine the separate signals.

5. An electron tube comprising a light responsive target electrode, and electron emitting source, an accelerating electrode positioned intermediate the target electrode and the electron emitting source for drawing the electrons from the source to the target, electrode means intermediate the accelerating electrode and the electron emitting source for forming the emitted electron stream into a plurality of separated electron beams each adapted to be focused upon the target electrode in slightly spaced relationship, means for modulating one of said beams, and means to simultaneously deflect the beams while maintaining substantially the same spacing, the unmodulated beam preceding the modulated beam in the scanning of the target electrode.

6. In the method of compensating for distortion in image translation with electronic scanning devices wherein an optical image is caused to fall upon a light sensitive mosaic electrode of a scanning tube wherein electrostatic charges are developed in accordance with the intensity of the optical image which comprises the steps of simultaneously and synchronously scanning the mosaic electrode by a plurality of scanning beams, developing from the scansion of the mosaic electrode by each of the scanning beams signal outputs which include only distortion signals for one electron scanning beam and image signals accompanied by distortion signals for the other scanning beam, combining the two resultant signals in phase opposition to substantially neutralize the distortion signals accompanying the image signals, and transmitting the resultant signal.

7. In the method for compensating for distortion in image translation with electronic scanning devices wherein an optical image is caused to fall upon a light sensitive mosaic electrode of a scanning tube wherein electrostatic charges are developed in accordance with the intensity of the optical image, the steps which comprise simultaneously and synchronously scanning the mosaic electrode with a pre-established time delay by two separate and slightly spaced scanning beams, modulating one of the scanning beams at a frequency greater than the maximum frequency developed from scansion of the charges due to the optical image, producing from the scansion of the mosaic electrode by the one of the scanning beams signal outputs which include only distortion signals and producing from the scansion of the mosaic electrode by the other scanning beam image signals accompanied by distortion signals, combining the two resultant signals to substantially neutralize the distortion signals accompanying the image signals, and transmitting the resultant signal.

8. The method of compensating for distortion in image translation with electronic scanning devices wherein an optical image is caused to fall upon a light sensitive mosaic electrode of a scanning tube wherein electrostatic charges are developed in accordance with the intensity of the optical image which comprises the steps of simultaneously and synchronously scanning the mosaic electrode by a plurality of slightly spaced scanning beams, modulating one of the scanning beams at a frequency greater than the highest frequency developed from scansion of the optical image, producing from the scansion of the mosaic electrode by each of the scanning beams signal outputs which include for the modulated scanning beam only distortion signals and for the unmodulated scanning beam image signals accompanied by distortion signals of substantially like character to those produced from the modulated scanning beam, combining the two resultant signals in proper phase relation to substantially neutralize the distortion signals accompanying the image signals and transmitting the resultant signals.

9. A television system comprising an electronic scanning tube having positioned therein a mosaic electrode upon which electrostatic charges are adapted to accumulate in accordance with the brilliance of an optical image projected thereupon, means for simultaneously scanning the mosaic electrode with a plurality of slight spaced electronic scanning beams to produce a plurality of signal outputs of which one signal output includes signal representations of the intensity of an optical image projected upon the mosaic electrode, means for modulating one of said beams, means for combining the two output signals in opposite phase to substantially neutralize distortion effects in the optical signals, and means for transmitting the resultant signal.

10. In a television system wherein an electronic image scanning tube having a mosaic electrode upon which an optical image is projected to produce upon the mosaic electrode electrostatic charges of magnitude substantially proportional to the brilliance of related elemental areas of the optical image, means for developing and projecting upon the mosaic electrode simultaneously a plurality of focused electron scanning beams each separated from the other at the point of impact by a small predetermined separation, means for modulating one of the scanning beams at a modulation frequency greater than the highest frequency developed due to scansion of the mosaic electrode, means for developing by the scansion of the mosaic electrode by the unmodulated developed electron beam signal outputs representing the optical image projected upon the mosaic electrode and accompanying image distortion signals, means for developing from the modulated electron beam only substantially like character distortion signals, and means for combining in substantially phase opposition the two developed signals for transmission.

11. In a system for compensating for distortion in television, an electronic image scanning tube including a mosaic electrode, means for projecting on to the mosaic electrode an optical image of which an electro-optical replica is to be produced at reception points, means for developing within the scanning tube a plurality of independent electron beams, means for focusing each of the separate beams with predetermined spaced positioning under normal conditions upon the mosaic electrode, means for modulating one of the beams, means for simultaneously and synchronously scanning the mosaic electrode by each of the developed electron beams to produce from one of the electron beams image signals and distortion signals and to produce from the modulated electron beams distortion signals only, means for combining the two signals in substantially phase opposition and means for transmitting the resultant image signals.

HARLEY A. IAMS.