

[54] **CRT WITH BUILT-IN DISPLAY
REGISTRATION TEST**

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[58] Field of Search..... 314/21, 22, 18;
340/324 A

[56] **References Cited**

UNITED STATES PATENTS

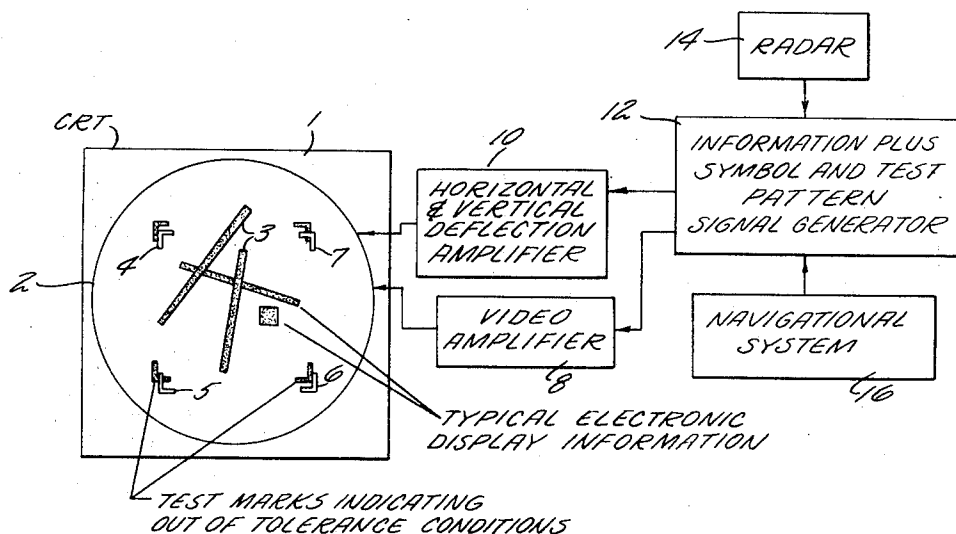
2,523,162	9/1950	Sunstein	315/21 R
2,604,534	7/1952	Graham	176/68
3,207,945	9/1965	Goodman	315/22

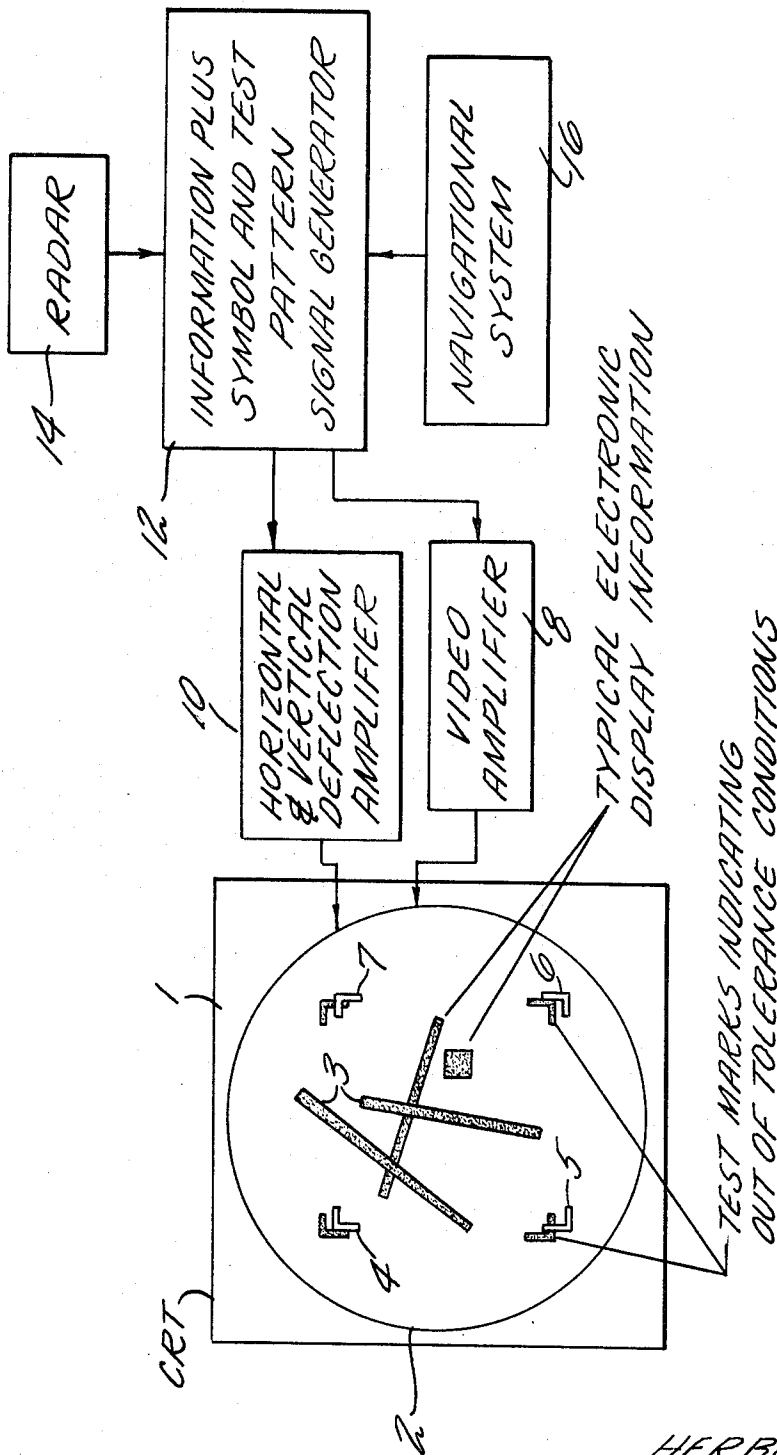
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[57] **ABSTRACT**

The face of a cathode ray tube is treated so as to provide inactive areas thereon, either by having the face of the CRT opaqued before the deposition of phosphor thereon, or by having the phosphor selectively removed, such as by etching or scribing, in any desired configuration. The inactive areas are in the form of simple check symbols which may be continuously generated, said symbols being invisible so long as complete registration occurs, and become visible so as to indicate fault, whenever the registration or symbol generation apparatus driving the CRT fails to operate within tolerance. Flashing symbols may be utilized to direct attention to the loss of registration, and a purposeful misregistration may be introduced in the system to test for the generation of the normally invisible check symbols. The inactive areas may be sufficiently fine so as not to detract from other displayed information during normal system operation.

4 Claims, 1 Drawing Figure





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CRT WITH BUILT-IN DISPLAY REGISTRATION TEST

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates to CRT display systems, and more particularly to a display monitor built into a CRT.

2. Description of the Prior Art

In the CRT display art, many display systems are utilized with symbol and que generators to provide a large variety of information on a display screen. In some cases, different que symbols and information are superposed to form a composite display indicative of information relating to the position of the vehicle in which the display is mounted (such as an aircraft) in graphic, actual visual analog form, as well as digitally.

In the event that the parameters of the system driving the CRT, or parameters of the CRT itself, become altered during operation, relative sizes of various display segments and positioning of some of the displayed information may become altered, thereby introducing errors into the display.

To test for system malfunctions of this type, prior art systems have utilized specially generated display patterns, which must be compared with a mask placed specially over the face of the CRT, simply to perform the test. Such systems generally utilize the presence of a generated pattern to test for the quality thereof, thereby precluding the utilization of such tests concurrently with viewing of actual, operational display material. Thus, such tests are limited to maintenance use, and are not useful in on-line monitoring of the viability of the system.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a simple, on-line test for a CRT display system.

According to the present invention, small areas on the face of a CRT are inactivated by opaquing or removing of the phosphor, said inactive areas being in the configuration of special check marks or symbols, said CRT adapted for use in a system in which special check mark symbols are continuously generated in addition to information to be displayed, the check mark symbols being coincident in normal operation with said inactive areas and therefore invisible.

The present invention provides, directly on the face of the CRT, the capability of a display system test, normal operation of which provides a negative indication, and only abnormal operation provides a positive indication which accompanies the display of operational information. The invention may be implemented in any display system having symbol generation capability, and will provide a display test for very little additional cost, weight or size in the overall system.

Other objects, features and advantages of the present invention will become more apparent in the light of the following detailed description of a preferred embodiment thereof, as illustrated in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The sole FIGURE herein comprises a simplified schematic block diagram illustrative of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, a CRT 1 (cathode ray tube) has a display face 2 upon which a variety of information may be displayed, as at 3. A plurality of inactive areas 4-7 are provided on the face of the tube. These may be provided by placing opaque ink or paint on the inner glass surface of the tube prior to deposition of the phosphor thereon, or by selective removal of a portion of the phosphor by etching or scribing. The inactive areas 4-7 may be provided only near the edge of the display area so as to provide a minimum of interference with the normal display pattern. Additionally, these areas may be made extremely small, so as not to interfere with the display of information even on areas of the tube which include the inactive areas 4-7.

The cathode ray tube may be driven, as is known in the art, by a video amplifier 8 and deflection circuitry 10 in response to signals provided by symbol generation means 12, which may include means for generating a normal test pattern of check mark symbols or test marks which are normally coincident with the inactive areas 4-7. Symbols and patterns generated by the signal generator 12 may be in response to a radar system receiver 14, (or may be in response to a TV camera, if desired), as well as to inputs from the navigational system 16 of a vehicle (such as an aircraft). The signal generator 12 may comprise any one of a large number of such signal generators employed in CRT raster swept display systems, of which there are a plethora in the prior art.

The invention may be practiced in a manner so as to take into account the amount of distortion or misalignment which is through to be permissible in this system. For instance, if a wide degree of tolerance is to be permitted, the inactive areas 4-7 may be relatively large and the check mark symbols relating thereto may be much thinner or smaller so as to remain under the inactive areas over a wide degree of degradation or misalignment of the symbol or positioning signals, without becoming visible. On the other hand if very close tolerance is required, the size of the check mark symbols can be made approximately equal to the size of the inactive areas 4-7 so that any change in parameters of the system will result in an immediate visibility of the check mark symbol.

The invention thus comprises a CRT 1 having specially treated areas on the face thereof, which areas will be insensitive to the beam of the CRT 1 when the patterns being displayed thereon are properly registered therewith. However, if the deflection circuitry or symbol generation circuitry suffer any variance or degradation in operating parameters (such as voltage drifts as a result of temperature excursions) the check mark test patterns will no longer register properly with the inactive areas 4-7 on the face of the CRT 1, and will therefore become at least partially visible.

In operating a system employing the present invention, the pattern being displayed (including useful information and the check marks) may purposely be misregistered temporarily to ensure that the check marks are being generated. In addition, the check marks may be generated in a time varying fashion, such as flashing on and off at a rate which is clearly visible, thereby calling the operator's attention to the fact that a misregistration has occurred. In operation, a trained operator

will normally be able to interpret a misregistration which has occurred in such a fashion as to compensate for misregistration in his utilization of the displayed information. Of course, the invention may be practiced in a variety of differing systems, with different operational relationships to suit the purposes of the display system involved.

Although the invention has been shown and described with respect to a preferred embodiment thereof, it should be understood by those skilled in the art that various changes and omissions in the form and detail thereof may be made therein without departing from the spirit and the scope of the invention.

Having thus described a typical embodiment of our invention, that which we claim as new and desire to secure by Letters Patent of the United States is:

1. A system for the selective displaying of symbolic information on the face of a CRT comprising:

A CRT at least one inactive area on the face of said CRT, said inactive area being inoperative to generate a light image as the result of the impingement thereon of the beam of the CRT;

symbol generating circuitry for presenting to said CRT control signals generating a check mark symbol which will, in normal operation, register with said inactive area and thereby be invisible, said check mark symbol becoming visible in the event

that the generation or registration thereof falls outside of tolerance.

2. In the method of monitoring operation of a CRT raster swept display symbol presentation system, the steps of:

providing a CRT having an area of the display face thereof rendered inactive so as to be incapable of generating a light image in response to the beam of the CRT impinging thereon;

providing signals for controlling said CRT so as to generate patterns of light images at the face of the CRT, said signals including signals generating a check mark symbol which under normal operating conditions is registered at the inactive area on the face of said CRT and is therefore invisible.

3. The method according to claim 2 including the additional step of temporarily altering said signals so as to cause registration of said check mark symbol at least partially on areas of said surface of the CRT exclusive of said inactive area.

4. The method according to claim 2 wherein said step of providing signals includes providing signals generating said check mark signal as a time varying function which when displayed at other than said inactive area would readily attract the attention of a viewer of said CRT.

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