



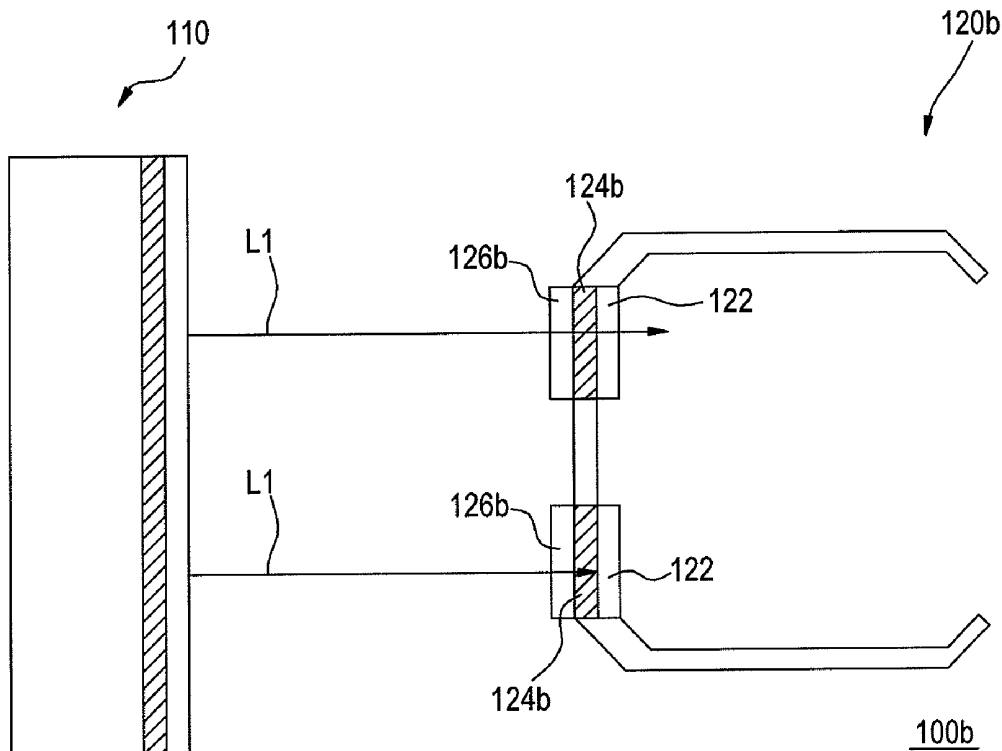
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(19) **United States**(12) **Patent Application Publication**
LIN et al.(10) **Pub. No.: US 2011/0292308 A1**(43) **Pub. Date: Dec. 1, 2011**(54) **3-D IMAGE DISPLAY SYSTEM AND DISPLAY
EQUIPMENT AND SHUTTER GLASSES
THEREOF****Publication Classification**(51) **Int. Cl.**
G02F 1/1335 (2006.01)(52) **U.S. Cl.** **349/13**(57) **ABSTRACT**

A 3D image display system includes a display equipment and a shutter glasses. The display equipment includes an LCD module. The LCD module has a linear polarizing unit and is able to generate an image light from the linear polarizing unit. The shutter glasses include two liquid crystal optical units, at least one linear polarizing unit, and at least one polarizing optical element. The linear polarizing unit is disposed between the polarizing optical element and the liquid crystal optical units. The image light passes through the polarizing optical element, the linear polarizing unit, and one of the liquid crystal optical units in sequence. When the image light passes through one of the liquid crystal optical units, the other liquid crystal optical unit blocks the image light.

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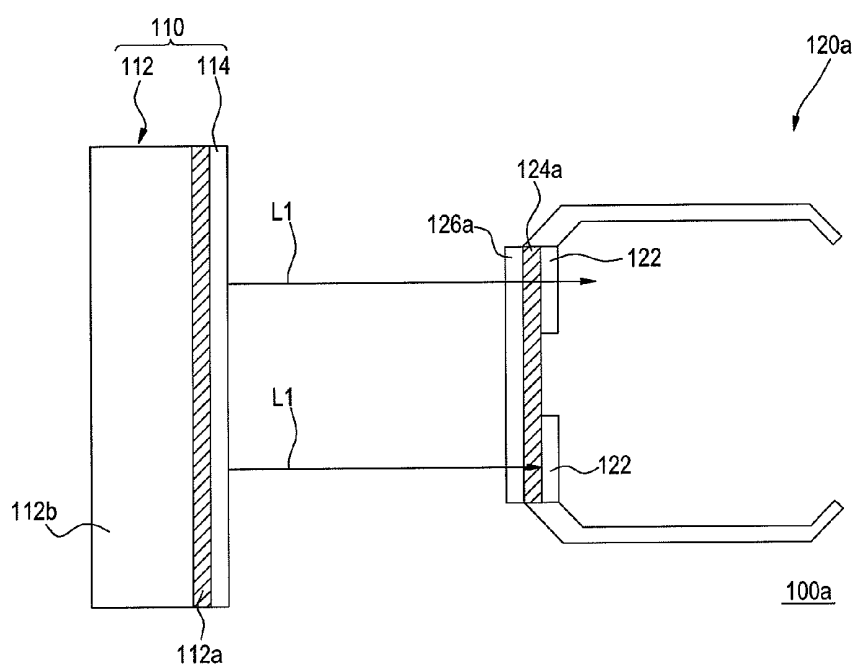


FIG. 1A

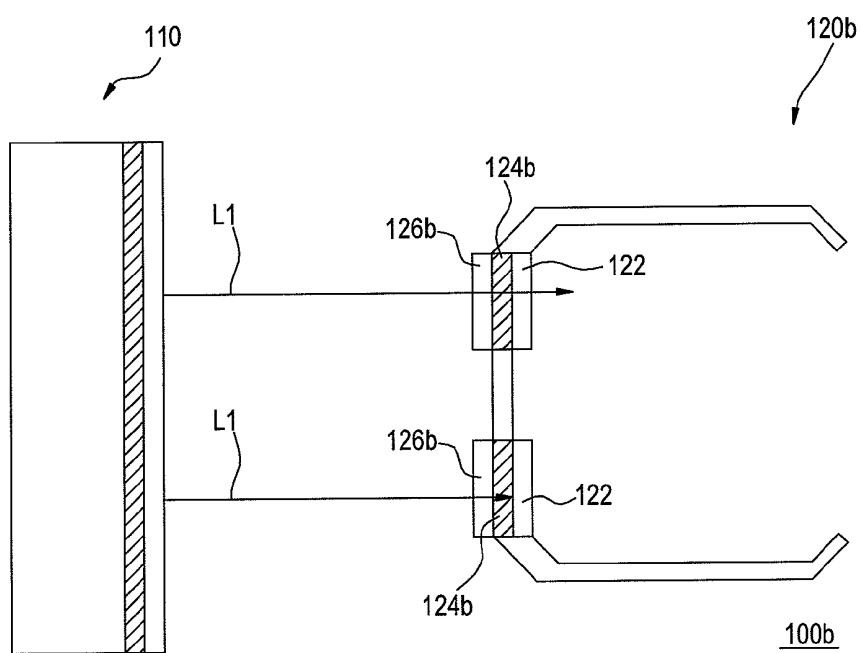


FIG. 1B

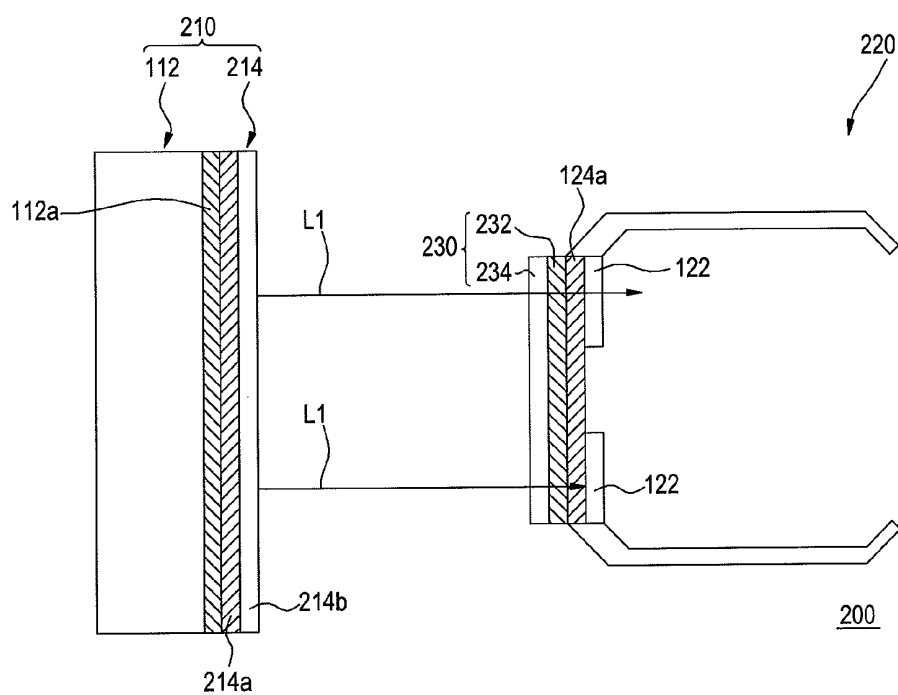


FIG. 2

3-D IMAGE DISPLAY SYSTEM AND DISPLAY EQUIPMENT AND SHUTTER GLASSES THEREOF

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Taiwan Patent Application No. 099210316, filed on May 31, 2010, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] 1. Field of Invention

[0003] The present invention relates to an image display system, and more particularly to a three-dimensional (3D) image display system and a display equipment and a shutter glasses thereof.

[0004] 2. Related Art

[0005] Nowadays, display systems capable of displaying 3D images have been developed in the field of image display technology and enable modern people to enjoy a stereoscopic visual effect. Currently, a 3D image display system including a display equipment and a shutter glasses already exists. When a viewer watches an image shown by the 3D image display system, the viewer needs to wear the shutter glasses, thereby experiencing a stereoscopic visual effect.

[0006] In detail, in such a 3D image display system, the display equipment generally alternately displays left-eye frames served for a left eye and right-eye frames served for a right eye. The shutter glasses alternately block view of the eyes, such that the left eye can only see the left-eye frames, and the right eye can only see the right-eye frames, thereby enabling the viewer to feel that the images displayed by the display equipment are stereoscopic, and experiencing a stereoscopic visual effect.

SUMMARY OF THE INVENTION

[0007] The present invention provides a 3D image display system capable of providing a stereoscopic visual effect.

[0008] The present invention provides a display equipment applied to the 3D image display system.

[0009] The present invention provides a shutter glasses applied to the 3D image display system. The shutter glasses comprising two liquid crystal optical units, at least one polarizing optical element, and at least one linear polarizing unit disposed between the polarizing optical element and the liquid crystal optical units. An image light passes through the polarizing optical element, the linear polarizing unit, and one of the liquid crystal optical units in sequence. When the image light passes through one of the liquid crystal optical units, the other liquid crystal optical unit blocks the image light.

[0010] The present invention also provides a display equipment applied to a 3D image display system. The display equipment comprising an LCD module having a linear polarizing unit and capable of generating an image light from the linear polarizing unit; and a polarizing optical element disposed on a transmission path of the image light. The polarizing optical element is used for converting a polarization state of the image light from a linear polarization into a non-linear polarization.

[0011] The present invention also provides a 3D image display system. The 3D image display system comprises a display equipment and a shutter glasses. The display equipment

comprises an LCD module, and the LCD module has a linear polarizing unit and is capable of generating an image light from the linear polarizing unit. The shutter glasses comprise two liquid crystal optical units, at least one linear polarizing unit, and at least one polarizing optical element. The linear polarizing unit is disposed between the polarizing optical element and the liquid crystal optical units. The image light passes through the polarizing optical element, the linear polarizing unit, and one of the liquid crystal optical units in sequence. When the image light passes through one of the liquid crystal optical units, the other liquid crystal optical unit blocks the image light.

[0012] The present invention also provides a 3D image display system. The 3D image display system comprises a display equipment and a shutter glasses. The display equipment comprises an LCD module and a polarizing optical element. The LCD module has a linear polarizing unit and is capable of generating an image light from the linear polarizing unit. The polarizing optical element is disposed on a transmission path of the image light and used for converting a polarization state of the image light from a linear polarization into a non-linear polarization. The shutter glasses comprise two liquid crystal optical units and at least one linear polarizing unit. The liquid crystal optical units and the linear polarizing unit are located on the transmission path of the image light, the image light passes through the polarizing optical element, the linear polarizing unit, and one of the liquid crystal optical units in sequence. When the image light passes through one of the liquid crystal optical units, the other liquid crystal optical unit blocks the image light.

[0013] Based on the above, when an image light is emitted from the display equipment, one of liquid crystal optical units of the shutter glasses allows the image light to pass through, and the other liquid crystal optical unit blocks the image light, such that the shutter glasses alternately block view of the left eye and right eye. When the display equipment alternately displays left-eye frames served for the left eye and right-eye frames served for the right eye, the 3D image display system of the present invention can provide images with the stereoscopic visual effect to the viewer through the shutter glasses.

[0014] In order to make the aforementioned and other objectives and advantages of the present invention comprehensible, embodiments accompanied with figures are described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The present invention will become more fully understood from the detailed description given herein below for illustration only, and thus are not limitative of the present invention, and wherein:

[0016] FIG. 1A is a schematic top view of a 3D image display system according to an embodiment of the present invention;

[0017] FIG. 1B is a schematic top view of a 3D image display system according to another embodiment of the present invention; and

[0018] FIG. 2 is a schematic top view of a 3D image display system according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] FIG. 1A is a schematic top view of a 3D image display system according to an embodiment of the present

invention. Referring to FIG. 1A, a 3D image display system **100a** in the embodiment includes a display equipment **110** and a shutter glasses **120a**. The shutter glasses **120a** alternately block view of the left and right eyes, and the display equipment **110** can alternately displays left-eye frames served for the left eye and right-eye frames served for the right eye.

[0020] A frequency at which the display equipment **110** alternately displays the left-eye frames and the right-eye frames may be consistent with a frequency at which the shutter glasses **120a** alternately block view of the left and right eyes. When a viewer wears the shutter glasses **120a** to watch images displayed by the display equipment **110**, the shutter glasses **120a** block view of the eyes of the viewer in a timely manner, such that the left eye of the viewer can only see the left-eye frames, and the right eye can only see the right-eye frames. Thus, the display equipment **110** can provide images with a stereoscopic visual effect for the viewer.

[0021] In the embodiment, the display equipment **110** applied to the 3D image display system **100a** includes a liquid crystal display (LCD) module **112** and a polarizing optical element **114**. The LCD module **112** has a linear polarizing unit **112a**. The linear polarizing unit **112a** may be substantially a linear polarizer, such that a linearly polarized light with a single polarization direction can pass through the linear polarizing unit **112a**.

[0022] The LCD module **112** is capable of generating an image light **L1** from the linear polarizing unit **112a**, and the image light **L1** may contain left-eye frames and right-eye frames. The LCD module **112** may be identical to an existing LCD module in terms of construction and display principles. In detail, the LCD module **112** may include the linear polarizing unit **112a** and a display module body **112b**. The display module body **112b** includes an LCD structure (not shown) and a backlight module (not shown).

[0023] The LCD structure is located between the linear polarizing unit **112a** and the backlight module. The backlight module can provide a planar light beam with uniform brightness, and the LCD structure and the linear polarizing unit **112a** are combined to form an LCD panel. When the planar light beam passes through the LCD panel, the LCD module **112** generates the image light **L1** from the linear polarizing unit **112a** and thus can display images on the linear polarizing unit **112a**.

[0024] The polarizing optical element **114** is capable of changing a polarization state of a light and converting the polarization state of the light from a linear polarization into a non-linear polarization. For example, the polarizing optical element **114** is capable of converting a linearly polarized light into a circularly polarized light, an elliptically polarized light, or a non-polarized light. The non-polarized light is such as a natural light.

[0025] The polarizing optical element **114** is disposed on a transmission path of the image light **L1**, and may be attached on the linear polarizing unit **112a**. When the image light **L1** is emitted from the linear polarizing unit **112a**, the image light **L1** subsequently passes through the polarizing optical element **114**. The image light **L1** just emitted from the linear polarizing unit **112a** is a linearly polarized light, that is, a polarization state of the image light **L1** at this time is a linear polarization. However, after the image light **L1** passes through the polarizing optical element **114**, the polarizing

optical element **114** converts the polarization state of the image light **L1** from the linear polarization into a non-linear polarization.

[0026] The polarizing optical element **114** may be a diffuser or a quarter-wave plate, and a light output surface of the diffuser may present an appearance of a matte surface or a glossy surface. When the polarizing optical element **114** is the diffuser, the polarizing optical element **114** is capable of converting the image light **L1** into the natural light. The polarizing optical element **114** may convert the image light **L1** by scattering, such that the image light is converted into the natural light.

[0027] When the polarizing optical element **114** is the quarter-wave plate, the polarizing optical element **114** has a fast axis and a slow axis, and is capable of converting the image light **L1** into the circularly polarized light or the elliptically polarized light. In detail, when an included angle between a polarization direction of the linear polarizing unit **112a** and the fast axis (or the slow axis) is equal to 45 degrees, the image light **L1** is converted into the circularly polarized light. When the included angle between the polarization direction of the linear polarizing unit **112a** and the fast axis (or the slow axis) is not equal to 45 degrees, and the polarization direction of the linear polarizing unit **112a** and the fast axis or the slow axis do not overlap, the image light **L1** is converted into an elliptically polarized light.

[0028] Since the polarizing optical element **114** is capable of changing the polarization state of the light and can convert the polarization state of the light from the linear polarization into the non-linear polarization, the polarization state of the image light **L1** after passing through the polarizing optical element **114** is the non-linear polarization. That is to say, at this time, the image light **L1** is, for example, the circularly polarized light, the elliptically polarized light, or the natural light, that is, the light of images presented by the display equipment **110** from the polarizing optical element **114** is no longer the linearly polarized light.

[0029] The shutter glasses **120a** applied to the 3D image display system **100a** includes two liquid crystal optical units **122**, a linear polarizing unit **124a**, and a polarizing optical element **126a**. The linear polarizing unit **124a** is disposed between the polarizing optical element **126a** and the liquid crystal optical units **122**, and the polarizing optical element **126a** may be attached on the linear polarizing unit **124a**. After being emitted from the display equipment **110**, the image light **L1** passes through the polarizing optical element **126a**, the linear polarizing unit **124a**, and one of the liquid crystal optical units **122** in sequence. When the image light **L1** passes through one of the liquid crystal optical units **122**, the other liquid crystal optical unit **122** blocks the image light **L1**.

[0030] In detail, the liquid crystal optical units **122** have a plurality of liquid crystal molecules. Arrangement of the liquid crystal molecules may be changed by applying an electric field and may enable the liquid crystal optical units **122** to allow a light with a certain polarization direction to pass through. When the image light **L1** passes through the linear polarizing unit **124a** and is converted into a linearly polarized light, the liquid crystal optical units **122** allow the image light **L1** to pass through or block the image light **L1** through the electric field applied on the liquid crystal molecules. Thus, the shutter glasses **120a** enables the left eye of the viewer to see only the left-eye frames and the right eye to see only the right-eye frames.

[0031] The polarizing optical element **126a** of the shutter glasses **120a** may be identical to the polarizing optical element **114** of the display equipment **110**, that is, the polarizing optical element **126a** may be the diffuser or the quarter-wave plate, and the polarizing optical element **126a** may be a diffuser having an appearance of a glossy surface. Therefore, the polarizing optical element **126a** is also capable of changing the polarization state of the light, and the image light **L1** emitted from the polarizing optical element **114** can pass through the polarizing optical element **126a** and the linear polarizing unit **124a**.

[0032] In detail, when the image light **L1** after passing through the polarizing optical element **114** is the circularly polarized light, the elliptically polarized light, or the natural light, and the polarizing optical element **126a** is the diffuser, the image light **L1** after passing through the polarizing optical element **126a** is still the circularly polarized light, the elliptically polarized light, or the natural light.

[0033] When the image light **L1** after passing through the polarizing optical element **114** is the circularly polarized light or the elliptically polarized light, and the polarizing optical element **126a** is the quarter-wave plate, the image light **L1** is converted into the linearly polarized light after passing through the polarizing optical element **126a**. However, at this time, the polarization direction of the image light **L1** which is converted into the linearly polarized light is the same as the polarization direction of the linear polarizing unit **124a**, so that the image light **L1** can pass through the linear polarizing unit **124a**, and enter to the liquid crystal optical units **122**.

[0034] Based on the above, since the polarizing optical element **114** of the display equipment **110** is capable of converting the polarization state of the image light **L1** into the non-linear polarization, for example, converting the image light **L1** into the circularly polarized light, the elliptically polarized light, or the natural light, an included angle between the polarization direction of the linear polarizing unit **124a** in the shutter glasses **120a** and the polarization direction of the linear polarizing unit **112a** in the display equipment **110** does not affect that the image light **L1** passes through the shutter glasses **120a**.

[0035] In other words, even if the included angle between the polarization direction of the linear polarizing unit **124a** and the polarization direction of the linear polarizing unit **112a** changes, the viewer wearing the shutter glasses **120a** will not perceive any abnormal variation in brightness when viewing images of the display equipment **110**. Therefore, the brightness of the images with the stereoscopic visual effect provided by the 3D image display system **100a** of this embodiment is not affected by the polarization directions of the linear polarizing unit **124a** and **112a**.

[0036] It should be noted that the 3D image display system **100a** also can not use the polarizing optical element **114** or **126a**. That is to say, in the embodiment shown in FIG. 1A, the polarizing optical element **126a** of the shutter glasses **120a** or the polarizing optical element **114** of the display equipment **110** may be omitted, so that the 3D image display system **100a** may use only one polarizing optical element, and the polarizing optical element belongs to the shutter glasses **120a** or the display equipment **110**.

[0037] When the 3D image display system **100a** uses only one polarizing optical element (that is, the polarizing optical element **114** or **126a**), the display equipment **110** still can normally display images, and the shutter glasses **120a** still can block view of the eye of the viewer in a timely manner.

That is to say, even if the polarizing optical element **114** or **126a** is not used, the 3D image display system **100a** can normally operate on the whole.

[0038] Moreover, the polarizing optical elements **114** and **126a** are both capable of changing a polarization state of a light, so that even if the 3D image display system **100a** uses only one of the polarizing optical element **114** and **126a**, the included angle between the polarization direction of the linear polarizing unit **124a** in the shutter glasses **120a** and the polarization direction of the linear polarizing unit **112a** in the display equipment **110** does not still affect that the image light **L1** passes through the shutter glasses **120a**.

[0039] In detail, when the 3D image display system **100a** only uses the polarizing optical element **114** but does not use the polarizing optical element **126a**, that is, only the polarizing optical element **114** of the display equipment **110** is used, the polarization state of the image light **L1** emitted by the display equipment **110** from the polarizing optical element **114** is still the non-linear polarization, so that the image light **L1** can still pass through the linear polarizing unit **124a** of the shutter glasses **120a** without blocked by the linear polarizing unit **124a**.

[0040] On the contrary, when the 3D image display system **100a** only uses the polarizing optical element **126a** but does not use the polarizing optical element **114**, that is, only the polarizing optical element **126a** of the shutter glasses **120a** is used, although the image light **L1** emitted by the display equipment **110** is not converted into the linearly polarized light because the image light **L1** does not pass through the polarizing optical element **114**, the polarizing optical element **126a** can convert the polarization state of the image light **L1** from the linear polarization into the non-linear polarization. For example, the image light **L1** is converted into the circularly polarized light, the elliptically polarized light, or the natural light, such that the image light **L1** can pass through the linear polarizing unit **124a** without blocked by the linear polarizing unit **124a**.

[0041] It can be seen that no matter whether both the display equipment **110** and the shutter glasses **120a** have polarizing optical elements, or only one of the display equipment **110** and the shutter glasses **120a** has a polarizing optical element, the included angle between the polarization directions of the linear polarizing unit **124a** and the linear polarizing unit **112a** does not affect that the image light **L1** passes through the shutter glasses **120a**. Therefore, the polarizing optical elements **114** and **126a** shown in FIG. 1A are merely illustrated as an example and not limited the invention.

[0042] FIG. 1B is a schematic top view of a 3D image display system according to another embodiment of the present invention. Referring to FIG. 1B, a 3D image display system **100b** of the embodiment includes a display equipment **110** and a shutter glasses **120b**. The shutter glasses **120b** is similar to the shutter glasses **120a** of the above embodiment, except that the shutter glasses **120b** includes two linear polarizing units **124b** and two polarizing optical elements **126b**, as shown in FIG. 1B.

[0043] In particular, the polarizing optical elements **126b** are respectively corresponding to the liquid crystal optical units **122**, and the linear polarizing units **124b** are also respectively corresponding to the liquid crystal optical units **122**. The linear polarizing units **124b** are disposed between the polarizing optical elements **126b** and the liquid crystal optical units **122**, and each of the polarizing optical elements **126b** may be attached on one of the linear polarizing units **124b**.

Thus, before the image light L1 enters to the liquid crystal optical units 122, the image light L1 still passes through the polarizing optical elements 126b and the linear polarizing units 124b in sequence.

[0044] The 3D image display systems 100b and 100a are the same in terms of advantages, functions, and principles of generating the stereoscopic visual effect, so that the details will not be described herein again. In addition, in other embodiments, the linear polarizing units 124b may be replaced by a single linear polarizing unit 124a, and the polarizing optical elements 126b may be replaced by a single polarizing optical element 126a. Therefore, the numbers of the linear polarizing units 124b and the polarizing optical elements 126b in FIG. 1B are merely illustrated as an example, and not limited the present invention.

[0045] FIG. 2 is a schematic top view of a 3D image display system according to another embodiment of the present invention. Referring to FIG. 2, a 3D image display system 200 of this embodiment is similar to the 3D image display system 100a shown in FIG. 1A and includes a display equipment 210 and a shutter glasses 220. The display equipment 210 and the shutter glasses 220 are respectively similar to the display equipment 110 and the shutter glasses 120a in terms of construction, except that polarizing optical elements 214 and 230 used in the display equipment 210 and the shutter glasses 220 are different from the polarizing optical elements 114 and 126a.

[0046] In detail, the display equipment 210 includes an LCD module 112 and a polarizing optical element 214, and the shutter glasses 220 includes two liquid crystal optical units 122, a linear polarizing unit 124a, and a polarizing optical element 230. The polarizing optical elements 214 and 230 are both circular polarizers, and the circular polarizer includes a quarter-wave plate and a linear polarizer. That is to say, the polarizing optical element 214 includes a linear polarizer 214a and a quarter-wave plate 214b, and the polarizing optical element 230 includes a linear polarizer 232 and a quarter-wave plate 234.

[0047] In the display equipment 210, the polarizing optical element 214 may be attached on the linear polarizing unit 112a of the LCD module 112, and the linear polarizer 214a is located between the linear polarizing unit 112a and the quarter-wave plate 214b. An included angle between a polarization direction of the linear polarizer 214a and a fast axis (or a slow axis) of the quarter-wave plate 214b is equal to 45 degrees, and the linear polarizer 214a and the linear polarizing unit 112a have the same polarization direction, so that the image light L1 can pass through the polarizing optical element 230 and be converted into a circularly polarized light by the quarter-wave plate 214b.

[0048] In the shutter glasses 220, the polarizing optical element 230 may be attached on the linear polarizing unit 124a, and the linear polarizer 232 is located between the linear polarizing unit 124a and the quarter-wave plate 234. An included angle between a polarization direction of the linear polarizer 232 and a fast axis (or a slow axis) of the quarter-wave plate 234 is equal to 45 degrees, and the linear polarizer 232 and the linear polarizing unit 124a have the same polarization direction.

[0049] When the image light L1 emitted from the polarizing optical element 214 enters to the shutter glasses 220, the image light L1 passes through the quarter-wave plate 234, the linear polarizer 232, and the linear polarizing unit 124a in sequence. At this time, the quarter-wave plate 234 converts

the image light L1 into a linearly polarized light with a polarization direction that is the same as the polarization direction of the linear polarizer 232, so that the image light L1 can pass through the linear polarizer 232 and the linear polarizing unit 124a, and enters to the LCD module 112.

[0050] It can be seen that since the polarizing optical element 214 of the display equipment 210 is capable of converting the image light L1 into the circularly polarized light, an included angle between the polarization directions of the linear polarizing unit 124a in the shutter glasses 220 and the polarization directions of the linear polarizing unit 112a in the display equipment 210 does not affect that the image light L1 passes through the shutter glasses 220. Therefore, the polarization directions of the linear polarizing unit 124a and the linear polarizing unit 112a do not affect the brightness of the images which have the stereoscopic visual effect and are provided by the 3D image display system 200 in the embodiment.

[0051] In addition, it is similar to the above embodiments that the 3D image display system 200 may also not use the polarizing optical element 214 or 230, but use only one polarizing optical element (for example, the polarizing optical element 214 or 230). That is to say, in the embodiment shown in FIG. 2, the polarizing optical element 230 of the shutter glasses 220 may be omitted, and only the polarizing optical element 214 of the display equipment 210 is used; or the polarizing optical element 214 may be omitted, and only the polarizing optical element 230 is used.

[0052] When the 3D image display system 200 uses only one polarizing optical element (that is, the polarizing optical element 214 or 230), the display equipment 210 still can normally display images, and the shutter glasses 220 still can block view of the eyes of the viewer in a timely manner. Therefore, even if the polarizing optical element 214 or 230 is not used, the 3D image display system 200 can also normally operate on the whole.

[0053] Moreover, the polarizing optical elements 214 and 230 are circular polarizer and thus are both capable of changing a polarization state of a light. Even if the 3D image display system 200 uses only the polarizing optical element 214 or 230, the included angle between the polarization directions of the linear polarizing unit 124a and the linear polarizing unit 112a does not affect that the image light L1 passes through the shutter glasses 220. Therefore, no matter whether both the display equipment 210 and the shutter glasses 220 have polarizing optical elements, or only one of the display equipment 210 and the shutter glasses 220 has a polarizing optical element, the image light L1 still can pass through the linear polarizing unit 124a without blocked.

[0054] It should be noted that although the number of the circular polarizer (that is, the polarizing optical element 230) included in the shutter glasses 220 in FIG. 2 is only one, in other embodiments, the shutter glasses 220 may also include two circular polarizers, and the circular polarizers are respectively corresponding to the liquid crystal optical units 122 and may be attached on the linear polarizing unit 124a. Besides, the single linear polarizing unit 124a shown in FIG. 2 may be replaced by the two linear polarizing units 124b shown in FIG. 1B. It can be seen that both numbers of the linear polarizing units 124a and the polarizing optical elements 230 in FIG. 2 are merely illustrated as an example and not limited the present invention.

[0055] Based on the above, since the shutter glasses alternately block view of a left eye and a right eye, and the display

equipment alternately displays left-eye frames served for the left eye and right-eye frames served for the right eye, the 3D image display system of the present invention can provide images with a stereoscopic visual effect for a viewer, such that the viewer can see realistic stereoscopic images.

[0056] Moreover, the 3D image display system of the present invention may use at least one polarizing optical element, and the polarizing optical element is capable of changing the polarization state of the image light generated by the display equipment, such that the included angle between the polarization direction of the linear polarizing unit in the shutter glasses and the polarization direction of the linear polarizing unit in the display equipment does not affect that the image light passes through the shutter glasses. Therefore, when the viewer wears the shutter glasses to view images displayed by the display equipment, the brightness of the images will not change under the influence of the polarization directions of the linear polarizing unit and the linear polarizing unit, thereby preventing from reducing the viewer's enjoyment of the stereoscopic visual effect due to the abnormal variation in the brightness of the images.

[0057] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

What is claimed is:

1. A shutter glasses, applied to a 3D image display system, the shutter glasses comprising:
 - two liquid crystal optical units;
 - at least one polarizing optical element; and
 - at least one linear polarizing unit, disposed between the polarizing optical element and the liquid crystal optical units, wherein an image light passes through the polarizing optical element, the linear polarizing unit, and one of the liquid crystal optical units in sequence, and when the image light passes through one of the liquid crystal optical units, the other liquid crystal optical unit blocks the image light.
2. The shutter glasses according to claim 1, wherein the polarizing optical element is a diffuser or a quarter-wave plate.
3. The shutter glasses according to claim 1, wherein the polarizing optical element is a circular polarizer.
4. The shutter glasses according to claim 3, wherein the circular polarizer comprises a quarter-wave plate and a linear polarizer, the linear polarizer is located between the linear polarizing unit and the quarter-wave plate, and the linear polarizer and the linear polarizing unit have a same polarization direction.
5. The shutter glasses according to claim 1, wherein the polarizing optical element is attached on the linear polarizing unit.
6. The shutter glasses according to claim 1, wherein a number of the polarizing optical element is two, and the polarizing optical elements are respectively corresponding to the liquid crystal optical units.
7. A display equipment, applied to a 3D image display system, the display equipment comprising:
 - an LCD module, having a linear polarizing unit and capable of generating an image light from the linear polarizing unit; and

- a polarizing optical element, disposed on a transmission path of the image light and used for converting a polarization state of the image light from a linear polarization into a non-linear polarization.

8. The display equipment according to claim 7, wherein the polarizing optical element is a diffuser or a quarter-wave plate.

9. The display equipment according to claim 7, wherein the polarizing optical element is a circular polarizer.

10. The display equipment according to claim 9, wherein the circular polarizer comprises a quarter-wave plate and a linear polarizer, the linear polarizer is located between the linear polarizing unit and the quarter-wave plate, and the linear polarizer and the linear polarizing unit have a same polarization direction.

11. The display equipment according to claim 7, wherein the polarizing optical element is attached on the linear polarizing unit.

12. A 3D image display system, comprising:

- a display equipment, comprising an LCD module, wherein the LCD module has a linear polarizing unit and is capable of generating an image light from the linear polarizing unit; and

- a shutter glasses, comprising two liquid crystal optical units, at least one linear polarizing unit, and at least one polarizing optical element, wherein the linear polarizing unit is disposed between the polarizing optical element and the liquid crystal optical units, the image light passes through the polarizing optical element, the linear polarizing unit, and one of the liquid crystal optical units in sequence, and when the image light passes through one of the liquid crystal optical units, the other liquid crystal optical unit blocks the image light.

13. The 3D image display system according to claim 12, wherein the polarizing optical element is a diffuser or a quarter-wave plate.

14. The 3D image display system according to claim 12, wherein the polarizing optical element is a circular polarizer.

15. The 3D image display system according to claim 14, wherein the circular polarizer comprises a quarter-wave plate and a linear polarizer, the linear polarizer is located between the linear polarizing unit and the quarter-wave plate, and the linear polarizer and the linear polarizing unit have a same polarization direction.

16. The 3D image display system according to claim 12, wherein the polarizing optical element is attached on the linear polarizing unit.

17. The 3D image display system according to claim 12, wherein a number of the polarizing optical element is two, and the polarizing optical elements are respectively corresponding to the liquid crystal optical units.

18. The 3D image display system according to claim 12, wherein the display equipment further comprises another polarizing optical element disposed on a transmission path of the image light and used for converting a polarization state of the image light from a linear polarization into a non-linear polarization.

19. The 3D image display system according to claim 18, wherein the polarizing optical element of the display equipment is attached on the linear polarizing unit.

20. A 3D image display system, comprising:

- a display equipment, comprising an LCD module and a polarizing optical element, wherein the LCD module has a linear polarizing unit and is capable of generating

an image light from the linear polarizing unit, the polarizing optical element is disposed on a transmission path of the image light and used for converting a polarization state of the image light from a linear polarization into a non-linear polarization; and

- a shutter glasses, comprising two liquid crystal optical units and at least one linear polarizing unit, wherein the liquid crystal optical units and the linear polarizing unit are located on the transmission path of the image light, the image light passes through the polarizing optical element, the linear polarizing unit, and one of the liquid crystal optical units in sequence, and when the image light passes through one of the liquid crystal optical units, the other liquid crystal optical unit blocks the image light.

21. The 3D image display system according to claim **20**, wherein the polarizing optical element is a diffuser or a quarter-wave plate.

22. The 3D image display system according to claim **20**, wherein the polarizing optical element is a circular polarizer.

23. The 3D image display system according to claim **22**, wherein the circular polarizer comprises a quarter-wave plate and a linear polarizer, the linear polarizer is located between the linear polarizing unit and the quarter-wave plate, and the linear polarizer and the linear polarizing unit have a same polarization direction.

24. The 3D image display system according to claim **20**, wherein the polarizing optical element is attached on the linear polarizing unit.

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摘要(译)

3D图像显示系统包括显示设备和快门眼镜。显示设备包括LCD模块。LCD模块具有线性偏振单元并且能够从线性偏振单元产生图像光。快门眼镜包括两个液晶光学单元，至少一个线性偏振单元和至少一个偏振光学元件。线性偏振单元设置在偏振光学元件和液晶光学单元之间。图像光依次通过偏振光学元件，线性偏振单元和一个液晶光学单元。当图像光通过一个液晶光学单元时，另一个液晶光学单元阻挡图像光。

