July 30, 1957 R. W. SONNENFELDT 2,801,363

DYNAMIC ELECTRON BEAM CONTROL SYSTEMS

Filed April 29, 1953 2 Sheets-Sheet 1

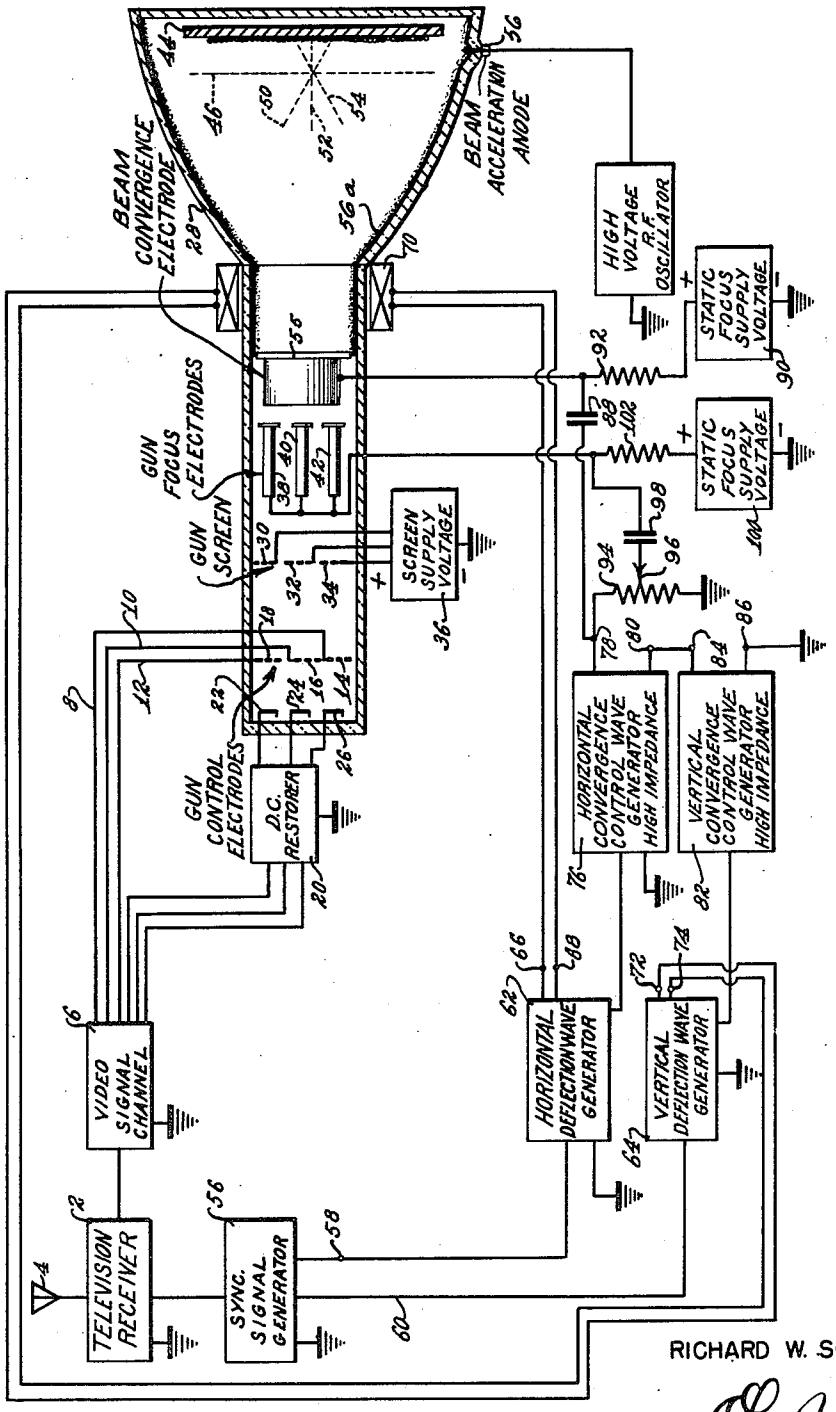


Fig. 1.

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Filed April 29, 1953 2 Sheets-Sheet 2

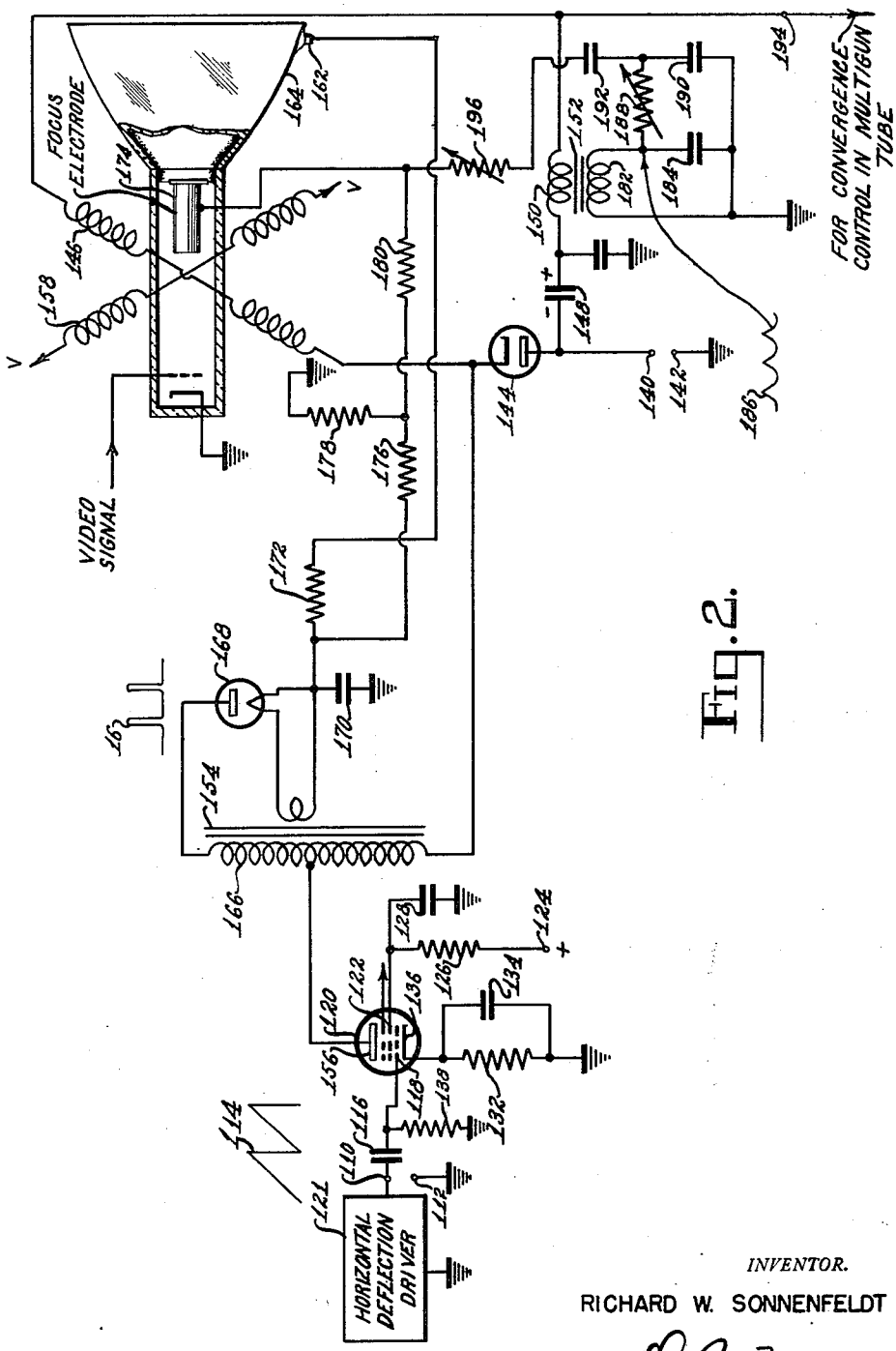


Fig. 2.

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2,801,363

DYNAMIC ELECTRON BEAM CONTROL SYSTEMS

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Application April 29, 1953, Serial No. 351,778

8 Claims. (Cl. 315—22)

This invention relates to improvements in wave synthesizing systems of the type used for controlling the electron beams of cathode ray tubes and in more particularity, although not necessarily exclusively to improved means for accomplishing the dynamic control of a plurality of electron beam components as employed in cathode ray tubes so as to maintain good focusing of the respective beam components as well as to ensure convergence of said components at all points of a raster scanned in a predetermined plane.

The present trend in television kinescopes is toward the use of flatter luminescent screens of increasingly greater areas. Also, the tendency is to shorten the tubes as much as possible to permit their employment in home instrument cabinets of smaller size. These factors make the problem of deflecting an electron beam or a plurality of electron beam components within the cathode ray tube a more difficult one. Deflection problems become even more complex when the size of the kinescope is increased along with the provision of specialized tube geometries aimed at enhancing the electron beam focus over the wide angles of deflection required in shorter tubes of large screen area.

A representative example of a cathode ray tube of the character referred to is a multi-color kinescope forming the subject matter of U. S. patent to Alfred N. Goldsmith, No. 2,630,542, issued March 3, 1953, and entitled "Multi-Color Television." The luminescent screen of this tube consists of a multiplicity of phosphor areas of sub-elemental dimensions. Different sub-elemental areas are respectively capable of producing a color of light corresponding to a different one of three component image colors, when excited by electron beam energy. In this tube the different light producing phosphor screen areas are excited respectively by a plurality of electron beams approaching the screen from different angles through an apertured masking electrode. Color selection is secured by controlling the angle at which the electron beams approach the screen.

Another representative example of the cathode ray tube to which the present invention may usefully apply, forms the subject matter of a copending U. S. patent application of Russell R. Law, Serial No. 165,552, filed June 1, 1950, and entitled "Color Television Reproducing Tubes." In general, the Law tube is similar to the Goldsmith tube. The difference is that the Law tube employs a single electron gun by which to produce the plurality of electron beam components whereas, in the Goldsmith tube, an electron gun is provided to produce each beam. This is accomplished by imparting a spinning type of movement to the beam so that it is made to rotate about the central or longitudinal axis of the tube. In its rotation about the tube axis, the beam occupies during successive intervals, substantially the same positions as the different electron beams of the Goldsmith tube.

The expression "electron beam components," as used in this specification and claims, is intended to cover the type of phosphor exciting electronic energy produced by a single or plurality of electron guns. This energy may be continuous or pulsating as required without departing from the spirit and scope of the present invention.

In the operation of multi-color kinescopes of the type referred to above, it is required that the plurality of electron beam components be made to converge substantially in the plane of the masking electrode at all points in the scanned raster. In view of the fact that the different points of the target electrode are at different distances from the point or region of the electron beam deflection, it is necessary to provide a field producing means which is variably energized to produce a dynamic convergence control. One such electron beam control system forms the subject matter of U. S. patent of Albert Friend, No. 2,751,519, issued June 19, 1956, entitled "Electron Beam Controlling Systems." In the Friend case, an electron optical system is variably energized as functions of both the horizontal and vertical beam deflections. It can be demonstrated that without dynamic convergence control the electron beam components converge at different points as they are deflected to scan a raster. The locus of these convergence points is approximately parabolic in form. Accordingly, as disclosed in the Friend application referred to dynamic convergence of the electron optical system can be realized by employing a composite convergence correction waveform which is a parabolic function of both the horizontal and vertical beam deflection waveforms.

It has also been found that in wide angle cathode ray beam deflection systems the electron beam components tend to become defocused for the same reasons that a plurality of discrete electron beams tend to diverge when an attempt was made to converge them on a single point in the target plane. The electron beam convergence problem and the electron beam focusing problem in wide angle deflection systems are respectively discussed in U. S. patent to Loren R. Kirkwood, entitled "Dynamic Electron Beam Control Systems," issued August 24, 1954, No. 2,687,493. Complete color television receiving system using a parabolic waveform for both beam convergence and beam focus correction in a multigun color kinescope is described in an article entitled "Compatible Color TV Receiver" by Kenneth E. Farr appearing in the January 1953, issue of Electronics, page 98. In the Kirkwood case and the Electronics article it is pointed out that the electrical waveform required for electron beam convergence correction as well as focus correction are substantially the same. Accordingly, throughout the specification the terms "correction signal" or "correction waveform" will be meant to include the use of a parabolic form of electrical signal to improve the dynamic beam convergence and/or dynamic beam focus in a cathode ray beam system.

The obtaining of truly parabolic waveforms of suitable amplitude for the correction of dynamic beam convergence and focus, without resorting to costly circuitry and apparatus, has presented itself as a major problem. Ideally, the beam convergence and beam focus correction signal should be obtained directly from the cathode ray beam deflection circuits associated with the cathode ray tube in which beam convergence and beam focus correction is to be carried out. This is true since it can be shown by electron optics theory that the amplitude of correction waveform signal required for convergence and focus correction in any given system is directly related to the amplitude and waveform of the beam deflection signal. Thus, if the correction signal waveform can be directly derived from those deflection circuits producing the basic beam deflection in the cathode ray beam device, aging of elements in the deflection circuits as well as long time changes in the values of circuit parameters can be met by complementary and corresponding change in

the amplitude and waveform of the correction signal. As one attempts to extract energy from a deflection circuit in a parabolic waveform, it is generally found that either linearity and circuit efficiency of the deflection system must be sacrificed or the correction waveform must suffer compromise in not representing a true mathematical parabola.

It is therefore an object of the present invention to provide an improved and simplified electron beam control system by which it is possible to maintain uniformity of performance in beam deflection within a cathode ray type tube.

It is a further object of the present invention to provide an improved generator circuit of electrical waves of complex waveform and high amplitude at a minimum of circuit complexity and expense.

It is still another object of the present invention to provide an improved and simplified means for deriving parabolic shaped waveforms suitable for cathode ray beam convergence and focus correction from standard forms of cathode ray beam deflection circuits.

It is further an object of the present invention to provide an improved and simplified means for deriving a parabolic shaped waveform of high voltage amplitude from a horizontal electromagnetic cathode ray deflection circuit of the type used in home instrument television receivers.

It is a further object of the present invention to provide an improved means for obtaining proper energization of the beam convergence and focus correction means of a multigun cathode ray beam color kinescope.

In the realization of the above objects and features of advantage, the present invention contemplates the provision of means for sampling the deflection current passing through the deflection yoke in an electromagnetic deflection system with additional means for integrating the signal information thus obtained to form a parabolic type control waveform suitable for use as an electron beam focus and convergence correction signal. The present invention further contemplates specific means for extracting the correction waveform information in such a way as to impose in the deflection yoke circuit a supplementary correction waveform which in fact aids deflection linearity of electron beam in wide angle cathode ray tubes.

In the application of the present invention to a horizontal type cathode ray beam deflection circuit which employs a standard form of electromagnetic yoke, an additional transformer having a high secondary to primary turns ratio is provided having its primary winding connected in series with the deflection yoke and the existing source of deflection waveform. The impedance of the primary circuit is made low enough to produce only a small voltage drop in the deflection yoke circuit. The secondary of the transformer is tuned to a frequency slightly below the deflection rate thereby to provide a type of integrating action. Phase shift means are also connected with the secondary winding so as to allow the phase relationship between the developed parabolic waveform to be altered in respect to the deflection current waveform in the yoke circuit.

In one embodiment of the present invention, the impedance considerations of the primary and secondary circuits connected with the transformer may be adjusted or designed so that the voltage drop across the primary winding is in turn of the type waveform and amplitude required to improve the yoke current waveform for use in wide angle beam deflection systems. The derivation of a dynamic correction signal in this fashion can be shown to offer the distinct advantage of affording a correction waveform which changes its envelope characteristic or shape in accordance with changes in the deflection current passing through the deflection yoke in such a way as to afford optimum dynamic convergence and focus correction for wide ranges of deflection current waveforms.

A more complete understanding of the present invention as well as other objects and features of advantage thereof will be gleaned in the reading of the following specification especially when taken in connection with the accompanying drawings, in which:

Figure 1 is a combination block and schematic representation of one form of cathode ray beam system of the color kinescope variety with which the present invention may be advantageously employed.

Figure 2 is a combination block and schematic representation of one form of horizontal deflection circuit embodying the present invention whereby to make available a focus and convergence correction waveform for use in a cathode ray beam deflection system.

Turning now to Figure 1, there is shown in block form the basic elements of a dot multiplex type color television system to which the present invention may be advantageously applied. The underlying principles of operation of the dot sequential color television system are treated at some length in an article entitled "Analysis of dot sequential color television," appearing in the October 1951 issue of the Proceedings of the Institute of Radio Engineers, page 1280.

In the arrangement of Figure 1 a television signal receiving means is indicated by block **2**. The television receiver amplifies signals detected by the antenna **4**, demodulates these signals and provides a video signal to the video signal channel means indicated by block **6**. Suitable color demodulation means are provided in the video signal channel **6** so that three separate component color signals are made available on the output buses **8**, **10** and **12**, respectively, connected with gun control electrodes **14**, **16** and **18**. Average brightness information for each color channel is developed by the D. C. restorer circuit **20**. The restorer circuit **20** is a three channel device which permits separate brightness information to be applied to the separate electron gun cathodes **22**, **24** and **26**.

As described in an article entitled "A three gun shadow mask color kinescope," by H. B. Law, appearing in October 1951 issue of the Proceedings of the I. R. E., pages 1186–1194, the color television picture reproducing kinescope **28**, referred to sometimes as a "Triniscope," includes three separate cathode ray beam gun structures. The gun control electrode and cathodes of these gun structures have been described hereinabove. Also shown within the envelope **28** are the respective gun screen electrodes **30**, **32** and **34**. The gun screen electrodes are connected in a conventional fashion to a source of positive power supply potential indicated by the block **36**. Focus control electrodes are indicated at **38**, **40** and **42** for focusing the respective electron beams onto the multicolor phosphor dot target **44**. A shadow mask for producing selective energization of predetermined color dots by the respective electron beams is indicated at **46**. For purposes of illustration the direction of approach to the target of the three electron beams produced by the three electron beam guns, is indicated by the dotted lines **50**, **52** and **54**. Thus, as described in the above article "A three gun shadow mask color kinescope" the three beams produced by the respective electron guns passing through a given aperture in the shadow mask **46**, will excite respective deposits of phosphor on the target **44**. The phosphor deposits on the target **44** are arranged in tangential relationship so that any group of three deposits served by a given aperture in the shadow mask **46** will, when simultaneously excited by properly balanced beam energy, act to produce a resultant white light. A beam convergence electrode **55** is provided for ensuring the coincidence of the three beams upon any given aperture in the shadow mask **46** for any angle of beam deflection. This convergence control results from an electrostatic lens effect produced by maintaining the ultor or beam accelerating

anode 56 with the conductive coating 56a at a higher positive potential than the focus electrode 55.

The method by which the beam convergence electrode serves to improve coincidence of the three electron rays produced by the three separate electron beam guns is discussed in an article "Deflection and convergence in color kinescopes," by Albert W. Friend, appearing in the Proceedings of the I. R. E. for October 1951, pages 1249–1263. In this article it is pointed out that in order to accomplish a satisfactory degree of beam convergence over very wide angles of deflection, the wave form of voltage applied to the beam convergence electrode 55 should be substantially parabolic in shape, and synchronously related to the deflection signal of the system. As brought out in the above identified U. S. patent entitled "Dynamic Electron Beam Control Systems," No. 2,687,493, issued August 24, 1954, by Loren R. Kirkwood, the dynamic beam convergence signal applied to the beam convergence electrode 55 may also be applied to the gun focus electrodes 38, 40 and 42 to improve the uniformity of focus of each of the beams over the area of the target 44. It is with the production or generation of the required parabolic waveform for use as a beam convergence electrode or for use as a beam convergence signal or gun focus control signal, that the present invention is concerned.

The general method employed in the prior art of developing and applying a complex correction signal to the beam convergence electrode and gun focus electrodes of a color triniscope, is illustrated in Figure 1. Demodulated video signal developed by the television receiver 2 is also applied to a sync signal separator 56. Circuits of this type are well known in the art and act in such a way as to separate the synchronizing component from the composite video signal as demodulated by the television receiver 2. Separated horizontal synchronizing signal may then appear on bus 58 while vertical synchronizing signal may appear on bus 60. These synchronizing signal buses are respectively connected with the input circuits of the horizontal and vertical deflection wave generators 62 and 64. The deflection wave generators 62 and 64 may be of conventional form. Horizontal deflection signal is developed across the output terminals 66 and 68 of the horizontal deflection wave generator. The output terminals 66 and 68 are connected with the horizontal deflection winding of the deflection yoke 70 surrounding the neck of the triniscope 28. Output terminals 72 and 74 for the vertical deflection wave generator 64 are correspondingly connected with the vertical deflection winding of the beam deflection yoke 70. Horizontal deflection wave energy is extracted from the horizontal deflection wave generator 62 and applied to a horizontal convergence control wave generator 76 which is designated as having a high impedance. The parabolic control wave for horizontal beam convergence and focus correction therefore will appear across the terminals 78 and 80 of the control wave generator 76. A corresponding control wave generator 82 is provided for excitation from the vertical deflection wave generator 64. The required parabolic type control waveform developed by the vertical convergence and focus control wave generator will therefore appear across terminals 84 and 86 thereof. As shown in the drawing the parabolic control waveform output signals of the horizontal and vertical convergence and focus control wave generators are serially added with one another to provide a composite complex correction waveform which may be applied to the beam convergence electrode 55. As shown in the drawing the terminal 86 of the vertical convergence focus control wave generator is grounded while the terminal 78 of the horizontal convergence and focus control wave generator is capacitively coupled, via capacitor 88, to the beam convergence electrode 55. A high potential static convergence bias supply voltage is provided by the voltage producing means 90. One terminal of the supply voltage means 90 is grounded while the other terminal is connected through a high resistance 92 to the beam convergence electrode 55. Thus the composite convergence and focus control wave will be superimposed upon the static potential developed by the supply voltage means 90.

In order to provide dynamic focus correction of the electron beams produced by the electron ray guns within the triniscope 28, a voltage dividing means 94 is connected across the terminal 78 to ground. A variable tap 96 on the resistance element 94 permits any voltage level of composite horizontal and vertical convergence and focus control wave to be obtained. This reduced amplitude version of the composite control wave is coupled via capacitor 98 to the gun focus electrodes 38, 40 and 42, as described in the above Kirkwood patent. Static focus supply voltage is supplied by the voltage supply means 100 having one terminal grounded and its positive terminal connected through a relatively high value resistor 102 to the gun focus electrodes.

It is noted that since the vertical convergence and focus control waveform generator is productive of a lower frequency parabolic voltage than the horizontal convergence focus control wave generator, it has one of its terminals connected with ground potential as shown at terminal 86. This prevents the possible attenuation of the higher frequency components of the horizontal convergence and focus control waveform generator from being dissipated in the circuit capacitances of the vertical convergence focus control waveform generator, as would be the case were the horizontal control waveform generator placed at ground potential instead of the vertical generator.

The above description of the arrangement shown in Figure 1 has been undertaken in an attempt to establish a better understanding of the problems which are so uniquely solved by the practice of the present invention as described hereinafter. The present invention concerns itself mainly with improved means for accomplishing the generation of a horizontal convergence and focus control waveform and hence is directed to a general form of improved circuitry which in essence combines the functions of blocks 62 and 76 in Figure 1. That is it incorporates in a single circuit a horizontal deflection waveform generator action as well as a horizontal convergence and focus control waveform generator action. It will be appreciated, however, that although the following description of one embodiment of the present invention is applied to horizontal deflection circuits, horizontal convergence and horizontal focus correction, that the fundamental principles may be applied to vertical deflection circuits having a sufficiently high deflection signal repetition rate.

One embodiment of the present invention is shown in Figure 2. In Figure 2 it will be assumed that a sawtooth deflection waveform of suitable linearity for cathode ray beam deflection purposes is available across terminals 110 and 112. The sawtooth waveform 114 appearing across these terminals is capacitively coupled via capacitor 116 to the control electrode 118 of a pentode type vacuum tube amplifier 120. By way of convenience a source of horizontal deflection signal source has been designated as a horizontal deflection driver at block 121. It will be appreciated that the merits of the present invention are in no way limited to the particular form of vacuum tube employed. Where a pentode amplifier is used a screen biasing potential should be applied to the screen electrode 122 from a source of positive power supply potential 124 through a dropping resistor 126. A conventional screen electrode bypass capacitor 128 is connected from the screen electrode 122 to circuit ground. A cathode biasing resistor 132 is shunted by cathode bypass capacitor 134 and is connected in the conventional manner between the cathode 136 and circuit ground. A conventional grid leak current resistor 138 is connected between the control electrode 118 and circuit ground.

Anode power supply requirements for the vacuum tube **120** are supplied from a power supply (not shown) having a positive terminal **140** and a negative terminal **142**, the latter being established at circuit ground. The diode **144** is connected in shunt with the horizontal deflection yoke winding **146** through B boost capacitor **148** and the primary winding **150** of the transformer **152**. Diode **144** through its unilateral conduction characteristics effectively captures and stores magnetic energy in the deflection yoke winding at the end of each deflection cycle and charges the B boost capacitor **148** with this energy. This results in an effectively higher anode power supply potential for the tube **120** than is available at the terminal **140**. This action is immediately understood by noting that the lower extremity of the deflection yoke winding **146** is connected through the auto transformer **154** to the anode **156** of the amplifier **120**. For purposes of illustrational convenience in Figure 2 no means have been shown for exciting the vertical deflection winding **158** of the deflection yoke. It will be understood that the terminals V—V of the deflection winding **158** will be connected to a suitable source of vertical deflection signal. Details of the operation of the above described B boost deflection circuit which results in a sawtooth current flow through the horizontal deflection winding **146**, are discussed in considerable detail in the U. S. patent to Edwin L. Clark No. 2,536,835, issued January 2, 1951, entitled "High Efficiency-Cathode Ray Beam Deflection System."

In the arrangement of Figure 2 beam accelerating potential for the ultor **162** of the kinescope **164** is supplied through the rectification of positive going pulses occurring at the upper extremity of the auto transformer winding section **167**. The positive going pulses **167** are rectified by the diode **168** to provide a high voltage direct current potential across the capacitor **170**. This high voltage potential is conveyed to the ultor **162** by means of the filter resistor **172**. A suitable high voltage bias potential for the focus electrode **174** of the kinescope **164** is derived from the diode rectifier **168** through the agency of a voltage divider and bleeder system comprising resistance elements **176** and **178**. The high voltage potential at the junction of elements **176** and **178** is conveyed by a resistor **180** to the focus electrode **174**.

In accordance with the present invention the transformer **152** whose primary winding **150** has been described as being connected in series with the horizontal deflection yoke winding, is of the voltage step-up variety. Ideally, the transformer **152** is so constructed that the primary winding **150** will present little impedance to deflection current flow while the secondary winding **182** should be productive of signal waveforms whose amplitude may rise to several thousand volts.

In accordance with the present invention, the inductance of the secondary winding **182** is resonated by a capacitor **184** (along with other circuit capacitances) to a frequency below the deflection circuit repetition rate, or sweep deflection frequency. Under these conditions the voltage waveform appearing across the secondary winding **182** will be substantially parabolic in form as shown by the waveform **186**. The parabolic form of the waveform **186** is of course predicated upon the existence of a perfect sawtooth of current through the transformer winding **150** as well as a substantially linear frequency response characteristic of the transformer **152**. A phase shifting network comprising a variable resistance element **188** and capacitor **190** is then connected in shunt with the capacitor **184**. The phase shifted correction waveform then appearing across capacitor **190** is coupled by a capacitor **192** to the focus electrode **174** of the kinescope **164**. Due to the impedance of the focus electrode static bias source as insured by the resistor **180**, the phase shifted correction waveform **186** as it appeares across the capacitor **190** is superimposed upon the static bias applied to the focus electrode **174**.

It is one of the features of the present invention that the waveform **186** appearing across the secondary **182** of transformer **152** will change its waveform in accordance with changes in the waveform of current through the primary winding **150**, which current in turn represents the current flowing through the deflection yoke winding **146**. Thus if for any reason the waveform or amplitude of the deflection yoke current changes, a corresponding change in the waveform and amplitude of the correction waveform **186** will occur. It has been found in practice and can be mathematically supported, that changes in the correction waveform due to changes in the current through the deflection yoke, as in such a direction as to maintain optimum dynamic focus correction over rather wide limits of deflection current waveform amplitude and shape. Thus as the power amplifier tube **120** ages or the damper tube **144** changes its characteristics with use, a high degree of focus correction will be maintained in the operation of the deflection circuit.

As shown in the drawing the output terminal **194** may be connected with the convergence electrode of a multigun kinescope of the type illustrated in Figure 1. In cases where less dynamic control signal is required for dynamic focus correction than is required for beam convergence in a multigun kinescope, an additional dropping resistor **196** may be employed. It is further within the scope of the present invention to provide separate phase shifting means for the correction signal developed across the secondary winding **182** in its application to the convergence electrode of a multigun kinescope. For purposes of illustrational convenience this modification has not been shown since it does not directly touch the merits of the present invention.

It is noteworthy in the practice of the present invention that the voltage drop appearing across the primary **150** of the supplementary transformer **152** will be parabolic in waveform and of such phase and polarity as to accomplish a degree of linearity control in the deflection current passing through the deflection yoke winding **146**. It is for this reason that the B boost power recovery deflection circuit of Figure 2 has not been shown as including a linearity control, per se. It will be appreciated, however, that a linearity control can in fact be added to the illustrated deflection circuit in a manner shown in the above reference Clark patent. In practice it will be found that the turns ratio for the supplementary transformer, **152** may be selected at will to provide optimum deflection current linearity correction since the developed secondary voltage is a function solely of primary current and the number of secondary turns.

It is therefore seen that in accordance with the present invention very little additional circuit complexity and construction cost is necessary to derive from a standard cathode ray beam deflection circuit, a high amplitude signal suitable for dynamic beam convergence and focus correction in cathode ray beam devices. As mentioned hereinabove, an understanding of the principles of operation of the present invention will make clear that its advantageous features are in no way limited to deflection circuits of the horizontal beam deflection type. The principles of the present invention can clearly be applied to vertical deflection circuits whenever operating frequencies and circuit parameters are of a value permitting the development of suitable waveforms of the type described above. The present invention is further not to be limited to the production of the parabolic waveform type of correction voltage or signal since it is apparent that by resonating the secondary winding of the transformer **152** to the deflection frequency a sinusoidal waveform of high amplitude can be developed across the capacitor **184**. The successful utilization of a sinusoidal waveform for dynamic beam convergence and focus correction in narrow angle cathode ray beam deflection systems is discussed in a copending U. S. patent to Gordon S. Kelly et al., No. 2,737,609, issued March 6, 1956, entitled "Electron Beam Control Systems."

What is claimed is:

1. In a parabolic waveform generating system the combination of: a source of cyclically recurrent sawtooth waveform signal current of predetermined frequency; a load circuit connected across said source whereby to accept the bow of substantially sawtooth current therefrom; transformer means having a primary and secondary winding circuit, said secondary winding circuit having a predetermined nominal inductance value; connections placing said primary winding in series with the connection of said load to said sawtooth signal source; and capacitance means of predetermined nominal value connected across at least a portion of said secondary winding, the nominal value of said capacitance means being established so as to resonate with the inductance value of said secondary winding circuit at a frequency sufficiently below said predetermined cyclically recurrent frequency of said sawtooth signal as to develop a substantially parabolic type waveform across said capacitance means.

2. In a cathode ray beam deflection system in which is to be developed a periodic sawtooth deflection signal having a given repetition frequency for primary control of a cathode ray beam instrumentality, said cathode ray beam instrumentality being of the type requiring a beam convergence signal and having means including a convergence signal input terminal for accepting a convergence signal and exercising a secondary beam control of the components of said cathode ray beam in accordance with said convergence signal, the combination of: a cathode ray beam deflection circuit having an output amplifier delivering a substantially sawtooth deflection waveform having a predetermined repetition frequency; a tuned circuit resonant to a frequency substantially below the repetition frequency of said deflection waveform; signal coupling means operatively connected between said output amplifier and said resonant tuned circuit to excite said resonant tuned circuit with deflection signals delivered by said amplifier to develop across said resonant circuit a substantially parabolic waveform; and passive signal coupling means connected to said tuned circuit and designated for connection with said convergence signal input terminal to establish secondary control of said cathode ray beam in accordance with the waveform developed across said tuned circuit.

3. In an electromagnetic cathode ray beam deflection system, the combination of: a source of cathode ray beam deflection signal of selected repetition frequency; an electromagnetic deflection yoke connected with said source of deflection signal; a transformer means having a primary winding and a secondary winding circuit of a predetermined nominal inductance value; connections placing said primary winding in series with the connection of said deflection yoke to said source of deflection signal; and a capacitor connected in shunt with at least a portion of said transformer means secondary winding, the nominal value of said capacitor being established to resonate with the inductance value of said transformer means secondary winding circuit at a frequency sufficiently below said deflection signal repetition frequency as to develop a substantially parabolic waveform synchronously related to said deflection signal.

4. A cathode ray beam deflection system in accordance with claim 3 wherein the cathode ray beam instrumentality designated for use with said system is of the type employing means for dynamic control of the electron beam components within the cathode ray beam instrumentality and wherein there is additionally provided passive signal coupling means connected from said transformer means secondary winding to the electron beam components dynamic control means of said cathode ray beam instrumentality.

5. In an electron beam deflection system suitable for use with a multigun kinescope having beam convergence means and dynamic focus means the combination of: a source of beam deflection signal having a selected fundamental frequency component; a transformer having a primary winding and a secondary winding circuit of predetermined inductance value; a set of deflection yoke excitation terminals designated for connection to an electromagnetic beam deflection yoke for said kinescope; connections placing said transformer primary winding and said deflection yoke excitation terminals in series in one another across said source of deflection signal; a capacitor connected across the secondary winding of said transformer, the value of capacitor being nominally established to produce resonance with the inductance of said secondary winding circuit at a frequency substantially below said selected fundamental component frequency of said deflection signal to produce a substantially parabolic control waveform across said capacitor which is synchronously related to said deflection signal; and signal coupling means connected from said capacitor to said dynamic focus control means to apply said control waveform to said dynamic focus control means.

6. An electron beam deflection system according to claim 5 wherein there is additionally provided a variable phase shifting network connected between said secondary winding and said dynamic focus control means.

7. An electron beam deflection system according to claim 5 wherein the secondary winding of said transformer is also connected with the beam convergence means of said kinescope.

8. In a cathode ray beam deflection system of the type suited for beam deflection excitation in a kinescope having a focus control electrode, the combination of: a source of recurrent deflection signal having a given repetition rate; an electron discharge tube having at least an anode, cathode and control electrode, said control electrode being electrically coupled to said source of deflection signal; a circuit potential reference terminal; direct current coupling means connected between said cathode and said reference terminal; a source of positive power supply potential referenced with respect to said reference terminal; a unilateral conduction device connected from said anode to said source of positive power supply potential; a cathode ray beam deflection yoke winding; a capacitor; a transformer having a primary winding and secondary winding of predetermined nominal inductance value; connections placing said deflection yoke winding, said transformer primary winding and said capacitor in series with one another to form a combination, connections placing said combination in shunt with said unilateral conduction device; capacitance means having a predetermined nominal capacitance value connected in shunt with a secondary winding of said transformer said predetermined capacitance value being established to resonate with the circuit of said secondary winding at a frequency substantially below the repetition rate of said deflection signal to produce a substantially parabolic control waveform across said secondary winding; and electrical phase shifting means connected between said transformer secondary winding and said kinescope focus electrode to apply a phase shifted version of said control waveform to said focus electrode.

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