

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11)

Publication number:

**0 099 655
A2**

(12)

EUROPEAN PATENT APPLICATION

(21)

Application number: 83303617.1

(51)

Int. Cl.³: G 09 G 1/00

(22)

Date of filing: 23.06.83

(30)

Priority: 24.06.82 JP 108868/82

(43)

Date of publication of application:
01.02.84 Bulletin 84/5

(84)

Designated Contracting States:
DE FR GB

(71)

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Display control method and apparatus.

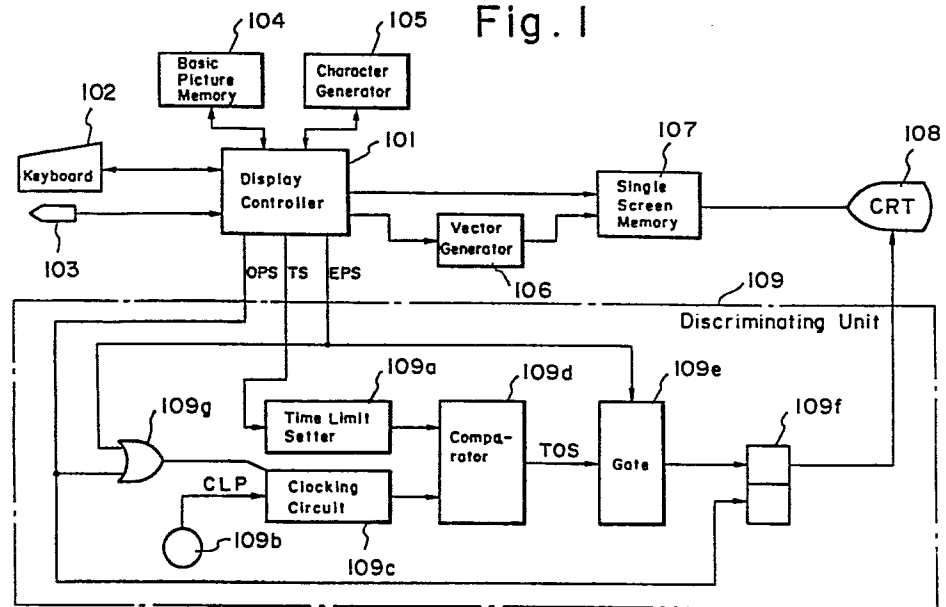
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Disclosed are a method and apparatus for controlling a picture displayed on the screen of a CRT. The method includes discriminating whether an operation involving the displayed picture has been performed by an operator within a set time limit through use of an input unit (102, 103), and erasing the picture displayed on the CRT screen when it is discriminated that the operation has not been performed within the set time limit, thereby preventing the picture from being displayed for a long period of time.

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Fig. 1



DISPLAY CONTROL METHOD AND APPARATUS

This invention relates to a display control
method and
5 use in
apparatus for displaying a picture on the screen of a
cathode-ray tube.

The screen of a cathode-ray tube (CRT) comprises a
sheet of glass coated with a fluorescent film which,
upon impact with an electron beam, emits light at the
10 point of impact. A picture which is desired to be
displayed on the CRT screen is broken down into a
multiplicity of picture elements, the brightness of
each picture element is decided and stored as picture
information in a single-screen memory, and raster
15 scanning is performed based on the picture information
stored in the single-screen memory, thereby producing
the desired picture on the CRT screen.

When the same area of the CRT screen continues to
20 present a display for an extended period of time, ion
burning results owing to prolonged impact of ions.
This can cause the displayed picture to flicker and has
great influence upon the life of the CRT.

In systems which rely upon CRT terminals, the
25 picture last displayed remains on the CRT screen unless
it is erased by a manual operation. In other words,
the information last called to the CRT screen continues
to be displayed even if the operator does not perform

any display-oriented operation using a keyboard, light pen or other device. There are often instances where a picture being displayed on a CRT screen remains unused for long periods of time, as when the operator is absent
5 from his seat or is engaged in work which does not involve the displayed information.

According to one aspect of the invention there is provided an apparatus for use in controlling a picture displayed on a CRT screen, comprising
10 discriminating means for

discriminating whether a display-oriented operation has been performed within a set time limit, and display erasing means for erasing a picture displayed on the CRT screen when it is discriminated
15 by the discriminating means that a display-oriented operation has not been performed within the set time limit.

According to a further aspect of the present invention there is provided a method of controlling a picture displayed on a CRT screen, comprising the
20 steps of:

(a) discriminating whether a display-oriented operation has been performed within a set time limit, and

25 (b) erasing a picture displayed on the CRT screen when it is discriminated in step (a) that a display-oriented operation has not been performed within the set time limit.

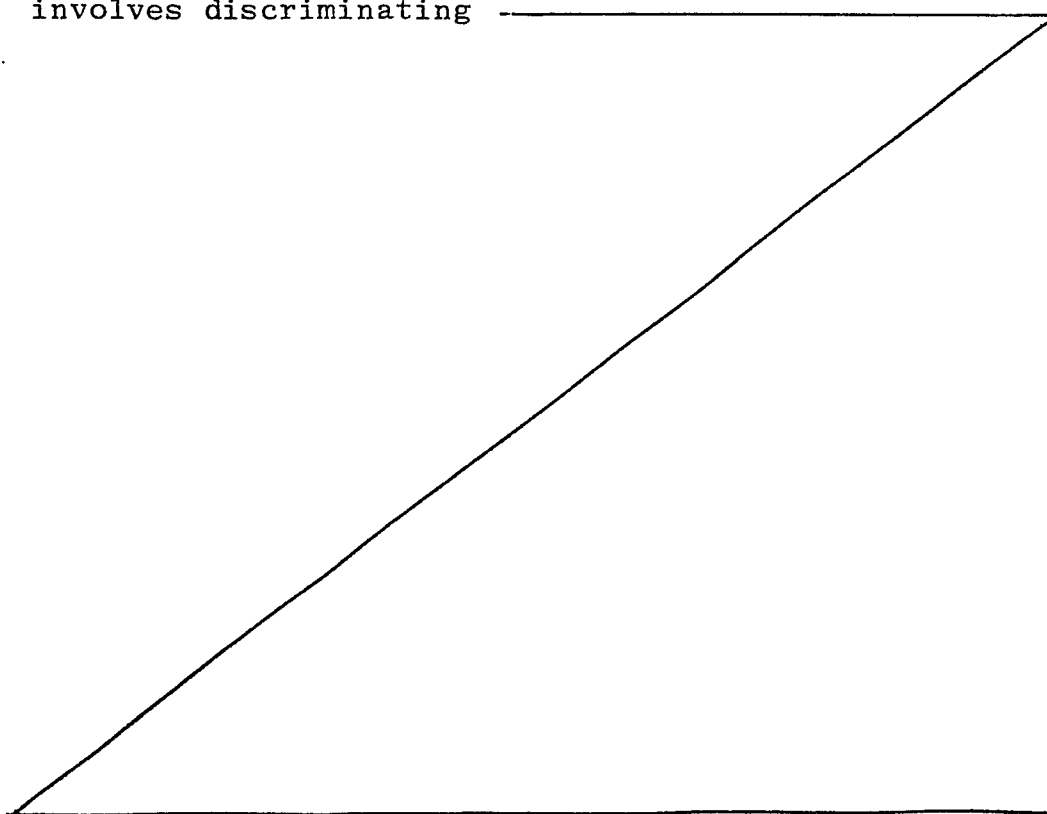
An embodiment of the invention may extend the life of a CRT by preventing ion burning of the fluorescent screen, by erasing a displayed picture automatically when the picture remains completely
5 unused in excess of a predetermined period of time.

Accordingly, an embodiment of the present invention may provide a display control apparatus and method capable of erasing a display automatically when no operation employing the displayed picture is
10 performed for a predetermined period of time.

By restricting constant picture display to a comparatively short period of time, ion burning of the screen may be avoided, whereby the life of the CRT is prolonged.

15 A preferred embodiment of the invention involves discriminating

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whether an operation involving the displayed picture has been performed by an operator within a set time limit through use of an input unit, and erasing the picture displayed on the CRT screen when it is discriminated that the operation has not been performed within the set time limit, thereby preventing the picture from being displayed for a long period of time. Means are provided for setting the time limit, beyond which it is desired that a picture not be displayed, means for measuring the length of time a picture has been displayed, means for comparing the set time limit and the measured length of time for producing an output when the set time limit is exceeded, and means for erasing the picture from the CRT in response to the output from the comparison means.

an embodiment of
Features and advantages of/ the present
invention will be apparent from the following
description taken in conjunction with the accompanying
drawings , in which;

20

Fig. 1 is a block diagram illustrating an embodiment of a display control apparatus according to the present invention, and

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Fig. 2 is a flowchart useful in describing a display control method in accordance with the present invention.

Referring first to Fig. 1, numeral 101 denotes a

display controller composed of a computer having a processor, a program memory storing a control program for picture and other processing, and a data memory. The display controller 101 is connected to input units such as a keyboard 102 and light pen 103, and to a basic picture memory 104 for storing one or more basic pictures. The particular basic picture that is to be displayed is decided by operating the keyboard 102. Stored in the memory 104, together with each basic picture, is a flag which indicates whether or not the displayed picture is to be erased upon passage of a set period of time, as well as said set period of time, denoted by T_s . If the flag bit is logical "1", the displayed picture will be erased from the CRT screen when the operator fails to operate the keyboard 102 or light pen 103 within the set time period T_s . Also connected to the display controller 101 is a character generator 105 which stores, in the form of $n \times m$ dots, Japanese kana, alphanumeric characters and various symbols. A vector generator 106 receives an input from the display controller 101 and delivers its output to a single-screen memory 107 in which a picture to be displayed on a CRT screen is stored in the form of picture elements. The output of the single-screen memory is applied to a CRT 108.

When a key on the keyboard 102 is pressed following the introduction of power to the system, a prescribed basic picture from the basic picture memory

104 is stored in the single screen memory 107, on the basis of which raster scanning is performed to display the basic picture on the CRT 108. Subsequent operation of the keyboard 102 or light pen 103 causes the display controller 101, which operates under the control of the
5 stored control program, to execute prescribed processing such as numerical data creation processing and, based on the results of this processing, to generate either characters obtained from the character generator 105 or graphics made up of straight lines and
10 arcs, these being produced by the vector generator 106. Characters and graphics are stored in the single-screen memory 107, and displayed on the CRT 108, superimposed on or independently of the basic picture. The foregoing processing enables prescribed pictures to be
15 displayed on the CRT screen in successive fashion.

The foregoing is a description of a common system long in use for controlling a display.

According to the present/^{embodiment of the}invention, there is provided a discriminating unit 109 which comprises a
20 time limit setter 109a the input to which is the predetermined time period T_s from the display controller 101, a clock pulse generator 109b generating clock pulses CLP, a clocking circuit 109c for clocking
the pulses CLP, a comparator 109d which receives
25 outputs from the time limit setter 109a and clocking circuit 109c for checking whether the time period T_s set in the time limit setter 109a has expired without

the execution of any input operation involving a displayed picture, the comparator producing a signal TOS indicative of the results of the check, a gate 109e which receives the signal TOS as an input thereto, a flip-flop 109f one of whose inputs is the output of the gate 109e and whose output is connected to the CRT 108, and an OR gate 109g whose two inputs are signals OPS, EPS, described below, the output of the OR gate 109g being connected to the clocking circuit 109c. The time limit setter 109a includes setting means such as a dial or button that is capable of varying the set time limit.

In response to operation of the keyboard 102, the display controller 101 reads in a basic picture from the basic picture memory 104 and discriminates whether the flag bit associated with the picture is logical "1" or logical "0". If the flag bit is a "1", then the control unit 101 inserts the period of time T_s into the time limit setter 109b and delivers an erase permission signal EPS to the clocking circuit 109c, via the OR gate 109g, and to the gate 109e to enable the gate. The clocking circuit 109c, constituted by a counter, has its contents cleared by the signal EPS and then begins counting the clock pulses CLP arriving from the clock pulse generator 109b. Thereafter, in response to subsequent operation of the keyboard 102 or light pen 103, the display controller 101 issues an operation signal OPS that is applied to the other input terminal

of the flip-flop 109f, and which is delivered through the OR gate 109g to the clear terminal of the clocking circuit 109c, thereby clearing its contents. As a result, the clocking circuit 109c is restored to a state of zero from which it resumes measuring elapsed
5 time by counting the clock pulses CLP.

When the operation signal OPS is not generated within the time limit T_s set in the time limit setter 109a, the comparator 109d delivers the signal TOS, namely a "time over" signal. The signal TOS is
10 directed through the gate 109e and applied to the flip-flop 109f, which responds by changing state. As a result the output from the flip-flop 109f, the cathode or first grid of the CRT 108 is biased to such an extent that the cathode can no longer generate an
15 electron beam, causing the display to be erased from the screen of the CRT 108. An alternative arrangement is permissible wherein the contents of the single-screen memory 107 are cleared in response to generation of the signal TOS.

20 Assume now that the operator manipulates the keyboard 102 after erasure of the picture from the CRT 108, thereby sending the display controller 101 a signal requesting certain picture processing. The display controller 101 responds by producing the signal
25 OPS, which resets the flip-flop 109f and the clocking circuit 109c. When the flip-flop 109f is reset, the cathode or first grid of the CRT 108 is restored to the

proper bias owing to the changed output of the flip-flop 109f, allowing the contents of the single-screen memory 107 to be displayed on the CRT screen. At the same time, the clocking circuit 109c resumes counting the clock pulses CLP from zero to
5 measure elapsed time.

It should be noted that the keyboard 102 can be provided with a picture restoration key which, when pressed, resets the clocking circuit 109c and flip-flop
10 109f.

Reference will now be had to the flowchart of Fig. 2 to describe a display control method of the present invention. In the flowchart, F represents the flag bit. When F is logical "1", the display is erased from
15 the CRT upon expiration of the set time limit. The character C in the flowchart represents the counter constituting the clocking circuit 109c for counting the clock pulses CLP. Further, Ts represents the set time limit, namely a system parameter which is set by the
20 operator. When the flag bit F is found to be "1", the counter C is cleared and placed in the initial state, from which it resumes counting the clock pulses CLP. In the event that the operator fails to use the
25 keyboard within the set time limit, the picture is erased from the CRT screen. If the operator then causes a picture to be re-displayed, processing will return to the step for clearing the counter to the initial state (zero), which will be followed by

repetition of the steps just described.

In accordance with the present invention as described and illustrated hereinabove, a display is erased from the CRT 108 when the operator does not
5 perform a display-oriented operation within the set time limit. Accordingly, a picture is displayed on the CRT screen for a comparatively short time, preventing ion burning and, hence, prolonging the life of the CRT. A picture, once erased, can be recalled to the CRT
10 screen merely by operating the keyboard.

As many apparently widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the
15 specific embodiments thereof except as defined in the appended claims.

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Claims:

1. An apparatus for use in controlling a picture displayed on a CRT screen, comprising discriminating means for

5 discriminating whether a display-oriented operation has been performed within a set time limit, and display erasing means for erasing a picture displayed on the CRT screen when it is discriminated by the discriminating means that a display-oriented
10 operation has not been performed within the set time limit.

2. The apparatus according to claim 1, wherein the discriminating means comprises means for measuring the length of time a picture has been displayed, and
15 means for comparing the set time limit and the measured length of time for producing an output, for the display erasing means, when the set time limit is exceeded.

discriminating mean comprises:

3. The apparatus according to claim 2, wherein said/
20 means for setting said time limit and for producing an output signal indicative of the set time limit;

clocking means, as the time measuring means, for measuring elapsed time and for producing an output signal indicative of elapsed time, said clocking means being arranged to be reset to zero when a display-
25 oriented operation has been performed;

comparison means, as said means for comparing, for comparing the output signals _____

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from said time limit setting means and from said clocking means for producing a time-over signal when the elapsed time measured by said clocking means exceeds the time limit, the
5 display erasing means/^{being}connected to the CRT and responsive to the time-over signal from said comparison means for erasing a picture displayed on the CRT screen.

4. The apparatus according to claim 3, wherein said
10 display erasing means comprises:

 a gate which, when enabled,
 produces an output signal in response to the time-over signal received as an input from said comparison means, and
15 a flip-flop which changes state in response to the output signal from said gate, thereby producing an output signal coupled to the CRT to erase the picture displayed on the CRT screen.

5. The apparatus according to/^{any preceding}claim , wherein the
20 time limit setting means includes means for varying the set time limit.

6. The apparatus according to any preceding claim, and comprising an input unit for influencing picture display on the CRT screen, by means of which input unit
25 said display-oriented operation can be performed.

7. The apparatus according to claim 6, wherein the input unit is coupled to a display controller which

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is operable to perform data creation processing for displaying a picture on the CRT screen.

8. Apparatus according to claim 7, wherein the discriminating means is controlled in dependence upon
5 the display controller.

9. A method of controlling a picture displayed on a CRT screen, comprising the steps of:

(a) discriminating whether a display-oriented operation has been performed within a set time limit,
10 and

(b) erasing a picture displayed on the CRT screen when it is discriminated in step (a) that a display-oriented operation has not been performed within the set time limit.

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Fig. 1

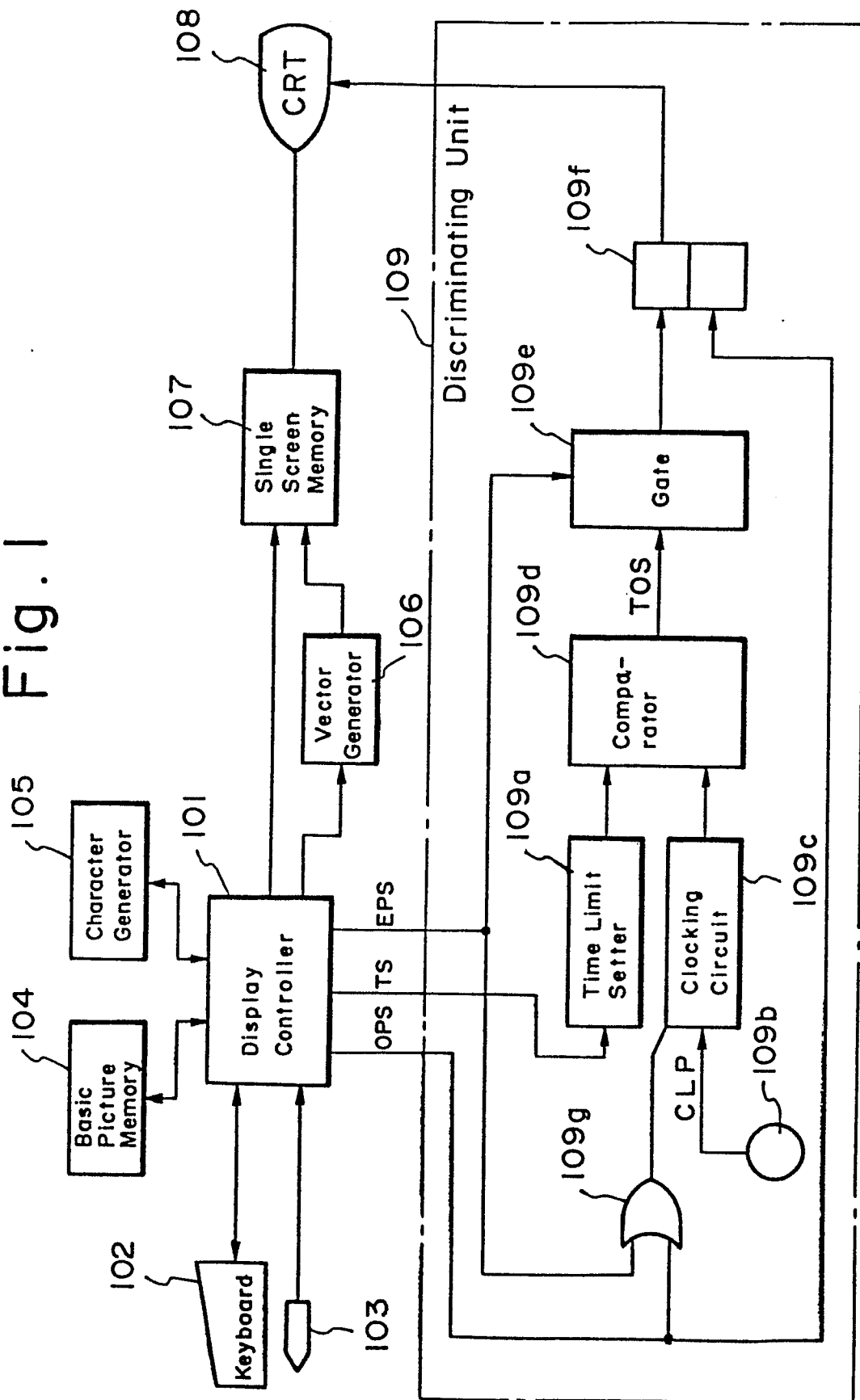


Fig. 2^{2/2}