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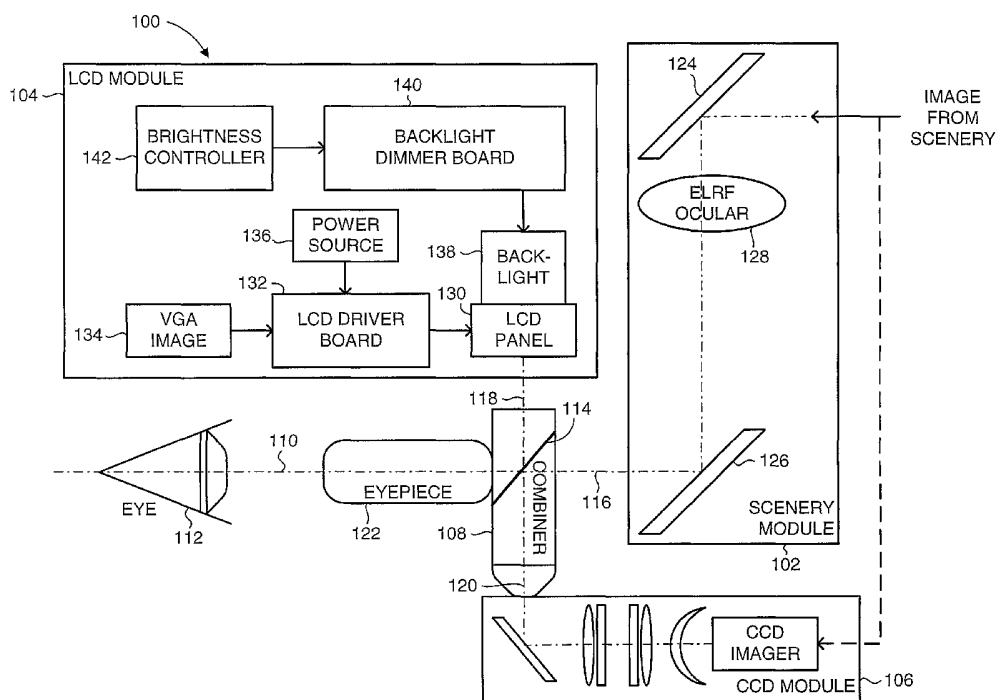
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(54) Title: PROJECTING RETICLE IMAGE



(57) Abstract: System for projecting a reticle for an aiming device, the system including a Liquid-Crystal Display module for generating a Liquid-Crystal Display reticle, and a scenery module for obtaining and providing a scenery image, wherein the reticle is superimposed onto the scenery image in alignment with a firing device linked with the aiming device.



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PROJECTING RETICLE IMAGE

FIELD OF THE DISCLOSED TECHNIQUE

The disclosed technique relates to optical sighting apparatus, in
5 general, and to a system for projecting a reticle display onto a target image
in particular.

BACKGROUND OF THE DISCLOSED TECHNIQUE

An optical sight is designed to identify a particular target and
10 provide an enhanced view of the image. The optical sight generally
includes cross-hairs or a reticle type display for centering the target on
line-of-sight, and a source of illumination for brightness contrast. The
optical sight may be used for preliminary target acquisition, weapon
aiming, or other related purposes. There are several basic types of optical
15 sights, each of which uses a different approach for illumination.
Telescopic sights magnify the target image and superimpose a reticle
pattern onto a target scene at the objective image plane. Reflex sight
systems superimpose a reticle onto the target image. A collimating lens
projects the reticle and a partially reflecting mirror or beam combiner
20 superimposes the reticle pattern onto the real-world scene. The reticle is
illuminated artificially or by light in the target image area, and the target
itself may be made dimmer to enhance contrast. Laser designator sights
physically illuminate the target using a laser beam. A laser beam is
positioned onto the target and projects a bright spot of a specified shape
25 and intensity. There also exist holographic sights, where a hologram of a
reticle pattern is generated, utilizing a light source to illuminate the
hologram.

The particular brightness level of the target area itself, along with
the surrounding light intensity, plays a major role in determining how well
30 the observer perceives the target image. The brightness factor poses a

problem in many scenarios. Sighting devices that have fixed reticle illumination intensity suffer from interference due to ambient light conditions. For example, if the target is in bright sunlight, the reticle may be difficult to distinguish. As a further example, when the target is in a shaded region, the reticle may mask the aimed at spot on the target. Other sighting devices attempt to use varying reticle illumination intensity techniques to counter these effects, but several drawbacks remain. Manual adjustment of brightness intensity can be tedious, time-consuming, and produce suboptimal results. Such inaccuracies can occur even with automated adjustment systems. The sights may be bulky, expensive, and adapted for use with only limited systems. As well, constant light and color changes may lead to confusion on the part of the observer, and greater visual perception time.

US Patent 4,665,622 to Idan, entitled "Optical Sighting Device", is directed to an optical sighting device for aiming a small firearm at a target. A hollow frame is mounted atop the rear end of a rifle barrel, with a short sighting window fixed in place on top of the frame. The sighting window comprises a lens assembly including a concave mirror surface aligned at an angle with the sight axis in such a way as to provide a direct view of the target through the mirror. A tiny lamp mounted inside the frame in the focal plane of the mirror surface generates an illuminated reticle. The reticle is projected through an aperture in the frame wall toward the mirror surface, where most of the light is reflected back along the sighting axis towards the eyes of the user. The effect is that the reticle image is perceived at a great distance beyond the sighting window, appearing as superimposed onto the target. The light source is powered by a small battery contained within the frame and operated by a switch on the side. The position of the reticle relative to the focal point of the mirror surface in the sighting window can be adjusted horizontally and vertically, to account for effects such as gravity and wind on trajectory. The intensity of the reticle light can also be adjusted, using a manual intensity controller

built into the frame, to take into consideration the ambient light conditions. Once the intensity degree is set, a light sensor responds to changes in ambient light to maintain the selected contrast between the reticle and target images, as viewed through the sighting window.

5 US Patent 4,877,324 to Hauri et al, entitled "Optical Sighting Device with Illuminated Aiming Mark", is directed to an optical sighting device for defining an aiming mark and superimposing the mark onto a target. A hollow tube is enclosed by glass plates at either end, with two plates at the front end sandwiching a partially reflecting mirror. A second
10 tube above the first contains a rod of phosphor material to illuminate an aiming mark. Ambient light enters the tube from a transparent hood, and is then emitted from the end surface of the rod, adjacent to an aiming mark etched onto a glass plate. The aiming mark is a central circular spot along with four lines in a radial arrangement. The mark is projected into the
15 viewing path via a deviating mirror, a lens, and the partially reflecting mirror, having the effect of appearing at an infinite distance to the observer. An adjusting screw on the housing can adjust the aiming mark horizontally and vertically. The aiming mark is illuminated by four radial tritium luminous cells mounted around the end surface of the collecting rod
20 in a housing which extends into a hollow cone. The hollow cone has a small aperture near the central spot of the aiming mark, through which light-collecting phosphor rods enter and illuminate the central circular spot during bright ambient light conditions. The metallic external part of the cone faces luminous cells, and directs the emitted light to the
25 corresponding lines of aiming mark, for enhancing illumination during poor ambient light conditions. Illumination can be varied in two ways. By rotating the transparent hood, the position of the luminous cells is shifted relative to the lines of the aiming mark, varying illumination (to a maximum when directly aligned). Also, the radiant surfaces of luminous cells are
30 covered by attenuation screens. These are screens of holes or spots of varying diameter that diminish the output from the light sources.

US Patent 5,279,061 to Betz et al, entitled "Sight Apparatus for Firearms", is directed to an optical sighting device for aiming a firearm at a remote moving target. A sight apparatus with cylindrical housing is mounted on top of a firearm barrel near the tip. The housing chamber
5 extends to an exit aperture having a predetermined cross section. The housing has a curved upward surface extending to an edge region surmounting the exit aperture. The upward surface and edge provide a sight silhouette to the eye position. A light emitting diode (LED) is mounted within the chamber to emit light collimated along the sight axis
10 path. The emitter is electrically charged to create a light output of predetermined intensity. The emitter brightness intensity and exit aperture cross-sectional dimension are selected in such a way as to achieve an enhanced brightness contour through physiological lateral inhibition mechanisms. This perceptual phenomenon of the human eye creates an
15 optimal contrast between brightness levels of the target and ambient light, when the eye is focused on the remote target. The resultant effect is that the observer perceives a sharper target position focused at an infinite distance beyond. For regular daylight conditions, a bright light emitting diode in the red spectrum region is used, in order to achieve the lateral
20 inhibition effect and cause "far field focus". For other ambient light and color conditions, the device employs illumination in different parts of the visible spectrum and at different intensities.

SUMMARY OF THE DISCLOSED TECHNIQUE

25 It is an object of the disclosed technique to provide a novel system for projecting a reticle for optical sights and aiming sights.

In accordance with the disclosed technique, there is thus provided a system for projecting a reticle for an aiming device, including a Liquid-Crystal Display (LCD) module for generating an LCD reticle, and a
30 scenery module for obtaining and providing a scenery image, wherein the reticle is superimposed onto the scenery image in alignment with a firing

device that is linked to the aiming device. Optionally, the system also includes a Charge-Coupled Device (CCD) module for enhancing, reinforcing, or replacing the scenery module, projecting additional information, or displaying an indirect scene.

5 Preferably, the reticle image is located relative to the scenery image according to presumed hit location of a firing device in the scenery. The location of the reticle image is calculated by accounting for any of the factors selected from the list consisting of: range; ammunition type; wind; atmospheric conditions; and additional factors that influence the trajectory
10 of a fired object.

 The system is optionally associated with an Eye-safe Laser Range Finder (ELRF), wherein a laser spot generated by the ELRF in the field of view is observed directly on objects in the scenery. An ELRF ocular may be featured therein for providing a laser reticle or spot for
15 marking a direct path from the optical sight to the target.

 The system preferably includes a combiner for superimposing the reticle onto the scenery image and the CCD module image.

 In a preferable embodiment, the LCD module includes reticle generation components such as an LCD Panel, an LCD driver board, and
20 a reticle image source, wherein the reticle image source provides to the LCD driver board location data respective of the relative location of the reticle image in the scenery image controls, and LCD driver board controls the LCD Panel to project the reticle image according to the location data. The LCD Driver Board preferably controls the reticle image by deflecting
25 the LCD panel thus shifting the reticle image projection respective of the scenery image. Further preferably, the reticle image source comprises a video graphics array (VGA) image

 In another preferable embodiment, the LCD module includes lighting and contrast components such as an LCD backlight, a backlight
30 dimmer board, and a brightness controller, wherein the LCD backlight produces the light for lighting the reticle, the backlight dimmer board

controls the brightness of the LCD backlight according to predetermined parameters or information regarding the lighting of the image scenery, and the brightness controller allows for manual or other intervening for controlling the brightness of the LCD backlight.

5 According to a further preferable embodiment, the LCD module comprises an LCD backlight, the LCD backlight comprises a LED matrix of high-intensity LEDs followed by a lightguide that absorbs light from the LED matrix of several components, a diffusion layer for diffusing incoming light from the lightguide, and a transmissive LCD Panel for blocking out all
10 light save for an area of reticle shape which remains unblocked, thereby generating a lighted reticle display.

 According to another preferable embodiment the reticle is projected at a bright-greenish color, most preferably at a wavelength of roughly 525 μ m.

15 In accordance with the disclosed technique, there is further provided a method for projecting a reticle for an aiming device, including the procedures of: obtaining a scenery image and providing the image to the eye of an observer, generating an LCD reticle, and superimposing the LCD reticle on the scenery image in alignment with a firing device. The
20 method may further include an optional procedure of determining range and orientation data related to the scenery. The reticle is preferably projected at a bright-greenish color, most preferably at a wavelength of roughly 525 μ m.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosed technique will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

5 Figure 1 is a schematic illustration of a system, constructed and operative in accordance with an embodiment of the disclosed technique;

 Figure 2 is an exploded view of an exemplary LCD backlight, used in conjunction with the embodiment of Figure 1;

 Figure 3 is a schematic illustration of an Eye-safe Laser Range
10 Finder Display magnified field of view, constructed and operative in accordance with another embodiment of the disclosed technique; and

 Figure 4 is a block diagram of a method for projecting a reticle for an aiming device, operative in accordance with a further embodiment of the disclosed technique.

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DETAILED DESCRIPTION OF THE EMBODIMENTS

The disclosed technique overcomes the disadvantages of the prior art by providing an optical sighting apparatus that utilizes a Liquid-Crystal Display (LCD) panel and beam splitter configuration to project a
20 reticle display onto a target image. The LCD based reticle provides an optical sight solution especially suitable for direct aiming devices, and particularly for mid-range weapons control systems, for example, in conjunction with Main Battle Tanks (MBT) or Light Armored Vehicles (LAV). Reference is now made to Figure 1, which is a schematic
25 illustration of a system, generally referenced 100, constructed and operative in accordance with an embodiment of the disclosed technique. System 100 includes a scenery module 102, an LCD module 104, a Charge-Coupled Device (CCD) module 106, and a combiner-splitter unit, or combiner 108. CCD module 106 is designed to enhance, back up, or
30 replace scenery module 102. The disclosed technique can operate either without CCD module 106 or without scenery module 102, although usually

a scenery module 102 is employed for direct views. The term "scenery" herein refers to the image provided by either of scenery module 102 or CCD module 106, or both. Scenery module 102, LCD module 104, and CCD module 106 are coupled with combiner 108. Combiner 108 can be a
5 separate unit or integrated with any of modules 102, 104 and 106.

Combiner 108 combines the images provided by scenery module 102 and LCD module 104 (and/or CCD module 106), and directs the combined image to the user line-of-sight, as represented by optical axis 110. Scenery module 102 provides an image from the scenery
10 (namely, from scenery module 102 or CCD module 106 or both) to the eye 112 of the beholder, through combiner 108. LCD module 104 provides a reticle display which is superimposed onto the scenery image at combiner 108, and forwarded to eye 112. CCD module 106 provides an image of a direct or an indirect scene, and is usually employed for enhancing the
15 image shown through scenery module 102. Alternatively, CCD module 106 may be employed for replacing the image shown through scenery module 102, or for projecting information (e.g., directional data, range data, environmental data, and the like), typically lateral to the direct image. For example, when the scenery view is obscure in nighttime or under dim
20 light conditions or when thermal detection is required, such as with ultraviolet (UV), infrared (IR), or Forward Looking Infra Red (FLIR) detection, sensing, or video technology, CCD Module 106 provides the enhanced or reproduced image of the required scenery. If information projection is required, CCD Module 106 adds the necessary data. CCD
25 module 106 can also serve to provide a view that does not overlap a direct view of the scenery obtained by scenery module 102, such as a rear view of a vehicle, or a bottom view of a vehicle (applicable mainly to aircrafts).

Other exemplary features of the embodiment shown in Figure 1 are illustrated in further detail. Combiner 108 includes a beam splitter represented by a semi-transparent reflective mirror 114 that can also
30 include a refractive component. Mirror 114 can be substituted by

equivalent means, such as other splitters and combining optical elements. The image from the scenery, provided by scenery module 102, is forwarded through semi-transparent mirror 114 to eye 112, as represented by optical paths 116 and 110. LCD module 104 provides a reticle image to mirror 114, which reflects the reticle image toward eye 112, as represented by optical paths 118 and 110. CCD module 106 provides a video image (or a different type of image) to mirror 114, which refracts the image toward eye 112, as represented by optical paths 120 and 110. An eyepiece 122 is installed in the path 110 to eye 112, and includes optical elements such as focusing, distortion or aberration correcting, screening, and the like.

Scenery module 102 captures an image from the scenery, and usually provides a direct view of the scenery. The image from the scenery is conveyed to combiner 108 via deflecting mirrors 124 and 126. When a laser beam is employed in conjunction with system 100, the laser spot in the field of view can often be observed directly on objects in the scenery, as perceived through scenery module 102, or conveyed through CCD module 106. Optionally, an Eye-safe Laser Range Finder (ELRF) is associated with system 100. An ELRF (not shown) transmits a pulse of laser light at a target and receives light which is reflected back from the target, to determine range data. In such a case, the association of the ELRF with system 100 is preferably provided by an ELRF ocular 128, which is preferably integrated with scenery module 102. ELRF ocular 128 provides a laser reticle or spot for marking the detected laser mark on the target. This may be achieved by enhancing, frequency-converting, or marking the observed spot. This may be called for in cases where the observed spot is in ranges beyond the observable light optical window (IR, UV, and the like) or very close in frequencies to ambient light and therefore indistinguishable. ELRF ocular 128 may also serve to direct the perceived spot detection data to the ELRF for range and orientation data retrieval.

LCD module 104 includes reticle generation components such as an LCD Panel 130, an LCD driver board 132, a reticle image source or generator, such as a video graphics array (VGA) image 134, and a power source 136. LCD module further includes reticle lighting and contrast components such as a backlight 138, a backlight dimmer board 140 and brightness controller 142. Backlight dimmer board 140 controls the brightness of backlight 138 according to predetermined parameters or information regarding the lighting of the image scenery.

Reference is now made to Figure 2, which is an exploded view of an exemplary LCD backlight, generally designated 148, used in conjunction with the embodiment of Figure 1, such as for backlight 138. Backlight 148 is comprised of several components. Direction of light is designated by arrow 150. The first layer 152 is a 3x3 matrix of high-intensity Light-Emitting Diodes (LEDs), followed by a lightguide or glass box 154 that absorbs light from LED matrix 152. The layer 156 on the bottom of glass box 154 diffuses the incoming light, below which is an optical component or layer 158, such as a Fresnel lens. The overall effect is a uniform light surface with approximate dimensions of 20x20 mm and very high brightness, as the light intensity reaches up to 20,000 ft-L (foot-lambert). A transmissive LCD Panel 130 (also shown in Figure 1) blocks out all light save for an area of reticle shape which remains unblocked, thereby generating a lighted reticle display. The reticle pattern may be selected to be a cross (such as shown in Figure 2) or any other suitable shape. The frequency of the projected reticle may be varied and controlling means therefor may be implemented. The intensity and the frequency at which the reticle is projected in superposition with the scenery image can be automatically determined in accordance with the processing of a combined image of the scenery and the reticle. However, in a preferable simplified embodiment, the reticle is selected to be a bright-greenish color of roughly 525 μ m wavelength, as this wavelength was

found to have a low reflectivity, good contrast with respect to ambient light of the scenery, and is well adapted for good perception by the human eye.

With reference back to Figure 1, LCD Panel 130 projects a reticle pattern onto the line-of-sight 110 of the observer. A beam splitter
5 such as mirror 114 reflects all, or at least a portion, of the reticle light towards line-of-sight 110 for scenery display, superimposing the reticle onto the viewed image. LCD Driver Board 132 controls the reticle image generated at LCD Panel 130 by determining the location of the reticle relative to the image. The location of the projected reticle may be
10 controlled by deflecting the LCD panel, thus shifting the reticle image projection respective of combiner 108 and the scenery image therein. An alternative arrangement would keep the reticle intact, preferably centered, while the scenery image is shifted, such as by moving one of deflecting mirrors 124, 126, 114, respectively, or another optical image capturing or
15 shifting means. LCD Driver Board 132 receives instructions for reticle alignment relative to the image from VGA Image 134. For producing these instructions, VGA Image 134 receives data from external devices that determine the presumed hit location in the scenery of a firing device. Thus, the generated reticle represents a line-of-sight path from the optical
20 sight to a target, which accounts for relevant factors that influence the trajectory of a fired object, such as range, ammunition type, wind, atmospheric conditions, and the like. In particular, the firing device (such as a cannon, rocket or missile launcher, and the like) may be linked, mechanically or otherwise, to the view seen through the optical path in
25 such a way that reticle represents the exact location of where the weapon will hit, with all relevant factors taken into account, such as by a computer system.

LCD Driver Board 132 is powered by Power Source 136, which can also serve for powering the other components of LCD module 104.
30 Power source 136 may include internal power sources or external power sources. Backlight 138 is controlled by Backlight Dimmer Board 140,

which determines the brightness of backlight 138. Dimmer board 140 is also controlled by brightness controller 142, which allows for manual or other interventional means to control the brightness of backlight 138, to provide optimal appearance respective of the scenery ambient light.

5 Reference is now made to Figure 3, which is a schematic illustration of an Eye-safe Laser Range Finder (ELRF) Display 200 magnified field of view, constructed and operative in accordance with another embodiment of the disclosed technique. Display 200 includes Projecting Reticle Unit (PRU) required Field of View (FOV) 202, center
10 mark of PRU required FOV 204, laser mark 206, and reticle 208. PRU required FOV 202 is the view seen within the ELRF, such as through ELRF ocular 128 of Figure 1, centered by center mark 204. Laser mark 206 represents a direct path from the optical sight to target 210, as determined by the ELRF system. Reticle 208 represents a path from the
15 optical sight accounting for all relevant factors that influence the trajectory of a fired object, such as range, ammunition type, wind, atmospheric conditions, and the like. As mentioned with reference to Figure 1, the firing device is electronically, mechanically or otherwise linked to the view seen through the optical sight in such a way that reticle 208 represents the
20 anticipated location of where the weapon will hit, with all relevant factors taken into account (by a suitable processor).

Reticle 208 is diminutive in size. Exemplary dimensions of reticle 208 are approximately 0.01mrad (miliradian) thickness in a field of view of approximately 120mrad (7.5°), and therefore reticle 208 does not
25 significantly interfere with or diminish the resolution of the external scenery. The position of reticle 208 with respect to a given target can be adjusted by the user via the weaponry adjusting mechanism. Preferably, allocating a bright-greenish color of roughly 525µm wavelength for reticle 208 provides for a low reflectivity and a high contrast between reticle 208
30 and the scenery, even if the brightness of the scenery is very high. Therefore, there is no need to adjust reticle 208 brightness over a large

range of scenery brightness. Reticle 208 maintains contrast ratio, meaning it does not impose any "parasitic" brightness on the scenery.

Reference is now made to Figure 4, which is a block diagram of a method for projecting a reticle for an aiming device, operative in accordance with a further embodiment of the disclosed technique.

In procedure 300, a scenery image is obtained and provided to the eye of an observer. With reference to Figure 1, scenery module 102 captures an image from the scenery, which is forwarded through semi-transparent mirror 114 to eye 112, as represented by optical paths 116 and 110. Optionally, CCD module 106 may be employed to enhance, reinforce, or replace the image shown through scenery module 102. CCD module 106 may further provide an indirect image from the scenery, or may project information (e.g., directional data, range data, environmental data, and the like), lateral to the direct image.

In procedure 302, an LCD reticle is generated. With reference to Figure 1, the reticle generation components of LCD module 104 generate an LCD reticle. These reticle generation components include LCD Panel 130, LCD Driver Board 132, and a reticle image source such as VGA image 134. The reticle lighting and contrast components of LCD module 104 influence the lighting and contrast of the generated reticle. These reticle lighting and contrast components include LCD backlight 138, backlight dimmer board 140, and brightness controller 142. LCD backlight 138 produces light for lighting the reticle. Backlight dimmer board 140 controls the brightness of LCD backlight 138 according to predetermined parameters or information regarding the lighting of the image scenery. Brightness controller 142 allows for manual (or automated) control of the brightness of LCD backlight 138.

In an optional procedure 304, range and orientation data related to the scenery is determined. An ELRF may determine range information associated with a target by transmitting a laser pulse toward the target and receiving the reflections therefrom. With reference to Figure 1, ELRF

ocular 128 may be integrated with scenery module 102. ELRF ocular 128 provides a laser reticle or spot for marking a direct path from the optical sight to the target. ELRF ocular 128 may also serve to direct the perceived spot detection data to the ELRF for range and orientation data retrieval.

In procedure 306, the generated LCD reticle is superimposed on the scenery image. With reference to Figure 1, LCD panel 130 projects a reticle pattern onto the line-of-sight 110 of the observer. It is recalled that the scenery image also reaches the observer via line-of-sight 110. Mirror 114 in combiner 108 reflects at least a portion of the reticle toward line-of-sight 110, thereby superimposing the reticle onto the viewed image as perceived by the observer.

VGA Image 134 receives data from external devices that determine the presumed hit location in the scenery of a firing device that is linked to the aiming device, and provides instructions to LCD Driver Board 132 for reticle alignment relative to the scenery image. LCD Driver Board 132 controls the location of the projected reticle by deflecting LCD Panel 130, thereby shifting the reticle image projection relative to combiner 108 and the scenery image therein. Alternatively, the reticle is kept intact and the scenery image is shifted, such as by moving one of deflecting mirrors 124, 126, 114, respectively. Preferably, the projected reticle represents a line-of-sight path from the optical sight to a target, which accounts for relevant factors that influence the trajectory of a fired object, such as range, ammunition type, wind, atmospheric conditions, and the like.

The pattern of the projected reticle may be selected to be any suitable shape, such as a cross. The frequency of the projected reticle may be varied. The intensity and the frequency at which the reticle is superimposed onto the scenery image can be automatically determined in accordance with the processing of a combined image of the scenery and the reticle. Preferably, the reticle is projected at a bright-greenish color,

most preferably at wavelength of roughly 525 μ m. It will be appreciated by persons skilled in the art that the disclosed technique is not limited to what has been particularly shown and described hereinabove. Rather the scope of the disclosed technique is defined only by the claims, which follow.

CLAIMS

1. A system for projecting a reticle for an aiming device, comprising:
a Liquid-Crystal Display (LCD) module for generating an LCD
5 reticle; and
a scenery module for obtaining and providing a scenery image;
wherein said reticle is superimposed onto said scenery image in
alignment with a firing device linked to said aiming device.
- 10 2. The system according to Claim 1, wherein the intensity and the
frequency at which said reticle is projected in superposition with said
scenery image is automatically determined in accordance with the
processing of a combined image of said scenery and said reticle.
- 15 3. The system according to either of Claims 1 or 2, further comprising a
Charge-Coupled Display (CCD) module for enhancing, reinforcing, or
replacing said scenery module, or for projecting information.
4. The system according to Claim 3, wherein said CCD module provides
20 an image of a direct or an indirect scene.
5. The system according to Claim 3, wherein said CCD module projects
information lateral to a direct image.
- 25 6. The system according to Claim 3, wherein said CCD module provides
an enhanced image of an obscure, nighttime, or dim light conditions
scenery.
7. The system according to Claim 3, wherein said CCD module
30 comprises UV, IR, or Forward Looking Infra Red (FLIR) detection,
sensing or video technology.

8. The system according to Claim 3, wherein said CCD module provides a view that does not overlap a direct view of said scenery module.
- 5 9. The system according to Claim 8, wherein said view comprises a rear view or a bottom view.
10. The system according to any of the Claims 1 to 9, further comprising a combiner for superimposing said reticle with said scenery image.
- 10 11. The system according to any of the Claims 1 to 10, further comprising an eyepiece.
12. The system according to any of the Claims 1 to 11, wherein said
15 eyepiece comprises any of the optical elements selected from the list consisting of: focusing; distortion correcting; aberration correcting; and screening.
13. The system according to Claim 3, further comprising a combiner
20 coupled with said LCD module, said scenery module, and said CCD module, said combiner combining the images provided by said LCD module, said scenery module, and said CCD module, and directing said combined image to the user line-of-sight.
- 25 14. The system according to any of the Claims 10 to 13, wherein said combiner comprises any combination from the list consisting of: a beam splitter; a semi transparent mirror; a reflective mirror; and a refractive component.
- 30 15. The system according to any of the Claims 1 to 14, associated with an Eye-safe Laser Range Finder (ELRF), wherein a laser spot

generated by said ELRF in the field of view is observed directly on objects in the scenery.

- 5 16. The system according to Claim 15, further comprising an ELRF ocular, providing a laser spot, for marking a direct path from the optical sight to the target.
- 10 17. The system according to Claim 16, wherein said laser reticle is produced after enhancing, frequency-converting, or marking of said laser spot.
- 15 18. The system according to any of the Claims 16 to 17, wherein said laser is operative in the ranges selected from the list consisting of: ranges beyond the observable light optical window; IR; UV; and ambient light.
- 20 19. The system according to any of the Claims 16 to 18, wherein said ELRF ocular directs perceived laser spot detection data to said ELRF for range or orientation data retrieval.
- 25 20. The system according to any of the Claims 1 to 19, wherein said LCD module includes reticle generation components and lighting and contrast components.
- 30 21. The system according to Claim 20, wherein said reticle generation components comprise an LCD Panel, an LCD driver board, and a reticle image source,
wherein said reticle image source provides to said LCD driver board location data respective of the relative location of said reticle image in said scenery image controls, and

wherein said LCD driver board controls said LCD Panel to project said reticle image according to said location data.

22. The system according to Claim 21, wherein said LCD Driver Board
5 controls said reticle image by deflecting said LCD panel thus shifting the reticle image projection respective of said scenery image.

23. The system according to Claim 21, wherein said reticle image source
10 comprises a video graphics array (VGA) image.

24. The system according to any of the Claims 20 to 23, wherein said
reticle lighting and contrast components comprise an LCD backlight,
a backlight dimmer board, and a brightness controller,

15 wherein said LCD backlight produces the light for lighting said reticle;

wherein said backlight dimmer board controls the brightness of
said LCD backlight according to predetermined parameters or
information regarding the lighting of said scenery image, and

20 wherein said brightness controller allows for manual or other interventional means for controlling the brightness of said LCD backlight.

25 25. The system according to Claim 24, wherein said LCD module comprises:

a Light-Emitting Diode (LED) matrix of high-intensity LEDs
followed by a lightguide that absorbs light from said LED matrix of
several components;

a diffusion layer for diffusing incoming light from said lightguide;
and

a transmissive LCD Panel for blocking out all light save for an area of reticle shape which remains unblocked, thereby generating a lighted reticle display.

5 26. The system according to any of the Claims 1 to 25, wherein said reticle is projected at a bright-greenish color.

27. The system according to any of the Claims 1 to 26, wherein said reticle is projected at wavelength of roughly 525 μ m.

10

28. The system according to any of the Claims 1 to 27, wherein said reticle image is located relative to said scenery image according to presumed hit location in the scenery of a firing device linked with said aiming device.

15

29. The system according to Claim 28, wherein said location of said reticle image is calculated by accounting for any of the factors selected from the list consisting of: range; ammunition type; wind; atmospheric conditions; and additional factors that influence the trajectory of a fired object.

20

30. A system for projecting a reticle for an aiming device, substantially as described or illustrated hereinabove or in any of the drawings.

25 31. A method for projecting a reticle for an aiming device, the method comprising the procedures of:

obtaining and providing a scenery image;

generating an LCD reticle; and

superimposing said LCD reticle onto said LCD image, in

30

alignment with a firing device linked with said aiming device.

32. The method according to Claim 31, further comprising the procedure of:

determining range and orientation data relating to said scenery.

5 33. The method according to any of the Claims 31 to 32, wherein said reticle is projected at a bright-greenish color.

34. The method according to any of the Claims 31 to 33, wherein said reticle is projected at wavelength of roughly 525 μ m.

10

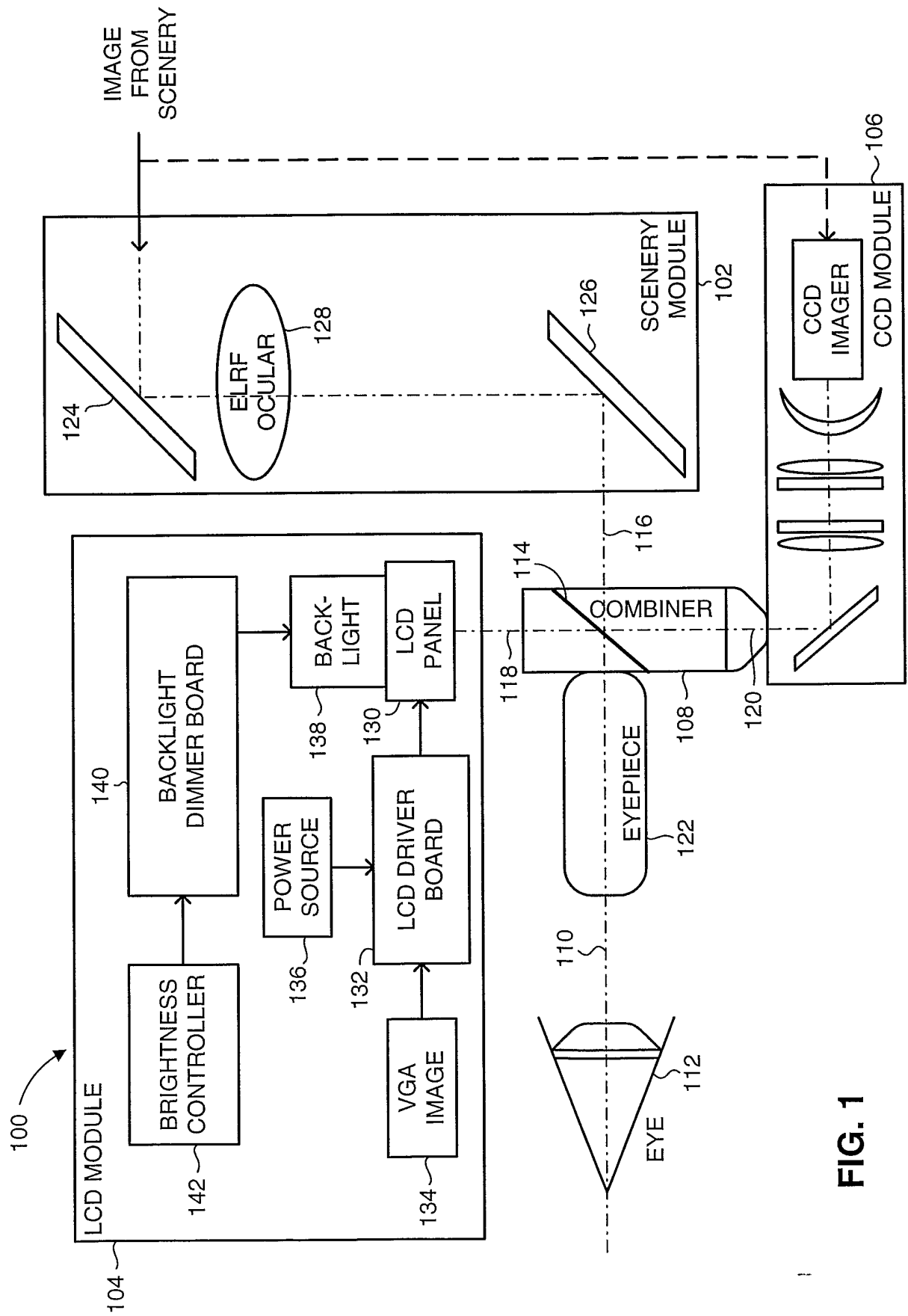


FIG. 1

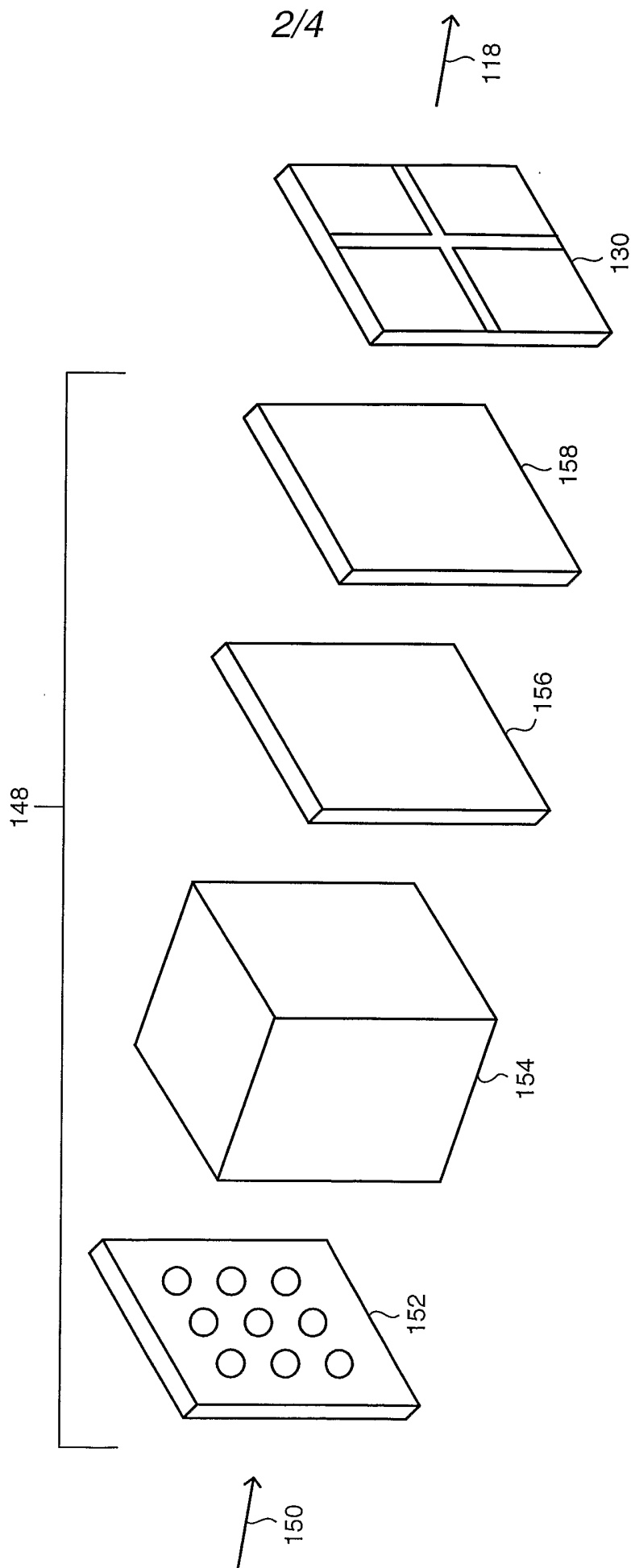
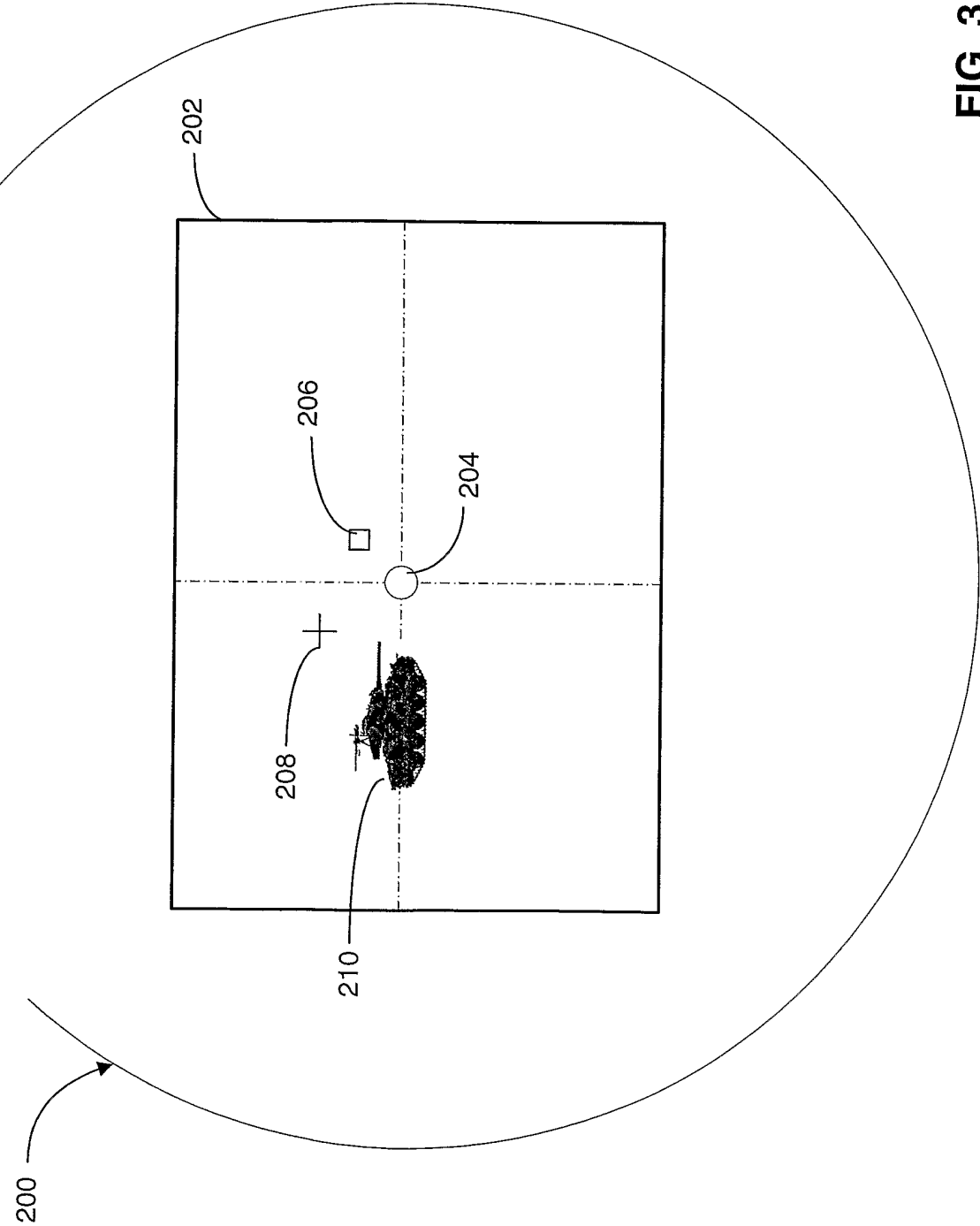
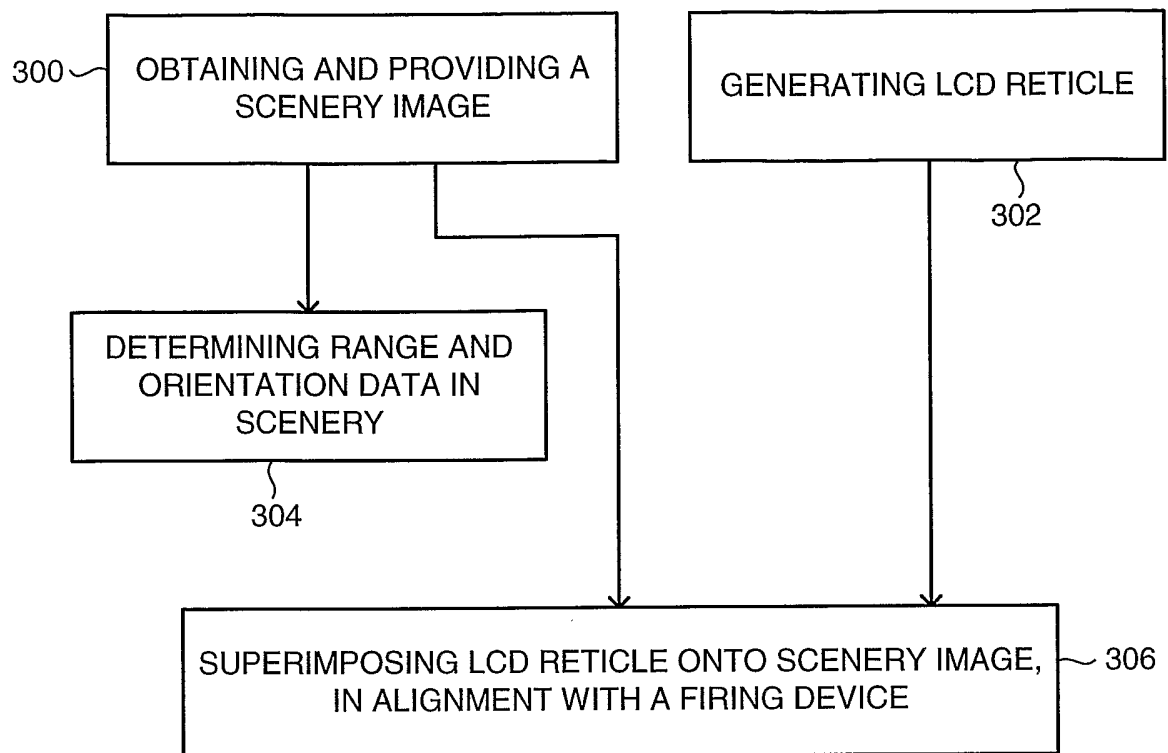


FIG. 2



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**FIG. 4**