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Jo

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(45) **Date of Patent: Jul. 30, 2019**

(54) **LAMP INCLUDING A MICRO-LED ARRAY FOR VEHICLE AND VEHICLE HAVING THE SAME**

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(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

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(51) **Int. Cl.**

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F21S 41/147	(2018.01)
F21S 41/19	(2018.01)
F21V 23/00	(2015.01)

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(52) **U.S. Cl.**

CPC ***F21V 19/003*** (2013.01); ***F21S 41/147*** (2018.01); ***F21S 41/151*** (2018.01); ***F21S 41/153*** (2018.01); ***F21S 41/19*** (2018.01); ***F21S 41/285*** (2018.01); ***F21S 43/14*** (2018.01); ***F21S 43/19*** (2018.01); ***F21S 43/26*** (2018.01); ***F21S 45/47*** (2018.01); ***F21V 23/001*** (2013.01); ***F21V 29/80*** (2015.01); *F21S 41/176* (2018.01); *F21S 43/16* (2018.01); *F21W 2107/10* (2018.01);

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CPC F21V 19/003; F21V 23/001; F21V 29/80; F21S 43/14; F21S 41/147; F21S 41/19; F21S 43/26; F21S 43/19; F21S 41/285; F21S 45/47; F21S 41/151; F21S 41/176; F21S 43/16; H01L 25/0753; H01L 25/0756; F21Y 2115/10; F21W 2107/10

See application file for complete search history.

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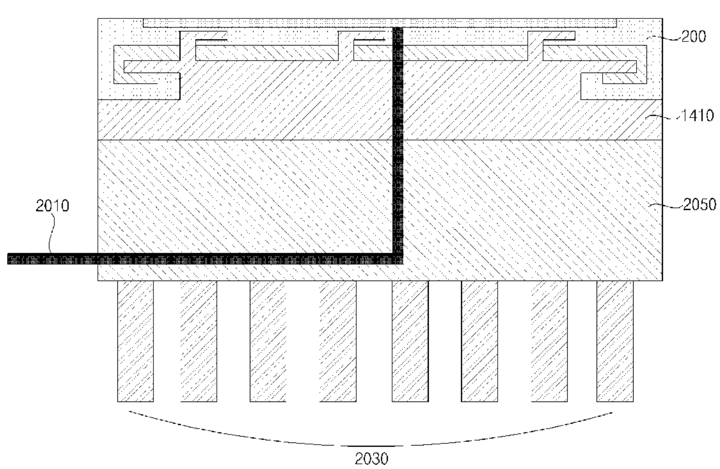
(57) **ABSTRACT**

A lamp for a vehicle includes a light generation unit, a bracket, and a lens configured to change an optical path of light generated by the light generation unit. The light generation unit includes a light array including a plurality of micro Light Emitting Diode (LED) chips, and the light array includes a bent portion that covers at least a part of the bracket.

19 Claims, 25 Drawing Sheets



(51) **Int. Cl.**

F21V 29/80	(2015.01)
F21S 45/47	(2018.01)
F21S 41/153	(2018.01)
F21S 43/14	(2018.01)
F21S 43/19	(2018.01)
F21S 41/151	(2018.01)
F21S 43/20	(2018.01)
F21Y 107/20	(2016.01)
F21Y 115/10	(2016.01)
F21S 41/176	(2018.01)
F21S 43/16	(2018.01)
F21W 107/10	(2018.01)
H01L 25/075	(2006.01)

(52) **U.S. Cl.**
CPC *F21Y 2107/20* (2016.08); *F21Y 2115/10* (2016.08); *H01L 25/0753* (2013.01); *H01L 25/0756* (2013.01)

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FIG. 1

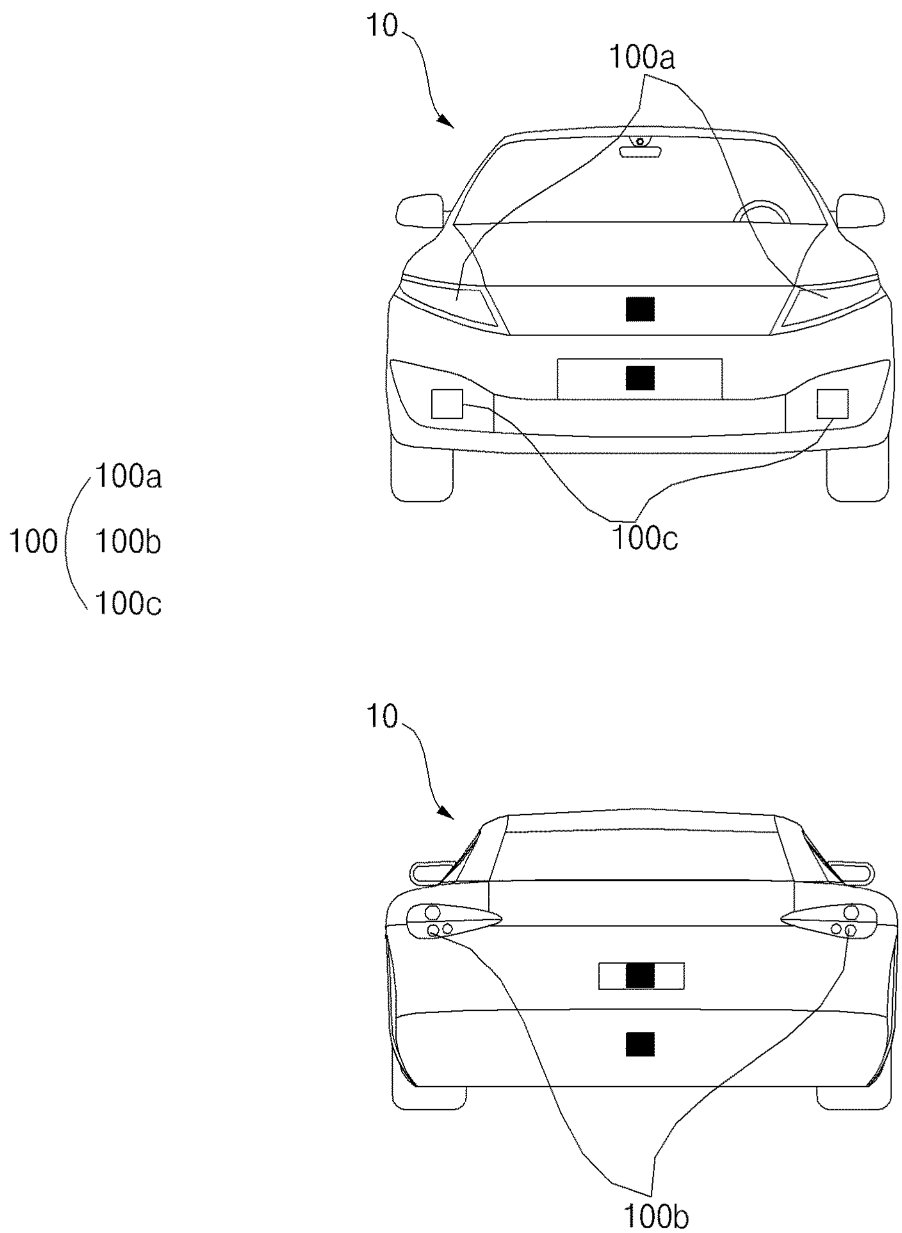


FIG. 2

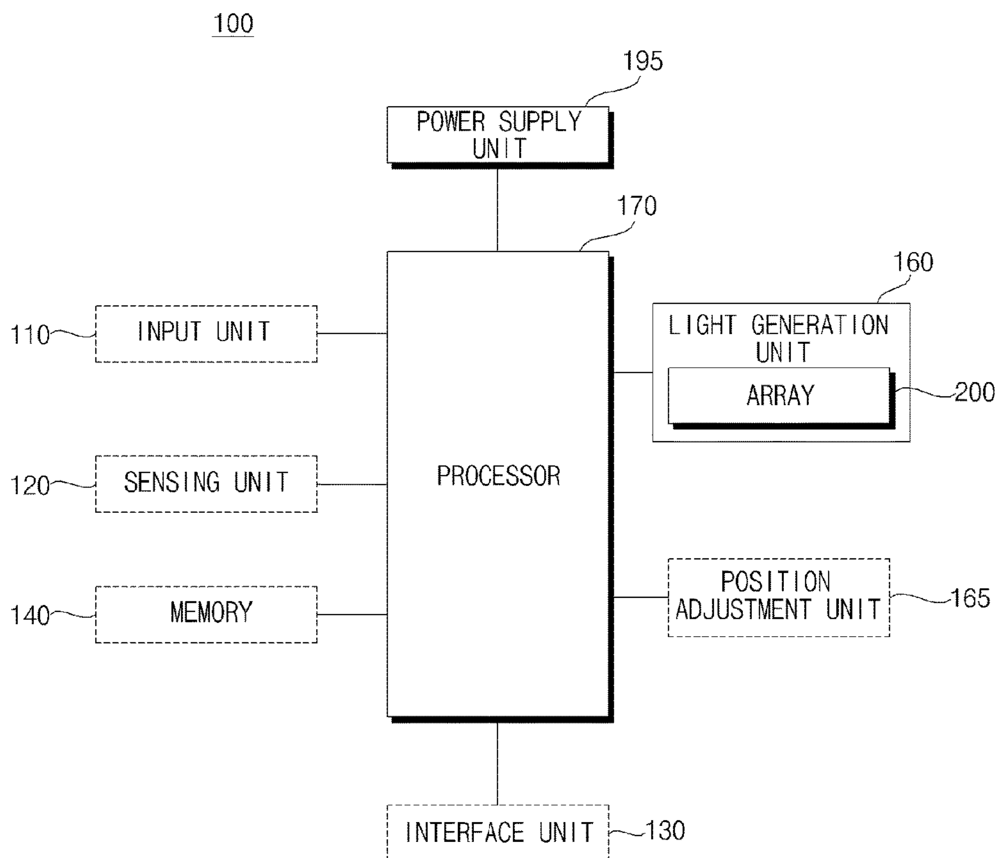

100
195
POWER SUPPLY UNIT
170
160
110
INPUT UNIT
LIGHT GENERATION UNIT
ARRAY
200
120
SENSING UNIT
PROCESSOR
140
MEMORY
POSITION ADJUSTMENT UNIT
165
INTERFACE UNIT
130

FIG. 3A

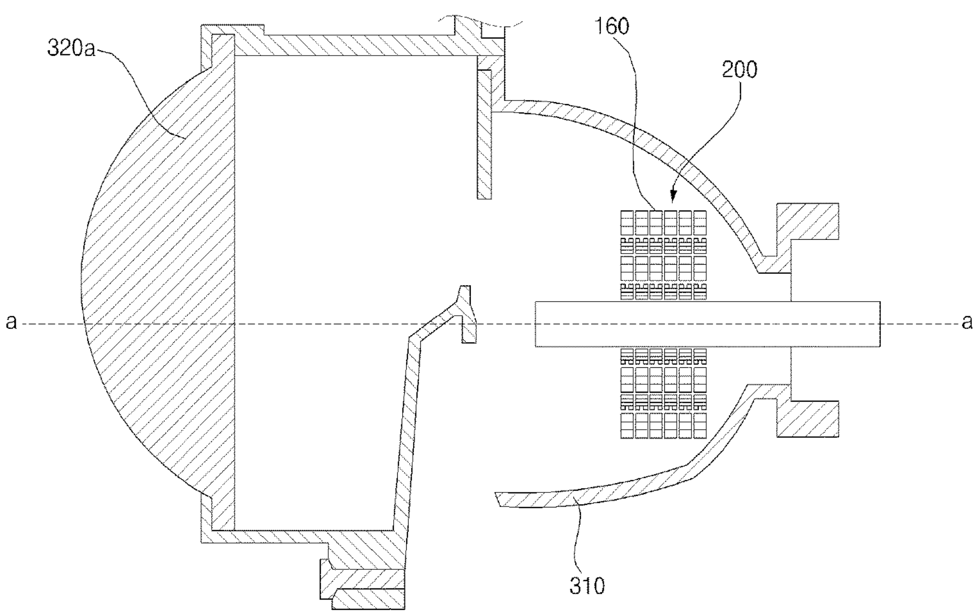


FIG. 3B

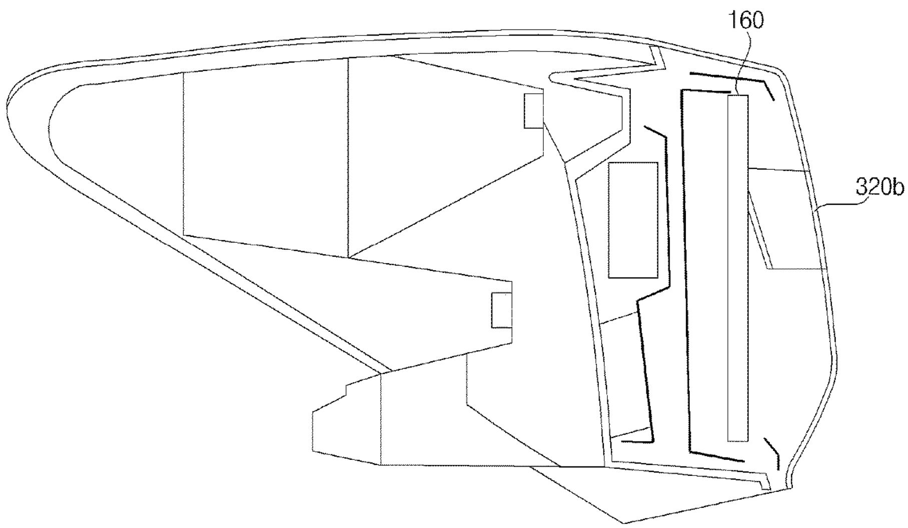


FIG. 4

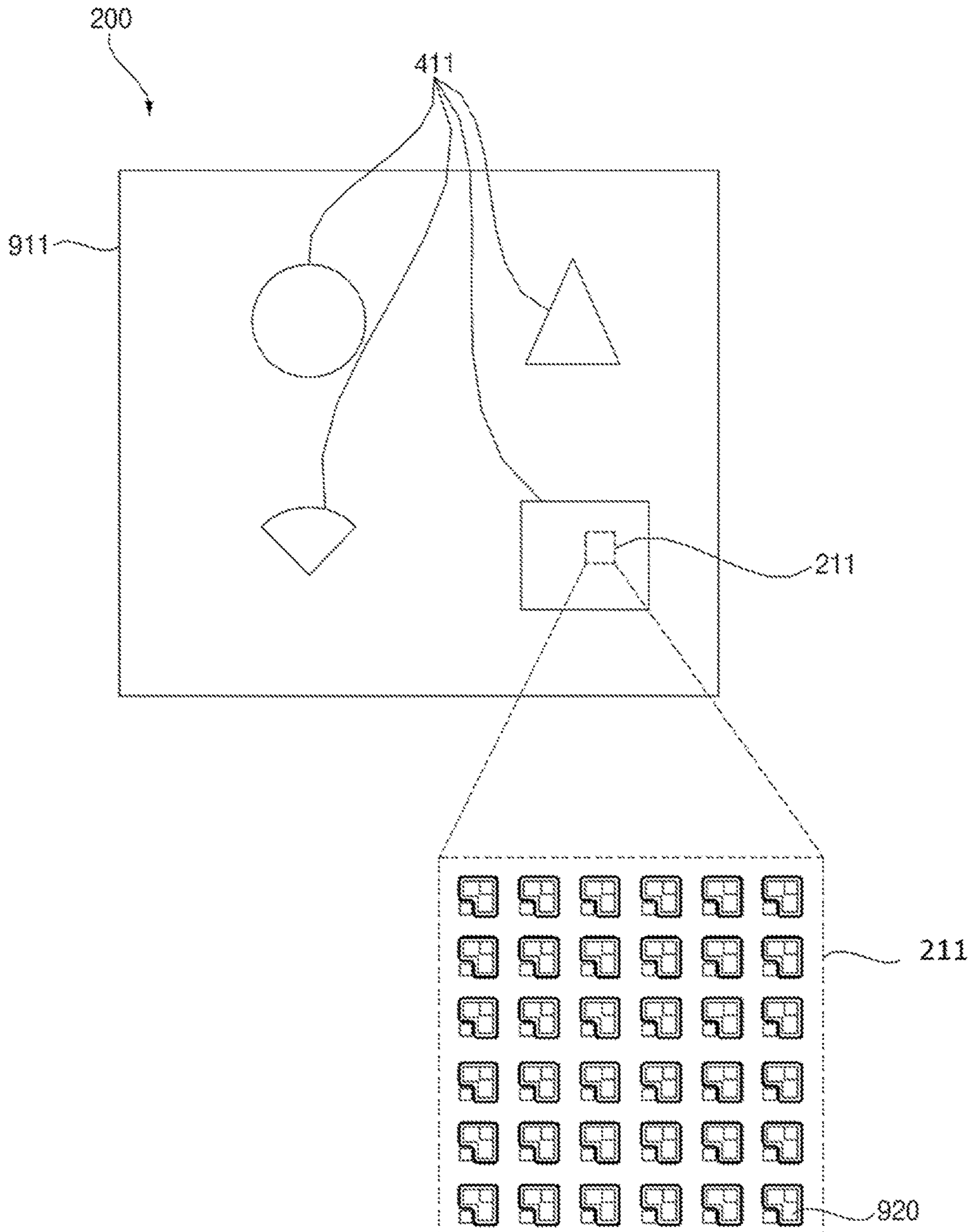


FIG. 5

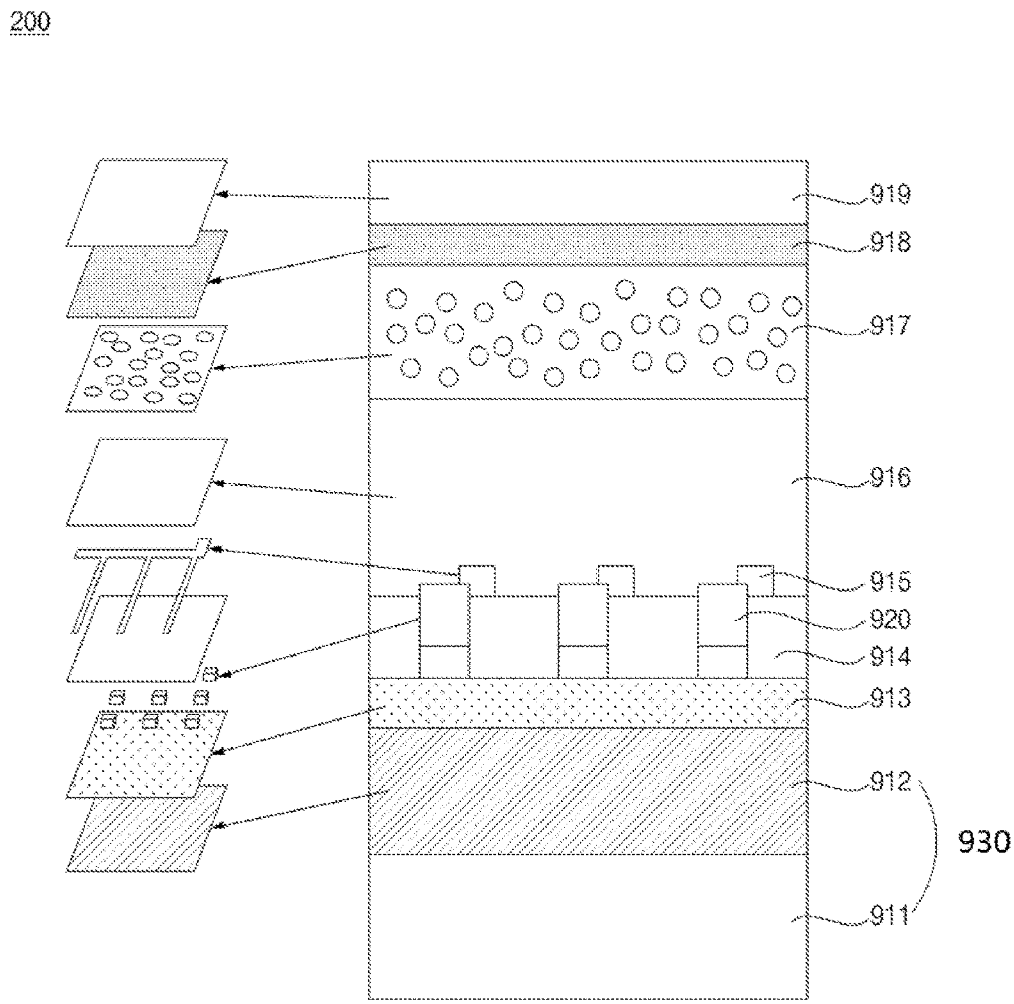


FIG. 6

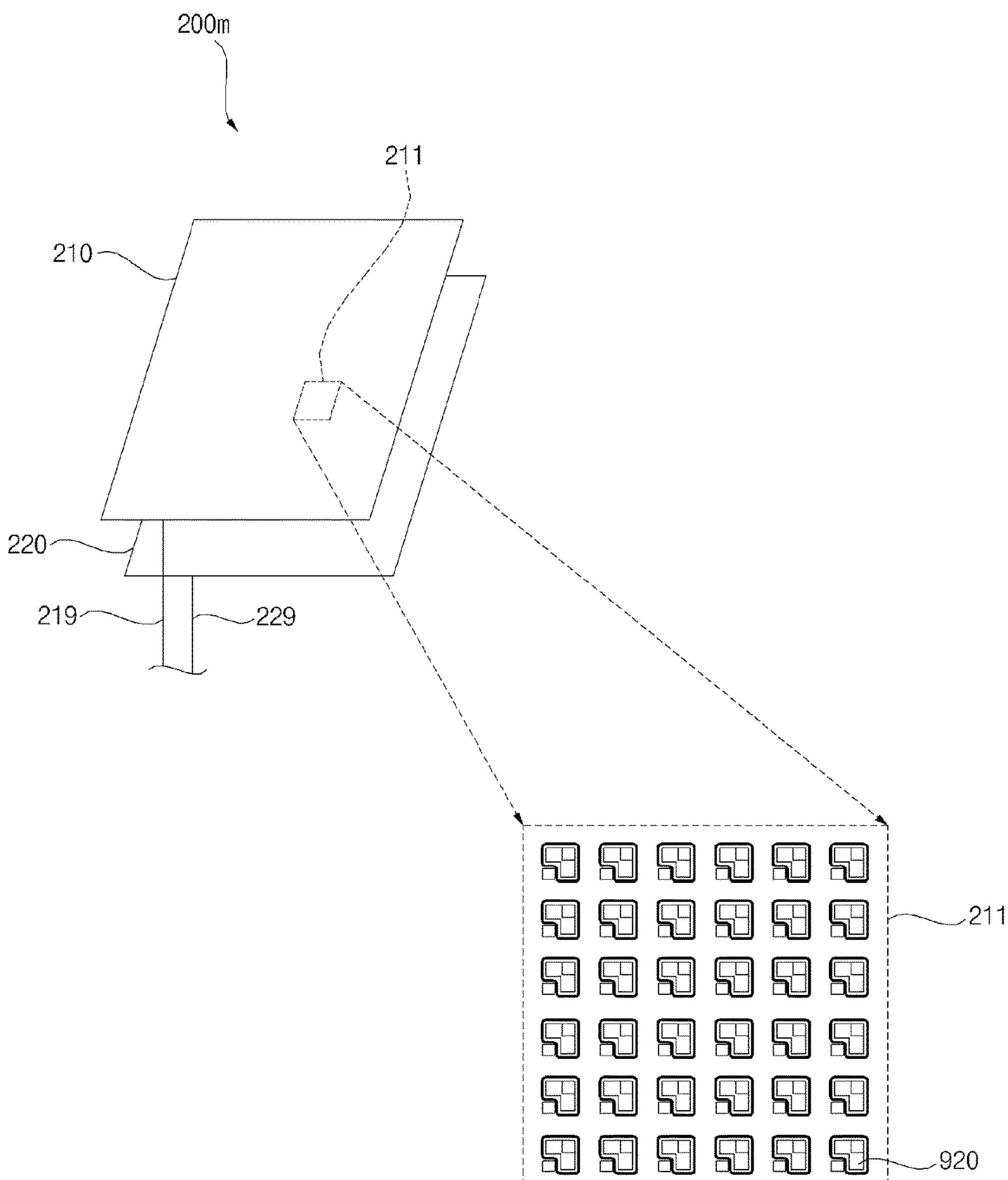


FIG. 7A

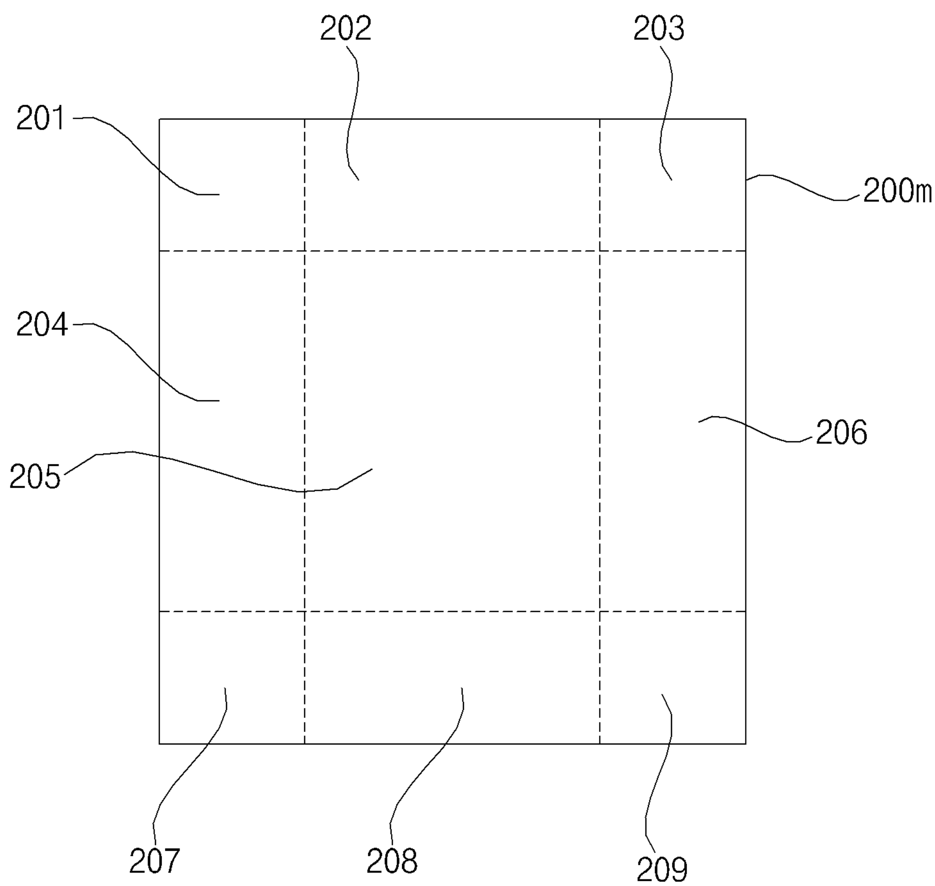


FIG. 7B

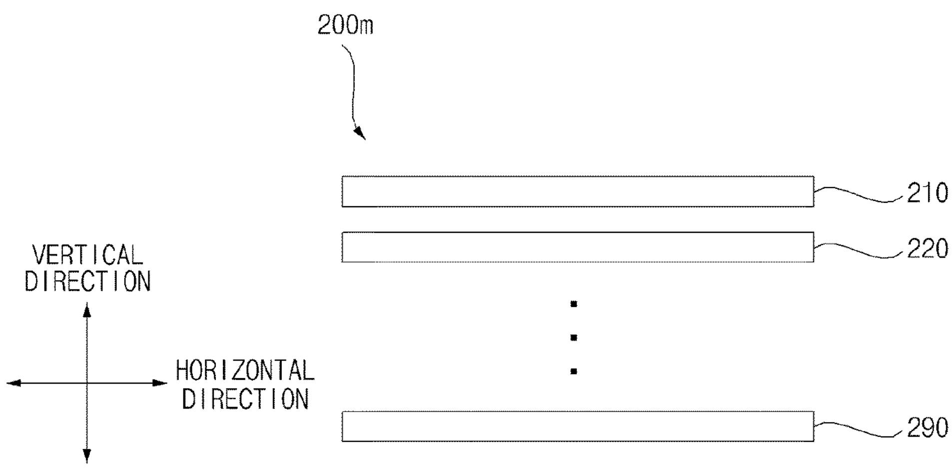


FIG. 8

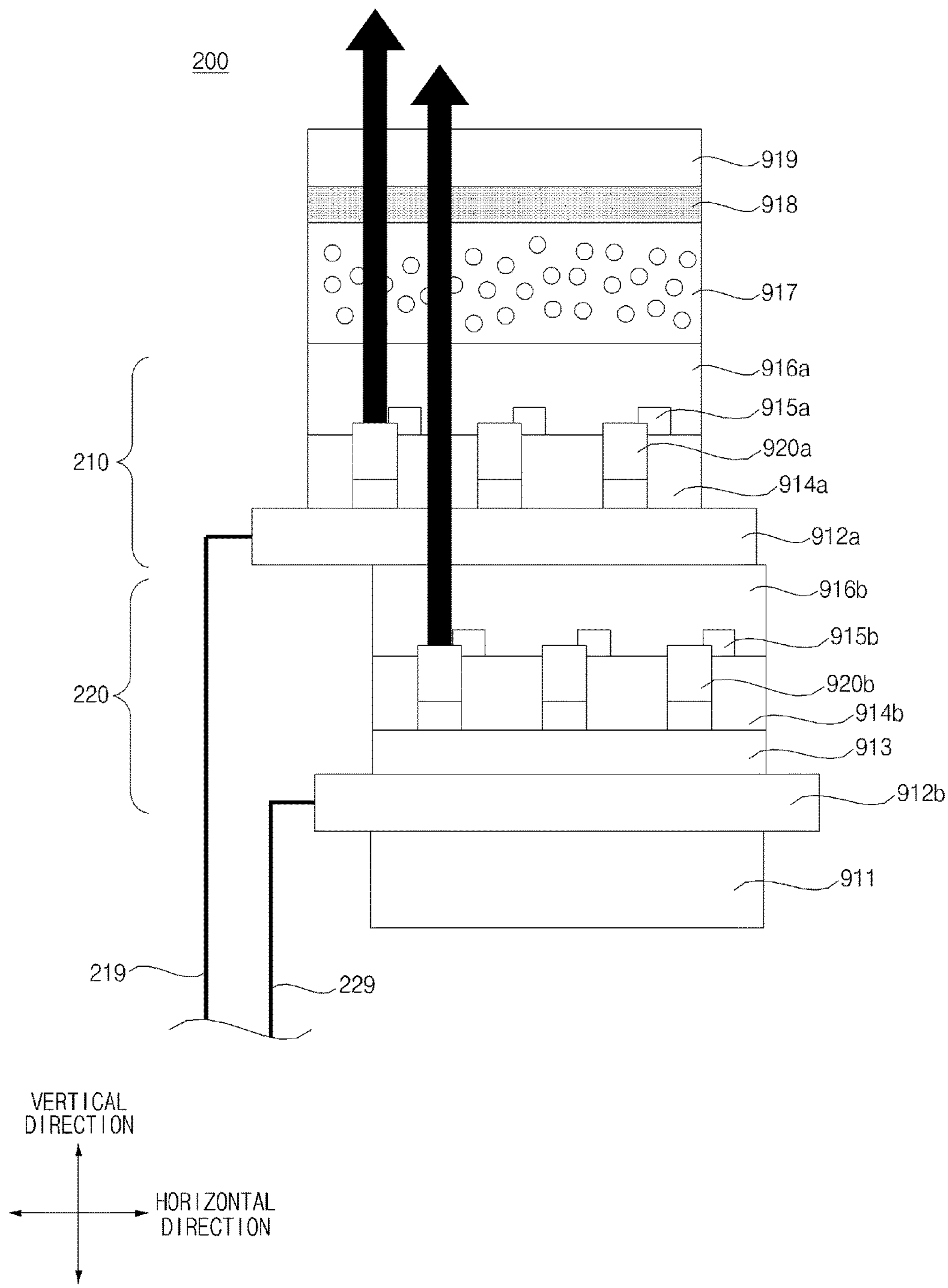

200
919
918
917
916a
915a
920a
914a
912a
916b
915b
920b
914b
913
912b
911
210
220
219
229
VERTICAL DIRECTION
HORIZONTAL DIRECTION

FIG. 9

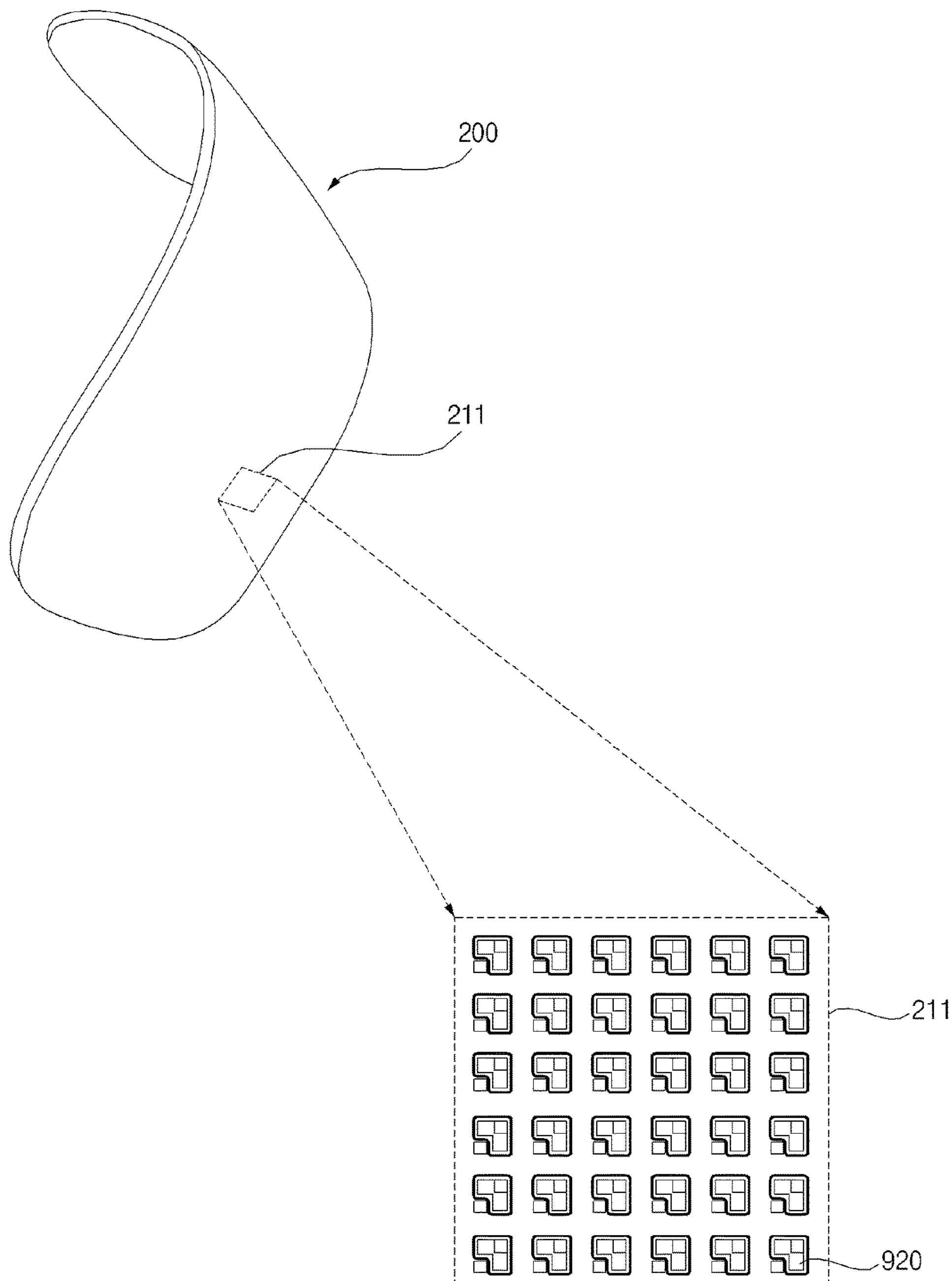


FIG. 10A

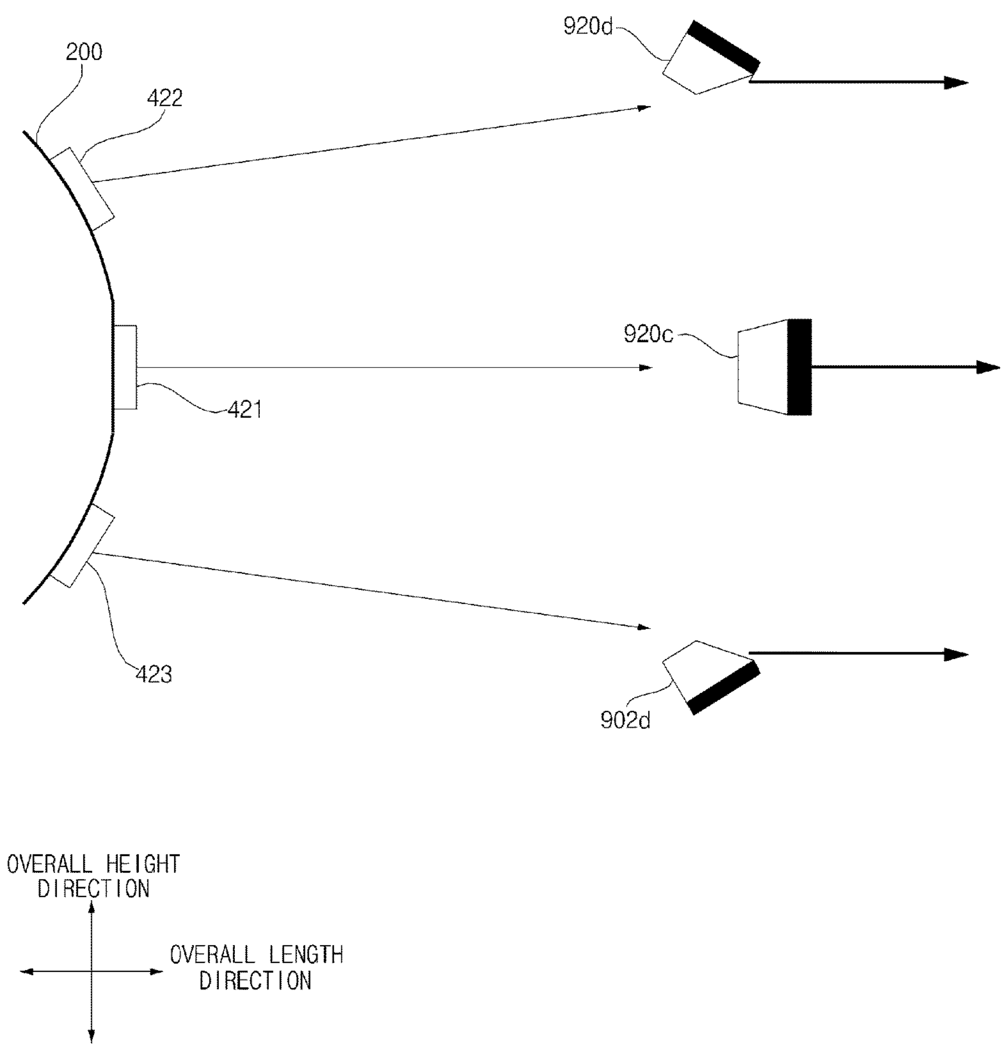

920d
200
422
920c
421
423
902d
OVERALL HEIGHT DIRECTION
OVERALL LENGTH DIRECTION

FIG. 10B

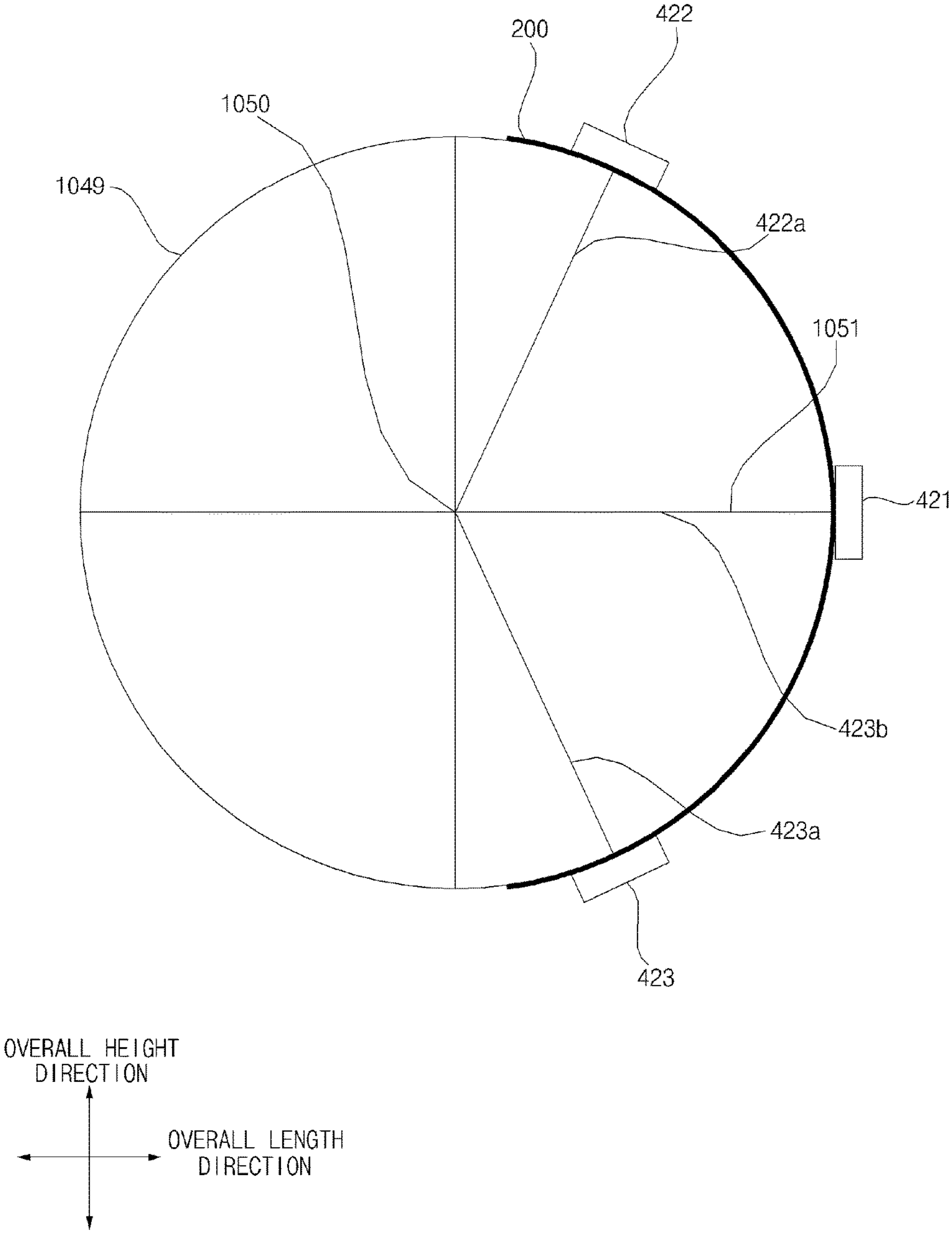

200
422
1050
1049
422a
1051
421
423b
423a
423
OVERALL HEIGHT DIRECTION
OVERALL LENGTH DIRECTION

FIG. 11A

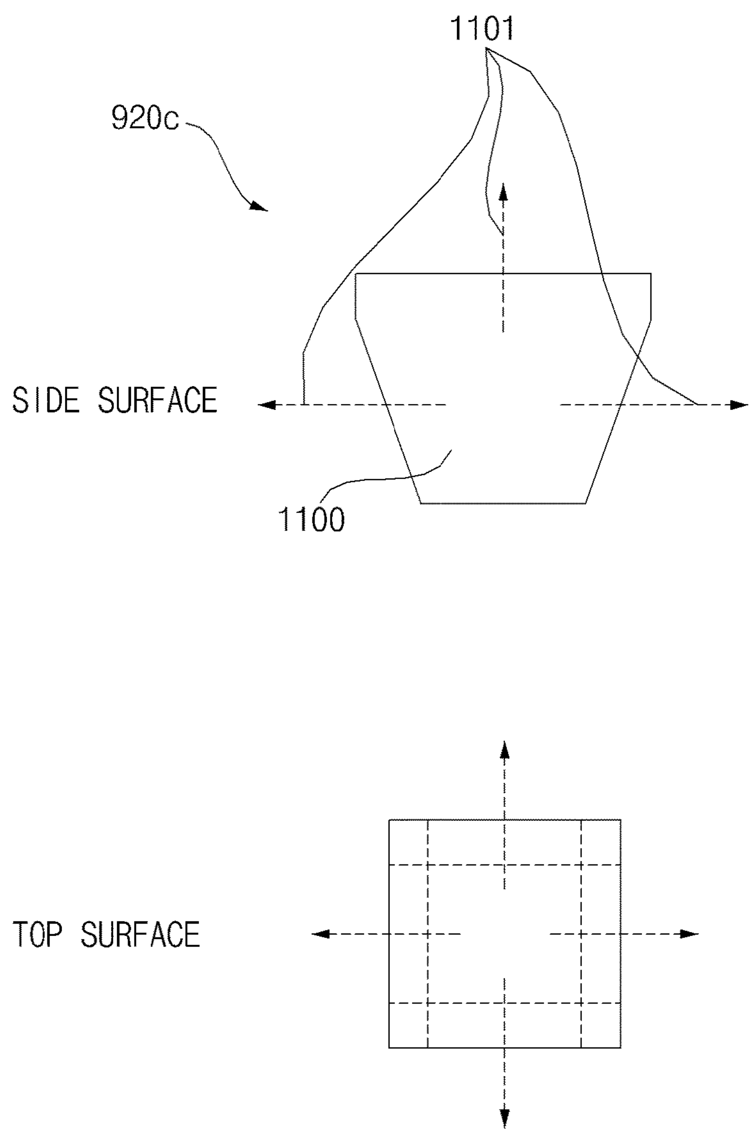


FIG. 11B

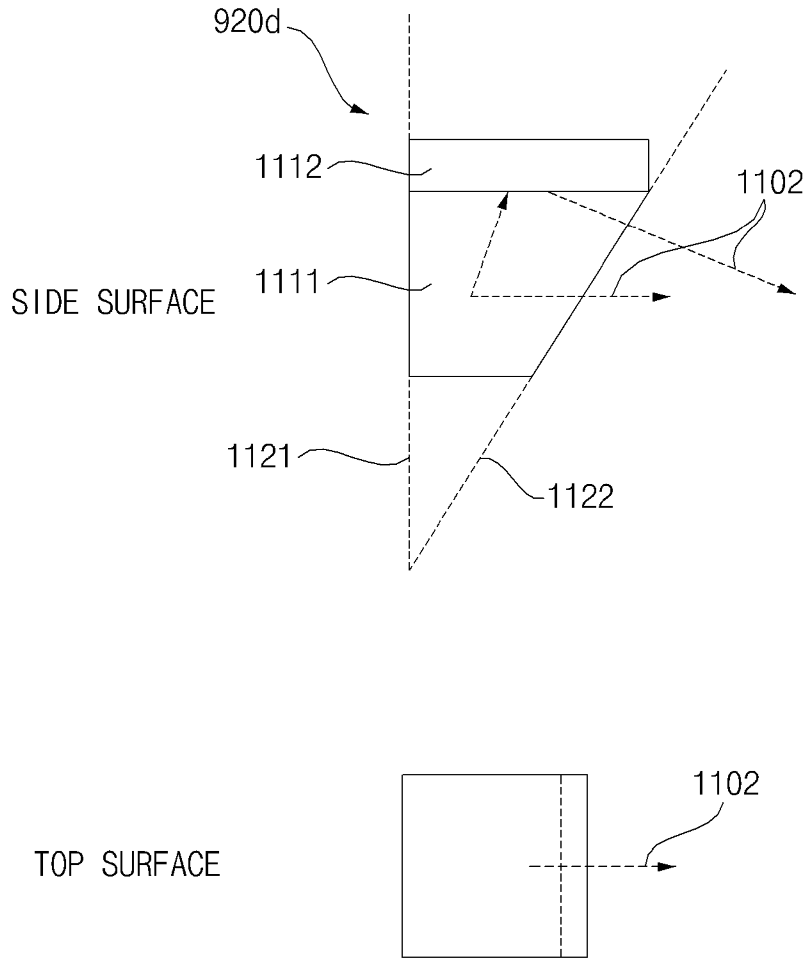
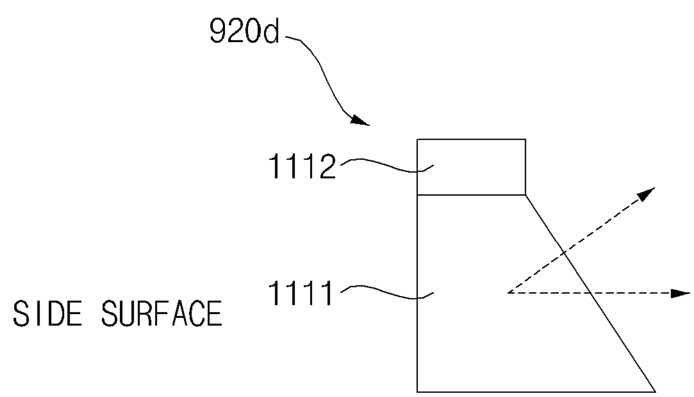


FIG. 11C



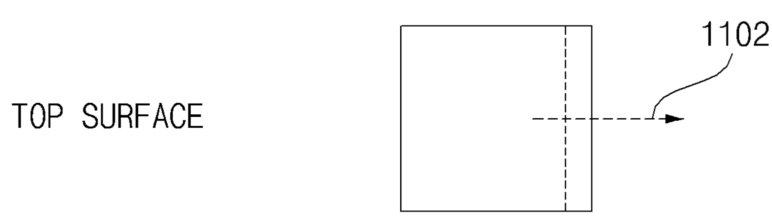
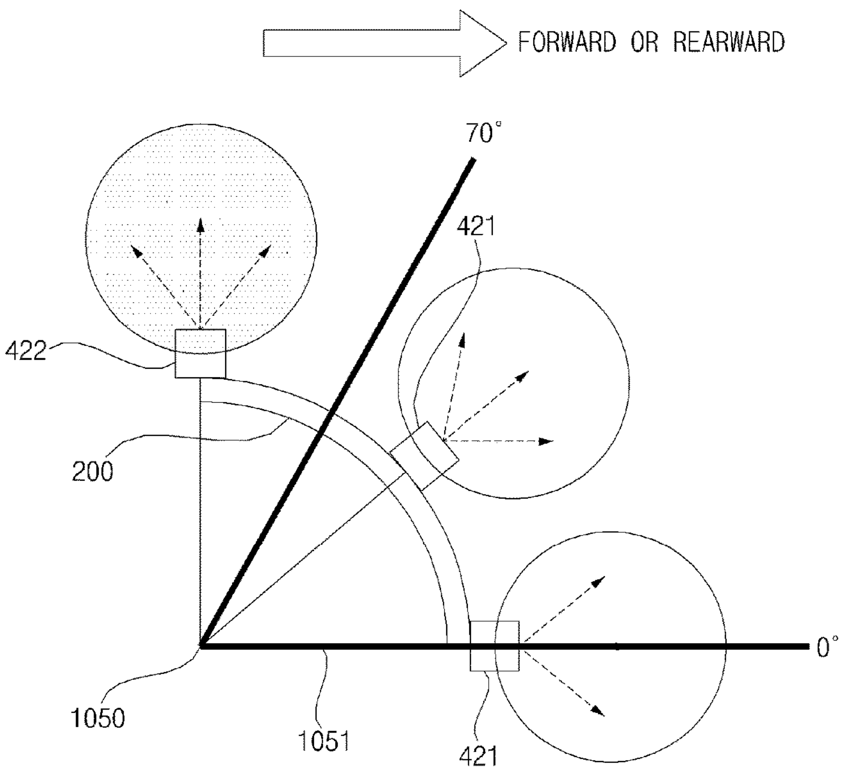


FIG. 12A


FORWARD OR REARWARD
70°
421
422
200
0°
1050
1051
421

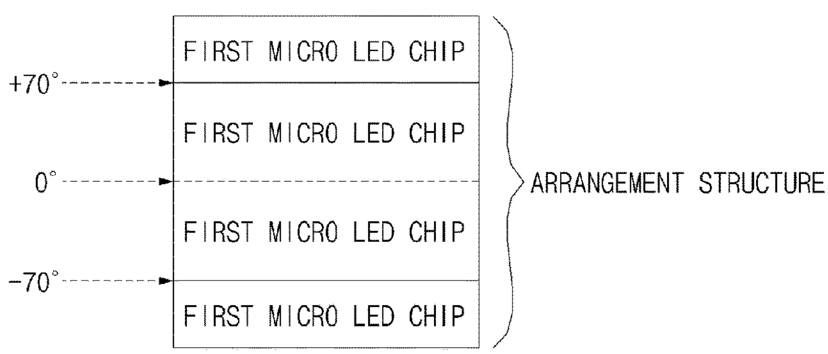

FIRST MICRO LED CHIP
+70°
FIRST MICRO LED CHIP
0°
ARRANGEMENT STRUCTURE
FIRST MICRO LED CHIP
-70°
FIRST MICRO LED CHIP

FIG. 12B

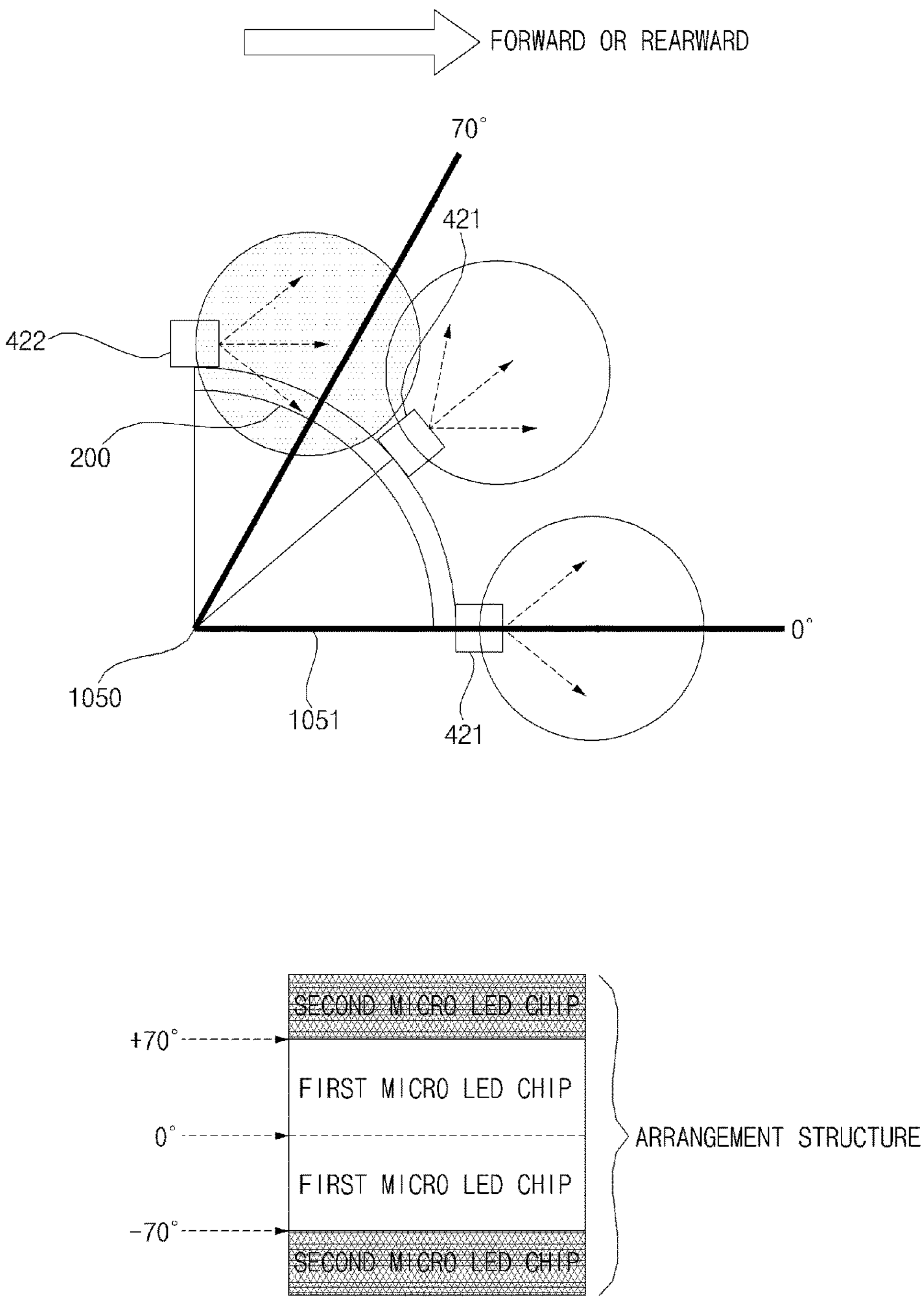

FORWARD OR REARWARD
70°
421
422
200
0°
1050
1051
421
SECOND MICRO LED CHIP
+70°
FIRST MICRO LED CHIP
0°
FIRST MICRO LED CHIP
-70°
SECOND MICRO LED CHIP
ARRANGEMENT STRUCTURE

FIG. 13

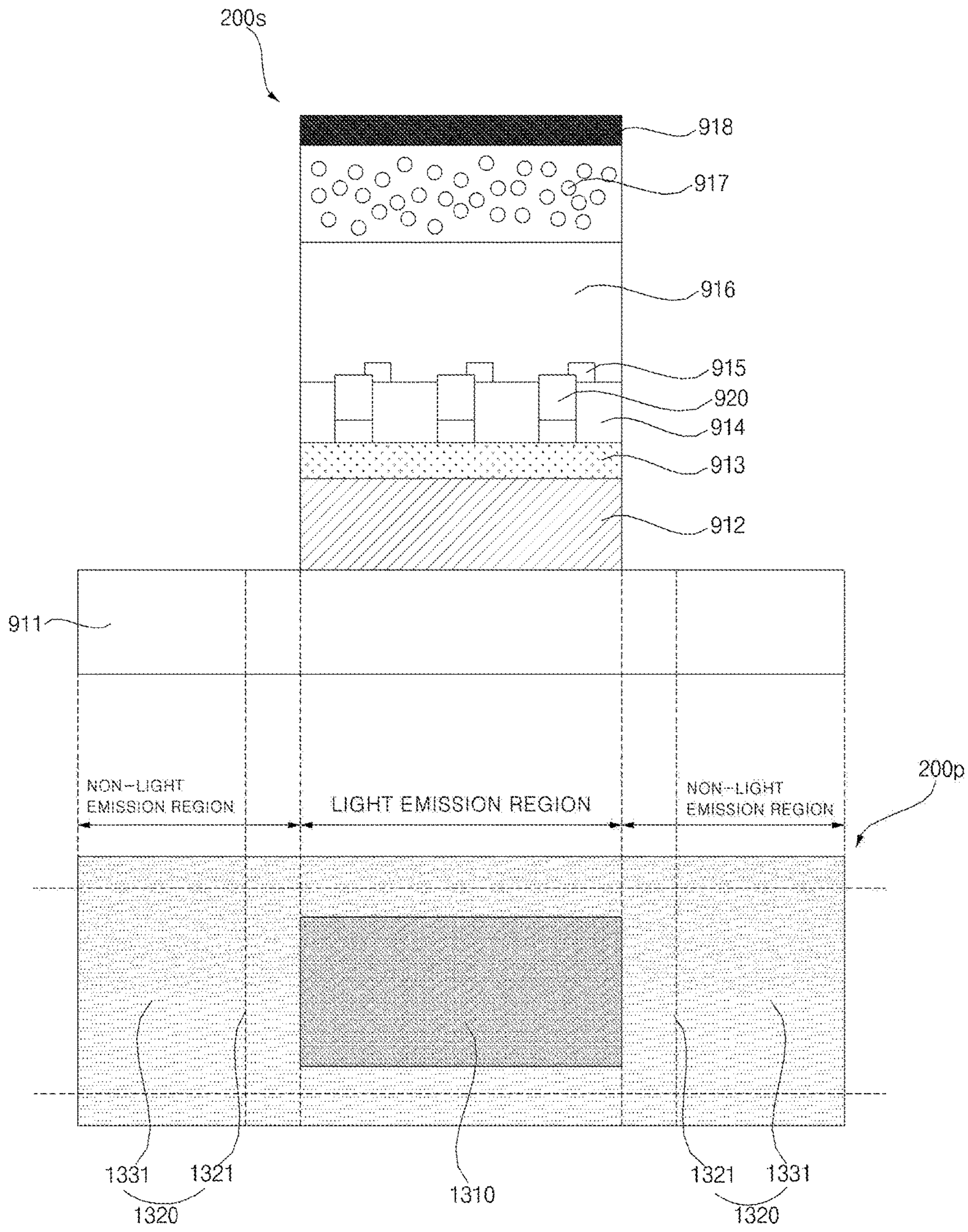

200s
918
917
916
915
920
914
913
912
911
NON-LIGHT EMISSION REGION
LIGHT EMISSION REGION
NON-LIGHT EMISSION REGION
200p
1331
1321
1320
1310
1321
1331
1320

FIG. 14

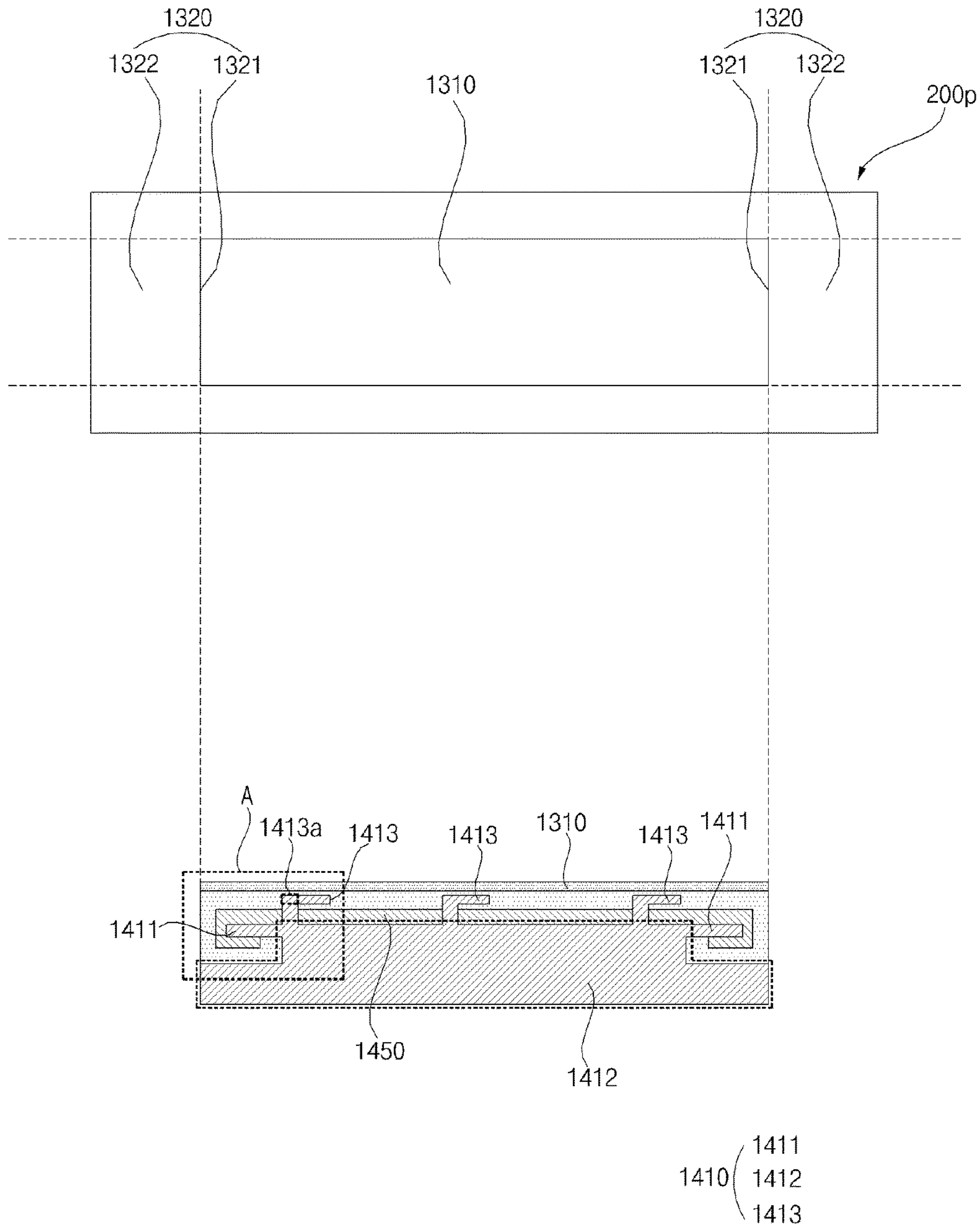

1320
1322
1321
1310
1320
1321
1322
200p
A
1413a
1413
1413
1310
1413
1411
1411
1450
1412
1410
1411
1412
1413

FIG. 15

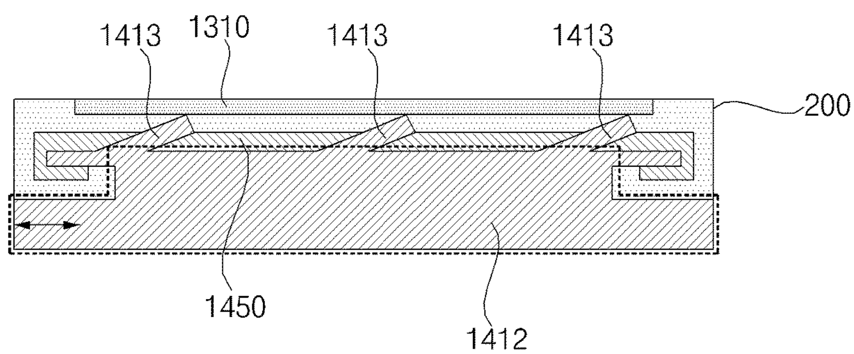


FIG. 16

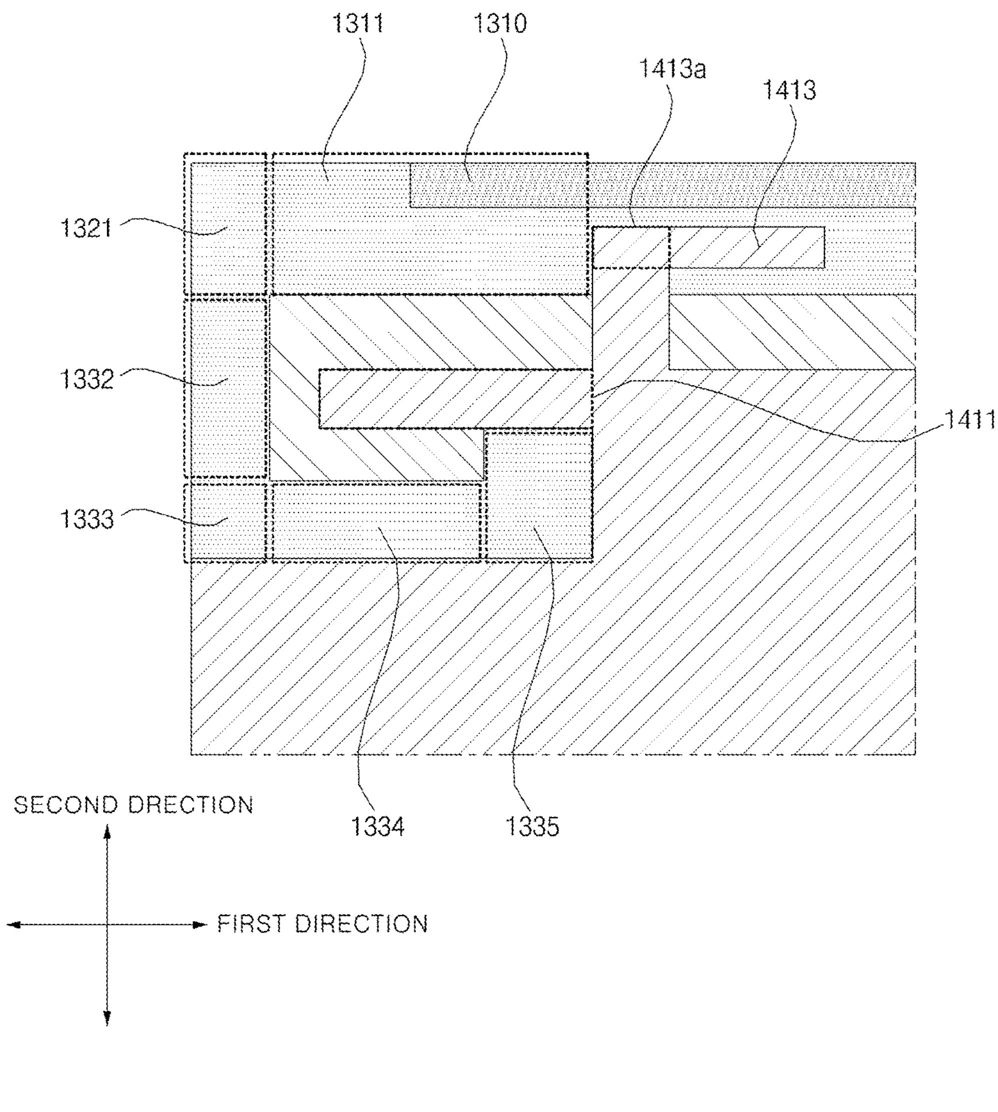

1311
1310
1413a
1413
1321
1332
1333
1411
1334
1335
SECOND DRECTION
FIRST DIRECTION

FIG. 17

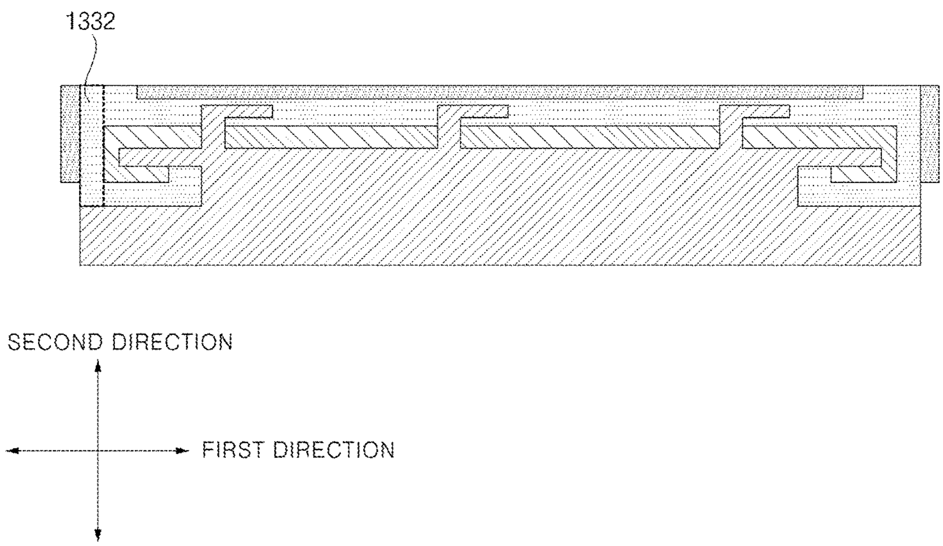


FIG. 18

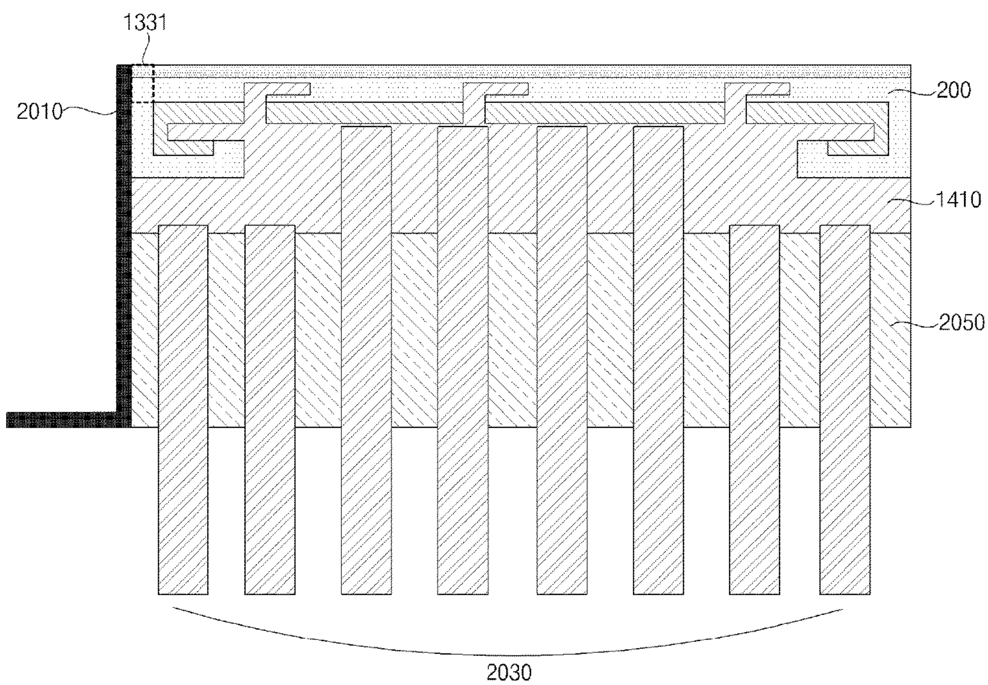
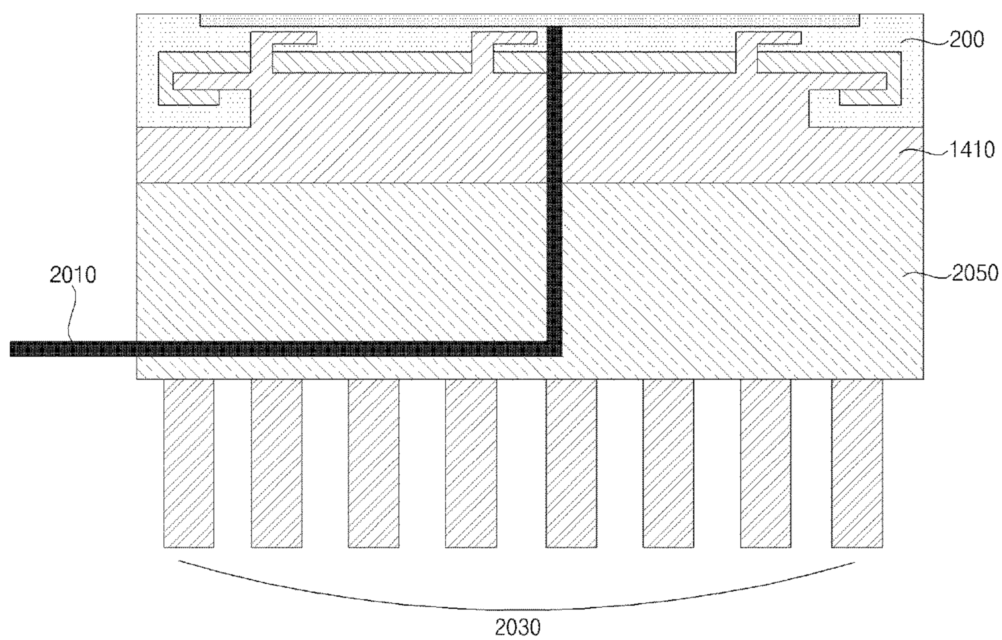


FIG. 19



LAMP INCLUDING A MICRO-LED ARRAY FOR VEHICLE AND VEHICLE HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the priority benefit of Korean Patent Application No. 10-2017-0083633, filed on Jun. 30, 2017, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

FIELD

The present disclosure relates to a lamp for vehicle, and a vehicle including a lamp.

BACKGROUND

A vehicle is an apparatus that can ride a user in a direction. An example of a vehicle may be an automobile.

The vehicle may include lamps. For example, the vehicle includes a head lamp, a rear combination lamp, and a fog lamp.

The lamps for a vehicle may be classified as lamps for providing visibility for a driver (e.g., a head lamp and a fog lamp), and lamps for notifying a simple signal (e.g., a rear combination lamp).

In some examples, a microchip (a "chip") or a small electronic device may be used as light sources of the lamps in a vehicle.

Recently, there have been efforts to utilize a plurality of micro Light Emitting Diode (LED) chips as light sources of the lamps for a vehicle.

In some examples where unit arrays including a plurality of micro LED chips are used as a light source of a vehicle lamp, it may be necessary to study and research a structure for fixing the unit arrays.

SUMMARY

One object of the present disclosure may be to provide a lamp for a vehicle, which has an array including a plurality of micro Light Emitting Diode (LED) chips that are coupled to a bracket.

Another object of the present disclosure may be to provide a vehicle including the lamp.

Objects of the present disclosure should not be limited to the aforementioned objects and other unmentioned objects will be clearly understood by those skilled in the art from the following description.

According to one aspect of the subject of matter described in this application, a lamp for a vehicle includes a light generation unit, a bracket, and a lens configured to change an optical path of light generated by the light generation unit. The light generation unit includes a light array including a plurality of micro Light Emitting Diode (LED) chips, and the light array includes a bent portion that covers at least a part of the bracket.

Implementations according to this aspect may include one or more of the following features. For example, the light array may be configured to flex. The light array may include a first region that includes the plurality of micro LED chips, and a second region that does not include the plurality of micro LED chips, where at least a portion of the second region has a bent shape. The bracket may include a base, and a holder that extends from the base toward the light array and that is configured to fix the light array to the holder. The holder may include one or more bent portions. The holder may extend from the base in a direction that forms an acute angle with respect to a surface of the base.

In some examples, the light array may include a bent region having a preset curvature, and the holder may be disposed at a location corresponding to the bent region of the light array. The lamp may further include an adhesive member configured to couple the light array to the bracket. The at least a portion of the bracket may contact the light array. The lamp may further include a wire configured to supply electrical energy to the light array, and the wire contacts the at least a portion of the bracket. In some cases, the light array may include at least one bent portion that is connected to the wire.

In some implementations, the lamp may further include a heat dissipation device that contacts at least a portion of the bracket and that is configured to dissipate heat generated from the light array. The heat dissipation device may include a plurality of dissipation pins that penetrates the bracket to thereby contact the light array. The lamp may further include a housing that defines an exterior of the lamp, and the plurality of dissipation pins may be exposed to an outside of the housing.

In some implementations, the light array may include a plurality of portions to cover the at least a part of the bracket. For example, the plurality of portions of the light array may include a first flat portion that extends in a first direction, and a first bent portion that extends from the first flat portion in a second direction. In some examples, the light array may further include a second flat portion that extends from the first bent portion in the second direction, and a second bent portion that extends from the second flat portion in the first direction. The light array may further include a third flat portion that extends from the second bent portion in the first direction, and a third bent portion that extends from the third flat portion in the second direction. In some examples, the second flat portion includes a portion of the plurality of micro LED chips.

In some implementations, the lamp may further include a supporting structure that contacts the bracket and that is configured to provide pressure to the bracket toward the light array. In some examples, the lamp may further include a wire configured to supply electrical energy to the light array, and the wire may penetrate the bracket and the supporting structure.

The details of other implementations are included in the following description and the accompanying drawings.

The implementations of the present disclosure have one or more effects as follows.

First, a bracket may fix a flexible array.

Second, a heat dissipation system may make it possible to dissipate heat generated from the plurality of micro LED chips.

Third, as a supporting structure presses the bracket, the array may contact with the bracket.

Effects of the present disclosure should not be limited to the aforementioned effects and other unmentioned effects will be clearly understood by those skilled in the art from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram illustrating example exterior appearance of an example vehicle.

FIG. **2** is a block diagram of an example lamp for a vehicle.

FIGS. **3**A and **3**B are diagrams illustrating an example lamp for a vehicle.

FIG. **4** is a diagram illustrating an example array module in which an example plurality of micro Light Emitting Diode (LED) chips are disposed.

FIG. **5** is a diagram illustrating an example array module in which a micro LED chip is disposed.

FIG. **6** is a diagram illustrating an example plurality of array modules.

FIG. **7**A illustrates an exemplary top view of an example plurality of array modules overlapping each other.

FIG. **7**B illustrates an exemplary side view of the plurality of array modules overlapping each other.

FIG. **8** is a diagram an example array module.

FIG. **9** is a diagram illustrating an example exterior appearance of an example array.

FIGS. **10**A and **10**B are schematic views of an array and micro LED chips.

FIGS. **11**A to **11**C are diagrams illustrating example shapes of an example plurality of micro LED chips.

FIGS. **12**A and **12**B are diagrams illustrating an example plurality of groups of micro LED chips disposed in an example array.

FIG. **13** is a diagram illustrating an example array.

FIG. **14** is a diagram illustrating an example lamp for a vehicle.

FIG. **15** is a diagram illustrating an example lamp for a vehicle.

FIG. **16** is an enlarged view of the portion A shown in FIG. **14**.

FIG. **17** is a diagram illustrating an example array and an example bracket of a lamp for a vehicle.

FIG. **18** is a diagram illustrating an example array and an example bracket of a lamp for a vehicle.

FIG. **19** is a diagram illustrating an example array and an example bracket of a lamp for a vehicle.

DETAILED DESCRIPTION

The implementations disclosed in the present specification will be described in detail with reference to the accompanying drawings, and the same or similar elements are denoted by the same reference numerals even though they are depicted in different drawings and redundant descriptions thereof will be omitted.

A vehicle as described in this specification may include an automobile, a motorcycle, and other types of vehicles. Hereinafter, a description will be given based on an automobile.

A vehicle as described in this specification may include all of an internal combustion engine vehicle including an engine as a power source, a hybrid vehicle including both an engine and an electric motor as a power source, and an electric vehicle including an electric motor as a power source.

In the following description, "the left side of the vehicle" refers to the left side in the forward driving direction of the vehicle, and "the right side of the vehicle" refers to the right side in the forward driving direction of the vehicle.

FIG. **1** is a diagram illustrating an example exterior appearance of an example vehicle.

Referring to FIG. **1**, a vehicle **10** may include a lamp **100** for vehicle.

The lamp **100** may include a head lamp **100***a*, a rear combination lamp **100***b*, and a fog lamp **100***c*.

The lamp **100** may further include a room lamp, a turn signal lamp, a daytime running lamp, a back lamp, and a positioning lamp.

The term "overall length" means the length from the front end to the rear end of the vehicle **10**, the term "overall width" means the width of the vehicle **10**, and the term "overall height" means the height from the bottom of the wheel to the roof. In the following description, the term "overall length direction L" may mean the reference direction for the measurement of the overall length of the vehicle **10**, the term "overall width direction W" may mean the reference direction for the measurement of the overall width of the vehicle **10**, and the term "overall height direction H" may mean the reference direction for the measurement of the overall height of the vehicle **10**.

FIG. **2** is a block diagram illustrating an example lamp for a vehicle.

Referring to FIG. **2**, the lamp **100** may include a light generation unit **160**, a processor **170**, and a power supply unit **190**.

The lamp **100** may further include an input unit **110**, a sensing unit **120**, an interface unit **130**, a memory **140**, and a position adjustment unit **165** individually or in combination.

The input unit **110** may receive a user input for controlling the lamp **100**.

The input unit **110** may include one or more input devices. For example, the input unit **110** may include one or more of a touch input device, a mechanical input device, a gesture input device, and a voice input device.

The input unit **110** may receive a user input for controlling operation of the light generation unit **160**.

For example, the input unit **110** may receive a user input for controlling turning on or off of the light generation unit **160**.

The sensing unit **120** may include one or more sensors.

For example, the sensing unit **120** may include a temperature sensor or an illumination sensor.

The sensing unit **120** may acquire temperature information of the light generation unit **160**.

The sensing unit **120** may acquire external illumination information of the vehicle **10**.

The interface unit **130** may exchange information, data, or a signal with another device provided in the vehicle **10**.

The interface unit **130** may transmit information, data, or a signal, received from another device provided in the vehicle **10**, to the processor **170**.

The interface unit **130** may transmit information, data, or a signal, generated by the processor **170**, to another device provided in the vehicle **10**.

The interface unit **130** may receive driving situation information.

The driving situation information may include at least one of: information on an object located outside of the vehicle **10**, navigation information, or vehicle state information.

The information on an object located outside of the vehicle **10** may include: information on the presence of the object, information on a location of the object, information on movement of the object, information on a distance between the vehicle **10** and the object, information on a speed of the vehicle **10** relative to the object, and information on a type of the object.

The object information may be generated by an object detection apparatus provided in the vehicle **10**. The object detection apparatus may detect an object based on sensing data generated by one or more sensors of: a camera, a Radio

Detection And Ranging (RADAR) sensor, a Light Detection And Ranging (LIDAR) sensor, an ultrasonic sensor, and an infrared sensor.

The object may include a line, a nearby vehicle, a pedestrian, a two-wheeled vehicle, a traffic signal, a light, a road, a structure, a bump, a geographical feature, and an animal.

The navigation information may include at least one selected from among map information, information on a set destination, information on a route to the set destination, and information on various object located along the route, lane information, or information on the current location of the vehicle **10**.

The navigation information may be generated by a navigation apparatus provided in the vehicle **10**.

The vehicle state information may include vehicle position information, vehicle speed information, vehicle tilt information, vehicle weight information, vehicle direction information, vehicle battery information, vehicle fuel information, vehicle tire pressure information, vehicle steering information, in-vehicle temperature information, in-vehicle humidity information, pedal position information, vehicle engine temperature information, etc.

The vehicle state information may be generated based on sensing information of various sensors provided in the vehicle **10**.

The memory **140** may store basic data for each unit of the lamp **100**, control data for the operational control of each unit of the lamp **100**, and input/output data of the lamp **100**.

The memory **140** may be any of various hardware storage devices, such as a ROM, a RAM, an EPROM, a flash drive, and a hard drive.

The memory **140** may store various data for the overall operation of the lamp **100**, such as programs for the processing or control of the processor **170**.

The memory **140** may be a subordinate element of the processor **170**.

Under the control of the processor **170**, the light generation unit **160** may convert electrical energy into light energy.

The light generation unit **160** may include an array **200** on which a plurality of groups of micro Light Emitting Diode (LED) chips is disposed.

The array **200** may be formed flexible.

The plurality of groups of micro LED chips may have different shapes.

In some implementations, there may be provided a plurality of arrays. The plurality of arrays may form an array module **200***m* (see FIG. **6**).

In some implementations, the array module **200***m* may be configured such that a plurality of arrays is stacked with one another.

The array module **200***m* may be formed flexible.

For example, the array **200** may be flexible, and a Flexible Copper Clad Laminate (FCCL) may be disposed on a flexible base **911** (see FIG. **5**). Light Emitting Diode (LED) chips of few micro meters (μm) may be transferred to and formed on the FCCL.

A micro LED chip may be referred to as a micro LED light emitting device package.

A micro LED chip may include a light emitting device therein.

A micro LED is an LED chip of a few micro-meter. For example, the size of a micro LED may be 5 to 15 μm.

A micro LED may be transferred to a substrate.

The array **200** may include a substrate and a subarray in which the plurality of micro LED chips is disposed. The array **200** may include one or more subarrays.

The subarray may be in any of various shapes.

For example, the subarray may be in a shape of a figure having a predetermined area.

For example, the subarray may have a circular shape, a polygonal shape, or a fan shape.

In some examples, the substrate includes a Flexible Copper Clad Laminated (FCCL) substrate.

For example, a base **911** (FIG. **5**) and a first electrode **912** (see FIG. **5**) may form a substrate.

In some examples, a base **911** (see FIG. **8**) and a second anode **912***b* (see FIG. **8**) may form a substrate.

The position adjustment unit **165** may adjust a position of the light generation unit.

The position adjustment unit **165** may control the light generation unit **160** to be tilted. Due to the tilting control of the light generation unit **160**, output light may be adjusted in an up-down direction (e.g., the overall height direction).

The position adjustment unit **165** may control the light generation unit **160** to be panned. Due to the panning control of the light generation unit **160**, output light may be adjusted in a left-right direction (e.g., the overall width direction).

The position adjustment unit **165** may further include a driving force generation unit (e.g., a motor, an actuator, and a solenoid) that provides a driving force required to adjust a position of the light generation unit **160**.

When the light generation unit **160** generates a low beam, the position adjustment unit **165** may adjust a position of the light generation unit **160** downward further than when the light generation unit **160** generates a high beam.

When the light generation unit **160** generates a high beam, the position adjustment unit **165** may adjust a position of the light generation unit **160** upward further than when the light generation unit **160** generates a low beam.

The processor **170** may be electrically connected to each unit of the lamp **100**. The processor **170** may control overall operation of each unit of the lamp **100**.

The processor **170** may control the light generation unit **160**.

By adjusting an amount of electrical energy supplied to the light generation unit **160**, the processor **170** may control the light generation unit **160**.

The processor **170** may control the array **200** on a region basis.

For example, the processor **170** may control the array **200** on a region basis in a manner of supplying a different amount of electrical energy to micro LED chips disposed on each region of the array **200**.

The processor **170** may control the array module **200***m* on a layer basis.

The plurality of layers in the array module **200***m* may be composed of a plurality of arrays **200**.

For example, the processor **170** may control the array module **220***m* on a layer basis in a manner of supplying a different amount of electrical energy to micro LED chips arranged in each layer of the plurality of arrays **200**.

Under the control of the processor **170**, the power supply unit **190** may supply electrical energy to each unit of the lamp **100**. For example, the power supply unit **190** may be supplied with power from a battery inside the vehicle **10**.

FIG. **3**A is a diagram illustrating an example lamp for a vehicle.

FIG. **3**A is a cross-sectional view of a head lamp an example of a lamp for a vehicle.

Referring to FIG. **3**A, the lamp **100** may include a light generation unit **160**, a reflector **310**, and a lens **320***a*.

The reflector **310** may reflect light generated by the light generation unit **160**. The reflector **310** may induce the light to be emitted forward or rearward of the vehicle **10**.

The reflector **310** may be formed of an aluminum (Al) or silver (Ag) material having a good reflectance, or may be coated on a reflective surface.

The lens **320***a* may be disposed before the light generation unit **160** and the reflector **310**. The lens **320***a* refracts light, generated by the light generation unit **160** and reflected by the reflector **310**, and allows the refracted light to pass therethrough. The lens **320***a* may be an aspheric lens.

The lens **320***a* may change an optical path of the light generated by the light generation unit **160**.

The lens **320***a* may be formed of transparent synthetic resin or glass.

FIG. **3**B is a diagram for explaining a lamp for a vehicle.

FIG. **3**B illustrates an exemplary cross-section of a rear combination ramp **100***b* as an example of the lamp **100**.

Referring to FIG. **3**B, a lamp **100** for a vehicle may include a light generation unit **160**, and a lens **320***b*.

The lens **320***b* may cover the light generation unit **160**. The lens **320***b* may allow light, generated by the light generation unit **160**, to be refracted and pass therethrough. The lens **320***b* may be an aspheric lens.

The lens **320***b* may change an optical path of the light generated by the light generation unit **160**.

The lens **320***b* may be formed of transparent synthetic resin or glass, for example.

FIG. **4** is a diagram illustrating an example plurality of array modules.

Referring to FIG. **4**, a plurality of micro LED chips **920** may be disposed on the array **200**.

The plurality of micro LED chips **920** may be transferred to the array **200**.

An interval for micro LED chips **920** on the array **200**, and a density of micro LED chips **920** (that is, the number of micro LED chips per unit area) on which the array **200** may be determined depending on a transfer interval.

The array **200** may include a plurality of sub-arrays **411** in which the plurality of groups of micro LED chips is disposed, respectively. The array **200** may include an area **211**.

The array **200** may include a base **911** and one or more sub-arrays **411**.

The base **911** may be formed of a polyimide (PI) material or the like.

In some implementations, the base **911** may be a substrate. For example, the base **911** may be a Flexible Copper Clad Laminate (FCCL) which will be described later.

The sub-arrays **411** may be disposed on the base **911**.

A plurality of micro LED chips **920** may be disposed in the sub-arrays **411**.

The sub-arrays **411** may be generated by cutting a main array which is an FCCL where the plurality of micro LED chips **920** is disposed.

In this case, a shape of each sub-array **411** may be determined by a shape into which the main array is cut.

For example, the sub-array **411** may have a shape of a two-dimensional figure (e.g., a circular, polygonal, or fan shape).

FIG. **5** is a diagram illustrating an example array where micro LED chips are disposed.

Referring to FIG. **5**, the array **200** may include a polyimide layer **911**, a Flexible Copper Clad Laminated (FCCL) **912**, a reflective layer **913**, an inter-layer dielectric film **914**, a plurality of micro LED chips **920**, a second electrode **915**, an optical spacer **916**, a phosphor layer **917**, a color filter film **918**, and a cover film **919**.

The polyimide layer **911** may be formed flexible.

The FCCL **912** may be formed of copper. The FCCL **912** may be referred to as a first electrode **912** in this application.

In some implementations, a combination of a layer composed of the polyimide layer **911** and the FCCL **912** may be referred to as a base **930**.

In some implementations, the polyimide layer **911** may be referred to as a base **911** in this application.

The first electrode **912** and the second electrode **915** may be electrically connected to the plurality of micro LED chips **920** so as to provide power thereto.

The first electrode **912** and the second electrode **915** may be light transmissive electrodes.

The first electrode **912** may be an anode.

The second electrode **915** may be a cathode.

The first electrode **912** and the second electrode **915** may include at least one metal material or a combination of metal materials, including but not limited to nickel (Ni), platinum (Pt), ruthenium (Ru), iridium (Ir), rhodium (Rh), tantalum (Ta), molybdenum (Mo), titan (Ti), silver (Ag), tungsten (W), copper (Cu), chromium (Cr), palladium (Pd), vanadium (V), cobalt (Co), niobium (Nb), zirconium (Zr), indium tin oxide (ITO), aluminum zinc oxide (AZO), or Indium Zinc Oxide (IZO).

The first electrode **912** may be formed between the polyimide layer **911** and the reflective layer **913**.

The second electrode **915** may be formed on the inter-layer dielectric film **914**.

The reflective layer **913** may be formed on the FCCL **912**. The reflective layer **913** may reflect light generated by the plurality of micro LED chips **920**. The reflective layer **913** is made of silver Ag, for instance.

The inter-layer dielectric film **914** may be formed on the reflective layer **913**.

The plurality of micro LED chips **920** may be formed on the FCCL **912**. The plurality of micro LED chips **920** may be attached to the reflective layer **913** or the FCCL **912** using a solder material or an Anisotropic Conductive Film (ACF).

In some example, each micro LED chip **920** may be an LED chip having a size of 10-100 μm.

The optical spacer **916** may be formed on the inter-layer dielectric film **914**. The optical spacer **916** is used to keep the plurality of micro LED chips **920** and the phosphor layer **917**, and may be formed of an insulating material.

The phosphor layer **917** may be formed on the optical spacer **916**. The phosphor layer **917** may be formed of resin in which phosphorus is evenly distributed. Depending on a wavelength of light emitted from a micro LED chips **920**, any one selected from a blue light-emitting phosphor, a blue-green light-emitting phosphor, a green light-emitting phosphor, a yellow-green light-emitting phosphor, a yellow light-emitting phosphor, a yellow-red light-emitting phosphor, an orange light-emitting phosphor, and a red light-emitting phosphor may be applied as the phosphor.

That is, a phosphor may be excited by light of a first color, which is emitted from the micro LED chips **920**, to thereby generate a second color.

The color filter film **918** may be formed on the phosphor layer **917**. The color filter film **918** may realize a specific color for light which has passed the phosphor layer **917**. The color filter film **918** may realize at least one or a combination of red (R), green (G), or blue (B).

The cover film **919** may be formed on the color filter film **918**. The cover film **919** may protect the array **200**.

FIG. **6** is a diagram illustrating an example array module.

Referring to FIG. **6**, the light generation unit **160** may include an array module **200***m* which includes a plurality of arrays.

For example, the light generation unit **160** may include a first array **210** and a second array **220**.

The first array **210** may be different from the second array **220** in terms of at least one of: an interval for a plurality of micro LED chips, positions of the plurality of micro LED chips, or a density of the plurality of micro LED chips.

The second array **220** may be different from the first array **210** in terms of at least one of: an interval for a plurality of micro LED chips, positions of the plurality of micro LED chips, or a density of the plurality of micro LED chips.

The density of the plurality of micro LED chips indicates the number of micro LED chips per unit area.

In the first array **210**, a first group of micro LED chips may be disposed in a first pattern.

The first pattern may be determined by at least one of: an interval for micro LED chips included in the first group, positions of the micro LED chips included in the first group on an array module, or a density of the micro LED chips included in the first group.

A plurality of micro LED chips included in the first array **210** may be disposed at a first interval.

The plurality of micro LED chips included in the first group may be disposed at the first interval.

In the second array **220**, a second group of micro LED chips may be disposed in a second pattern which is different from the first pattern.

The second pattern may be determined by at least one of: an interval for the micro LED chips included in the second group, positions of the micro LED chips included in the second group, or a density of the micro LED chips included in the second group.

The plurality of micro LED chips included in the second array **220** may be disposed at an interval as the same as the interval at which the plurality of micro LED chips included in the first array **210** is disposed.

The plurality of micro LED chips included in the second group may be disposed at an interval as the same as the interval at which the plurality of micro LED chips included in the first group is disposed.

That is, the plurality of micro LED chips included in the second group may be disposed at the first interval.

The plurality of micro LED chips included in the second group may be disposed not to overlap the plurality of micro LED chips included in the first group in a vertical or horizontal direction.

For example, the first group of micro LED chips may be disposed on the first array **210** not to overlap the second group of micro LED chips when viewed from above while the first array **210** and the second array **220** overlap each other.

For example, the second group of micro LED chips may be disposed on the second array **220** not to overlap the first group of micro LED chips when viewed from above while the second array **220** and the first array **210** overlap each other.

Due to such arrangement, it is possible to minimize intervention by the first group of micro LED chips in output power from the second group of micro LED chips.

In some implementations, the light generation unit **160** may include three or more arrays.

FIG. **7**A illustrates an exemplary top view of an example plurality of array modules overlapping each other.

FIG. **7**B illustrates an exemplary side view of the plurality of array modules overlapping each other.

Referring to FIGS. **7**A and **7**B, the processor **170** may control an array module **200***m* on a region basis (e.g., any of region **201** to **209**).

The processor **170** may adjust a light distribution pattern by controlling the array module **200***m* on a region basis.

The array module **200***m* may be divided into a plurality of regions **201** to **209**.

The processor **270** may adjust an amount of electrical energy to be supplied to each of the plurality of regions **201** to **209**.

The processor **170** may control the array module **200***m* on a layer basis.

The processor **270** may adjust an amount of light of output power by controlling the array module **200***m* on a layer basis.

The array module **200***m* may be composed of a plurality of layers. The plurality of layers may be composed of a plurality of arrays, respectively.

For example, a first layer of the array module **200***m* may be formed by a first array, and a second layer of the array module **200***m* may be formed by a second array.

The processor **270** may adjust an amount of electrical energy to be supplied to each of the plurality of layers.

FIG. **8** is a diagram an array module.

FIG. **8** illustrates a first array **210** and a second array **220** included in the array module **200***m*. However, the array module **200***m* may include three or more arrays.

Referring to FIG. **8**, the array module **200***m* may include a polyimide layer **911**, the first array **210**, and the second array **220**.

In some implementations, the array module **200***m* may further include a phosphor layer **917**, a color filter film **918**, and a cover film **919** in combination or individually.

The polyimide layer **911** may be formed flexible.

The second array **220** may be disposed on the base **911**.

In some implementations, a combination of a layer composed of the polyimide layer **911** and the second anode **912***b* may be referred to as a base **930**.

In some implementations, the polyimide layer **911** may be referred to as a base.

The second array **220** may be disposed between the first array **210** and the base **911**.

The second array **220** may include the second anode **912***b*, a reflective layer **913**, a second inter-layer dielectric film **914***b*, a second group of micro LED chips **920***b*, a second optical spacer **916***b*, and a second cathode **915***b*.

In some examples, the second anode **912***b* may be an FCCL. The second anode **912***b* may be formed of copper.

The second anode **9112** and the second cathode **915***b* may be light transmissive electrodes.

The second anode **912***b* and the second cathode **915***b* may be referred to as transparent electrodes.

The second array **220** may include a transparent electrode.

The second anode **912***b* and the second cathode **915***b* may include at least one metal material or a combination of metal materials, including but not limited to nickel (Ni), platinum (Pt), ruthenium (Ru), iridium (Ir), rhodium (Rh), tantalum (Ta), molybdenum (Mo), titan (Ti), silver (Ag), tungsten (W), copper (Cu), chromium (Cr), palladium (Pd), vanadium (V), cobalt (Co), niobium (Nb), zirconium (Zr), indium tin oxide (ITO), aluminum zinc oxide (AZO), or Indium Zinc Oxide (IZO).

The second anode **912***b* may be formed between the base **911** and the reflective layer **913**.

The second cathode **915***b* may be formed on the second inter-layer dielectric film **914***b*.

The reflective layer **913** may be formed on the second anode **912***b*. The reflective layer **913** may reflect light generated by a plurality of micro LED chips **920**. The reflective layer **913** may be made of silver (Ag), for instance.

The second inter-layer dielectric film **914***b* may be formed on the reflective layer **913**.

The second group of micro LED chips **920***b* may be formed on the second anode **912***b*. Each of the micro LED chips **920***b* included in the second group may be attached to the reflective layer **913** or the second anode **912***b* using a solder material or an Anisotropic Conductive Film (ACF).

The second optical spacer **916***b* may be formed on the second inter-layer dielectric film **914***b*. The second optical spacer **916***b* is used to keep the micro LED chips **920***b* and the first array **210** at a distance from each other, and the second optical spacer **916***b* may be formed of an insulating material.

The first array **210** may be formed on the second array **220**.

The first array **210** may include a first anode **912***a*, a first inter-layer dielectric film **914***a*, a first group of micro LED chips **920***a*, a first optical spacer **916***a*, and a first cathode **915***a*.

The first anode **912***a* may be an FCCL. The first anode **912***a* may be formed of copper.

The first anode **912***a* and the first cathode **915***a* may be light-transmissive electrodes.

The first anode **912***a* and the first cathode **915***a* may be referred to as transparent electrodes.

The first array **210** may include a transparent electrode.

The first anode **912***a* and the first cathode **915***a* may include at least one metal material or a combination of metal materials, including but not limited to nickel (Ni), platinum (Pt), ruthenium (Ru), iridium (Ir), rhodium (Rh), tantalum (Ta), molybdenum (Mo), titan (Ti), silver (Ag), tungsten (W), copper (Cu), chromium (Cr), palladium (Pd), vanadium (V), cobalt (Co), niobium (Nb), zirconium (Zr), indium tin oxide (ITO), aluminum zinc oxide (AZO), or Indium Zinc Oxide (IZO).

The first anode **912***a* may be formed between the second optical spacer **916***b* and the first inter-layer dielectric film **914***a*.

The first cathode **915***a* may be formed on the first inter-layer dielectric film **914***a*.

The first inter-layer dielectric film **914***a* may be formed on the first anode **912***a*.

The first group of micro LED chips **920***a* may be formed on the first anode **912***a*. Each of the micro LED chips **920***a* included in the first group may be attached to the first anode **912***a* using a solder material or an Anisotropic Conductive Film (ACF).

The first optical spacer **916***a* may be formed on the first inter-layer dielectric film **914***a*. The first optical spacer **916***a* is used to keep the micro LED chips **920***a* and the phosphor layer **917** at a distance from each other, and the first optical spacer **916***a* may be formed of an insulating material.

The phosphor layer **910** may be formed on the first array **210** and the second array **220**.

The phosphor layer **917** may be formed on the first optical spacer **916***a*. The phosphor layer **917** may be formed of resin in which a phosphorus is evenly distributed. Depending on a wavelength of light emitted from the micro LED chips **920***a* and **920***b* included in the first and second groups, any one selected from a blue light-emitting phosphor, a blue-green light-emitting phosphor, a green light-emitting phosphor, a yellow-green light-emitting phosphor, a yellow light-emitting phosphor, a yellow-red light-emitting phosphor, an orange light-emitting phosphor, and a red light-emitting phosphor may be applied as the phosphor.

The phosphor layer **917** may change wavelengths of lights emitted from the micro LED chips **920***a* and **920***b* included in the first and second groups.

The phosphor layer **917** may change a wavelength of first light generated by the micro LED chips **920***a* included in the first group, and a wavelength of second light generated by the micro LED chips **920***b* included in the second group.

The color filter film **918** may be formed on the phosphor layer **917**. The color filter film **918** may realize a specific color for light which has passed through the phosphor layer **917**. The color filter film **918** may realize any one of red (R), green (G), blue (B), or a combination thereof.

The cover film **919** may be formed on the color filter film **918**. The cover film **919** may protect the array module **200***m*.

The plurality of micro LED chips **920***b* included in the second array **220** may be disposed not to overlap the plurality of micro LED chips **920***a* included in the first array **210** in a vertical or horizontal direction.

The plurality of micro LED chips **920***b* included in the second group may be disposed not to overlap the plurality of micro LED chips **920***a* included in the first group in a vertical or horizontal direction.

The vertical direction may be a direction in which the array module **200***m* is stacked.

The micro LED chips **920***a* and **920***b* included in the first and second groups may output light in the vertical direction.

The horizontal direction may be a direction in which the micro LED chips **920***a* and **920***b* included in the first and second groups are disposed.

The horizontal direction may be a direction in which the base **911**, the first and second anodes **912***a* and **912***b*, or the phosphor layer **917** extends.

In some examples, the lamp **100** may further include a wire via which power is supplied to the array module **200***m*.

For example, the lamp **100** may include a first wire **219** and a second wire **229**.

Via the first wire **219**, power may be supplied to the first array **210**. The first wire **219** may consist of a pair of wires. The first wire **219** may be connected to the first anode **912***a* and/or the first cathode **915***a*.

Via the second wire **229**, power may be supplied to the second array **220**. The second wire **229** may consist of a pair of wires. The second wire **229** may be connected to the second anode **912***b* and/or the second cathode **915***b*.

The first wire **219** and the second wire **229** may be disposed not to overlap each other.

FIG. **9** is a diagram illustrating an example exterior of an array.

FIGS. **10**A and **10**B are schematic views of an example array and example micro LED chips. FIG. **10** is an exemplary side view.

Referring to the drawings, a plurality of groups of micro LED chips **920***c* and **920***d* may be disposed in the array **200**.

The micro LED chips **920***c* and **920***d* included in the plurality of groups may have different shapes.

As illustrated in FIG. **10**A, the array **200** may be bent with a different curvature in each region.

The array **200** may be divided into a plurality of regions **421**, **422**, and **423**.

The array **200** may be divided into the plurality of regions **421**, **422**, and **423** according to bending curvatures thereof.

The array **200** may include a first region **421**, a second region **422**, and a third region **423**.

The first region **421** may be a region which is bendable with a first curvature.

The second region **422** may be a region which is bendable with a second curvature. The second curvature may be greater than the first curvature.

The third region **423** may be a region which is bendable with a third curvature. The third curvature may be greater than the first curvature.

In some examples, a curvature may be defined as the inverse of the radius of the circle which contacts an inner surface (a surface in the opposite to a light output direction) of the array **200** which is bent.

In addition, a curvature may indicate a degree of bending of the array **200**.

For example, when a curvature for one region of the array **200** is 0, the region may be in a flat state where the region is flat.

Micro LED chips **920***c*, **920***d*, and **920***d* respectively disposed in the plurality of regions **421**, **422**, and **423** may have different shapes.

A micro LED chip **920***c* included in a first group and having a first shape may be disposed in the first region **421**. The micro LED chip **920***c* included in the first group and having the first shape will be described with reference to FIG. **11**A.

A micro LED chip **920***d* included in a second group and having a second shape may be disposed in the second region **422**. The micro LED chip **920***d* included in the second group and having the second shape will be described with reference to FIG. **11**B.

A micro LED chip **902***d* included in a third group and having the second shape and may be disposed in the third region **423**. The micro LED chip **902***d* included in the third group and having the second shape will be described with reference to FIG. **11**B. The micro LED chip included in the third group may be horizontally symmetric to the micro LED chip included in the second group.

As illustrated in FIG. **10**B, the array **200** may be bent with a constant curvature.

When viewed from the side, the array **200** may be bent to contact a virtual circle **1049** in the overall height direction. In this case, the array **200** may have an arc-shaped cross-section. In this case, the curvature of the array **200** may be the inverse of the radius of the virtual circle **1049**.

The array **200** may be divided into a plurality of regions **421**, **422**, and **423**.

The array **200** may be divided into a plurality of regions **421**, **422**, and **423** according to where they are positioned on the array **200**.

The array **200** may be divided based on angle ranges in a clockwise direction or in a counter clockwise direction between a virtual line, which connects a center **1050** of a virtual circle **1049** and the array **200**, and a line **1052**, which passes through the center **1050** of the virtual circle **1049** and is parallel to the horizon.

In this case, the counter clockwise direction to the line **1051** passing through the virtual line **1048** and being parallel to the horizon is defined as "+", and the clockwise direction is defined as "−".

The array **200** may include a first region **421**, a second region **422**, and a third region **423**.

The first region **421** may be a region with a first angle range. The first angle range may be a range between +70° and −70°.

The second region **422** may be a region with a second angle range. The second angle range may a range between +70° to +90°.

The third region **423** may be a region with a third angle range. The third angle range may be a range between −70° and −90°.

The plurality of micro LED chips **920***c*, **920***d*, and **9220***e* respectively disposed in the plurality of regions **421**, **422**, and **423** may have different shapes.

A micro LED chip **920***c* included in a first group and having a first shape may be arranged in the first region **421**. The micro LED chip **920***c* included in the first group and having the first shape will be described with reference to FIG. **11**A.

A micro LED chip **920***d* included in a second group and having a second shape may be disposed in the second region **422**. The micro LED chip **920***d* included in the second group and having the second shape will be described with reference to FIG. **11**B.

A micro LED chip **920***d* included in a third group and having the second shape may be disposed in the third region **423**. The micro LED chip **920***d* included in the third group and having the second shape will be described with reference to FIG. **11**C. The micro LED chip included in the third group may be horizontally symmetric to the micro LED chip included in the second group.

In some implementations, the micro LED chips **920***c*, **920***d*, and **920***e* may output light in different directions.

For example, when the plurality of micro LED chips **920***c*, **920***d*, and **920***e* is placed in the same plane, the plurality of micro LED chips **920***c*, **920***d*, and **920***e* may output light in different directions, respectively.

FIGS. **11**A to **11**C are diagrams illustrating example shapes of an example plurality of micro LED chips.

FIG. **11**A is a schematic view illustrating an example of a micro LED chip **920***c* included in a first group and having a first shape, the micro LED chip **920***c* which is shown in FIGS. **10**A and **10**B.

Referring to FIG. **11**A, the micro LED chip **920***c* included in the first group and having the first shape (hereinafter, referred to as a first micro LED chip) may have a normal shape.

The first micro LED chip **920***c* may include a body **1100**.

The body **1100** may include a p-n diode layer. The p-n diode layer may include a first-type semiconductor layer (e.g., a p-doped layer), an active layer, and a second-type semiconductor layer (e.g., a n-doped layer).

When viewed from the side, the first micro LED chip **920***c* may have a trapezoidal shape having an upper edge longer than a lower edge. A vertical cross-section of the body **1100** may be vertically symmetric.

When viewed from above, the body **1100** of the first micro LED chip **920***c* may have a rectangular shape.

The first micro LED chip **920***c* may output light **1101** in an upward direction and in a lateral direction. The first micro LED chip **920***c* may output the light in the upward direction and in any direction.

FIG. **11**B is a schematic view illustrating an example of a micro LED chip **920***d* included in a second group and having a second shape, the micro LED chip **920***d* which is shown in FIGS. **10**A and **10**B.

Referring to FIG. **11**B, the micro LED chip **920***d* included in the second group and having the second shape (hereinafter, referred to as a second micro LED chip) may have a shape different from the shape of the first micro LED chip **920***c*.

The second micro LED chip **920***d* may include a body **1111** and a reflective layer **1112**.

The body **1111** may include a p-n diode layer. The p-n diode layer may include a first-type semiconductor layer (e.g., a p-doped layer), an active layer, and a second-type conductor layer (e.g., a n-doped layer).

The body **1111** may have a horizontal cross-section which gradually becomes greater toward the reflective layer **1112**.

A vertical cross-section of the body **1111** may be vertically asymmetric.

For example, a side surface **1122** of the body **1111** may form a tilting angle relative to a direction vertical to a reflective layer **1112**. The side surface **1122** of the body **1111** may form an acute angle relative to the reflective layer **1112**.

In some examples, the tilting angle formed by the side surface **1122** of the body **1111** in the direction **1121** vertical to the reflective layer **1112** may be determined based on a second curvature.

For example, the greater the second curvature, the greater the tilting angle.

For example, the smaller the second curvature, the smaller the tilting angle.

The reflective layer **1112** may be disposed on the body **1111**.

The reflective layer **1112** may reflect light generated by the body **1111**. For example, the reflective layer **1112** may be made of silver (Ag).

When viewed from above, the body **1100** of the second micro LED chip **920*d*** may have a rectangular shape.

The second micro LED chip **920*d*** may focus and output light **1102** in one direction.

For example, when the lamp **100** functions as a rear combination lamp **100*b***, the second micro LED chip **920*d*** may focus and output light **1102** in a direction rearward of the vehicle **10**.

FIG. **11**C is a schematic diagram illustrating another example shape of the micro LED chip **920*d*** included in the second group and having the second shape according to FIGS. **10**A and **10**B.

The second micro LED chip **920*d*** in FIG. **11**C may have a shape different from the shape of the second micro LED chip shown in FIG. **11**B.

The second micro LED chip **920*d*** may include the body **111** and the reflective layer **1112**.

The body **1111** may have a horizontal cross-section which becomes smaller toward the reflective layer **1112**.

A vertical cross-section of the body **1111** may be vertically asymmetric.

The side surface **1122** of the body **1111** may be tilted relative to a direction **1121** vertical to the reflective layer **1112**. The side surface **1122** of the body **1111** may form an obtuse angle relative to the reflective layer **1112**.

FIGS. **12**A and **12**B are diagrams illustrating a plurality of groups micro LED chips disposed in an array.

As described above with reference to FIG. **10**B, the array **200** may be bent with a constant curvature.

The array **200** may include a plurality of regions **421**, **422**, and **426**.

The plurality of regions **421** and **422** may be distinguished from each another based on where each of the plurality of regions **421** and **422** is positioned on the array **200**.

For example, when viewed from the side, the first region **421** may be a region ranging from +70° and −70° between a virtual line, which connects the center **1050** of the virtual circle and the array **200**, and a line **1051**, which passes through the center **1050** of the virtual circle and is parallel to the horizon.

For example, when viewed from side, the second region **422** may be a region ranging from −70° to −90° between the virtual line, which connects the center **1050** of the virtual circle and the array **200**, and the line **1051**, which passes through the center **1050** of the virtual circle and is parallel to the horizon.

As illustrated in FIG. **12**A, the first micro LED chip **920*c*** may be disposed in each of the first region **421** and the second region **422**.

As illustrated in FIG. **12**B, the first micro LED chip **920*c*** may be disposed in the first region **421**, and the second micro LED chip **920*d*** may be disposed in the second region **422**.

If the lamp **100** is functioning as the rear combination lamp **100*b***, high light intensity is required in the rear side of the vehicle **10**.

When the lamp **100** includes an array **200** shown in FIG. **12**A, a first micro LED chip **920*c*** is disposed in a second region **422** to thereby allow light distributed upward and downward from the vehicle **10**, thereby reducing light intensity of light rearward of the vehicle **10**.

When the lamp **100** includes an array **200** shown in FIG. **12**B, a second micro LED chip **920*d*** is disposed in a second region **422** to thereby focus light in a direction rearward of the vehicle **10**. In addition, uniformity of luminous intensity may improve and color deviation may decrease.

If the lamp **100** functions as the head lamp **100*a*** or the fog lamp **10*c***, high light intensity forward of the vehicle **10** is required.

When the lamp **100** includes the array **200** shown in FIG. **12**A, the first micro LED chip **920*c*** is disposed in the second region **422** to thereby make light distributed upward or downward from the vehicle **10**, thereby reducing light intensity of light forward of the vehicle **10**.

When the lamp **100** includes the array **200** shown in FIG. **12**B, the second micro LED chip **920*d*** is disposed in the second region **422** to thereby make light focused in a direction forward of the vehicle **10**. In addition, uniformity of luminous intensity may increase and color deviation may decrease.

FIG. **13** is a diagram illustrating an example array.

FIG. **13** shows an exemplary cross-sectional view **200*a*** and an exemplary plane view **200*p*** of an array.

The array **200** may include a polyimide layer **911**, a first electrode **912**, a reflective layer **913**, an inter-layer dielectric film **914**, a plurality of micro LED chips **920**, a second electrode **915**, an optical spacer **916**, a phosphor layer **917**, and a color filter film **918**.

In some implementations, the array **200** may further include a cover film **919**.

Descriptions about components of the array **200** with reference to FIG. **5** may be applied to the first electrode **912**, the reflective layer **913**, the inter-layer dielectric film **914**, the plurality of micro LED chips **920**, the second electrode **915**, the optical spacer **916**, the phosphor layer **917**, the color filter film **918**, and the cover film **919** in FIG. **13**.

As shown in the example of the reference numeral **200*s***, the polyimide layer **911** may extend in a horizontal direction further than at least one of the first electrode **912**, the reflective layer **913**, the inter-layer dielectric film **914**, the optical spacer **916**, the phosphor layer **917**, the color filter film **918**, or the cover film **919**.

As the polyimide layer **911** extends in the horizontal direction further than another layer (or film), the array **200** may be divided into a first region **1310** and a second region **1320**.

The first region **1310** may be a region where the plurality of micro LED chips **920** is disposed.

The first region **1310** may be referred to as a light emission region.

The polyimide layer **911**, the first electrode **912**, the reflective layer **913**, the inter-layer dielectric film **914**, the plurality of micro LED chips **920**, the second electrode **915**, the optical spacer **916**, the phosphor layer **917**, the color filter film **918**, and the cover film **919** may be disposed on the first region **1310**.

The second region **1320** may be defined as a region where the plurality of micro LED chips **920** is not disposed. The second region **1320** may be referred to as a non-light emission region.

The polyimide layer **911** may be disposed on the second region **1320**.

At least a portion of the second region may be bent.

The second region may include a first bent portion **1321** and a fixing portion **1331**.

The first bent portion **1321** may be a portion of the array **200** which is bent toward a bracket **1410**.

The fixing portion **1331** may be a portion of the array **200** which embraces at least a portion of the bracket **1410** to keep the array **200** in close contact with the bracket **1410** and fixed to the bracket **1410**.

FIG. **14** is a diagram illustrating an example lamp for a vehicle.

Referring to FIG. **14**, the lamp **100** may further include a bracket **1410**.

The array **200** may be bent to embrace at least a portion of the bracket **1410**.

For example, the fixing portion **1331** of the array may be bent to embrace a protrusion **1411** of the bracket **1410**.

The bracket **1410** may fix the array **200**.

The bracket **1410** may include a base **1412**, the protrusion **1411**, and a holder **1413**.

The base **1412**, the protrusion **1411**, and the holder **1413** may be integrally formed.

The base **1412** may support the protrusion **1411** and the holder **1413**.

The base **1412** may have a shape corresponding to a shape of the array **200**.

For example, when the array **200** is bent with a predetermined first curvature, a surface of the base **1412** facing the array **200** may be a surface curved to the first curvature.

The protrusion **1411** may protrude from the base **1412** in a direction in which the array **200** extends.

The holder **1413** may fix the array **200**.

The holder **1413** may extend from the base **1412** in a first direction.

The holder **1413** may extend from the base **1412** toward the array **200**.

For example, the holder **1413** may extend toward the first region **1310** of the array **200**.

For example, the holder **1413** may extend toward the micro LED chip **920**.

For example, the holder **1413** may extend in a direction vertical to the base **1412**.

The holder **1413** may penetrate the array **200**.

For example, the holder **1413** may penetrate a region of the array **200** on which the plurality of micro LED chips **920** is not disposed.

The holder **1413** extends from the base **1412** to penetrate the array **200**, thereby fixing the array **200**.

The holder **1413** may include at least one bent portion **1413*a***.

The bent portion **1413*a*** may be formed as the holder **1413** extending in the first direction extends in a second direction.

The second direction may be a direction vertical to the first direction.

Even when an external force is applied during travelling of a vehicle, the bent portion **1413*a*** may keep the array **200** and the bracket **1410** coupled to each other.

The array **200** may include a bent region which is a region bent with a predetermined curvature.

The holder **1413** may be positioned in a region corresponding to the bent region of the array **200**.

For example, the holder **1413** may extend from the base **1412** toward a region corresponding to a bent region of the array **200**. The holder **1413** may penetrate the bent region of the array **200**.

The lamp **100** may further include an adhesive member **1450**.

The adhesive member **1450** may allow the array **200** to be attached to the bracket **1410**.

The adhesive member **1450** may be positioned between the array **200** and the bracket **1410**.

The adhesive member **1450** may include an adhesive, a double sided tape, or an adhesive film.

At least part of the bracket **1410** may contact the array **200**.

Even in the case where the adhesive member **1450** is disposed between the array **200** and the bracket **1410**, at least part of the bracket **1410** may contact the array **200**.

Due to the contact between the bracket **1410** and the array **200**, the adhesive member **1450** is not exposed to the outside.

FIG. **15** is a diagram for explaining a lamp for a vehicle.

A holder **1413** of the bracket **1410** shown in FIG. **15** may form an acute angle relative to a part of the base **1412**.

For example, the holder **1413** may form an acute angle relative to a surface of the base **1412** which faces the array **200**.

For example, the holder **1413** may form an acute angle relative to a surface of the base **1412** which faces the first region **1310** of the array **200**.

In some examples, the holder **1413** may provide additional support/holding power in addition to the adhesive member **1450**. The array **200** may partially cover or wrap around an outer edge of the bracket **1410**.

FIG. **16** is an enlarged view of the portion A shown in FIG. **14**.

In the following description, a first direction and a second direction may be used for relative orientation. The second direction may be different from the first direction. For example, the second direction may be a direction perpendicular to the first direction.

The first direction and the second direction may differ depending on a light output direction or a position of the array **200**.

For example, as illustrated in FIG. **16**, when the light generation unit **160** outputs light in a direction perpendicular to a road surface, the first direction may be a horizontal direction and a second direction may be a vertical direction.

In other examples, contrary to the example of FIG. **16**, when the light generation unit **160** outputs light in a direction parallel to a road surface, the first direction may be a vertical direction and the second direction may be a horizontal direction.

Referring to FIG. **16**, the array **200** may include a plurality of portions to cover or wrap around all or a portion of the bracket **1410** (e.g., a protrusion **1411**). For example, the array **200** may include a first flat portion **1311**, a first bent portion **1321**, a second flat portion **1332**, a second bent portion **1333**, a third flat portion **1334**, and a third bent portion **1335**.

The first flat portion **1311** extends in the first direction.

The first flat portion **1311** may include the first region **1310** (see FIGS. **13** and **14**).

The first flat portion **1311** may include a plurality of micro LED chips **920** disposed thereon.

The first bent portion **1321** may be bent from the first flat portion in the second direction.

The second flat portion **1332** extends from the first bent portion **1321**.

The second bent portion **1333** is bent from the second flat portion **1332** in the first direction.

The third flat portion **1334** extends from the second bent portion **1333** in the first direction.

The third bent portion **1335** extends from the third flat portion **1334** in the second direction.

For example, the fixing portion **1331** described above with reference to FIG. **13** may include the second flat portion **1332**, the second bent portion **1333**, the third flat portion **1334**, and the third bent portion **1335**.

As the fixing portion **1331** is formed to surround the protrusion, the array **200** may be tightly fixed to the bracket **1410**.

FIG. **17** is a diagram for explaining an example lamp for a vehicle.

Referring to FIG. **17**, the second flat portion **1332** may include a light emission region.

The second flat portion **1332** may have some of the plurality of micro LED chips **920** disposed thereon.

In some examples, a portion of the plurality of micro LED chips **920** may be disposed on the second flat portion **1332**.

As some of the plurality of micro LED chips **920** are disposed on the second flat portion **1332**, it may be possible to output light in the first direction as well as the second direction, thereby enhancing light efficiency.

FIG. **18** is a diagram for explaining an example lamp for a vehicle.

Referring to FIG. **18**, the lamp **100** may further include a wire **2010**.

The wire **2010** may include an anode wire and a cathode wire.

The wire **2010** may supply electrical energy to the array **200**.

One end of the wire **2010** may be connected to a battery inside a vehicle.

The other end of the wire **2010** may be connected to the array **200**.

The array **200** may include at least one bent portions **1321**, and the wire **2010** may be connected to the bent portion **1321**.

For example, a light emission region included in the array **200** may extend up to the bent portion **1321**. In this case, the wire **2010** may be connected to the bent portion **1321** and the light emission region, thereby being enabled to supply electrical energy to the array **200**. In this case, the wire **2010** may be connected to the bent portion **1321** and a first electrode **912** of the light emission region to supply electrical energy.

The wire **2010** may contact at least part of the bracket **1410**.

For example, the wire **2010** may contact one exterior surface of the bracket **1410**.

The lamp **100** may further include a heat dissipation system **2030**.

The heat dissipation system **2030** may contact at least part of the bracket **1410**.

The heat dissipation system **2320** may manage heat that is generated from the array **200**.

The heat dissipation system **2030** may include a plurality of dissipation pins. A dissipation pin may be formed of a material having an excellent thermal conductivity.

The plurality of dissipation pins may penetrate the bracket **1410** to contact the array **200**.

In some implementations, the lamp **100** may include a housing.

The housing may define the exterior of the lamp **100**. The housing may accommodate constituent elements of the lamp **100**.

The plurality of dissipation pins may penetrate the housing. In this case, some of the plurality of dissipation pins may be exposed to the outside of the housing.

The lamp **100** may further include a supporting structure **2050**.

The supporting structure **2050** may contact the bracket **1410**.

The supporting structure **2050** may press the bracket **1410** toward the array **200**. As the supporting structure **2050** presses the bracket **1410** toward the array **200**, the array **200** is able to contact the bracket **1410** more closely. In addition, the array **200** is fixed to the bracket **1410** with the fixing portion **1331** embracing the protrusion **1411** of the bracket **1410**. In this case, due to the bending of the array **200**, the array **200** and the bracket **1410** are not spaced apart from each other.

By allowing the bracket **1410** presses the third flat portion **1334**, the supporting structure **2050** may help the array **200** to be fixed to the bracket **1410** more securely.

The supporting structure **2050** may be any of components included in the lamp **100**.

The wire **2010** may contact one exterior surface of the supporting structure **2050**.

FIG. **19** illustrates an example array and an example bracket of a lamp for a vehicle.

Referring to FIG. **19**, the wire **2010** may penetrate the inside of the bracket **1410**.

The wire **2010** may penetrate the inside of the bracket **1410** to be connected to the array **200**.

By penetrating the inside of the supporting structure **2050**, the wire **2010** may be connected to the array **200**.

As the wire **2010** penetrates the bracket **1410** and the supporting structure **2050** to be connected to the array **200**, the wire **2010** may be arranged neatly.

In some implementations, the bracket **1410** and the supporting structure **2050** may have a flat shape as illustrated. In some implementations, the brake **1410** and the supporting structure **2050** may have a curved shape, or a combination of a flat and curved shape. The bracket **1410** and the supporting structure **2050** may be flexible. In examples where the bracket **1410** and the supporting structure **2050** have curve shapes, the array **200** may be bent to curve corresponding to curvatures of the curved shapes of the bracket **1410** and the supporting structure **2050**. A curved shape may include a bent shape.

The present disclosure as described above may be implemented as code that can be written on a computer-readable medium in which a program is recorded and thus read by a computer. The computer-readable medium includes all kinds of recording devices in which data is stored in a computer-readable manner. Examples of the computer-readable recording medium may include a hard disk drive (HDD), a solid state disk (SSD), a silicon disk drive (SDD), a read only memory (ROM), a random access memory (RAM), a compact disk read only memory (CD-ROM), a magnetic tape, a floppy disc, and an optical data storage device. In addition, the computer-readable medium may be implemented as a carrier wave (e.g., data transmission over the Internet). In addition, the computer may include a processor or a controller. Thus, the above detailed description should not be construed as being limited to the implementations set forth herein in all terms, but should be considered by way of example. The scope of the present disclosure should be determined by the reasonable interpretation of the accompanying claims and all changes in the equivalent range of the present disclosure are intended to be included in the scope of the present disclosure.

Although implementations have been described with reference to a number of illustrative implementations thereof, it should be understood that numerous other modifications and implementations can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

1. A lamp for a vehicle, comprising:
- a light generation unit;
- a bracket; and
- a lens configured to change an optical path of light generated by the light generation unit,
- wherein the light generation unit comprises a light array including a plurality of micro Light Emitting Diode (LED) chips, and
- wherein the light array includes a bent portion that covers at least a part of the bracket, and
- wherein the light array comprises a plurality of portions to cover the at least a part of the bracket, the plurality of portions of the light array including:
  - a first flat portion that extends in a first direction, and
  - a first bent portion that extends from the first flat portion in a second direction.

2. The lamp according to claim **1**, wherein the light array is configured to flex.

3. The lamp according to claim **1**, wherein the light array comprises:
- a first region that includes the plurality of micro LED chips; and
- a second region that does not include the plurality of micro LED chips, and
- wherein at least a portion of the second region has a bent shape.

4. The lamp according to claim **1**, wherein the bracket comprises:
- a base; and
- a holder that extends from the base toward the light array and that is configured to fix the light array to the holder.

5. The lamp according to claim **4**, wherein the holder comprises one or more bent portions.

6. The lamp according to claim **4**, wherein the holder extends from the base in a direction that forms an acute angle with respect to a surface of the base.

7. The lamp according to claim **4**, wherein the light array comprises a bent region having a preset curvature, and
- wherein the holder is disposed at a location corresponding to the bent region of the light array.

8. The lamp according to claim **4**, further comprising an adhesive member configured to couple the light array to the bracket.

9. The lamp according to claim **4**, wherein the at least a portion of the bracket contacts the light array.

10. The lamp according to claim **1**, further comprising a wire configured to supply electrical energy to the light array, the wire contacting the at least a portion of the bracket.

11. The lamp according to claim **10**, wherein the light array comprises at least one bent portion that is connected to the wire.

12. The lamp according to claim **1**, further comprising a heat dissipation device that contacts at least a portion of the bracket and that is configured to dissipate heat generated from the light array.

13. The lamp according to claim **12**, wherein the heat dissipation device comprises a plurality of dissipation pins that penetrates the bracket to thereby contact the light array.

14. The lamp according to claim **13**, further comprising a housing that defines an exterior of the lamp,
- wherein the plurality of dissipation pins are exposed to an outside of the housing.

15. The lamp according to claim **1**, wherein the light array further comprises:
- a second flat portion that extends from the first bent portion in the second direction; and
- a second bent portion that extends from the second flat portion in the first direction.

16. The lamp according to claim **15**, wherein the light array further comprises:
- a third flat portion that extends from the second bent portion in the first direction; and
- a third bent portion that extends from the third flat portion in the second direction.

17. The lamp according to claim **15**, wherein the second flat portion includes a portion of the plurality of micro LED chips.

18. The lamp according to claim **1**, further comprising a supporting structure that contacts the bracket and that is configured to provide pressure to the bracket toward the light array.

19. The lamp according to claim **18**, further comprising a wire configured to supply electrical energy to the light array, the wire penetrating the bracket and the supporting structure.

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