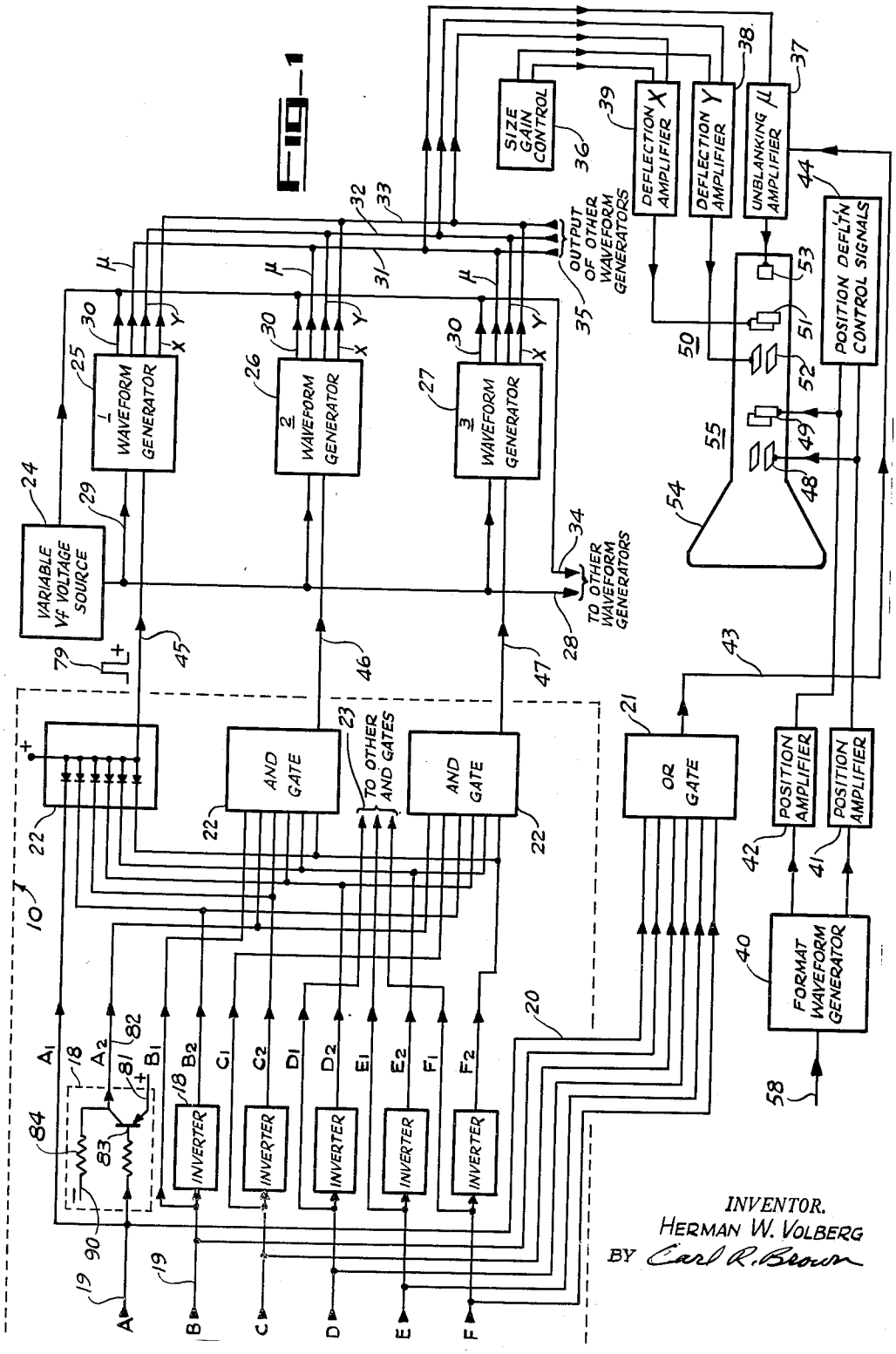
Feb. 6, 1962 H. W. VOLBERG 3,020,530

SYSTEM FOR DISPLAYING CODED INFORMATION ON CATHODE RAY TUBES

Filed Aug. 4, 1958

2 Sheets-Sheet 1

FIG-1



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2 Sheets-Sheet 2

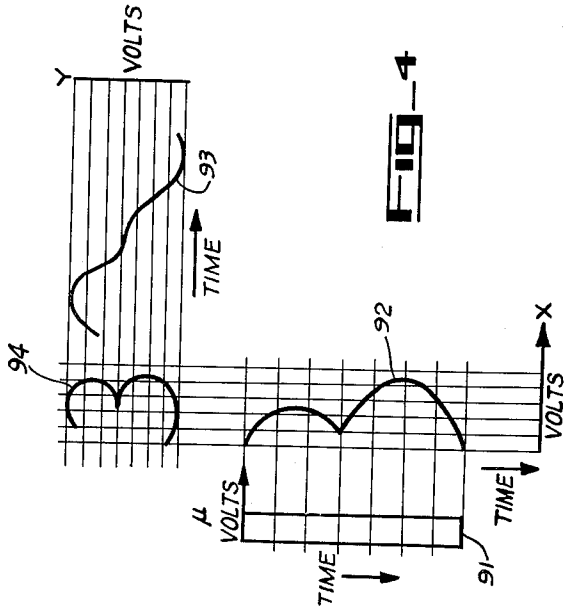

FIG. 4

	A	B	C	D	E	F
1	1	0	0	0	0	0
2	0	1	0	0	0	0
3	0	0	1	0	0	0
4	1	1	0	0	0	0
5	1	0	1	0	0	0

FIG. 2

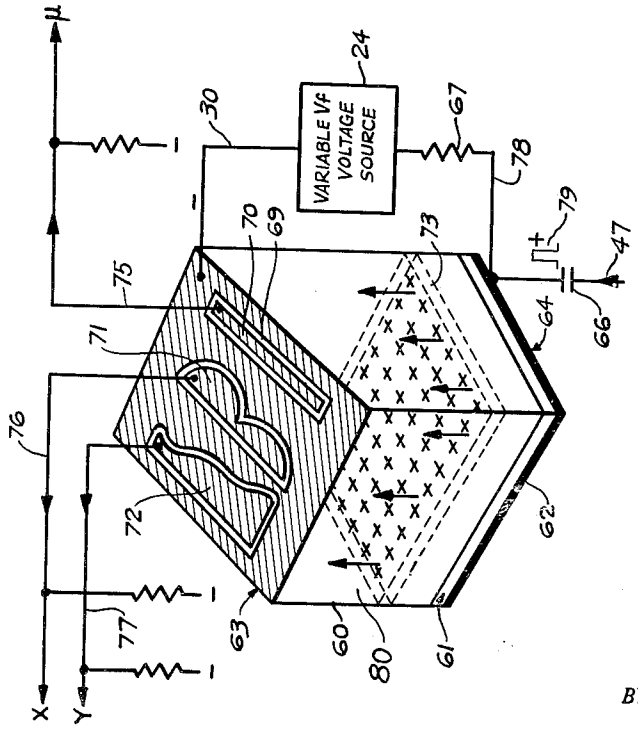

FIG. 3

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SYSTEM FOR DISPLAYING CODED INFORMATION ON CATHODE RAY TUBES

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Filed Aug. 4, 1958, Ser. No. 753,032
12 Claims. (Cl. 340—324)

The present invention relates to a system for displaying coded information in the form of characters on cathode ray display means. More particularly, it pertains to a circuit, and waveform generating units capable of receiving and decoding incoming code information, transforming the coded information into configurated waveforms through semi-conductor waveform generating units, and supplying the waveforms to cathode ray display means causing predetermined character images to be displayed in accordance with the logic of the incoming code.

In using present-day computers and similar type systems for processing data and providing output information in the form of analog or binary logic, it is often desirable to "readout" or display the output logic in the form of character images on cathode ray tubes. Systems presently used for this purpose are quite complex and expensive. Therefore, it is of an obvious advantage to have a simplified system.

It is accordingly an object of this invention to provide a simple and relatively inexpensive system of displaying high speed electronic code information in the form of characters on cathode ray tube display means.

Another object of the invention is to provide a system displaying high speed electronic code information in the form of characters on cathode ray tube display means having a rugged construction, long life and a relatively small size.

It is another object of this invention to provide a system of the type disclosed with a synchronized unblanking control and a variable intensity modulation of the electron beam.

It is another object of the invention to provide a system that displays high speed electronic code information in a format arrangement.

It is also an object of this invention to provide a system that displays high speed electronic code information in the form of variable character sizes.

It is a further object of this invention to provide a waveform generating unit in a system of the type disclosed capable of driving any number of conventional type cathode ray tubes.

In accordance with the present invention, coded information in the form of analog, binary or other forms having a particular alphabetic or numerical character designation is supplied to an appropriate decoding circuit. The circuit decodes the input information disseminating it in the form of pulses to circuit channels corresponding to particular characters to be displayed by the cathode ray display means. Output pulses from the channels are thereupon employed to energize waveform generating units for generating configurated waveforms. These units comprise individual semi-conductor units, each of which is capable of providing a predetermined configurated waveform output that, when impressed on the cathode ray display means, will cause a predetermined character to be written or drawn on the cathode ray display means. The configurated waveform outputs of any one waveform generator combine to control the deflection of the electron beam in a manner causing the electron beam spot to be deflected tracing out each desired character smoothly and continuously.

The system provides apparatus capable of high speed presentation of any desired character or configurated

form having any desired size consistent with the size of the tube screen. It is also capable of providing synchronized unblanking of the beam generating means in the cathode ray display means for desired synchronized energizing, interrupting and shutting off of the display. The unblanking unit is also capable of providing intensity modulation of the display thereby permitting portions of the character displays to be shaded if desired. The waveform generating units may be energized by an interrogation pulse for each character to be displayed, and the waveforms generated therefrom may be used to drive in synchronism any number of cathode ray tubes for displaying similar information. The system has a minimum number of electrical components rendering it relatively inexpensive and simple to construct for systems of this type. Further, the type of components of which it is possible to use in the systems permits a small, compact and easily made portable unit. The system of the invention may be used with conventional cathode ray tubes, known in the art and may also include a built-in format generating device.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the drawings, in which:

FIGURE 1 is a circuit schematic diagram of the present invention;

FIGURE 2 is a graphic illustration of the 6-bit binary code arrangement for characters to be displayed on the screen of the cathode ray tube;

FIGURE 3 is a perspective view with accompanying circuitry of a waveform generator for use in the present invention;

FIGURE 4 is a graphic illustration of the relationship of the waveforms generated by a waveform generator in causing the cathode ray tube to display a predetermined character.

Referring more particularly to the drawings, like reference numerals refer to the same parts throughout the several views. In FIGURE 1, a specific embodiment of the invention is shown comprising a decoding circuit **10** for decoding incoming code information. This circuit provides output pulses to particular lines connected to individual waveform generators, which generators correspond with the character designation attributable to the incoming code. The decoding circuit may be made capable of decoding any form of code information as for example, binary or analog or the like.

In the embodiment, decoding circuit **10** is capable of decoding 6-bit binary information and disseminating it to a circuit network in accordance with its attributable character designations. It receives the incoming 6-bit binary information of either positive or negative polarity at input lines A, B, C, D, E and F. Each of the incoming binary bits pass to a parallel circuit, as for example, the binary bit received by line **19** provides a potential output to line A_1 having the same positive or negative potential as that received by input line A. The incoming pulse supplied to line A_2 passes through the inverter unit **18**, which will give it a 180° phase shift, thereby changing its polarity from positive to negative, or from negative to positive depending on the incoming polarity of the bit.

All the inverter units have identical circuits and operate in the manner illustrated at **18**, wherein, an input pulse is fed to the base **83** of transistor **81**. The collector is connected to a negative voltage source **90** through resistor **84**. When the base **83** receives a negative pulse, the transistor conducts and assumes a substantially short circuited condition between emitter and collector providing a positive output pulse. When a positive pulse of greater magnitude than the positive emitter potential is fed to the base, the transistor is then

cut off, causing a negative output pulse to be supplied to output line 82, or, in this instance, A_2 from negative voltage source 90. Accordingly, lines A_1, B_1, C_1, D_1, E_1, and F_1 all carry output pulses having of a polarity identical to that received from lines A, B, C, D, E and F, while lines A_2, B_2, C_2, D_2, E_2 and F_2 carry output pulses of a polarity opposite to that received by the incoming lines.

Each of the "and" gates 22 are also identical and of conventional design. They each have a uni-directional device in each of their six input lines. The uni-directional devices are positioned in each of the incoming lines to pass only a positive potential to the common output line 45. As is well known in the art, "and" gate 22 will provide an output pulse to common output line 45 only when each of the incoming lines connected thereto simultaneously carry a positive pulse. Each group of binary code pulses represent a particular character through the arrangement of the positive and negative pulses in the 6-bit code group. Also, each "and" gate 22 is responsive to only one particular code group in relation to its character designation. The network of connecting lines between the receiving portion of decoding unit 10 and the "and" gates 22 are so arranged and interconnected as to provide positive pulses in each of the lines connected to the particular "and" gate to be energized by a corresponding incoming binary code group.

In FIGURE 3, the positive and negative bits of the binary code for energizing the particular "and" gates identified with numerals 1 through 5 are set forth. The invention is capable of reading out as many characters as desired, and there would accordingly be a code group and an "and" gate for each individual character. Lines D_1, E_1 and F_1 shown at 23 would lead to such other "and" gates as would be desired. As aforesaid, there is an "and" gate for each character to be displayed on the screen of the tube in response to the incoming code and accordingly, a network of lines from each of the incoming lines A, B, C, D, E and F would be connected to all the "and" gates in a manner similar to the network of lines connected to the "and" gates shown. For purposes of simplicity, only a representative portion of the "and" gates are illustrated.

Wave form generating units 25, 26 and 27 each generate waveforms which when supplied to the deflection means 50 in cathode ray tube 54, will cause the respective numerals 1, 2 and 3 to be written on the screen of the cathode ray tube. Each waveform generating unit operates independently of the rest and when receiving a positive interrogating pulse from its respective "and" gate, will cause a single predetermined character to be displayed on the tube screen. The waveform generating units may take a form as illustrated in FIGURE 4 and as disclosed in detail in applicant's copending application Serial No. 753,031, assigned to the common assignee hereof.

Each unit comprises a body or block 60 of semi-conductor material. Block 60 has a general rectangular configuration with a truncated portion 63 giving an inclined surface to the upper portion that is at an angle with flat or bottom portion 62 of the block 60. The block 60 being of semi-conductor material, may take the form of either P type or N type material such as P type germanium or silicon, or the like, or, N type germanium or silicon or the like, or, it may be of intrinsic semi-conductive material. The general properties required of the material is that they have current carriers therein, or, be capable of having current carriers therein which will drift through the material in the form of a relatively thin planar sheet or in a pocket having a relatively small dimension in response to an interrogation pulse.

The block 60 shown in FIGURE 3 consists of N type material 80 which forms a major part of the block with P type germanium or silicon material attached to the bottom side thereof as shown at 61, in a manner well known in the art of joining such substances together. An ohmic coating contact covers the bottom surface 62 of the block 60. On the upper surface of the block 60, the inclined portion 63 is substantially covered with ohmic material being interrupted by the insulated configurated conductor portions 70, 71 and 72. The configurated conductor portions form predetermined configurated areas which are also covered with ohmic material, but which are separated from the other ohmic coated surfaces on the surface 63 in the manner shown by insulated border portions 69. Each of the configurated conductor portions 70, 71 and 72 are connected to separate output lines 75, 76 and 77.

Contact 64 and line 78 are connected through a limiting resistor 67 to a variable voltage source V_f shown as 24. Voltage source V_f creates a sweeping field through the block by way of inclined surface 63 and the bottom surface 62. Positive interrogation pulses are supplied to the unit 60 by means of line 47 through D.C. blocking capacitor 66.

In operation, the waveform generating unit provides a configurated waveform output in substantially the manner as follows. An interrogating pulse 79 is supplied to line 47 through D.C. blocking capacitor 66 to contact the ohmic coating 64 at the bottom 62 of the block 60. This positive pulse when applied to the P type semi-conductive material 61 causes holes to be injected into the N type material 80 which comprises the majority portion of the block. The holes are injected into the N type material 80 in the form of a relatively thin planar sheet 73 encompassing the entire cross sectional area of the block. The thickness of the sheet of holes 73 at the point of initial injection is generally dependent upon the length of the positive square wave pulse 79 and the pulse amplitude. Following the injection of the sheet of holes into the N type material, the sheet of holes drifts in a predetermined manner towards the inclined surface 63 in response to the sweeping field created by the variable voltage source 24. The speed of drift of the sheet of holes or current carriers 73 toward the inclined surface is dependent upon the strength of the field. The V_f voltage source 24 includes means for varying the strength of the sweeping field thereby permitting the time required for the sheet of current carriers to traverse the length of the semi-conductor materials to be selectively varied. The sheet of current carriers 73 drift in a direction substantially perpendicular to the bottom surface 62 in response to the sweeping field while maintaining a substantially planar relationship to the bottom surface 62. As a result, the sheet of current carriers 73 intersect the overall area of the inclined surface 63 in successive time intervals contacting the nearest portion first and contacting the furthest portion from the bottom surface 62 last. Accordingly, the sheet of current carriers progressively contact the entire inclined surface 63 and the configurated portions 70, 71 and 72 by stages relative to time. The holes or current carriers in the sheet 73, which contacts that portion of the surface 63 outside the insulated configurated portion, returns to the voltage source V_f through connecting line 30.

The current carriers successively contacting the configurated conductor portions 70, 71 and 72 create the output waveforms in their respective connecting lines 75, 76 and 77. At any one instant of time during the intersection of these configurated portions by the sheet of current carriers, the magnitude of the respective output waves correspond to the sum of the current carriers contacting the conductor portions at that instant. The magnitude of the output waveform for any instant of time is therefore substantially proportional to the size of the area of the individual conductor portions being contacted at that instant by the current carriers. Accordingly, the configurated areas of the individual conductors 70, 71 and 72 determines the magnitude of the output wave at any one instant of time. Inasmuch as the sheet contacts the con-

ductor areas succesively with time, a waveform is generated in output lines **75**, **76** and **77** having a magnitude in accordance with their configurations, giving a desired output waveform corresponding thereto.

The particular waveforms generated by conductors **70**, **71** and **72** are designated as μ, x and y. The μ voltage waveform is the unblanking voltage while the x voltage waveform is that voltage used to control the deflection of the electron beam in the cathode ray tube **54** in the horizontal direction and the y voltage waveform is used to control the deflection of the electron beam in the vertical direction. The combination x—y voltages when applied to the electrostatic deflection plates **51** and **52** deflect the electron beam in the manner causing a character to be written or drawn on the screen of the tube. FIGURE 4 illustrates diagrammatically a graph of the respective μ, x and y waveforms plotted in the relationship of time versus voltage. The graphs are so arranged as to illustrate the manner in which the voltage waveforms control the potential on the deflection plates in the cathode ray tube **54** to deflect the electron beam in a manner to write or draw a character numeral **3** on the screen of the tube.

The unblanking voltage waveform μ generated in conductor **70** is illustrated at **91** in FIGURE 4. This voltage waveform controls the electron beam generating means **53** of the cathode ray tube **54** permitting an electron beam to be generated and projected toward the screen only when the unblanking voltage is present. The x waveform form **92** received from conductor **71** controls the horizontal deflection of the electron beam by its variable magnitude being applied to the horizontal electrostatic deflection plates **51**. The y voltage waveform **93** received from conductor **72** controls the vertical deflection of the electron beam by controlling the potential on the vertical deflection plates **52**. When all three waveforms are simultaneously supplied to the cathode ray tube **54** in the manner aforesaid, the electron beam is caused to be deflected to predetermined positions on the screen of the tube, writing or drawing a character thereon in the shape of the numeral **3** illustrated at **94** in FIGURE 4. The unblanking voltage **91** turns on the beam generating means at the start of the x and y voltage waves and shuts off the electron beam at the finish of the x and y voltage waves. Thus, the unblanking voltage assures that there is no continuation of the electron beam after the writing of the character on the screen.

While it is obvious that if no varying control potential remained on the electrostatic plates after the x and y voltages have terminated, then there would be no further writing influence on the beam. However, the beam generating and projecting unit is still operating, causing a spot on the screen and the unblanking voltage functions to synchronize extinguishment of the electron beam at the termination of the x and y waveforms. The unblanking voltage waveform originating in the waveform generator, as shown in FIGURE 4, has substantially a constant magnitude, inasmuch as the configurated conductor **20** has a substantially rectangular shape. However, conductor **20** may have any configuration consonant with the waveform configuration output desired. Impressing an unblanking waveform having a variable magnitude or an interrupted magnitude on the beam generating means will permit the intensity of the electron beam to be selectively varied or interrupted. This allows shading or breaks in the characters displayed on the tube screen.

Referring again to FIGURE 1, the waveform generators provide output waveforms μ, x and y to common connecting lines **31**, **32** and **33** when the waveform generators receive an interrogating pulse from their respective "and" gates. The waveforms are carried by the connecting lines **31**, **32** and **33** to respective deflection amplifiers **37**, **38** and **39**. These deflection amplifiers function to amplify the waveform signals to provide a voltage output having a magnitude sufficient to control the deflection plates **51** and **52** in their deflecting of the electron beam. The output of the amplifiers are connected to the electrostatic plates and the beam generating means **53**.

The variable V_f voltage source **24** controls the speed at which a sheet of current carriers **73** traverses the semiconductor medium **80**. This voltage may be selectively varied thereby varying the speed at which the sheet of current carriers **73** sweep the configurated conductor portions. Accordingly, should it be desirable to increase or decrease the length of the configurated waveforms relative to time, this may be accomplished by varying the variable voltage source **24**. As shown in FIGURE 1, each of the waveform generators are connected to a single variable V_f voltage source. Accordingly, the time length of each of the waveforms generated by each of the units may be adjusted through a single control. However, a variable voltage source may also be provided for each of the individual waveform generators, or for a series of waveform generators, thereby permitting more individual control. Line **28** may be connected to other waveform generators which may be added to the display system.

The size gain control unit **36** includes a regulated voltage source which may be selectively varied. The voltage output of the control unit is supplied to each of the x and y deflection amplifier units. This voltage controls the degree of amplification of the x and y waveform signals by the deflection amplifier units. Since the size of the character images displayed on the tube screen depends upon the magnitude of the x and y voltage, the size of the displayed character images may be selectively varied by varying the output voltage from size control unit **36**.

With respect to FIGURE 3, when an interrogation pulse **79** is fed to the waveform generating unit, energy pulses of two different forms pass through the semi-conductor material. One energy pulse is the voltage waveforms resulting from the sheet of current carriers which progress through the semi-conductor material at a delayed rate of speed. The other energy pulse is an electrical current pulse which passes through the semi-conductor material at the conventional speed for the passage of electrical current through a conductor. The time required for the current carriers to traverse the semi-conductor medium exceeds that of the electrical pulse. Accordingly, in response to a group of incoming binary code, an electrical current pulse passes through the semiconductor medium and to the tube prior to the voltage waveforms. This electrical pulse is capable of momentarily unblanking the beam generating means causing an electron beam to be projected on the screen of the tube. To prevent this momentary illumination of a spot on the tube screen, an overriding control pulse is supplied to the unblanking amplifier **37** via lines **20** through "or" gate **21** and line **43**. "Or" gate **21** has an "or" gate circuit, which is well known in the art, being capable of providing an output pulse to line **43** in response to any positive pulse in any individual one or more of lines **20**. Thus, when any incoming binary code is received by input lines A, B, C, D, E, or F, "or" gate **20** will receive at least one positive pulse through one of lines **20** causing a pulse to reach the unblanking amplifier through line **43**. This electrical pulse overrides the electrical pulse received by the unblanking amplifier through the waveform generator circuit, thereby precluding the unblanking of the beam generating means.

In summary, the operation of the system is as follows. Incoming binary code is received by lines A, B, C, D, E and F. The decoding unit **10** decodes the incoming binary code and through one of the various "and" gates **22** provides a positive output pulse to a predetermined, individual one of the waveform generators. This interrogation pulse causes current carriers to traverse the semi-conductor medium of the waveform generators creating configurated waveforms to be supplied to output lines **31**, **32** and **33**. The output waveforms in lines **31**, **32** and **33** are supplied to deflection amplifiers **37**, **38** and **39** which amplify the respective waveforms for control-

ling the deflection means 50. The unblanking amplifier simultaneously supplies an output control waveform to the beam generating means 53 causing an electron beam to be generated and projected towards the tube screen. The configurated voltage waveforms supplied to the respective vertical and horizontal deflection plates, so deflect the beam in its passage through the tube that a character is written or drawn on the screen of the tube. Deflection plates 55 in response to the position deflection control signals from unit 44 establish the position on the screen of the tube 54 that the character will be drawn or illustrated. Accordingly, the displayed character may be located at any position on the screen of the tube.

In displaying coded information in the form of characters on the screen of a cathode ray tube, it is often desirable that the resulting display have a prearranged heading, generally known as a format, that may be constant for each series of character fill in information. Such headings generally find their greatest use where the information on the screen of the tube is transformed into a printed recording, or, is reduced to a permanent record through the use of photographic processes. For this purpose, the present invention provides a format waveform generator 40 which provides appropriately configurated waveforms through position amplifiers 41 and 42 to the position deflection means 47. The waveforms from the format generator 40 provide a predetermined positioning of the characters generated in response to the incoming binary code.

Inasmuch as the format generator positions a plurality of characters in a composite display, the format waveform has a longer time duration than the individual character waveforms. The format waveform generator functions in substantially the same manner as the character generator illustrated in FIGURE 3. As stated earlier, the semi-conductor material used in the waveform generators, may be of the N type, P type or intrinsic. In the specific embodiment shown in FIGURE 3, N type semi-conductive material was used. In using N type semiconductive material for the majority portion of the semiconductor blocks, the current carriers will be holes, while if P type material is used for the majority portion, the current carriers will be electrons. Electron current carriers will traverse the semi-conductor block in a shorter time interval than will hole current carriers. Therefore, the majority portion of character waveform generators may be made of P type semi-conductive material and the format waveform generator may be made of N type. This would permit a time differential between the format waveforms and the character waveforms. This time differential may be obtained in other ways, as for example, the format waveform generating unit may be made larger or have its inclined portion 13 positioned at a greater angle with the bottom surface 12. Also, the sweeping field resulting from variable voltage V_f may be varied to increase the time differential. In using the format waveform generator in the specific embodiment, the incoming interrogation pulse through line 58 will be synchronized with a predetermined group of incoming code signals to be received by the decoding unit. The aforesaid synchronized control will cause to be displayed on the screen of the tube 54 a logical character arrangement which will provide the desired format on the screen of the tube. This format may then be filled in with logical information from subsequently received binary code information.

The particular embodiments of the invention illustrated and described herein are illustrative only and the invention includes such other modifications and equivalents as may readily appear to those skilled in the art, within the scope of the appended claims.

I claim:

1. In a cathode ray system for displaying coded information in the form of character images comprising, at least one cathode ray tube having beam generating means for generating and projecting an electron beam toward a screen and deflection means for deflecting said beam to predetermined positions on said screen, decoding means for receiving and decoding incoming groups of coded information, said decoding means providing output pulses to a single predetermined terminal means dependent upon the code group received, a plurality of waveform generating units each responsive to said output pulses for providing distinctively shaped output voltage waveforms to said deflection means, each waveform generating unit including a semi-conductor having distinctively shaped electrodes thereon, each of said electrodes providing output waveforms having configurations corresponding to said configuration of said electrodes, said deflection means in response to said waveforms causing said electron beam to draw on the screen of said tube a predetermined character corresponding to said incoming code.

2. In a display system wherein coded information having particular character designations are capable of being received and decoded by decoding means providing individual output pulses corresponding to individual character designations, and cathode ray means having beam generating means and deflection means and final position deflection means for receiving waveforms corresponding to said character designations causing character images of said character designations to be displayed, the combination with said decoding means and said cathode ray means including a plurality of semi-conductor waveform generating units, each of said units in response to one of said individual output pulses being capable of providing output waveforms to said deflection means having predetermined configurations corresponding to said individual character designation and being capable of providing an unblanking waveform to said beam generating means, said output waveforms and said unblanking waveforms being synchronized in time causing said beam generating means to be selectively energized only when said output waveforms are received by said deflection means, field means impressed across said waveform generating units for selectively varying the time length of said waveforms, amplifier means between said units and said deflection means for varying the magnitude of said output waveforms and said unblanking waveforms, variable control means for providing selective positive control of said amplifier in varying said magnitude of said output waveforms and said unblanking waveforms by said amplifier means, other blanking control means for momentarily blanking said beam generating means when said decoding means receives said coded information, and other semiconductor waveform generating means providing output waveforms to said position deflection means in coordination with said incoming code for causing said position deflection means to position a plurality of said character displays in a predetermined manner on said cathode ray means.

3. In a display system wherein coded information having particular character designations are capable of being received and decoded by a decoding means providing individual output pulses corresponding to individual character designations and cathode ray means having beam generating means and deflection means when receiving waveforms corresponding to said character designations causing character images of said character designations to be displayed, the combination with said decoding means and said cathode ray means including a plurality of semiconductor waveform generating means, each of said generating means in response to one of said individual output pulses being capable of providing output waveforms to said deflection means having predetermined configurations corresponding to said individual character designation and being capable of providing an unblanking waveform to said beam generating means, said output waveforms and said unblanking waveforms being synchronized in time causing said beam generating means to be selectively

energized only when said output waveforms are received by said deflection means, field means impressed across said waveform generating units for selectively varying the time length of said waveforms, amplifier means between said units and said deflection means for selectively varying the magnitude of said output waveforms and said unblanking waveforms, and another blanking control means for momentarily blanking said beam generating means when said decoding means receives said coded information.

4. In a display system wherein coded information having particular character designations are capable of being received and decoded by a decoding means providing individual output pulses corresponding to individual character designations, and cathode ray means having beam generating means and deflection means and final position deflection means for receiving waveforms corresponding to said character designations causing character images of said character designations to be displayed, the combination with said decoding means and said cathode ray means including a plurality of semiconductor waveform generating units, each of said units comprising a single semiconductor body having a light doping of impurities therein, said body having configurated current collecting areas thereon, each of said areas being insulated from the other, injecting means positioned on the other end of said body for injecting current carriers therein in response to one of said output pulses, variable field means for causing said current carriers to drift at a predetermined speed in a direction toward said areas, said areas being positioned in a manner to be able to intercept portions of said current carriers successively with time, said areas having waveforms created therein in response to said current carriers, at any given instant said waveforms having a magnitude corresponding to the size of said areas being intersected by said current carriers during said instant, circuit means projecting said waveforms onto said deflection means and said beam generating means for causing to be displayed on said cathode ray means a character corresponding to said individual character designations, amplifier means between said units and said cathode ray means for selectively varying the magnitude of said output waveforms, separate blanking control means for momentarily blanking said beam generating means when said decoding means receives said coded information, and other semi-conductor waveform generating means providing output waveforms to said position deflection means in coordination with said incoming code for causing said position deflection means to position a plurality of said character displays in a predetermined manner on said cathode ray means.

5. In a display system wherein coded information having particular character designations are capable of being received and decoded by a decoding means providing individual output pulses corresponding to individual character designations and cathode ray means having beam generating means and deflection means for receiving waveforms corresponding to said character designations causing character images of said character designations to be displayed, the combination with said decoding means and said cathode ray means including a plurality of semi-conductor waveform generating means, each of said generating means in response to one of said individual output pulses being capable of providing output waveforms to said deflection means having predetermined configurations corresponding to said individual character designation and being capable of providing an unblanking waveform to said beam generating means, said output waveforms and said unblanking waveforms being synchronized in time causing said beam generating means to be selectively energized only when said output waveforms are received by said deflection means, field means impressed across said waveform generating units for selectively varying the time length of said waveforms, amplifier means between said units and said deflection means for selectively varying the magnitude of said output waveforms and said unblanking waveforms.

6. In a system for displaying coded information in the form of characters on the screen of a cathode ray tube having deflection means, decoding means for receiving incoming coded information and providing output pulses with respect to the character designation of said coded information, means for generating and supplying to said deflection means a group of voltage waveforms, said generating means including a plurality of individual semi-conductor waveform generating units each having a character designation, each of said units in response to an interrogating pulse simultaneously providing a first configurated voltage waveform to the horizontal deflection plates of said deflection means and providing a second configurated voltage waveform to the vertical deflection plates of said deflection means, said deflection means in response to said first and second waveforms acting to deflect said electron beam in a predetermined manner causing to be inscribed on said screen said designated character identified with said unit, said decoding means providing an output pulse to one of said units when said incoming code has a character designation corresponding to said character designation on said unit.

7. In a system for displaying coded input information in the form of characters on a cathode-ray display means, decoding means having separate output terminal means for each code group of input information, said decoding means providing output pulses at one of said terminal means which depends upon the particular code group being presented, a plurality of independently operating waveform generating units one for each of said code groups, each of said units including a current carrying medium and electrodes having configurated areas positioned on said medium, the configuration of each of said areas being related to a particular character formation, each of said units being activated in response to a corresponding one of said output pulses to provide output signals at said electrodes whose waveform depends upon the predetermined configuration of the corresponding electrode, said cathode-ray display means including deflection means energized by said output signals of configurated waveform from an activated waveform generating unit for producing a display having a pattern dependent upon the waveform of said output signals.

8. A system as described in claim 7 including field means impressed across said waveform generating units for selectively varying the duration of said output signals.

9. In a system for displaying coded input information in the form of characters on the screen of an evacuated cathode-ray tube including therein electron beam deflection means, decoding means having separate output terminal means for each code group of input information, said decoding means providing output pulses at one of said terminal means which depends upon the particular code group being presented, a plurality of independently operating waveform generating units one for each of said code groups disposed externally of said cathode-ray tube, each of said units including a current carrying medium and electrods having configurated areas positioned on said medium, the configuration of each of said areas being related to a particular character formation, each of said units being activated in response to a corresponding one of said output pulses to provide output signals at said electrodes whose waveform depends upon the predetermined configuration of the corresponding electrode, said deflection means producing a display having a pattern dependent upon the waveform of the output signals in response to said output signals from an activated waveform generating unit.

10. In a system for displaying coded input information in the form of characters on a cathode-ray display means, decoding means having separate output terminal means for each code group of input information, said decoding

means providing output pulses at one of said terminal means which depends upon the particular code group being presented, a plurality of independently operating waveform generating units one for each of said code groups, each of said units including a current carrying medium and first and second electrodes having distinct configurated areas positioned on said medium, the configuration of each of said areas being related to a particular character formation, each of said units being activated in response to a corresponding one of said output pulses to provide output signals at said first and second electrodes whose waveform depends upon the predetermined configuration of the corresponding electrode, said cathode-ray display means including first and second mutually perpendicular deflection means which in response to said output signals from said first and second electrodes respectively of an activated waveform generating unit provide a display having a pattern dependent upon the waveform of said output signals.

11. In a system for displaying coded input information in the form of characters on a cathode-ray display means, decoding means having separate output terminal means for each code group of input information, said decoding means providing output pulses at one of said terminal means which depends upon the particular code group being presented, a plurality of independently operating waveform generating units one for each of said code groups, each of said units including a current carrying medium and first, second and third electrodes having distinct configurated areas positioned on said medium, the configuration of the areas of said first and second electrodes being related to a particular character formation, each of said units being acivated in response to a corresponding one of said output pulses to provide output signals at said first, second and third electrodes whose waveform depends upon the predetermined configuration of the corresponding electrode, said cathode-ray display means including first and second mutually perpendicular deflection means which in response to said output signals from said first and second electrodes respectively of an activated waveform generating unit provide a display having a pattern dependent upon the waveform of said output signals, means responsive to the presence of any of

said code groups for momentarily blanking said cathode-ray display means, and means responsive to the output signal from said third electrode caused by passage of current carriers through said medium for overcoming the effect of said blanking control means.

12. In a cathode ray system for displaying coded information in the form of characters upon an electro-responsive display, an electron beam generating and projecting unit for generating an electron beam and projecting said beam towards said electro-responsive display, a beam deflection unit having distinct portions for deflecting said electron beam in at least two mutually exclusive directions, decoding means for receiving and decoding incoming groups of coded information, said decoding means providing output pulses to a single predetermined terminal means dependent upon the code group received, each of said code groups having a particular character designation, a distinct waveform generating unit for each code group, each of said waveform generating units being energized in response to a corresponding one of said output pulses for providing at least two output voltage waveforms, the configuration of said waveforms from a given waveform generating unit being related to the configuration of the character designating the code group associated with the given waveform generating unit, means for supplying said output voltage waveforms available from an energized generating unit to corresponding portions of said deflection unit for causing said electron beam to draw on said electro-responsive display a predetermined character image corresponding to said character designation.

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