

Description

This invention relates to video display apparatus and, in particular, to deflection loss protection circuits for cathode ray tubes.

A video display apparatus, such as a television receiver or a computer monitor, incorporates a cathode ray tube (CRT) that produces one or more electron beams. The beams are made to impinge upon and illuminate a phosphor display screen of the CRT by action of a high voltage beam accelerating potential. The electron beam or beams are repeatedly deflected or scanned in horizontal and vertical directions at given rates or frequencies to form a raster on the CRT display screen. The electron beam intensity is modulated in accordance with video signal information to produce a picture on the display screen.

The display screen phosphor coating is susceptible to damage from the impingement of an unscanned electron beam which can occur, for example, due to loss of a deflection signal or failure of the deflection windings of the deflection yoke. In a conventional flyback-type power supply and deflection circuit, horizontal deflection rate retrace or flyback pulses are used to produce the high voltage level via a high voltage transformer. Loss of horizontal deflection, therefore, results in the loss of high voltage or beam accelerating potential, so that damage to the CRT is avoided.

In some applications, such as computer monitors where accurate voltage regulation is critical, it is desirable to generate the high voltage level separate from the horizontal deflection circuit. In a circuit of this type, loss of horizontal deflection may not result in the loss of high voltage, so that damage to the phosphor display screen may occur.

US-A-3588608 discloses an oscilloscope having a protection circuit for disabling the high voltage to the CRT thereof. The CRT of an oscilloscope uses electrostatic deflection. The high voltage is produced by an oscillator including a transformer. The level of the high voltage is regulated by d.c. variation of the current supplied to the oscillator. The output of a horizontal sweep generator is applied to a control circuit which senses when the generator fails to produce the horizontal sweep output. If such failure is sensed, at least some of the current otherwise supplied to the oscillator is diverted to ground, preventing the oscillator from oscillating.

The control circuit comprises a controlled rectifier having a gate coupled to the sweep generator via a transformer. The transformer differentiates the output of the sweep generator to produce a train of pulses which render the rectifier conductive. The rectifier then discharges a capacitor. Thus if the generator produces its output, the capacitor is dis-

charged. If the generator fails to produce the output, the capacitor charges to a voltage which is sensed by a switching arrangement which actuates an output transistor to divert the oscillator current to ground.

US-A-3588608 senses merely whether or not the horizontal sweep output is generated.

The present invention seeks to provide protection circuitry for a video display device having an electromagnetic deflection circuit which disables the high voltage generator even if the horizontal sweep output is abnormally produced, such as when the electromagnetic deflection coil becomes disconnected.

In accordance with the present invention, there is provided a video display apparatus comprising a high voltage generating means incorporating means responsive to a control signal for controlling the production of the high voltage deflection circuit means for producing a deflection rate signal and means responsive to the deflection rate signal for generating the control signal, characterized in that the video display apparatus comprises an electromagnetic deflection winding, the deflection circuit means produces the deflection rate signal in the said winding, and the controlling means includes a high voltage regulator responsive to the value of said high voltage, and is responsive to deflection rate trigger signals having an amplitude above a predetermined threshold level for causing said high voltage generating means to operate, and is substantially nonresponsive to the presence of trigger signals having an amplitude below said predetermined threshold level such that said high voltage is not produced; said deflection circuit means produces a deflection rate signal having an amplitude above a first level during normal operation of said deflection circuit means and producing a deflection rate signal having a reduced amplitude below said first level when said deflection winding is disconnected from the deflection circuit while said deflection circuit continues to operate; and said generating means is responsive to said deflection rate signal and generates the trigger signals, said trigger signals having an amplitude above said predetermined level when the amplitude of said deflection rate signal is above said first level, said trigger signals having an amplitude below said predetermined level when the amplitude of said deflection rate signal is below said first level, such that said high voltage is produced during normal production of said deflection rate signal and is not produced when said deflection rate signal is below said first level.

In the accompanying drawing:

FIGURE 1 is a block and schematic diagram of a portion of a video display apparatus embodying an aspect of the present invention; and

FIGURE 2 illustrates waveforms useful in understanding the operation of the circuit shown in FIGURE 1.

Referring to FIGURE 1, there is schematically shown a portion of a video display apparatus, such as a computer monitor or a television receiver, in which video signals (from a source not shown) are applied to video processing circuitry 10 via a conductor 11. The video signals may be provided, for example, by tuning circuitry incorporated as part of the video display apparatus or by external means, such as a computer or a video cassette recorder. Video processing circuitry 10 produces drive signals that are applied to the electron gun assembly 12 of a cathode ray tube (CRT) 13 via a conductor 14. Electron gun assembly 12 generates one or more electron beams 15 that are caused to impinge upon and illuminate a phosphor display screen 16 located on the front panel of CRT 13. The intensity of the electron beams is controlled in accordance with the picture information of the video signals.

The source of video signals may also provide line and field rate synchronizing information, for example, as part of a composite video signal, which is then separated from the video information, or as separate synchronizing signals. The vertical or field rate synchronizing signals are accordingly applied from a terminal 17 to a vertical deflection circuit 18 via a conductor designated VS. Vertical deflection circuit 18, via terminals V and V', generates vertical rate deflection current in a vertical deflection winding 20, located on the neck of CRT 13, that in turn produces a vertical deflection field for deflecting or scanning the electron beams 15 at a field rate across display screen 16. Horizontal or line rate synchronizing signals are applied from a terminal 21 to horizontal oscillator circuitry 22 via a conductor designated HS. The horizontal rate output signal from horizontal oscillator 22 is applied to horizontal driver circuit 23 which produces horizontal rate switching signals for a horizontal output device, shown as transistor 24. Transistor 24 forms part of a resonant retrace-type output circuit 25 that also includes damper diode 26, resistor 27 and retrace capacitor 30. Output circuit 25 generates, via terminals H and H', horizontal rate deflection current in horizontal deflection winding 31, also located on the neck of CRT 13, that produces a horizontal deflection field for deflecting electron beams 15 at a line rate across display screen 16. The direct component of deflection current through deflection winding 31 and linearity coil 32 is controlled by centering circuit 33, in accordance with a factory set-up adjustment, in order to achieve horizontal centering of the scanned video information on display screen 16.

The horizontal deflection voltage is applied across primary winding 34 of a transformer 35, thereby inducing a voltage across secondary winding 36, which is illustratively shown as comprising a tapped winding. The voltage developed across the portion of winding 36 designated 36A is applied to a horizontal deflection regulator circuit 37. Deflection regulator circuit 37 acts to control the horizontal deflection current amplitude by controlling the effective B+ supply voltage to the deflection circuit in accordance with the sensing voltage developed across winding portion 36A.

Embodying an aspect of the present invention, the voltage developed across winding portion 36B is utilized to provide input or trigger pulses to high voltage regulator circuit 40. Both high voltage regulator circuit 40 and horizontal deflection regulator circuit 37 may illustratively incorporate an integrated circuit such as that designated CA555, manufactured by RCA Corporation. The width modulated output pulse signal of high voltage regulator circuit 40 is applied to the gate of a field effect transistor (FET) 41 by a drive circuit 42. Drive circuit 42 comprises capacitor 43, transformer 44, capacitor 48, resistor 45 and FET input voltage limiting zener diode 46. The drain of FET 41 is coupled to a source of potential, illustratively of the order of +130 volts DC, via inductor 47. Switching of FET 41 by the output signal from high voltage regulator circuit 40 effectively chops the +130 volts input voltage level such that a voltage level is established across capacitor 50, and present at terminal 51. The level of the voltage established at terminal 51 is determined as follows. An output signal at a terminal 52 of horizontal oscillator 22 is applied to the gate of a field effect transistor (FET) 53, causing FET 53 to switch between conductive and nonconductive states. The switching signal from horizontal oscillator 22 is a constant duty cycle single frequency pulse train, having a pulse frequency illustratively of the order of 64 kHz. Conduction of FET 53 causes current to flow in primary winding 54 of a high voltage transformer 55 from the source of potential established at terminal 51, thereby developing a high voltage level across tertiary or high voltage winding 56, which is applied to the high voltage or ultor terminal 57 of CRT 13. Feedback of the high voltage level to high voltage regulator 40 is accomplished via conductor 60 and voltage divider 61. Since FET 53 is switched at a constant rate and duty cycle, regulation of the high voltage level occurs by controlling the voltage level at terminal 51 as a result of controlling the switching of FET 41.

The voltage developed across winding 62 of transformer 55 is rectified and filtered by diode 63 and capacitor 64, respectively, to produce a DC voltage that is illustratively applied, via terminal 65,

to the screen grid of electron gun assembly 12 of CRT 13. The level of screen grid voltage is regulated by regulator circuit 66 comprising, in part, comparator 67 and transistor 70. A voltage indicative of the screen grid voltage level is applied to the noninverting input of comparator 67 via a voltage divider 71. A reference voltage is applied to the noninverting input of comparator 67. When the level of the voltage indicative of the screen grid voltage level exceeds the reference voltage level, comparator 67 produces an output signal that causes transistor 70 to conduct, thereby discharging capacitor 64 and reducing the screen grid voltage level.

As previously described, the high voltage level is produced as a result of switching of FET 41 caused by the pulse width modulated output signal from high voltage regulator 40. The output signal of high voltage regulator 40 is produced in response to trigger pulses derived from the voltage across winding portion 36B. Failure of the horizontal deflection circuitry will therefore result in a loss of current flow through winding 34, such that no voltage is developed across winding portion 36B. Consequently, no trigger pulses are produced for high voltage regulator circuit 40 and the high voltage generating circuitry is desirably disabled. Under certain fault conditions, however, such as when horizontal deflection winding 31 becomes disconnected, for example, the horizontal deflection circuitry, including horizontal deflection output circuit 25, may continue to operate. Sufficient current may flow through winding 34 even in the absence of deflection winding 31 to enable the production of a pulse from winding portion 36B that has sufficient amplitude to cause triggering of high voltage regulator 40. Therefore, a pulse processing circuit 72 responds to the voltage pulses produced across winding portion 36B in a manner that causes high voltage regulator circuit 40 to be triggered during normal horizontal deflection operation and does not allow regulator circuit 40 to be triggered during abnormal operation of the horizontal deflection circuitry. Pulse processing circuit 72 comprises resistors 73 and 74, capacitor 75, and resistors 76, 77 and 80. The operation of pulse processing circuit will be described with reference to FIGURE 2.

The operation of pulse processing circuit 72 causes applied pulses to be differentiated and attenuated so that pulses produced during normal deflection circuit operation result in trigger pulses of sufficient amplitude to cause triggering of high voltage regulator circuit 40 while pulses that may be produced during abnormal deflection circuit operation result in pulses that do not have sufficient amplitude to cause triggering of high voltage regulator circuit 40. During normal deflection circuit operation, the pulses developed across winding

portion 36B appear as shown in FIGURE 2A. These horizontal rate pulses will exceed a level designated N during normal deflection circuit operation. After being differentiated and attenuated by pulse processing circuit 72, the trigger pulses applied to high voltage regulator circuit 40 appear as shown in FIGURE 2B. The trigger threshold level T of high voltage regulator circuit 40 is also shown in FIGURE 2B. As can be seen, the trigger pulses applied to high voltage regulator circuit 40 during normal operation of the horizontal deflection circuit exceed the trigger threshold T, resulting in normal triggering of the high voltage regulator circuit 40.

During an abnormal condition in which the horizontal deflection current is not produced, yet the horizontal deflection output circuit 25 continues to operate, such as when the deflection winding 31 becomes disconnected, the pulses developed across winding 36B may appear as shown in FIGURE 2C. As can be seen, the pulses shown do not exceed the level N. Differentiation and attenuation by pulse processing circuitry 72 results in pulses that appear as shown in FIGURE 2D. As can be seen, the pulses of FIGURE 2D do not exceed the trigger threshold T and are therefore of insufficient amplitude to cause triggering of high voltage regulator circuit 40. Consequently, no high voltage is produced.

Claims

1. A video display apparatus comprising a high voltage generating means (40-47,50-56) incorporating means (40) responsive to a control signal (from 72) for controlling the production of the high voltage, deflection circuit means (22,23,24,25) for producing a deflection rate signal and

means (35,72) responsive to the deflection rate signal for generating the control signal,

characterized in that the video display apparatus comprises an electromagnetic deflection winding (31), the deflection circuit means produces the deflection rate signal in the said winding, and the controlling means (40) includes a high voltage regulator responsive to the value of said high voltage, and is responsive to deflection rate trigger signals (from 72) having an amplitude above a predetermined threshold level (T) for causing said high voltage generating means to operate, and is substantially nonresponsive to the presence of trigger signals having an an amplitude below said predetermined threshold level such that said high voltage is not produced;

said deflection circuit means (22,23,25) produces a deflection rate signal having an amplitude above a first level during normal

to the screen grid of electron gun assembly 12 of CRT 13. The level of screen grid voltage is regulated by regulator circuit 66 comprising, in part, comparator 67 and transistor 70. A voltage indicative of the screen grid voltage level is applied to the noninverting input of comparator 67 via a voltage divider 71. A reference voltage is applied to the noninverting input of comparator 67. When the level of the voltage indicative of the screen grid voltage level exceeds the reference voltage level, comparator 67 produces an output signal that causes transistor 70 to conduct, thereby discharging capacitor 64 and reducing the screen grid voltage level.

As previously described, the high voltage level is produced as a result of switching of FET 41 caused by the pulse width modulated output signal from high voltage regulator 40. The output signal of high voltage regulator 40 is produced in response to trigger pulses derived from the voltage across winding portion 36B. Failure of the horizontal deflection circuitry will therefore result in a loss of current flow through winding 34, such that no voltage is developed across winding portion 36B. Consequently, no trigger pulses are produced for high voltage regulator circuit 40 and the high voltage generating circuitry is desirably disabled. Under certain fault conditions, however, such as when horizontal deflection winding 31 becomes disconnected, for example, the horizontal deflection circuitry, including horizontal deflection output circuit 25, may continue to operate. Sufficient current may flow through winding 34 even in the absence of deflection winding 31 to enable the production of a pulse from winding portion 36B that has sufficient amplitude to cause triggering of high voltage regulator 40. Therefore, a pulse processing circuit 72 responds to the voltage pulses produced across winding portion 36B in a manner that causes high voltage regulator circuit 40 to be triggered during normal horizontal deflection operation and does not allow regulator circuit 40 to be triggered during abnormal operation of the horizontal deflection circuitry. Pulse processing circuit 72 comprises resistors 73 and 74, capacitor 75, and resistors 76, 77 and 80. The operation of pulse processing circuit will be described with reference to FIGURE 2.

The operation of pulse processing circuit 72 causes applied pulses to be differentiated and attenuated so that pulses produced during normal deflection circuit operation result in trigger pulses of sufficient amplitude to cause triggering of high voltage regulator circuit 40 while pulses that may be produced during abnormal deflection circuit operation result in pulses that do not have sufficient amplitude to cause triggering of high voltage regulator circuit 40. During normal deflection circuit operation, the pulses developed across winding

portion 36B appear as shown in FIGURE 2A. These horizontal rate pulses will exceed a level designated N during normal deflection circuit operation. After being differentiated and attenuated by pulse processing circuit 72, the trigger pulses applied to high voltage regulator circuit 40 appear as shown in FIGURE 2B. The trigger threshold level T of high voltage regulator circuit 40 is also shown in FIGURE 2B. As can be seen, the trigger pulses applied to high voltage regulator circuit 40 during normal operation of the horizontal deflection circuit exceed the trigger threshold T, resulting in normal triggering of the high voltage regulator circuit 40.

During an abnormal condition in which the horizontal deflection current is not produced, yet the horizontal deflection output circuit 25 continues to operate, such as when the deflection winding 31 becomes disconnected, the pulses developed across winding 36B may appear as shown in FIGURE 2C. As can be seen, the pulses shown do not exceed the level N. Differentiation and attenuation by pulse processing circuitry 72 results in pulses that appear as shown in FIGURE 2D. As can be seen, the pulses of FIGURE 2D do not exceed the trigger threshold T and are therefore of insufficient amplitude to cause triggering of high voltage regulator circuit 40. Consequently, no high voltage is produced.

Claims

1. A video display apparatus comprising a high voltage generating means (40-47,50-56) incorporating means (40) responsive to a control signal (from 72) for controlling the production of the high voltage, deflection circuit means (22,23,24,25) for producing a deflection rate signal and

means (35,72) responsive to the deflection rate signal for generating the control signal,

characterized in that the video display apparatus comprises an electromagnetic deflection winding (31), the deflection circuit means produces the deflection rate signal in the said winding, and the controlling means (40) includes a high voltage regulator responsive to the value of said high voltage, and is responsive to deflection rate trigger signals (from 72) having an amplitude above a predetermined threshold level (T) for causing said high voltage generating means to operate, and is substantially nonresponsive to the presence of trigger signals having an amplitude below said predetermined threshold level such that said high voltage is not produced;

said deflection circuit means (22,23,25) produces a deflection rate signal having an amplitude above a first level during normal



operation of said deflection circuit means and producing a deflection rate signal having a reduced amplitude below said first level when said deflection winding is disconnected from the deflection circuit while said deflection circuit continues to operate; and

said generating means (35,72) is responsive to said deflection rate signal and generates the trigger signals, said trigger signals having an amplitude above said predetermined level when the amplitude of said deflection rate signal is above said first level, said trigger signals having an amplitude below said predetermined level when the amplitude of said deflection rate signal is below said first level, such that said high voltage is produced during normal production of said deflection rate signal and is not produced when said deflection rate signal is below said first level.

2. Apparatus according to claim 1, wherein the high voltage regulator (40, 41, 42, 43-46 comprises a pulse width modulator (40) having a trigger threshold and triggered by trigger pulses of amplitude greater than the trigger threshold to produce respective control pulses the widths of which are varied in accordance with the value of the high voltage to regulate the high voltage and which control pulses actuate the high voltage generating means (50-56), the pulse width modulator (40) being non-responsive to trigger pulses of amplitude less than the trigger threshold whereby the high voltage generating means is not actuated, and the trigger signal generating means (35, 72, 33-36B, 73-78) produces the trigger pulses of amplitude greater than the trigger threshold in response to normal operation of the deflection circuit and produces the trigger pulses of amplitude less than the threshold when said deflection winding is disconnected from the deflection circuit.
3. Apparatus according to claim 2 wherein the regulator (40) comprises switching means (41) coupled to the high voltage generating means (22, 50-56), the switching means (41) being responsive to the width modulated control pulses to energize the high voltage generating means.
4. Apparatus according to claim 3 wherein the high voltage generating means comprises a transformer (55) having a primary winding (54) having one end thereof coupled by the switching means (41) to a source of energizing potential and having the other end coupled to a further switching means (53) which is switched

at the said deflection rate.

5. Apparatus according to claim 1, 2, 3 or 4 wherein the trigger signal generating means includes means (75, 77) for differentiating the deflection rate signal.

Patentansprüche

1. Videoanzeigevorrichtung mit Mitteln (40 bis 47, 50 bis 56) zur Hochspannungserzeugung, die Mittel (40) enthalten, die auf ein Steuersignal (von 72) zur Steuerung der Hochspannungserzeugung ansprechen, mit Ablenkschaltungsmitteln (22, 23, 24, 25) zur Erzeugung eines ablenkrequenten Signals, und mit Mitteln (35, 72), die auf das ablenkfrequente Signal ansprechen, um das Steuersignal zu erzeugen, dadurch gekennzeichnet, daß die Videoanzeigevorrichtung eine elektromagnetische Ablenkwicklung (31) enthält, daß die Ablenkschaltungsmittel das ablenkfrequente Signal in der Wicklung erzeugen, und daß die Steuermittel (40) einen auf den Wert der Hochspannung ansprechenden Hochspannungsregler enthalten und einerseits auf ablenkfrequente Auslösesignale (von 72) ansprechen, deren Amplitude oberhalb eines vorgegebenen Schwellwertpegels (T) liegt, um die Hochspannungserzeugungsmittel zum Arbeiten zu veranlassen, und andererseits auf das Vorhandensein von Auslösesignalen mit einer unter dem vorgegebenen Schwellwertpegel liegenden Amplitude im wesentlichen nicht ansprechen, so daß die Hochspannung nicht erzeugt wird; daß die Ablenkschaltungsmittel (22, 23, 25) ein ablenkfrequentes Signal mit einer Amplitude erzeugen, die während des Normalbetriebes der Ablenkschaltungsmittel oberhalb eines ersten Pegels liegt, und daß sie ein ablenkfrequentes Signal mit einer verminderten Amplitude unterhalb des ersten Pegels erzeugen, wenn die Ablenkwicklung von der Ablenkschaltung abgeschaltet ist, während die Ablenkschaltung ihren Betrieb fortsetzt; und daß die Erzeugungsmittel (35, 72) auf das ablenkfrequente Signal ansprechen und die Auslösesignale erzeugen, daß die Auslösesignale eine Amplitude oberhalb des vorgegebenen Pegels haben, wenn sich die Amplitude des ablenkrequenten Signals oberhalb des ersten Pegels befindet, daß die Auslösesignale eine Amplitude unterhalb des vorgegebenen Pegels haben, wenn sich die Amplitude des ablenkrequenten Signals unterhalb des ersten Pegels befindet, so daß die Hochspannung während der normalen Produktion des ablenk-



frequenten Signals erzeugt wird; aber nicht erzeugt wird, wenn sich das ablenkfrequente Signal unterhalb des ersten Pegels befindet.

2. Vorrichtung nach Anspruch 1, bei der
 der Hochspannungsregler (40, 41, 42, 43 bis 46) einen Impulsbreitenmodulator (40) mit einer Auslöseschwelle umfaßt und durch Auslöseimpulse ausgelöst wird, deren Amplitude größer ist als die Auslöseschwelle, um entsprechende Steuerimpulse zu erzeugen, deren Breite gemäß dem Wert der Hochspannung verändert wird, um die Hochspannung zu regeln, und wobei die Steuerimpulse die Hochspannungserzeugungsmittel (50 bis 56) betätigen, wobei der Impulsbreitenmodulator (40) nicht auf Auslöseimpulse anspricht, deren Amplitude kleiner ist als die Auslöseschwelle, wodurch die Hochspannungserzeugungsmittel nicht betätigt werden und

die das Auslösesignal erzeugenden Mittel (35, 72, 33 bis 36B, 73 bis 78) die Auslöseimpulse bei normalem Betrieb der Ablenkschaltung mit einer Amplitude erzeugen, die größer als die Auslöseschwelle ist, und die das Auslösesignal erzeugenden Mittel die Auslöseimpulse mit einer Amplitude erzeugen, die kleiner als die Auslöseschwelle ist, wenn die Ablenkwicklung von der Ablenkschaltung abgeschaltet ist.

3. Vorrichtung nach Anspruch 2, bei der der Regler (40) Schaltmittel (41) umfaßt, die mit den Hochspannungserzeugungsmitteln (22, 50 bis 56) verbunden sind, wobei die Schaltmittel (41) auf die breitenmodulierten Steuerimpulse ansprechen, um die Hochspannungserzeugungsmittel zu speisen.

4. Vorrichtung nach Anspruch 3, bei der die Hochspannungserzeugungsmittel einen Transformator (55) mit einer Primärwicklung (54) umfassen, deren eines Ende durch die Schaltmittel (41) mit einer Quelle eines Speisepotentials verbunden ist, und deren anderes Ende mit weiteren Schaltmitteln (53) verbunden ist, die mit der Ablenkfrequenz geschaltet werden.

5. Vorrichtung nach Anspruch 1, 2, 3 oder 4, bei der die das Auslösesignal erzeugenden Mittel Mittel (75, 77) zur Differenzierung des ablenkfrequenten Signals enthalten.

Revendications

1. Dispositif d'affichage vidéo comprenant des moyens (40-47, 50-56) pour générer une haute tension incorporant des moyens (40) agis-

sant en réponse à un signal de commande (de 72) pour commander la production de la haute tension, des moyens de circuit de déviation (22, 23, 24, 25) pour produire un signal de vitesse de déviation et,

- des moyens (35, 72) agissant en réponse au signal de vitesse de déviation pour générer le signal de commande, caractérisé en ce que le dispositif d'affichage vidéo comprend un enroulement de déviation électromagnétique (31), les moyens de circuit de déviation produisent le signal de vitesse de déviation dans ledit enroulement, et les moyens de commande (40) comportent un régulateur de haute tension agissant en réponse à la valeur de ladite haute tension et qui agit en réponse aux signaux de déclenchement de vitesse de déviation (de 72) ayant une amplitude supérieure d'un niveau de seuil prédéterminé (T) pour amener à fonctionner lesdits moyens générant la haute tension et qui n'agit sensiblement pas en réponse à la présence de signaux de déclenchement ayant une amplitude inférieure audit niveau de seuil prédéterminé, telle que ladite haute tension n'est pas produite ;

- lesdits moyens de circuit de déviation (22, 23, 25) produisent un signal de vitesse de déviation ayant une amplitude supérieure à un premier niveau lors du fonctionnement normal desdits moyens de circuit de déviation et produisant un signal de vitesse de déviation ayant une amplitude réduite, inférieure audit premier niveau, lorsque ledit enroulement de déviation est déconnecté du circuit de déviation alors que le circuit de déviation continue à opérer et,

- lesdits moyens de génération (35, 72) agissent en réponse audit signal de vitesse de déviation et ils génèrent les signaux de déclenchement, lesdits signaux de déclenchement ayant une amplitude supérieure audit niveau prédéterminé lorsque l'amplitude dudit signal de vitesse de déviation est supérieure audit premier niveau, lesdits signaux de déclenchement ayant une amplitude inférieure audit niveau prédéterminé lorsque l'amplitude dudit signal de vitesse de déviation est inférieure audit premier niveau, de manière que ladite haute tension soit produite lors d'une production normale dudit signal de vitesse de déviation et qu'elle ne soit pas produite lorsque ledit signal de vitesse de déviation



est en dessous dudit premier niveau.

2. Dispositif selon la revendication 1 dans lequel :
 - le régulateur de haute tension (40, 41, 42, 43, 46) comprend un modulateur de largeur d'impulsions (40) ayant un seuil de déclenchement et déclenché par des impulsions de déclenchement dont l'amplitude est supérieure à celle du seuil de déclenchement pour produire des impulsions de commande respectives dont les largeurs varient en fonction de la valeur de la haute tension afin de réguler la haute tension, les impulsions de commande actionnent les moyens générant la haute tension (50-56), le modulateur de largeur d'impulsions (40) n'agissant pas en réponse aux impulsions de déclenchement dont l'amplitude est inférieure au seuil de déclenchement si bien que les moyens générant la haute tension ne sont pas actionnés et, les moyens générant le signal de déclenchement (35, 72, 33-36 B, 73-78) produisent des impulsions de déclenchement d'amplitude plus grande que le seuil de déclenchement en réponse au fonctionnement normal du circuit de déviation et ils produisent des impulsions de déclenchement d'amplitude plus faible que le seuil lorsque ledit enroulement de déviation est déconnecté du circuit de déviation.
3. Dispositif selon la revendication 2 dans lequel le régulateur (40) comprend des moyens de commutation (41), couplés aux moyens de génération de haute tension (22, 50-56), les moyens de commutation (41) agissant en réponse aux impulsions de commande modulées en largeur pour exécuter lesdits moyens générant la haute tension.
4. Dispositif selon la revendication 3 dans lequel lesdits moyens générant la haute tension comprennent un transformateur (55) ayant un enroulement primaire (54) dont une extrémité est couplée par les moyens de commutation (41) à une source de potentiel d'excitation et dont l'autre extrémité est couplée à d'autres moyens de commutation (53) qui sont commutés à ladite vitesse de déviation.
5. Dispositif selon les revendications 1, 2, 3 ou 4 dans lequel les moyens générant le signal de déclenchement comprennent des moyens (75, 77) pour différencier le signal de vitesse de déviation.

