Delta Electronics 3D Display & Projection Patent Portfolio

16 Patent Families – 23 Active Assets

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Executive Summary

- RZV has been exclusively retained by Delta Electronics to support the monetization of a patent portfolio covering foundational 3D illumination, projection, and glasses-free display technologies with remaining life through the mid-to-late 2030s.
- Delta Electronics is a global leader in power and thermal management, providing high-efficiency solutions for IT infrastructure, electric vehicles, and industrial applications, and, through its subsidiaries, technologies for smart buildings, intelligent video surveillance, and healthcare.
- Specifically, the portfolio protects core stereoscopic hardware, including projector light-source and illumination systems (multi-primary solid-state engines), holographic / virtual-image projection configurations, multi-view autostereoscopic (glasses-free) displays using lenticular and microlens optics, compact head-mounted display optical modules (e.g., light-turning prisms, light-guide structures), stereoscopic light-source and backlight modules, and modular multi-projector / video-wall configurations.

Active Granted Patents:
16 US, 5 TW, 2 CN
Encumbrances & EOU Information:
Available under NDA
Price Expectations:
Consistent with current market
Deal Structure:
We will consider all proposals
Deadlines:
Offers will be considered in the order received

Portfolio (US Granted Patents)

INPADOC Family	Patent Number	Delta Number	Priority Date	Estimated Expiry	Title
451060734	US9507166B2	20120088-US	2013-01-09	2035-01-05	Illumination system for stereoscopic projection device
451164914	US9453955B2	20120389-US	2013-01-15	2034-02-20	Projection system
459066181	US10101587B2	201510089-US	2015-12-18	2036-07-18	Display apparatus
462014403	US10368060B2	201610221-US	2016-12-06	2037-06-12	Head mounted display
447518757	US8827456B2	20110080-US	2011-07-15	2033-01-09	Projector and splitting and combining units thereof
447910816	US8952996B2	20110038-US	2011-09-27	2033-04-06	Image display system
448743715	US9261703B2	20110382-US	2012-01-11	2033-04-30	Multi-view autostereoscopic display
449621350	US9151956B2	20120035-US	2012-05-23	2033-11-04	Light source system for stereoscopic projection
455267303	US9568740B2	20140076-US	2014-08-06	2035-10-14	Six-primary solid state illuminator and operating method using the same
455348202	US9684178B2	20140079-US	2014-08-19	2035-04-04	Solid state illuminator for emitting beams with different wavelengths and operating method using the same
455402289	US9442301B2	20140077-US	2014-08-28	2035-05-21	Autostereoscopic display device and autostereoscopic display method using the same
457749347	US9547227B1	20150090-US	2015-08-07	2035-12-04	Display apparatus
459367777	US10666931B2	201510171-US	2016-04-15	2038-07-28	Autostereoscopic display device and autostereoscopic display method
460189206	US10514551B2	201610072-US	2016-07-20	2037-08-24	Stereo display device
461525542	US9915773B1	201610371-US	2017-04-28	2037-06-18	Backlight module and stereo display device using the same
462951628	US10488664B2	201610195-US	2017-02-16	2038-03-12	Head mounted display

Note: Table shows US granted patents; corresponding TW and CN patents available in the provided spreadsheet.

Key Assets

US 9,507,166 B2

Title:	Illumination system for stereoscopic projection device
Priority:	09 January 2013
Est. Expiry:	05 January 2035
Independent Claims	2
Abstract	An illumination system for a stereoscopic projection device is provided. The illumination system comprises a luminous element and a color wheel module. The luminous element is adapted to generate a plurality of first wave band lights when the color wheel module has a plurality of wave band transmitting transforming areas and a plurality of wave band reflecting transforming areas. When the first wave band lights are projected to the wave band transmitting transforming areas, the first wave band lights are adapted to transmit the wave band transmitting transforming areas to excite a plurality of first selected wave band lights. When the first wave band lights are projected to the wave band reflecting transforming areas, the wave band reflecting transforming areas are adapted to excite and reflect a plurality of second selected wave band lights.

1. An illumination system for a stereoscopic projection device, comprising:
a luminous element generating a plurality of first wave band lights; and
a color wheel module having a rotating disk, a plurality of wave band transmitting transforming areas and a plurality of wave band reflecting transforming areas which are formed on the rotating disk;
wherein when the first wave band lights are projected to the wave band transmitting transforming areas, the first wave band lights transmit the wave band transmitting transforming areas to excite a plurality of first selected wave band lights different from the first wave band lights, and when the first wave band lights are projected to the wave band reflecting transforming areas, a plurality of second selected wave band lights different from the first wave band lights and the first selected wave band lights are excited and reflected from the wave band reflecting transforming areas.

US 9,151,956 B2

Title:	Light source system for stereoscopic projection
Priority:	23 May 2012
Est. Expiry:	04 November 2033
Independent Claims	1
Abstract	A light source system for stereoscopic projection is disclosed, which includes: at least one light source set, two filters, a rotary wheel, a TIR prism, a multiband filter and at least one reflector. The at least one light source set and the two filters are disposed at a first side of the rotary wheel, while the TIR prism, the reflector and the multiband filter are disposed at a second side of the rotary wheel. With the above arrangements, the light source system could provide different lights of different wavebands to a light valve of a projector in different time sequences, and the projector could thus project a right-eye view angle image and a left-eye view angle image to viewers to form a stereoscopic image.

1. A light source system for stereoscopic projection, comprising:
a first light source set, having a first solid-state light source for providing a first light of a first waveband and a second solid-state light source for providing a second light of a second waveband;
two filters, being disposed in front of the first light source set, and matching the first waveband and the second waveband respectively;
a rotary wheel, having a first side and a second side opposite the first side, wherein the first light source set and the two filters are disposed at the first side;
a total internal reflection (TIR) prism, being disposed at the second side of the rotary wheel, and having a first surface and a second surface which are perpendicularly connected to each other, and further having a light exit surface which is oblique to the first and second surfaces, wherein the first surface faces the rotary wheel;
a multiband filter, being disposed at the second side of the rotary wheel, and being adjacent to and directly facing the second surface; and
a first reflector, being disposed at the second side of the rotary wheel and facing the second surface, wherein the multiband filter is disposed between the first reflector and the second surface, and the first reflector is oblique to and directly facing the multiband filter.

US 9,453,955 B2

Title:	Projection system
Priority:	15 January 2013
Est. Expiry:	20 February 2034
Independent Claims	1
Abstract	A projection system includes at least one projector and a holographic projection film. The projector projects a first image to a projection surface. The holographic projection film mirrors the first image on the projection surface to form a second image on an imaging surface. The projection surface and a standard surface define a first angle therebetween. The first angle is Y degrees. The holographic projection film and the standard surface define a second angle therebetween. The second angle is 45+X degrees. Y and X substantially satisfy: Y=2X.

1. A projection system, comprising:
at least one projector for projecting a first image to a projection surface;
a holographic projection film for mirroring the first image on the projection surface to form a second image on an imaging surface, wherein the projection surface and a standard surface define a first angle therebetween, the first angle being Y degrees, and the holographic projection film and the standard surface define a second angle therebetween, the second angle being 45+X degrees, wherein Y and X substantially satisfy: Y=2X;
a holographic projection frame encompassing the holographic projection film; and
an angle adjusting device comprising a motor, the angle adjusting device being coupled to the holographic projection frame and configured to mechanically drive the holographic projection frame to rotate so as to adjust the second angle.

US 10,101,587 B2

Title:	Display apparatus
Priority:	18 December 2015
Est. Expiry:	18 July 2036
Independent Claims	2
Abstract	A display apparatus and a display method are disclosed. The display apparatus includes a left eye block and a right eye block. Each of the left eye and right eye block includes a relay unit and an eyepiece unit. Relay unit including at least one first optical lens is configured to receive light beams of input image, and generate a relay image by enlarging input image through the at least one first optical lens. The eyepiece unit including at least one second optical lens is configured to receive light beams of relay image, and generate an output image for a user to see by converging light beams of relay image through the at least one second optical lens.

1. A display apparatus, comprising:
a left eye block and a right eye block, each of the left eye block and the right eye block comprising:
a relay unit comprising at least one first optical lens configured to receive light beams of an input image and generate a relay image by enlarging the input image through the at least one first optical lens; and
an eyepiece unit comprising at least one second optical lens configured to receive light beams of the relay image and generate an output image by converging the light beams of the relay image through the at least one second optical lens, wherein the at least one first optical lens comprises:
a first positive lens assembly, configured to receive the light beams of the input image;
a first reflecting mirror, configured to receive the light beams of the input image transmitted from the first positive lens assembly and reflect the light beams of the input image;
a first negative lens assembly, configured to receive the light beams of the input image from the first reflecting mirror; and
a second reflecting mirror, configured to receive the light beams of the input image transmitted from the first negative lens and reflect the light beams of the input image to form the relay image.

US 10,368,060 B2

Title:	Head mounted display
Priority:	06 December 2016
Est. Expiry:	12 June 2037
Independent Claims	1
Abstract	A head mounted display includes a first and second light sources, a light turning prism, a field lens group, an image output module, a first and second eyepiece modules. The first and second light sources are respectively configured to emit first and second lights. The image output module is configured to receive the first light and the second light, and to respectively generate a first image light and a second image light with corresponding image information. The light turning prism is optically coupled between the first light source (or the second light source) and the field lens group. The light turning prism is configured to vary a propagating direction of the first light (or the second light) from the first light source (or the second light source) to the image output module. The first/second eyepiece modules are configured to make the second/first image light image to first/second target positions.

1. A head mounted display, comprising:
a first light source configured to emit a first light;
a second light source configured to emit a second light;
an image output module configured to receive the first light and the second light, and to respectively generate a first image light and a second image light with corresponding image information;
a light turning prism configured to vary a propagating direction of the first light from the first light source to the image output module and vary a propagating direction of the second light from the second light source to the image output module, wherein the light turning prism has a first light-redirecting surface and a second light-redirecting surface extending to a region between the first and second light sources, a distance between the first and second light-redirecting surfaces decreases as the first and second light-redirecting surface are further away from the image output module, the first light-redirecting surface is configured to redirect the propagating direction of the second light in a reflecting manner and to allow the second image light to pass therethrough, the second light-redirecting surface is configured to redirect the propagating direction of the first light in the reflecting manner and to allow the first image light to pass therethrough, where the first light-redirecting surface is more proximal to the first light source than the second light-redirecting surface, and the second light-redirecting surface is more proximal to the second light source than the first light-redirecting surface;
a first eyepiece module configured to make the second image light image to a first target position; and
a second eyepiece module configured to make the first image light image to a second target position;
wherein the first light source is disposed between the light turning prism and the first eyepiece module, and the second light source is disposed between the light turning prism and the second eyepiece module.

Thanks!

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