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YUN et al.

(54) **OPTICAL SEMICONDUCTOR BASED ILLUMINATING APPARATUS**

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USPC **362/249.01**

(57) **ABSTRACT**

Disclosed herein is an optical semiconductor based illuminating apparatus including light emitting modules including at least one semiconductor optical device; and a housing enclosing one side surface of at least one of the light emitting modules. This optical semiconductor based illuminating apparatus may promote convenience for checking and repairing, simply perform separation and fastening, have excellent waterproofing characteristics and durability, prevent accidents such as short circuit and electric shock improve heat radiation performance, prevent introduction of foreign materials, be easily cleaned and maintained, reliably provide power of a main power line to a plurality of light emitting modules, and utilize a space and secure reliability of a product regardless of a size and a shape of a power supply embedded therein.

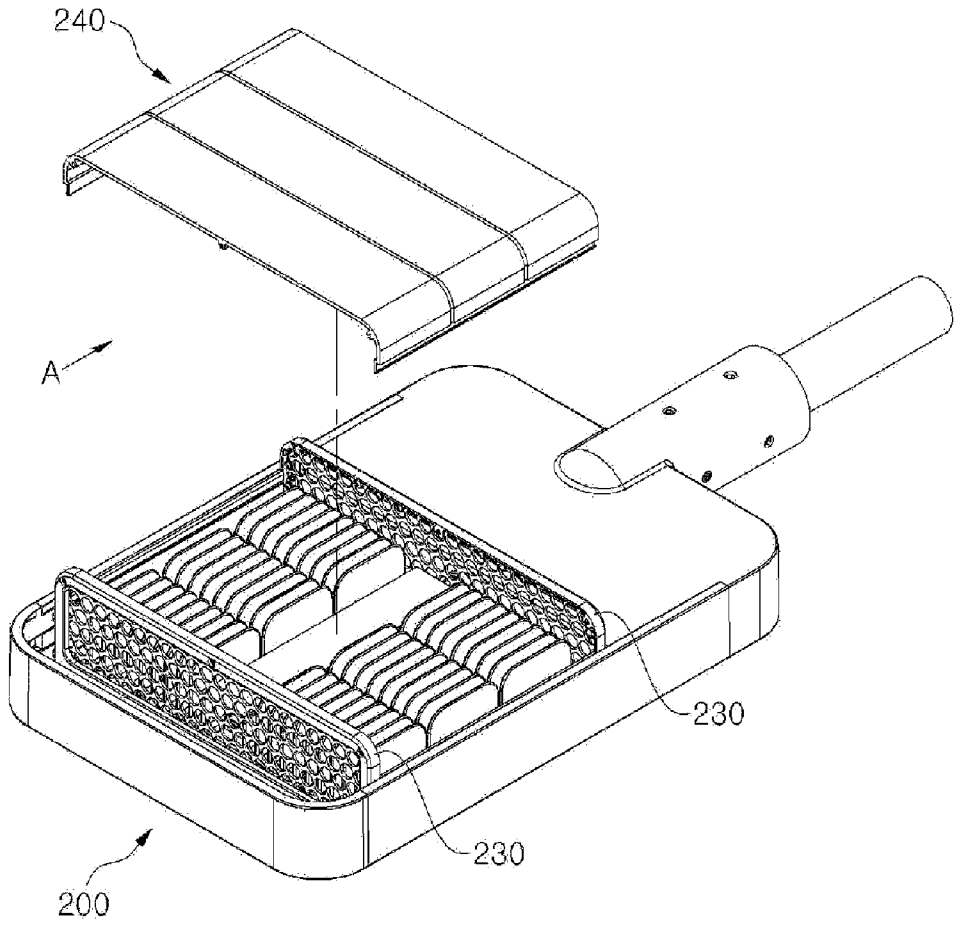

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FIG. 1.

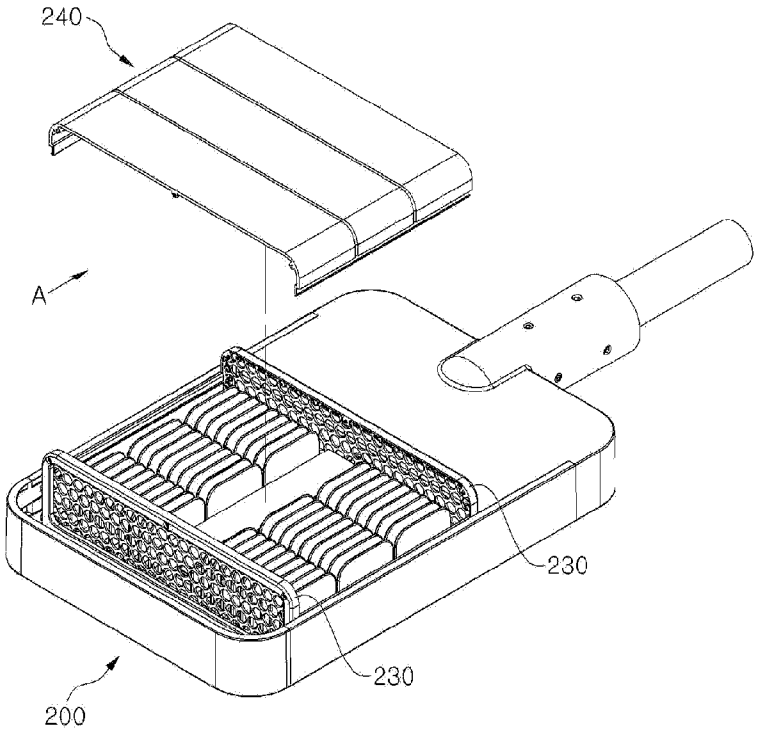

FIG. 2.

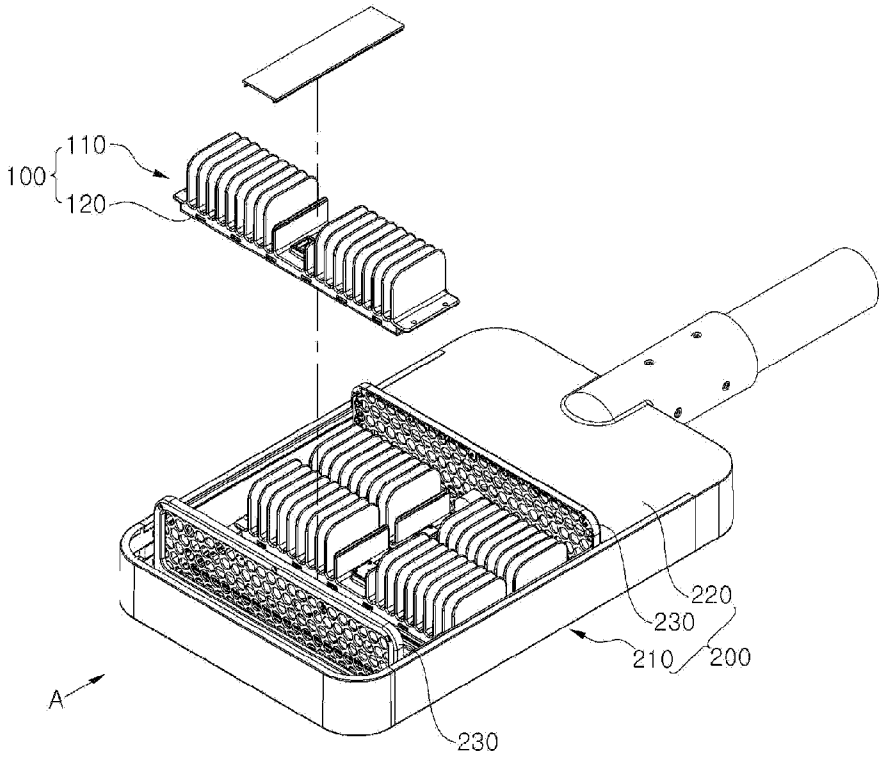

FIG. 3.

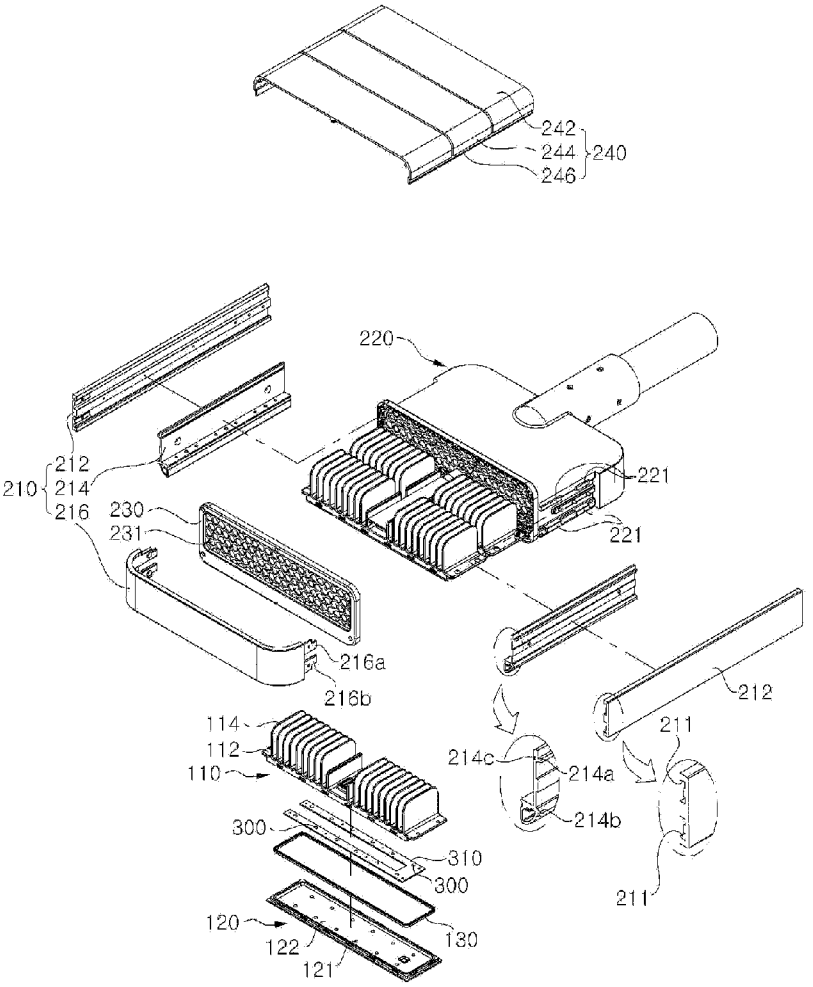
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FIG. 4.

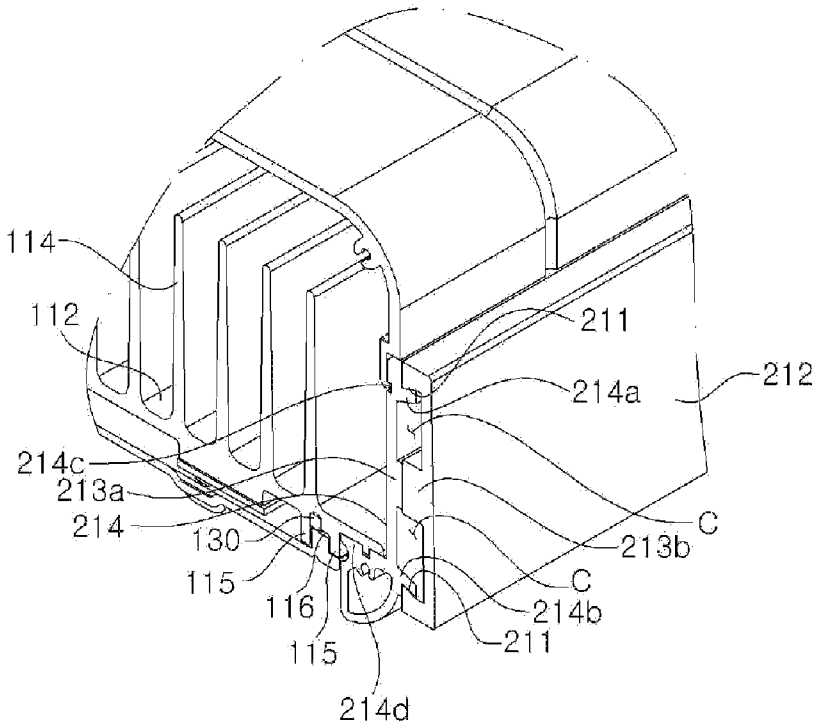
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FIG. 5.

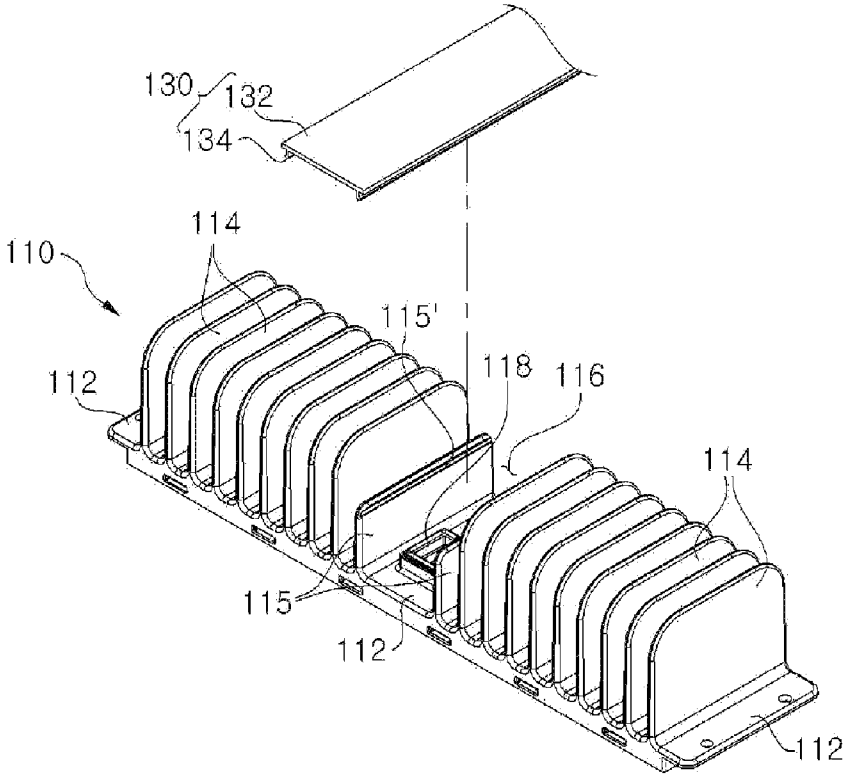
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FIG. 6.

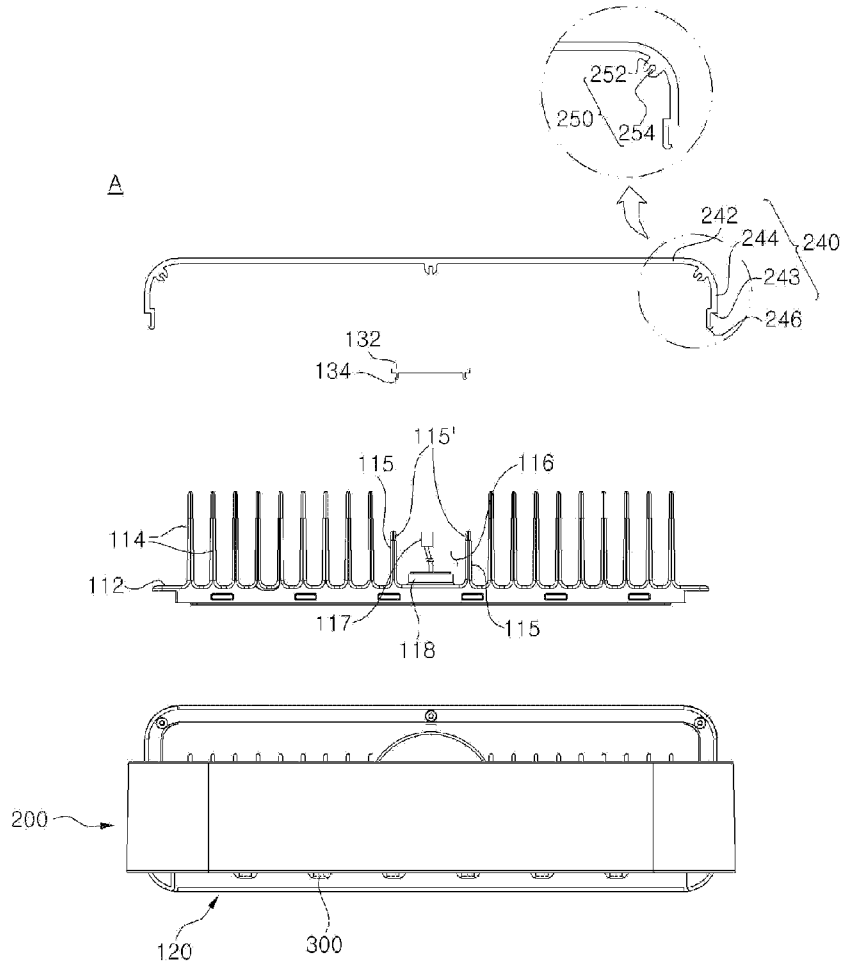
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FIG. 7.

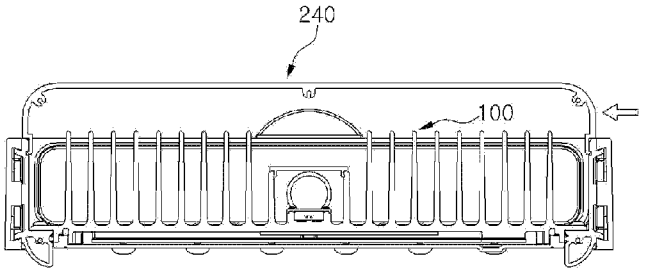
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FIG. 8.

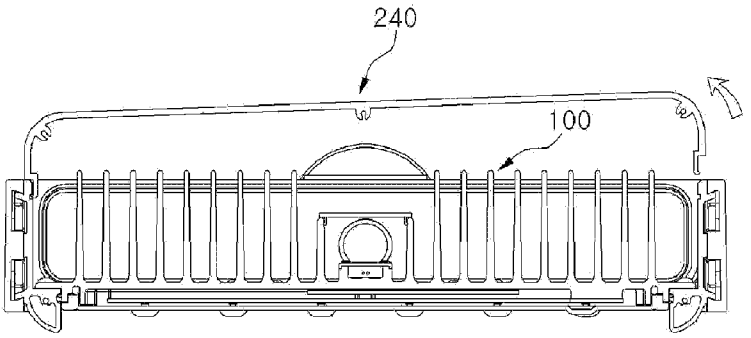
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FIG. 9.

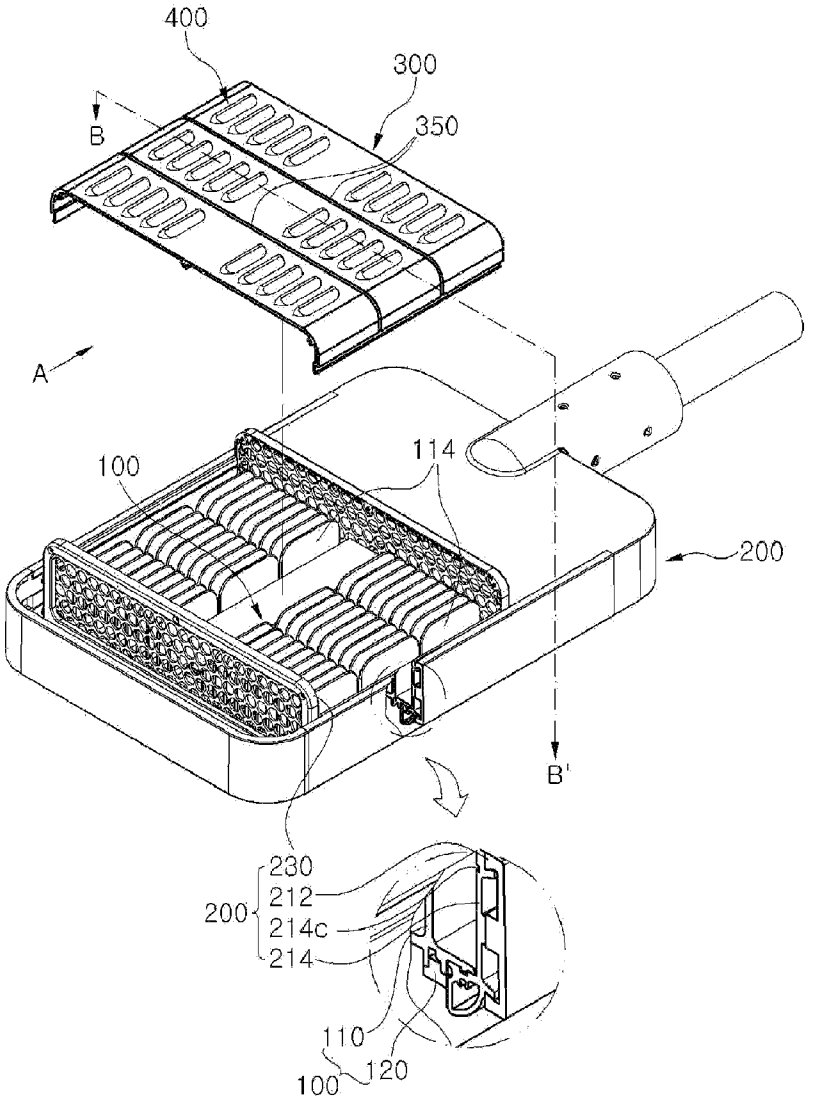
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FIG. 10.

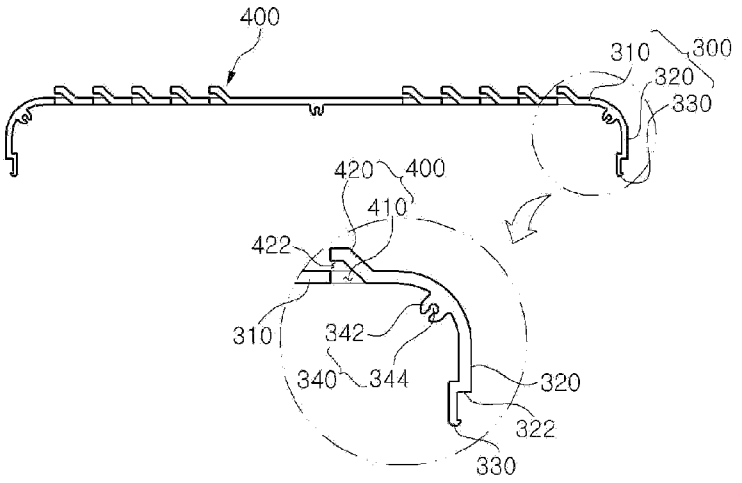

FIG. 11.

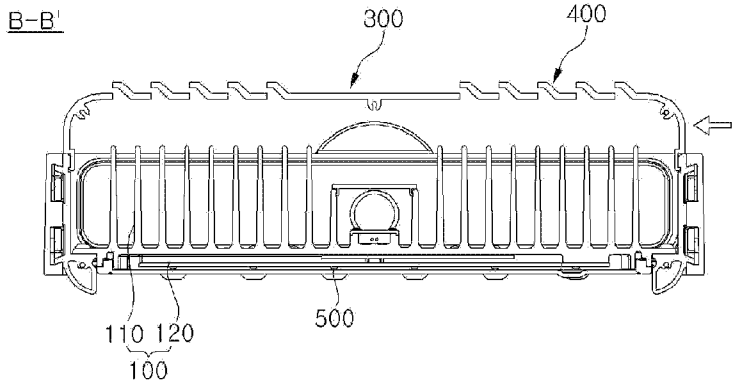

FIG. 12.

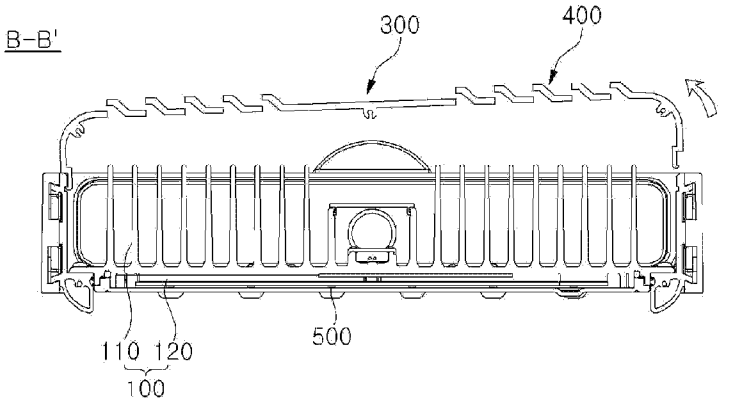

FIG. 13.

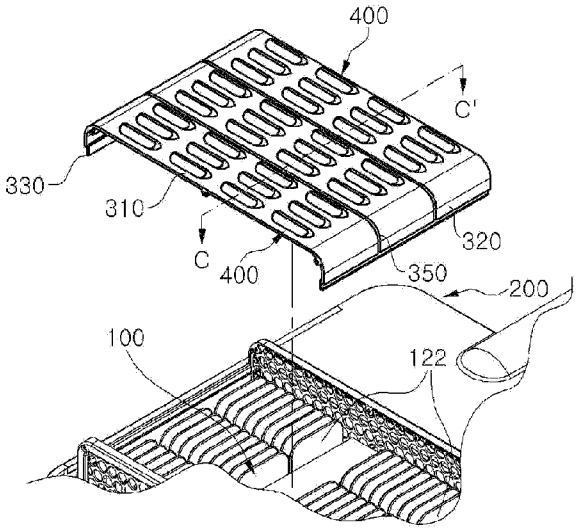

FIG. 14.

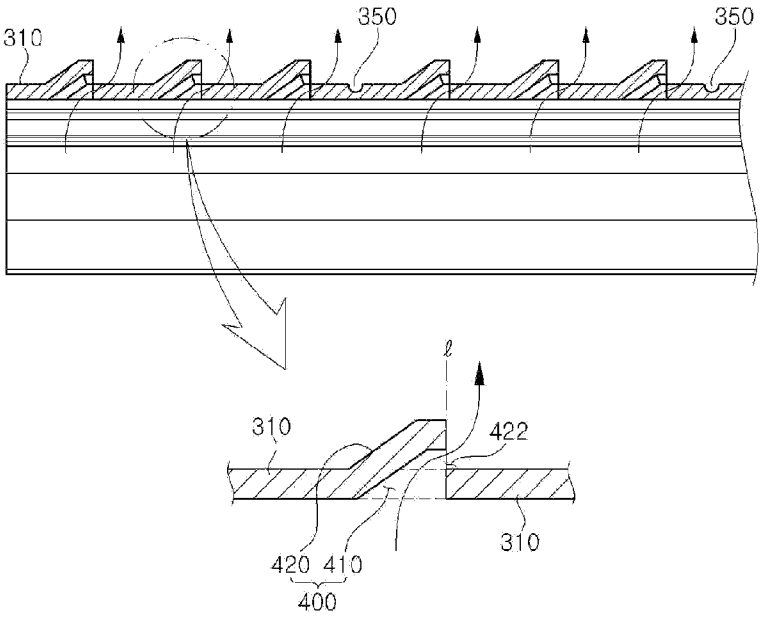

FIG. 15.

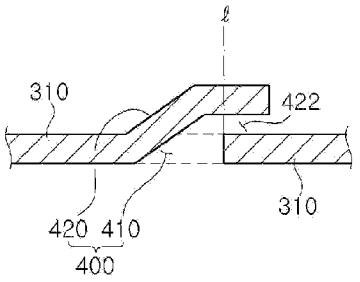

FIG. 16.

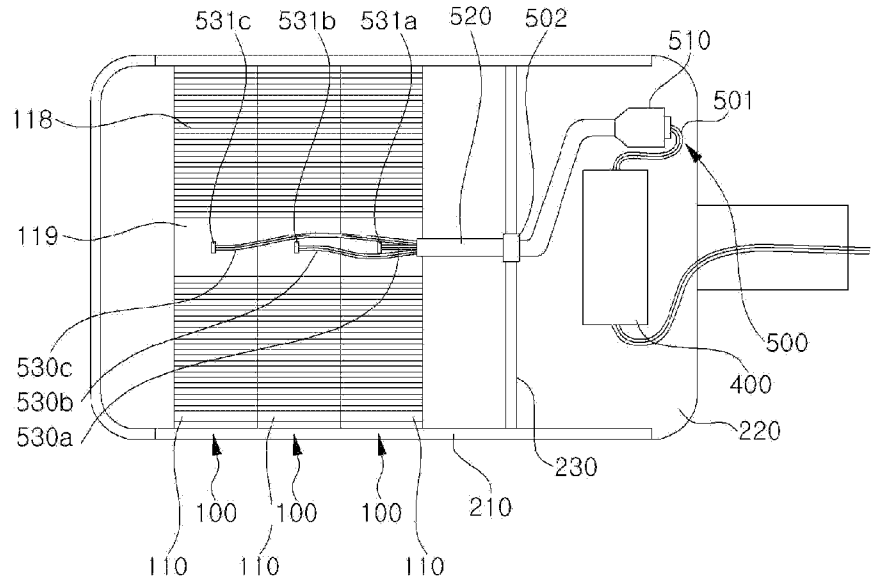
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FIG. 17.

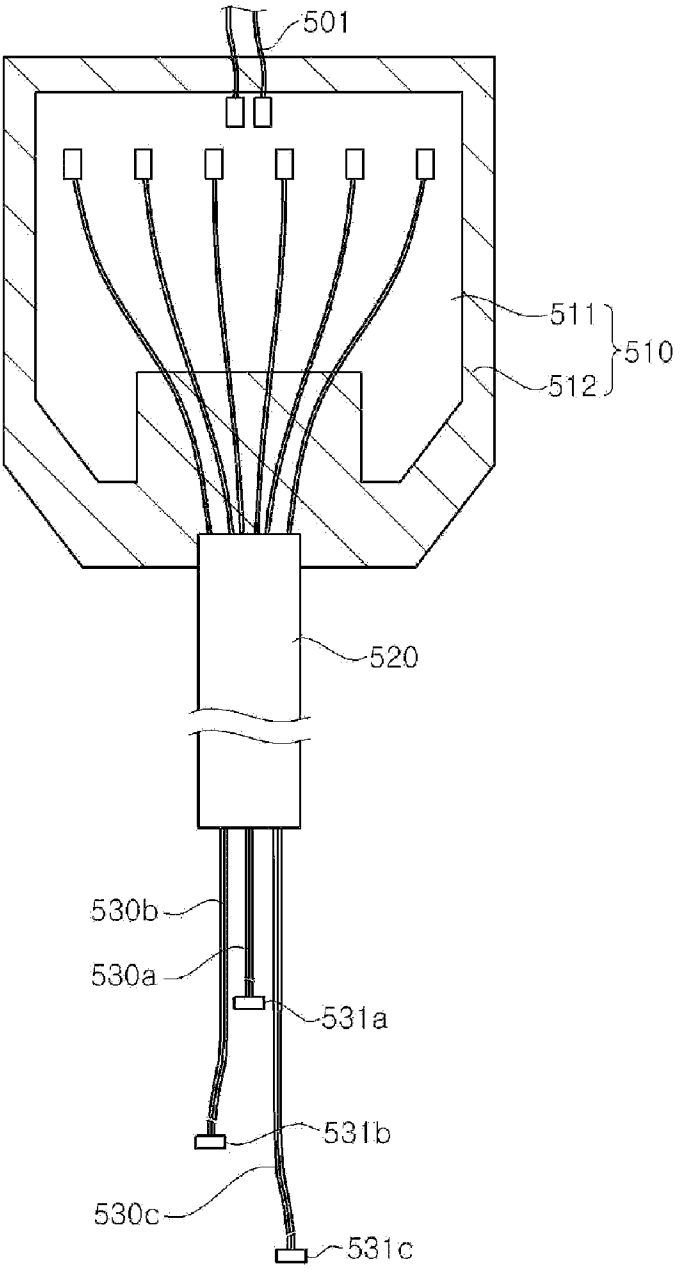
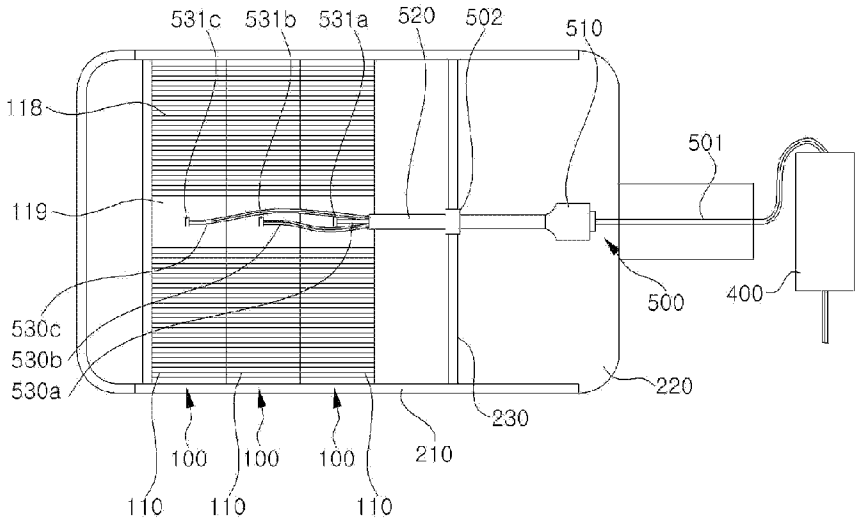


FIG. 18.



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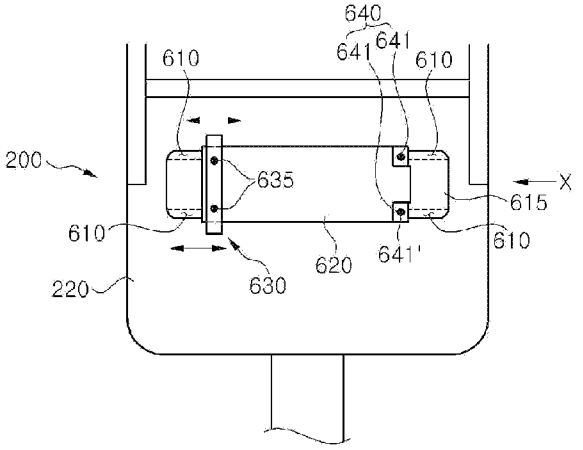

FIG. 20.

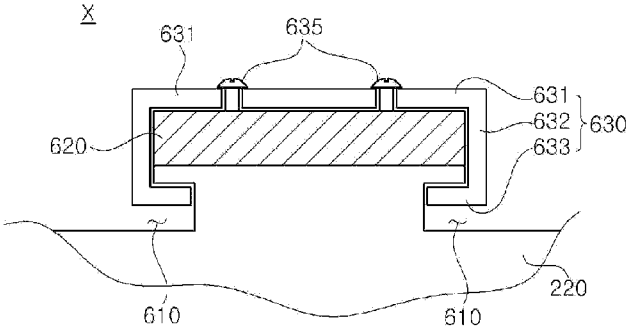

FIG. 21.

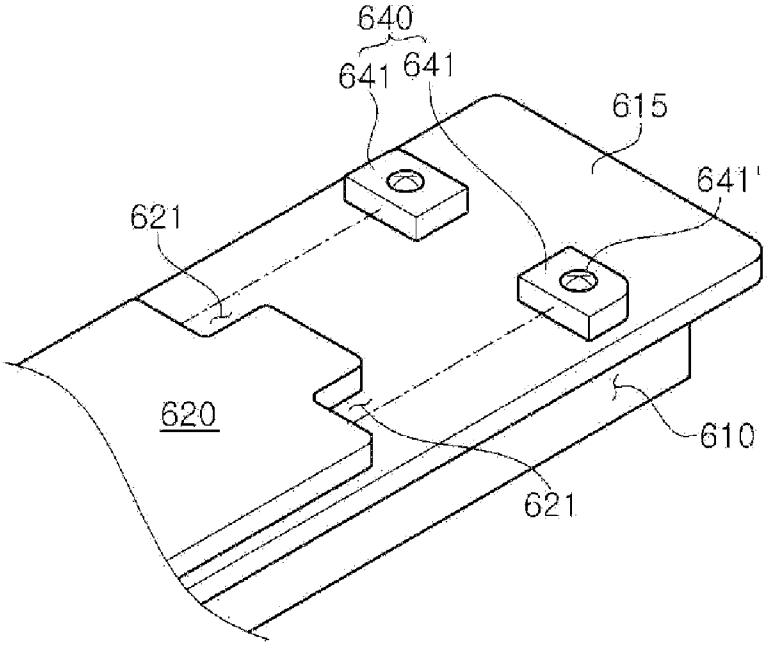
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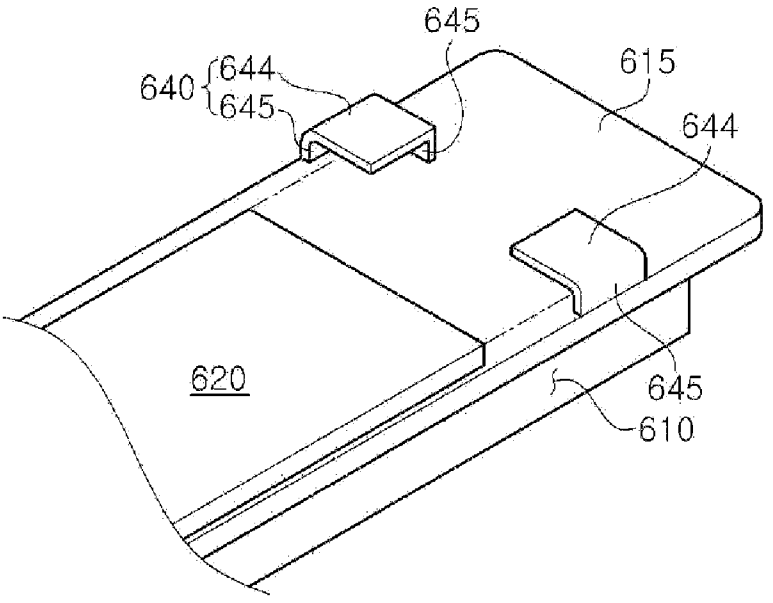
FIG. 22.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OPTICAL SEMICONDUCTOR BASED ILLUMINATING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from and the benefit of Korean Patent Application No. 2011-0103259, filed on Oct. 10, 2011, Korean Patent Application No. 2011-0108062, filed on Oct. 21, 2011, and Korean Patent Application No. 2011-0116739, filed on Nov. 10, 2011, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an optical semiconductor based illuminating apparatus.

[0004] 2. Discussion of the Background

[0005] An optical semiconductor such as a light emitting diode (LED) is one of the components that have been recently spotlighted widely as an illuminating apparatus since it has lower power consumption, a longer lifespan, more excellent durability, and significantly higher brightness as compared with an incandescent lamp and a fluorescent lamp.

[0006] Particularly, an illuminating apparatus using the optical semiconductor as a light source has been recently used for illumination, security, or the like. Therefore, the illuminating apparatus should be conveniently assembled and configured. In addition, since the illuminating apparatus is used in a state in which it is exposed to the air, a waterproofing property should be maintained and measures should be taken against accidents such as short circuit and electric shock.

[0007] In addition, the illuminating apparatus using the optical semiconductor as a light source should have a structure in which components may be instantly replaced or repaired at the time of fault generation or malfunction.

[0008] In the illuminating apparatus using the optical semiconductor as a light source, as wattage increases or decreases, the number of products in the module form described above increases or decreases. In the case in which a plurality of products are embedded in the illuminating apparatus, when a fault occurs in each product, the entire illuminating apparatus cannot but be disassembled and reassembled.

[0009] In addition, the illuminating apparatus using the optical semiconductor as a light source includes a heat sink mounted in order to improve heat radiation performance and generally exposed to the air in order to promote a heat radiation effect. However, the heat sink is polluted by excrement of birds that tend to sit down at a high place, such that the heat sink looks bad in view of an appearance.

[0010] Meanwhile, an illuminating apparatus using a semiconductor device such as a light emitting diode (LED) as a light source has been mainly used as an illuminating apparatus requiring a high light output, such as a factory lamp, a street lamp, or a security lamp. This illuminating apparatus generates a large amount of heat at the time of a light emitting operation of a light emitting module including a semiconductor optical device.

[0011] In implementing this illuminating apparatus, a distributor for distributing power lines from a main power line from a power supply to a plurality of light emitting modules is also required.

[0012] The distributor as described above should include a distributor body provided at one side thereof and connected to the main power line and require a plurality of distribution lines extended from the distributor body.

[0013] Therefore, this distributor has a structure in which the plurality of distribution lines are branched and led from the distributor body. In this structure, a waterproofing problem of the distribution lines at distribution positions has been raised.

SUMMARY OF THE INVENTION

[0014] The present invention provides an optical semiconductor based illuminating apparatus capable of promoting convenience for checking and repairing, simply performing separation and fastening, having excellent waterproofing characteristics and durability, and preventing accidents such as short circuit and electric shock.

[0015] Further, the present invention provides an optical semiconductor based illuminating apparatus capable of improving heat radiation performance.

[0016] Further, the present invention provides an optical semiconductor based illuminating apparatus capable of preventing introduction of foreign materials and being easily cleaned and maintained.

[0017] Further, the present invention provides an optical semiconductor based illuminating apparatus capable of reliably providing power of a main power line to a plurality of light emitting modules.

[0018] Further, the present invention provides an optical semiconductor based illuminating apparatus capable of utilizing a space and securing reliability of a product regardless of a size and a shape of a power supply embedded therein.

[0019] According to an exemplary embodiment of the present invention, there is provided an optical semiconductor based illuminating apparatus including: light emitting modules including at least one semiconductor optical device; and a housing enclosing one side surface of at least one of the light emitting modules.

[0020] The housing may be separated into a plurality of components.

[0021] The light emitting module may include: a heat sink part including the semiconductor optical device and disposed in the housing; and an optical cover coupled to the heat sink part.

[0022] The housing may include an outer frame enclosing one side surface of at least one of the light emitting modules.

[0023] The housing may further include a support having the outer frame slidably coupled thereto.

[0024] The housing may further include fixing plates having edges of both end portions fixed to facing surfaces of the outer frame, respectively, and embedded in the outer frame to fix both edges of the light emitting module, respectively.

[0025] The light emitting modules may be disposed between the fixing plates while forming one or more rows and columns.

[0026] The heat sink part may include: a heat radiation plate having at least one semiconductor optical device formed thereon; and a plurality of heat radiation fins formed on one surface of the heat radiation plate.

[0027] The heat sink part may include: a heat radiation plate having at least one semiconductor optical device formed thereon; a plurality of heat radiation thin plates disposed on the heat radiation plate; and heat pipes penetrating through

IPR2025-01016 EX1017

the plurality of heat radiation thin plates to thereby be connected to the heat radiation plate and forming internal channels.

[0028] The heat sink part may include a wiring path formed by a pair of partition walls protruded from the heat radiation plate.

[0029] The heat sink part may further include a connection terminal mounted on the heat radiation plate forming the wiring path to thereby be electrically connected to the semiconductor optical device.

[0030] The heat sink part may further include: first grooves depressed in facing surfaces of the pair of partition walls, respectively; and an auxiliary cover having both end portions detachably coupled to the first grooves to cover a lower portion of the wiring path.

[0031] The respective connection terminals of the heat sink parts adjacent to each other may be connected to each other by a detachable connector.

[0032] One or more light emitting modules having the same size and shape may be disposed so as to be in parallel with each other in the housing.

[0033] A plurality of light emitting modules may be disposed so as to be in parallel with the fixing plates.

[0034] A plurality of light emitting modules may be disposed so as to be perpendicular to the fixing plates.

[0035] The auxiliary cover may include: a cover piece covering the wiring path while contacting edges of upper end portions of the partition walls; and auxiliary hooks protruded from a lower surface of the cover piece in a length direction of the cover piece and having end portions coupled to the first grooves.

[0036] The auxiliary cover may include: a cover piece contacting edges of upper end portions of the partition walls of the heat sink parts disposed in plural so as to cover the wiring path formed by the partition walls; and auxiliary hooks protruded from a lower surface of the cover piece in a length direction of the cover piece and having end portions coupled to a plurality of first grooves formed in the plurality of partition walls.

[0037] The outer frame of the housing may include side frames having second grooves formed in a length direction thereof and having a shape corresponding to those of fixing bars protruded on both side surfaces of the support.

[0038] The outer frame may further include a side bracket having a third groove formed at an upper portion of an inner side surface thereof in the length direction, a step formed at a lower portion of the inner side surface thereof, and fixing bars formed on an outer side surface thereof and corresponding to the second grooves to thereby be coupled to the side frame.

[0039] The outer frame may further include a connection frame having fixing pieces protruded from both end portions thereof, respectively, and having a shape corresponding to that of a coupling space formed by the fixing bars and the second grooves.

[0040] The optical semiconductor based illuminating apparatus may further include a cover covering an upper portion of the light emitting module and having both end portions coupled to the outer frame.

[0041] The cover may include: a plate covering the upper portion of the light emitting module; connection pieces extended from both end portions of the plate and bent toward the outer frame; and catching hooks extended from end portions of the connection pieces to thereby be detachably coupled to the third grooves.

[0042] The cover may further include reinforcing structures protruded inwardly along connection portions between the plate and the connection pieces.

[0043] The cover may further include step parts formed at lower portions of the connection pieces so as to be stepped and having upper end portions seated on edges of an upper portion of the outer frame, and the catching hooks may be formed at lower end portions of the step parts.

[0044] The reinforcing structure may include: a body protruded from the connection portion between the plate and the connection piece; and a hollow part cut inwardly in a length direction of the body and formed in a cylindrical shape at the center of the body to thereby be expanded or contracted according to elastic deformation of the connection piece.

[0045] The light emitting modules adjacent to each other or the outermost light emitting module and the housing may be disposed so as to be spaced apart from each other.

[0046] The housing may further include: a cover having both end portions detachably coupled to facing edges of the housing, respectively, while being deformed, so as to cover an upper portion of the light emitting module; and vent units formed in the cover to discharge heat generated from the light emitting module.

[0047] The cover may include: connection pieces extended from both end portions of a plate covering the upper portion of the light emitting module and bent toward the housing to thereby be elastically deformed so as to approach each other or be spaced apart from each other while facing each other; and catching hooks extended from end portions of the connection pieces to thereby be detachably coupled to an upper portion of an inner side surface of the housing, and the vent unit may be formed in the plate.

[0048] The plate may further include a plurality of grooves formed in a direction corresponding to a direction in which the plurality of light emitting modules embedded in the housing are disposed, and the vent unit may be formed between the grooves adjacent to each other.

[0049] The vent unit may include vent holes formed at equidistance so as to penetrate through the plate in the direction in which the light emitting modules are disposed.

[0050] The vent holes may penetrate through the plate in a slit shape so as to be in parallel with a plurality of heat radiation fins protruded from the light emitting module and disposed at equidistance.

[0051] The vent holes may penetrate through the plate in a slit shape so as to be perpendicular to a plurality of heat radiation fins protruded from the light emitting module and disposed at equidistance.

[0052] The vent holes may penetrate through the plate at positions corresponding to positions at which the semiconductor optical devices included in the light emitting module are disposed.

[0053] The vent unit may further include a vent guide extended from an edge of one side of the vent hole upwardly of the plate to cover an upper portion of the vent hole and having an outlet provided at the other side thereof.

[0054] An edge of the outlet side of the vent guide may be disposed on a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole.

[0055] An edge of the outlet side of the vent guide may pass through a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole and be then extended to the plate in the vicinity of the edge of the other side of the vent hole.

IPR2025-01016 EX1017

[0056] The vent unit may include a plurality of vent holes penetrating through the plate of the cover covering the upper portion of the light emitting module.

[0057] The optical semiconductor based illuminating apparatus may further include a distributor distributing power received from a main power line to the light emitting modules.

[0058] The distributor may include: a distributor body connected to the main power line; a cable jacket extended from the other side of the distributor body by a predetermined length; and a plurality of distribution cables led from the distributor body, passing through the cable jacket, and then connected to each of the plurality of light emitting modules.

[0059] The distributor body may include: a power distribution printed circuit board having terminals connected to the main power line and the distribution cables and a power distribution circuit connected to the terminals; and a molding part formed to cover the entire power distribution PCB.

[0060] The cable jacket may be extended from an inner portion of the molding part to an outer portion thereof.

[0061] The housing may include an auxiliary space separated from a main space by a partition wall, the distributor body may be positioned at the auxiliary space, the cable jacket may pass through the partition wall and be then extended into the main space, and the distribution cables may be branched from the cable jacket in the main space.

[0062] The cable jacket may be assembled to a cable gland installed at the partition wall.

[0063] The plurality of light emitting modules may include a heat sink provided at the rear thereof, and the heat sink may include a path at which at least one of the distribution cables is positioned and heat radiation fins formed in the vicinity of the path.

[0064] The plurality of light emitting modules may be disposed so as to be in parallel with each other, such that the paths are continuously connected to each other.

[0065] The distribution cables may have different lengths.

[0066] The distributor may receive direct current power from a switch mode power supply (SMPS) connected to the main power line, wherein the SMPS is positioned inside the housing.

[0067] The distributor may receive direct current power from an SMPS connected to the main power line, wherein the SMPS is positioned outside the housing.

[0068] The housing may include: a pair of rails formed on an inner surface of the support; a power supply (hereinafter, referred to as an SMPS) disposed at an upper portion of the rail; and a bracket having both end portions reciprocating along the pair of rails and fixing the SMPS.

[0069] The housing may further include a seat jaw disposed between the pair of rails and having the SMPS seated thereon.

[0070] The rails may be formed along both edges of the seat jaw.

[0071] The bracket may include: a first piece contacting an upper surface of the SMPS; second pieces extended from both end portions of the first piece, respectively; and third pieces extended from end portions of the second pieces, respectively, to contact the rails.

[0072] The housing may further include fixtures formed on an inner surface of the support and fixing both sides of one end portion of the SMPS.

[0073] The bracket may further include at least one bolt detachably coupled to the first piece to contact or be spaced apart from the upper surface of the SMPS.

[0074] The fixture may include a pair of blocks detachably coupled to the inner surface of the support and having a shape corresponding to those of cut parts formed at both sides of one end portion of the SMPS, respectively.

[0075] The fixture may include: fourth pieces that are in parallel with the inner surface of the support and disposed at both sides of one end portion of the SMPS, respectively; and blocking walls extended to an inner side surface of the support along two edges of the fourth pieces meeting each other and contacting both sides of one end portion of the SMPS.

[0076] In addition, a 'semiconductor optical device' described in the claims and the detailed description means a device such as a light emitting diode chip, or the like, including or using an optical semiconductor.

[0077] This 'semiconductor optical device' may include a package level of device in which various kinds of optical semiconductors including the above-mentioned light emitting diode chip is included.

BRIEF DESCRIPTION OF THE DRAWINGS

[0078] FIGS. **1** and **2** are perspective views showing a process of separating an optical semiconductor based illuminating apparatus according to an exemplary embodiment of the present invention;

[0079] FIG. **3** is an exploded perspective view showing the entire configuration of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention;

[0080] FIG. **4** is a partially cut-away perspective view showing a coupling relationship between a light emitting module and a housing which are main parts of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention;

[0081] FIG. **5** is a perspective view showing a heat sink part and an auxiliary cover of the light emitting module which is the main part of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention;

[0082] FIG. **6** is a view viewed from the point A of FIG. **2**;

[0083] FIGS. **7** and **8** are views showing a process of separating a cover from an upper portion of the light emitting module which is the main part of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention, wherein FIG. **7** is a conceptual diagram showing a state before separating the cover from the upper portion of the light emitting module; and FIG. **8** is a conceptual diagram showing a process of separating the cover from the upper portion of the light emitting module.

[0084] FIG. **9** is a perspective view showing the entire structure of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention;

[0085] FIG. **10** is a view viewed from the point A of FIG. **9**;

[0086] FIGS. **11** and **12** are cross-sectional views taken along the line B-B' of FIG. **1**;

[0087] FIGS. **13** to **15** are views showing a cover which is a main part of an optical semiconductor based illuminating apparatus according to another exemplary embodiment of the present invention;

[0088] FIG. **16** is a plan view showing a state in which the cover of the housing is omitted in the illuminating apparatus so that the rear of the light emitting module may be viewed;

IPR2025-01016 EX1017

[0089] FIG. **17** is a partially cut-away view of a distributor shown in FIG. **16**;

[0090] FIG. **18** is a conceptual diagram describing an illuminating apparatus according to another exemplary embodiment of the present invention;

[0091] FIG. **19** is a conceptual diagram showing a coupling relationship between a bracket and an SMPS which are main parts of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention;

[0092] FIG. **20** is a cross-sectional view viewed from the point X of FIG. **19**; and

[0093] FIGS. **21** and **22** are partially exploded perspective views showing a state in which the SMPS is coupled to a fixture which is a main part of the optical semiconductor based illuminating apparatus according to various exemplary embodiments of the present invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0094] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0095] FIGS. **1** and **2** are perspective views showing a process of separating an optical semiconductor based illuminating apparatus according to an exemplary embodiment of the present invention; FIG. **3** is an exploded perspective view showing the entire configuration of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention; and FIG. **4** is a partially cut-away perspective view showing a coupling relationship between a light emitting module and a housing which are main parts of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention.

[0096] The optical semiconductor based illuminating apparatus according to the present invention may includes a housing **200** mounted with at least one light emitting module **100** including a semiconductor optical device **300**, having opened upper and lower surfaces, and enclosing an edge of the light emitting module **100**, as shown.

[0097] Therefore, in the case in which the light emitting module **100** malfunctions or is not operated, a worker may separate only a corresponding light emitting module **100** from the housing **200** without separating the entire apparatus due to structural characteristics of the light emitting module **100** detachably coupled to the housing **200** in a vertical direction of the housing **200**.

[0098] A process of separating the light emitting module **100** will be simply described. When a cover **240** to be described below is separated from the housing **200** as shown in FIG. **1**, a light emitting module that is out of order or malfunctions among at least one light emitting modules **100** disposed between fixing plates **230** to be described below is separated from the housing **200** as shown in FIG. **2**, thereby making it possible to perform simple repairing and replacement without extensively disassembling the entire apparatus including the housing **200**.

[0099] According to the present invention, the example as described above may be applied, and various examples as follows may also be applied.

[0100] For reference, FIG. **5** is a perspective view showing a heat sink part and an auxiliary cover of the light emitting module which is the main part of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention; FIG. **6** is a view viewed from the point A of FIG. **2**; FIGS. **7** and **8** are views showing a process of separating a cover from an upper portion of the light emitting module which is the main part of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention, wherein FIG. **7** is a conceptual diagram showing a state before separating the cover from the upper portion of the light emitting module; and FIG. **8** is a conceptual diagram showing a process of separating the cover from the upper portion of the light emitting module.

[0101] First, the light emitting module **100** may include the semiconductor optical device **300** as described above and have a structure in which an optical cover **120** is coupled to a heat sink part **110**.

[0102] Here, an example in which one or more light emitting modules **100** having the same size and shape are disposed so as to be in parallel with each other in the housing **200** as shown may be applied. In addition, although not particularly shown, an example in which the light emitting modules **100** are disposed in the housing **200** while forming one or more rows and columns may also be applied.

[0103] In addition, when one or more light emitting modules **100** having the same size and shape are disposed so as to be in parallel with each other as shown, the light emitting modules **100** adjacent to each other or the outermost light emitting module **100** and the housing **200** are disposed so as to have a predetermined interval therebetween, thereby making it possible to promote ventilation and heat radiation effects.

[0104] The heat sink part **110** may have the semiconductor optical device **300** disposed thereat and be seated on a lower portion of an inner side surface of the housing **200** to discharge heat generated from the semiconductor optical device **300**, and the optical cover **120** may be detachably coupled to the heat sink part **110** along an edge of the heat sink part **110**, protect the semiconductor optical device **300**, and additionally perform a light diffusion function.

[0105] The heat sink part **110** may have a structure in which heat radiation fins **114** are protruded on a heat radiation plate **112**, a wiring path **116** is formed at the center of the heat radiation plate **112** on which the heat radiation fins **114** are protruded, and a connection terminal **118** electrically connected to the semiconductor optical device **300** is formed on the heat radiation plate **112** at a portion at which the wiring path **116** is formed.

[0106] That is, the heat radiation plate **112** has the semiconductor optical device **300** disposed thereon, both end portions seated on the housing **200**, and the optical cover **120** coupled thereto.

[0107] A plurality of heat radiation fins **114** may be protruded from both end portions of the heat radiation plate **112** toward the center thereof on the heat radiation plate **112** to increase a heat transfer area, thereby promoting a heat radiation effect.

[0108] In addition to a structure in which the heat radiation fins **114** having a simple flat panel shape are disposed at equidistance as shown, an application and a design change in which the heat radiation fins **114** having various shapes are disposed in various patterns on the heat radiation plate **112** are obvious to those skilled in the art. Therefore, an additional description thereof will be omitted.

IPR2025-01016 EX1017

[0109] The wiring path **116** is formed by a pair of partition walls **115** and **115** protruded from a central portion of the heat radiation plate **112**, and the connection terminal **118** is mounted on the heat radiation plate **112** forming the wiring path **116** to thereby be electrically connected to the semiconductor optical device **300**.

[0110] Here, although the case in which the wiring path **116** is formed at the center of the heat radiation plate **112** is shown in the accompanying drawings, the wiring path **116** is not necessarily disposed at the center of the heat radiation plate **112** according to a kind or an internal structure of various illuminating apparatuses.

[0111] Here, a plurality of heat sink parts **110** may be mounted in the housing **200** as shown, an external power supply (not shown) of the housing **200** and the connection terminal **118** may be electrically connected to each other, and the respective connection terminals **118** of the heat sink parts **110** adjacent to each other may be connected to each other by a detachable connector **117** as shown in FIG. **6**.

[0112] For example, in the case in which one of the light emitting modules **100** disposed in three rows malfunctions (See FIG. **2**), a process of removing only the corresponding light emitting module **100**, connecting the connectors **117** formed at both of the remaining light emitting modules **110** to each other, and connecting them to the external power of the housing **200** is performed, thereby making it possible to perform emergency measures until the corresponding light emitting module **100** is replaced by a new component.

[0113] In addition, the heat sink part **110** may be provided with an auxiliary cover **130** having both end portions detachably coupled to first grooves **115'** and **115'** depressed in facing surfaces of the pair of partition walls **115** and **115**, respectively, to cover a lower portion of the wiring path **116**, in order to prevent accidents such as short circuit and electric shock, or the like, due to penetration of moisture, or the like, into the electric wires and the connectors **117** disposed along the wiring path **116**.

[0114] More specifically, the auxiliary cover **130** may have a structure in which auxiliary hooks **134** and **134** are protruded from a lower surface of a cover piece **132** covering the wiring path **116** while contacting edges of upper end portions of the partition walls **115** and **115** in a length direction of the cover piece **132** and have end portions coupled to the first grooves **115'** and **115'**.

[0115] In addition, the auxiliary cover **130** includes the cover piece **132** manufactured corresponding to lengths of the edges of the upper end portions of the partition walls **115** and **115** of the heat sink parts **110** disposed in plural so as to cover the wiring path **116** formed by the partition walls **115** and **115**, such that a plurality of light emitting modules **100** may be managed.

[0116] Further, although not particularly shown, an example of a structure of the heat sink part **110** in which a plurality of heat radiation thin plates are disposed on the heat radiation plate **112** and heat pipes allowing these heat radiation thin plates and the heat radiation plate **112** to be in communication with each other is formed to increase a heat radiation effect may also be applied.

[0117] Meanwhile, the housing **200**, which encloses an edge of the light emitting module **100** as described above, may have a structure in which at least one light emitting module **100** is disposed between the fixing plates **230** disposed while traversing an internal space formed by an outer frame **210** coupled to both sides of a support **220**.

[0118] That is, the outer frame **210** serves as a partition wall enclosing the edge of the light emitting module **100**, the support **220** has the outer frame **210** slidably coupled thereto and connected to an external power supply, the fixing plates **230** have edges of both end portions fixed to facing surfaces of the outer frame **210**, respectively, and are embedded in the outer frame **210** to fix both edges of the light emitting module **100**, respectively.

[0119] The fixing plate **230** includes a plurality of holes **231** formed therein as shown to increase a heat transfer area, thereby making it possible to promote heat discharging in the housing **200**.

[0120] Meanwhile, a structure of the outer frame **210** of the housing **200** will be described in more detail with reference to a cut portion of FIG. **4**. The outer frame **210** may have a structure in which side frames **212** are slidably coupled to both sides of the support **220**, side brackets **214** are also slidably coupled to inner sides of the side frames **212**, and both end portions of a connection frame **216** are coupled to a coupling space C formed by the side frames **212** and the side brackets **214**.

[0121] That is, the side frames **212** includes second grooves **211** formed in a length direction thereof and having a shape corresponding to those of fixing bars **221** protruded on both side surfaces of the support **220** and are fixed to the support **220** by sliding the second grooves **211** on the bars **221**.

[0122] In addition, the side bracket **214** includes fixing bars **214***a* and **214***b* which are protruded on an outer side surface thereof and have a shape corresponding to that of the bar **221**, a third groove **214***c* which is formed at an upper portion of an inner side surface thereof in the length direction, and a step **214***d* which is formed at a lower portion of the inner side surface thereof and on which an edge of the light emitting module **100** is seated, and is fixed to the side frame **212** by sliding the fixing bars **214***a* and **214***b* into the second grooves **211**.

[0123] Further, the connection frame **216** includes fixing pieces **216***a* and **216***b* which are protruded from both end portions thereof, respectively, and have a shape corresponding to that of the coupling space C formed by the fixing bars **214***a* and **214***b* and the second grooves **211** to connect end portions of the side frames **212** each coupled to both sides of the support **220** to each other.

[0124] Therefore, as described above, this coupling structure of the outer frame **210** allows a fastener such as a bolt, or the like, to be coupled from an inner side of the outer frame **210** formed by slidably coupling each component, that is, the side frames **212**, the side brackets **214**, and the connection frame **216** to each other, thereby making it possible to maintain an appearance and prevent defects such as rust generation, a crack, and the like.

[0125] Here, the fixing bars **214***a* and **214***b* may be protruded at upper and lower portions of the side bracket **214**, respectively, wherein the upper fixing bar **214***a* may be formed to be inclined upwardly and the lower fixing bar **214***b* may be formed to be inclined downwardly.

[0126] Here, the second grooves **211** of the side frame **212** are also formed to have a shape corresponding to those of the upper and lower fixing bars **214***a* and **214***b*, thereby making it possible to maintain firmly fastening force of the outer frame **210** itself and also maintain durability for vertical load, shearing stress, and impact in a vertical direction in which the outer frame **210** is opened.

IPR2025-01016 EX1017

[0127] In addition, the coupling space C formed by the fixing bars **214***a* and **214***b* and the second grooves **211** may be bisected by allowing a first support protrusion **213***a* protruded from the side bracket **214** and a second support protrusion **213***b* protruded from the side frame **212** to contact each other, so as to further improve structural strength, and the fixing pieces **216***a* and **216***b* may have a shape corresponding to that of the bisected coupling space C.

[0128] Further, the outer frame **210** may be mounted with the cover **240** having both end portions detachably coupled to the third groove **214***c* and covering an upper portion of the light emitting module **100** in order to protect the light emitting module **100**.

[0129] Therefore, the cover **240** may be detachably coupled to the outer frame **210** in the vertical direction with respect to opened upper and lower portions of the outer frame **210**.

[0130] More specifically, the cover **240** may include connection pieces **244** extended from both end portions of a plate **242** covering the upper portion of the light emitting module **100** and bent toward the outer frame **210** and catching hooks **246** extended from end portions of the connection pieces **244** to thereby be detachably coupled to the third grooves **214***c*.

[0131] That is, in the cover **240**, each of the connection pieces **244** extended from both end portions of the plate **242** is elastically deformed so as to approach each other or be spaced apart from each other, thereby making it possible to promote convenience for separation and fastening.

[0132] In addition, the cover **240** may further include step parts **243** formed at lower portions of the connection pieces **244** so as to be stepped and having upper end portions seated on edges of an upper portion of the outer frame **210**, and the catching hooks **246** may be formed at lower end portions of the step parts **243**.

[0133] The step parts **243** allow the connection pieces **244** to be accurately seated in the housing **200**, specifically, on the edges of the upper portion of the outer frame **210** while allowing the connection pieces **244** to be elastically deformed, thereby assisting in determining a position at which the cover **240** is accurately coupled to the housing **200**.

[0134] In addition, the cover **240** may further include reinforcing structures **250** protruded inwardly along connection portions between the plate **242** and the connection pieces **244**, in addition to the above-mentioned step part **243**.

[0135] The third grooves **214***c* allow the connection pieces **244** to be accurately seated on the housing **200**, specifically, the edges of the outer frame **210**, more specifically, edges of an upper portion of the side bracket **214** while allowing the connection pieces **244** to be elastically deformed, thereby assisting in determining a position at which the cover **240** is accurately coupled to the housing **200**.

[0136] The reinforcing structure **250** may serve to maintain durability for repeated elastic deformation of the connection piece **244** with respect to the plate **242** and provide a coupling space with the fixing plate **230**.

[0137] That is, both end portions of the reinforcing structure **250** are detachably coupled to the fixing plate **230** embedded in the housing **200** by a fastener such as a bolt, or the like, while fixing both edges of the light emitting module **100**, respectively.

[0138] In addition, the catching hook **246** is formed at a lower end portion of the step part **243**, and a distance from the catching hook **246** to the step part **243** corresponds to a distance from the edge of the upper end portion of the side bracket **214** to the third groove **214***c*.

[0139] More specifically, the reinforcing structure **250** includes a hollow part **254** cut inwardly in a length direction of a body **252** protruded from the connection portion between the plate **242** and the connection piece **244** and formed in a cylindrical shape at the center of the body **252**.

[0140] Here, the hollow part **254** of the body **252** may be expanded or contracted according to the elastic deformation of the connection piece **244**.

[0141] Therefore, when a worker applies force in a direction of an arrow as transparently shown in FIG. **7** in order to separate the cover **240**, the cover **240** may be easily separated upwardly of the light emitting module **100** as shown in FIG. **8**.

[0142] In addition to the method of separating the cover **240** as described above, although not particularly shown, an example in which the worker simultaneously applies force from both sides of the cover **240** to separate the cover **240** upwardly of the light emitting module **100** may also be applied.

[0143] Meanwhile, the optical semiconductor based illuminating apparatus according to the present invention may have a structure in which at least one light emitting module **100** including a semiconductor optical device **500** (See FIG. **11**) is mounted in a housing **200**, both end portions of a cover **300** are detachably coupled to facing edges of the housing, respectively, while being deformed, so as to cover an upper portion of the light emitting module **100**, and the cover **300** is provided with vent units **400** to discharge heat generated from the light emitting module **100** as shown in FIG. **9**.

[0144] Therefore, the worker may easily separate the cover from the housing **200** due to structural characteristics of the cover **300** capable of being deformed even through slight force is applied from one side of the cover **300** to the cover **300**.

[0145] In addition, the vent unit **400** may improve heat radiation performance simultaneously with preventing introduction of foreign materials.

[0146] According to the present invention, the example as described above may be applied, and various examples as follows may also be applied.

[0147] First, the light emitting module **100** has a structure in which a heat sink part **110** including the semiconductor optical device **500** is covered by an optical cover **120** as shown in a portion cut in FIG. **9**.

[0148] In the housing **200** in which the light emitting module **100** is embedded as described above, the light emitting modules **100** are mounted between a side frame **212** and fixing plates **230**, and both end portions of a cover **300** to be described below are detachably coupled to third grooves **214***c*.

[0149] The side frame **212** serves as a partition wall enclosing an edge of the light emitting module **100**.

[0150] The third grooves **214***c* are formed at an upper portion of an inner side surface of the side frame **212** so as to correspond to both end portions of the cover **300**.

[0151] The fixing plates **230** are embedded in the side frame **212** so as to be perpendicular to a direction in which the third groove **214***c* are formed to fix both edges of the light emitting modules **100**, respectively.

[0152] The fixing plates **230** are formed with a plurality of holes to increase a heat transfer area, thereby making it possible to improve a heat radiation effect in the housing **200**.

IPR2025-01016 EX1017

[0153] The cover **300** has a structure in which both edges thereof contact facing edges of the fixing plates **230** exposed upwardly of the side frame **212**.

[0154] Here, an upper end portion of the housing **200** may be provided with the third grooves **214***c* to which the cover **300** is detachably coupled and a lower end portion thereof may be provided with the side bracket **214** on which the edge of the light emitting module **100** is seated and which is coupled to an inner side surface of the side frame **212**.

[0155] Meanwhile, the cover **300**, which covers the upper portion of the light emitting module **100** as described above, has a structure in which connection pieces **320** are extended from both end portions of a plate **310** covering the upper portion of the light emitting module **100** and bent toward the housing **200** to thereby be elastically deformed so as to approach each other or be spaced apart from each other while facing each other, and catching hooks **330** are extended from end portions of the connection pieces **320** to thereby be detachably coupled to an upper portion of an inner side surface of the housing **200**, that is, the third grooves **214***c*, as shown in FIG. **10**.

[0156] Here, the cover **300** may further include steps **322** formed at lower portions of the connection pieces **320** so as to be stepped and having an upper end portion seated on edges of an upper portion of the housing **200**, more specifically, edges of an upper portion of the side bracket **214** and reinforcing structures **340** protruded inwardly along connection portions between the plate **310** and the connection pieces **320**.

[0157] The steps **322** allow the connection pieces **320** to be accurately seated on the housing **200**, specifically, the edges of the side frame **212**, more specifically, the edges of the upper portion of the side bracket **214** while allowing the connection pieces **320** to be elastically deformed, thereby assisting in determining a position at which the cover **300** is accurately coupled to the housing **200**.

[0158] The reinforcing structure **340** may serve to maintain durability for repeated elastic deformation of the connection piece **320** with respect to the plate **310** and provide a coupling space with the fixing plate **230**.

[0159] That is, both end portions of the reinforcing structure **340** are detachably coupled to the fixing plate **230** embedded in the housing **200** by a fastener such as a bolt, or the like, while fixing both edges of the light emitting module **100**, respectively, the catching hook **330** is formed at a lower end portion of the step **322**, and a distance from the catching hook **330** to the step **322** corresponds to a distance from the edge of the upper end portion of the side bracket **214** to the third groove **214***c*.

[0160] More specifically, the reinforcing structure **340** is cut inwardly in a length direction of a body **342** protruded from the connection portion between the plate **310** and the connection piece **320**, wherein the body **342** has a hollow part **344** formed at the center thereof and having a cylindrical shape.

[0161] Here, the hollow part **344** of the body **342** may be expanded or contracted according to the elastic deformation of the connection piece **320**.

[0162] Therefore, when a worker applies force in a direction of an arrow as transparently shown in FIG. **11** in order to separate the cover **300**, the cover **300** may be easily separated upwardly of the light emitting module **100** as shown in FIG. **12**.

[0163] In addition to the method of separating the cover **300** as described above, although not particularly shown, an example in which the worker simultaneously applies force from both sides of the cover **300** to separate the cover **300** upwardly of the light emitting module **100** may also be applied.

[0164] Meanwhile, the cover **300** may serve to cover the upper portion of the light emitting module **100** and prevent introduction of foreign materials as described above and be provided with at least one groove **350** depressed from a lower end portion of the connection piece **320** provided at one side of the plate **310** up to a lower end portion of the connection piece **320** provided at the other side of the plate **310** as shown in FIG. **13**.

[0165] Here, the groove **350** may also be used in order to induce discharging of moisture in rainy weather.

[0166] Although not shown in detail in FIG. **13**, the groove **350** may be inclined downwardly from the center of the plate **301** toward the connection pieces **320** of both sides thereof, thereby making it possible to improve a drain effect.

[0167] Further, although not particularly shown, the cover **300** may further have an inclination surface formed by bending the plate **310** so as to be gradually inclined downwardly from the center of the plate **310** toward the connection pieces **320** of both sides thereof in order to improve the drain effect.

[0168] Meanwhile, the cover **300** may be further provided with vent units **400** for discharging heat generated from the light emitting module **100** as shown in FIG. **13**.

[0169] In the cover **300**, the vent units **400**, more specifically, vent holes **410** to be described below may be formed so as to be in parallel with each heat radiation fin in a direction in which a plurality of heat radiation fins configuring the heat sink part **110** are disposed as shown in FIGS. **9** to **12**. Alternatively, an example in which vent holes **410** to be described below are formed in a direction perpendicular to the heat radiation fins as shown in FIGS. **13** to **15** may also be applied.

[0170] For reference, an arrow represented by a curved line indicates a movement direction of air.

[0171] Here, an example of a structure in which the vent unit **400** includes the vent holes **410** (See an enlarged portion of FIG. **10** and FIGS. **14** and **15**) formed at equidistance so as to penetrate through the plate **310** of the cover **300** covering the upper portion of the light emitting module **100** may be applied.

[0172] Here, the vent holes **410** may have any area that is in the range of 1 to 90% of an area of the plate **310** and be disposed in various patterns.

[0173] Meanwhile, the vent unit **400** may further include a vent guide **420** extended from an edge of one side of the vent hole **410** upwardly of the plate **310** to cover an upper portion of the vent hole **410** and having an outlet **422** provided at the other side thereof, in order to block introduction of foreign materials from the outside while performing a heat radiation function, as shown.

[0174] Here, specifically, an example in which the vent holes **410** penetrate through the plate **310** in a slit shape (it may be inferred from a shape of the vent guide **420** that although not shown in FIGS. **9** to **12**, the vent hole **410** has a slit shape in which a length thereof is larger than a width thereof) so as to be in parallel with the plurality of heat radiation fins protruded from the heat sink part **110** configuring the light emitting module **100** and disposed at equidistance may be applied.

[0175] Here, an example in which the vent holes **410** penetrates through the plates **310** at positions corresponding to

IPR2025-01016 EX1017

positions at which the semiconductor optical devices **500** are disposed as shown in FIG. **12** may be applied.

[0176] In addition, an example in which the vent holes **410** penetrate through the plate **310** in a slit shape so as to be perpendicular to a plurality of heat radiation fins **122** protruded from the light emitting module and disposed at equidistance may also be applied, as shown in FIG. **13**.

[0177] Here, an edge of the outlet **422** side of the vent guide **420** may be disposed on a virtual straight line l extended in a direction perpendicular to an edge of the other side of the vent hole **410**, as shown in FIG. **14**.

[0178] Meanwhile, an example in which the edge of the outlet **422** side of the vent guide **420** passes through the virtual straight line l extended in the direction perpendicular to the edge of the other side of the vent hole **410** and is then extended to the plate **310** in the vicinity of the edge of the other side of the vent hole **410** as shown in FIG. **15** may also be applied.

[0179] Meanwhile, FIG. **16** is a plan view showing a state in which the cover of the housing is omitted in the illuminating apparatus so that the rear of the light emitting module may be viewed; and FIG. **17** is a partially cut-away view of a distributor shown in FIG. **16**.

[0180] The optical semiconductor based illuminating apparatus according to the present invention may include a plurality of light emitting modules **100** having the structure as described is above.

[0181] As shown in FIGS. **16** and **17**, the illuminating apparatus includes a box type support frame **220** and an outer frame **210** coupled to the box type support frame **220**.

[0182] An inner portion of the outer frame **210** is provided with a space in which the plurality of light emitting modules **100**, **100**, and **100** are disposed so as to be in parallel with each other.

[0183] An inner portion of the support frame **220** may be provided with a power supply **400** (hereinafter, a switching mode power supply (SMPS) such as the SMPS.

[0184] The SMPS **400** is connected to an alternate current (AC) power line led from the outside in a state in which it is positioned in the support frame **220**.

[0185] Each light emitting module **100** includes a heat sink **110** having a plurality of plate shaped heat radiation fins **118** formed integrally therewith at a side opposite to a side at which light is emitted.

[0186] The center of each heat sink **100** is provided with a cable path **119** in which the heat radiation fins **118** are not formed.

[0187] The cable paths **119** of each of the plurality of light emitting modules **100** are connected to each other at the rear of the heat sinks **110**.

[0188] The cable paths **119** of all of the light emitting modules **100** are connected to each other at the rear of the heat sinks **110** to form a single long cable path.

[0189] According to the exemplary embodiment of the present invention, a distributor **500** receiving direct current (DC) power through a main power line extended from an output terminal of the SMPS **400** and distributing the DC power to the plurality of light emitting modules **100** is provided.

[0190] Referring to FIGS. **16** and **17**, the distributor **500** includes a distributor body **510**, an external cable jacket **520**, and a plurality of distribution cables **530***a*, **530***b*, and **530***c*.

[0191] The distributor body **510** is connected to the main power line **501** at one side thereof and is connected integrally with the external cable jacket **520** at the other side thereof.

[0192] In addition, the plurality of distribution cables **530***a*, **530***b*, and **530***c* are installed so as to be led from the other side of the distributor body **510**.

[0193] Here, the plurality of distribution cables **530***a*, **530***b*, and **530***c* pass through the external cable jacket **520** by a predetermined length section when or before they are led from the distributor body **510**.

[0194] The external cable jacket **520** encloses the plurality of distribution cables **530***a*, **530***b*, and **530***c* in a state in which they are connected integrally with the distributor body **510**.

[0195] Therefore, the plurality of distribution cables **530***a*, **530***b*, and **530***c* are enclosed by the external cable jacket **520** by a predetermined length from the distributor body **510**, such that they are not exposed to the outside.

[0196] The plurality of distribution cables **530***a*, **530***b*, and **530***c* have different lengths so as to be connected to the light emitting modules **100**, **100**, and **100** disposed at different positions.

[0197] The plurality of distribution cables **530***a*, **530***b*, and **530***c* include connectors **531***a*, **531***b*, and **531***c* provided at a distal end thereof in order to be electrically connected to the light emitting modules **100**, **100**, and **100**.

[0198] The distributor body **510** is positioned in the box type support frame **200**.

[0199] The external cable jacket **520** is disposed to penetrate through a partition wall partitioning the box type support frame **200** and an installation space (hereinafter, referred to as a 'light emitting module space') of the light emitting modules **100**, for example, the fixing plate **230** according to the present embodiment.

[0200] A through-hole of the partition wall is installed with a cable gland **502** to which the external cable jacket **520** is assembled.

[0201] The distribution cables **530***a*, **530***b*, and **530***c* are led from the external cable jacket **520** in the light emitting module space and connected to the light emitting modules **100**, **100**, and **100** disposed at different positions, respectively.

[0202] Since the external cable jacket **520** covers the distribution cables **530***a*, **530***b*, and **530***c* in a sealing structure in a predetermined length section, particularly, a predetermined length section in an environment requiring waterproofing, a risk such as disconnection, or the like, due to penetration of moisture may be blocked in advance.

[0203] As shown in FIG. **17**, the distributor body **510** includes a power distribution printed circuit board (PCB) **511** and a molding part **512** formed to cover the entire power distribution PCB **511**.

[0204] One end portion of the external cable jacket **520** is positioned in the molding part **512** to thereby be protected from the outside.

[0205] In addition, the power distribution PCB **511** has positive (+) and negative (−) terminals connected to the main power line **501** and positive (+) and negative (−) terminals connected to the distribution cables **530***a*, **530***b*, and **530***c* and includes a parallel circuit pattern formed therebetween.

[0206] The distribution cables are integrated in the external cable jacket **520** within the molding part **512** of the distributor body **510**.

[0207] As described above, the main power line **501** may be connected to the SMPS **400** which is a power supply converting external AC power into DC power.

IPR2025-01016 EX1017

[0208] In this case, the main power line **501** distributes the DC power from the SMPS **400** to the plurality of light emitting modules.

[0209] The external cable jacket **520** has flexibility so as to avoid interference with other components.

[0210] For example, in the case in which a large apparatus or component such as the SMPS is installed in the support frame **220**, the external cable jacket **520** may be disposed to be flexed so as to avoid interference with this large component.

[0211] FIG. **18** is a diagram describing an illuminating apparatus according to another exemplary embodiment of the present invention.

[0212] According to the above-mentioned embodiment described with reference to FIG. **16**, the SMPS **400** is positioned inside the support frame **220** which is a portion of the housing.

[0213] On the other hand, in the illuminating apparatus according to the present embodiment, the SMPS **400** is positioned outside the housing of the illuminating apparatus, as shown in FIG. **18**.

[0214] The DC power converted from the AC power by the SMPS **400** positioned outside the housing is supplied to the distributor **500** positioned inside the support frame **220** of the housing through the main power line **501**.

[0215] Since other configurations are the same as those of the above-mentioned embodiment, a description thereof will be omitted in order to avoid overlap.

[0216] Meanwhile, in the present invention, an example of a structure in which an SMPS **620** mounted in the support **220** of the housing **200** may be fixed corresponding to various shapes and sizes of the SMPS **620** as shown in FIGS. **19** to **22** may also be applied.

[0217] For reference, FIG. **19** is a conceptual diagram showing a coupling relationship between a bracket and an SMPS which are main parts of the optical semiconductor based illuminating apparatus according to the exemplary embodiment of the present invention; FIG. **20** is a cross-sectional view viewed from the point X of FIG. **19**; and FIGS. **21** and **22** are partially exploded perspective views showing a state in which the SMPS is coupled to a fixture which is a main part of the optical semiconductor based illuminating apparatus according to various exemplary embodiments of the present invention.

[0218] A pair of rails **610** is formed on an inner surface of a support **220**, the SMPS **620** is disposed at an upper portion of the rail **610**, and a bracket **630** has both end portions reciprocating along the pair of rails **610** and fixes the SMPS **620**.

[0219] Here, the support **220** configuring the housing **200** may further include a seat jaw **615** disposed between the pair of rails **610** and having the SMPS **620** seated thereon.

[0220] The seat jaw **615** is to provide an area allowing the SMPS **620** to be stably disposed.

[0221] Here, it may be appreciated from FIG. **20** that the rails **610** are formed along both edges of the seat jaw **615**.

[0222] Meanwhile, the bracket **630** will be described in detail. The bracket **630** includes a first piece **631** contacting an upper surface of the SMPS **620**, second pieces **632** extended from both end portions of the first piece **631**, respectively, and third pieces **633** extended from end portions of the second pieces **632**, respectively, to contact the rails **610**.

[0223] In addition, the bracket **630** may further include at least one bolt **635** detachably coupled to the first piece **631** to contact or be spaced apart from the upper surface of the SMPS **620**, in order to move the SMPS **620** along the rails **610** in accordance with a length of the SMPS **610** and then certainly fix the SMPS **620**.

[0224] Further, the housing **200** may further include fixtures **640** formed on an inner surface of the support **220** thereof, more specifically, on the seat jaw **615** and fixing both sides of one end portion of the SMPS **620**.

[0225] Here, the fixture **640** may have a structure in which it includes a pair of blocks **641** detachably coupled to the inner surface of the support **220** and having a shape corresponding to those of cut parts **621** formed at both sides of one end portion of the SMPS **620**, respectively, as shown in FIG. **21**.

[0226] In addition, the fixture **640** may also have a structure in which it includes fourth pieces **644** that are in parallel with the inner surface of the support **220** and disposed at both sides of one end portion of the SMPS **620**, respectively, and blocking walls **645** extended to an inner side surface of the support **220** along two edges of the fourth pieces **644** meeting each other and contacting both sides of one end portion of the SMPS **620**, as shown in FIG. **22**.

[0227] As described above, it may be appreciated that a basic technical spirit of the present invention is to provide the optical semiconductor based illuminating apparatus capable of promoting convenience for checking and repairing, simply performing separation and fastening, having excellent waterproofing characteristics and durability, preventing accidents such as short circuit and electric shock improving heat radiation performance, preventing introduction of foreign materials, being easily cleaned and maintained, reliably providing power of a main power line to a plurality of light emitting modules, and utilizing a space and securing reliability of a product regardless of a size and a shape of a power supply embedded therein.

[0228] According to the present invention having the configuration as described above, the following effects may be accomplished.

[0229] First, according to the present invention, at least one light emitting module is detachably coupled to the housing having opened upper and lower surfaces and enclosing the edge of the light emitting module in the vertical direction of the housing, such that the separation and the fastening between the light emitting module and housing may be simply performed and action may be instantly taken at the time of generation of a fault or a malfunction, thereby making it possible to provide convenience to a worker at the time of checking and repairing by the worker.

[0230] In addition, according to the present invention, the wiring path is formed at the center of the heat sink part, and the auxiliary cover detachably coupled to the wiring path to cover the wiring path and the cover detachably coupled to the housing to cover the upper portion of the light emitting module embedded in the housing are provided, thereby making it possible to maintain waterproofing characteristics and air tightness and prevent accidents such as short circuit and electric shock.

[0231] Further, according to the present invention, the electrical connection is made by the connector capable of being detachably coupled to the semiconductor optical device disposed at the heat sink part along the above-mentioned wiring path, and the respective light emitting modules are also electrically connected to each other by this connector, such that even though a fault occurs in any one of the plurality of light

IPR2025-01016 EX1017

emitting modules, a function of the illuminating apparatus may be sufficiently performed using the remaining light emitting modules.

[0232] In addition, according to the present invention, the cover detachably coupled to the housing while being elastically deformed is provided, thereby making it possible to easily check and repair internal components of the apparatus.

[0233] Further, according to the present invention, the cover covering the upper portion of the light emitting module is provided with the vent unit, thereby making it possible to improve heat radiation performance, preventing introduction of foreign materials, and easily perform cleaning and maintenance.

[0234] In addition, according to the present invention, the distributor in which the plurality of distribution lines are led and branched from the distributor body in which waterproofing or air tightness are ensured in a state in which they are sealed and integrated by a predetermined length section, thereby making it possible to reliably provide the power of the main power line to the plurality of light emitting modules.

[0235] Further, according to the present invention, the bracket having both end portions reciprocating along the pair of rails so as to fix the SMPS disposed at the upper portion of the pair of rails formed on the inner surface of the support is provided to be actively adapted for various sizes and shapes of the SMPS embedded in the illuminating apparatus, thereby making it possible to secure generality.

[0236] In addition, various modifications and applications may be made by those skilled in the art without departing from the scope of the basic technical spirit of the present invention.

What is claimed is:

1. An optical semiconductor based illuminating apparatus comprising:

light emitting modules including at least one semiconductor optical device; and

a housing enclosing one side surface of at least one of the light emitting modules.

2. The optical semiconductor based illuminating apparatus of claim **1**, wherein the housing is separated into a plurality of components.

3. The optical semiconductor based illuminating apparatus of claim **1**, wherein the housing includes:

a cover having both end portions detachably coupled to facing edges of the housing, respectively, while being deformed, so as to cover an upper portion of the light emitting module; and

vent units formed in the cover to discharge heat generated from the light emitting module.

4. The optical semiconductor based illuminating apparatus of claim **1**, further comprising a distributor distributing power received from a main power line to the light emitting modules.

5. The optical semiconductor based illuminating apparatus of claim **1**, wherein the light emitting module includes:

a heat sink part including the semiconductor optical device and disposed in the housing; and

an optical cover coupled to the heat sink part.

6. The optical semiconductor based illuminating apparatus of claim **1**, wherein the housing includes an outer frame enclosing one side surface of at least one of the light emitting modules.

7. The optical semiconductor based illuminating apparatus of claim **6**, wherein the housing further includes a support having the outer frame slidably coupled thereto.

8. The optical semiconductor based illuminating apparatus of claim **6**, wherein the housing further includes fixing plates having edges of both end portions fixed to facing surfaces of the outer frame, respectively, and embedded in the outer frame to fix both edges of the light emitting module, respectively.

9. The optical semiconductor based illuminating apparatus of claim **8**, wherein the light emitting modules are disposed between the fixing plates while forming one or more rows and columns.

10. The optical semiconductor based illuminating apparatus of claim **5**, wherein the heat sink part includes:

a heat radiation plate having at least one semiconductor optical device formed thereon; and

a plurality of heat radiation fins formed on one surface of the heat radiation plate.

11. The optical semiconductor based illuminating apparatus of claim **5**, wherein the heat sink part includes:

a heat radiation plate having at least one semiconductor optical device formed thereon;

a plurality of heat radiation thin plates disposed on the heat radiation plate; and

heat pipes penetrating through the plurality of heat radiation thin plates to thereby be connected to the heat radiation plate and forming internal channels.

12. The optical semiconductor based illuminating apparatus of claim **10**, wherein the heat sink part includes a wiring path formed by a pair of partition walls protruded from the heat radiation plate.

13. The optical semiconductor based illuminating apparatus of claim **11**, wherein the heat sink part includes a wiring path formed by a pair of partition walls protruded from the heat radiation plate.

14. The optical semiconductor based illuminating apparatus of claim **12**, wherein the heat sink part further includes a connection terminal mounted on the heat radiation plate forming the wiring path to thereby be electrically connected to the semiconductor optical device.

15. The optical semiconductor based illuminating apparatus of claim **13**, wherein the heat sink part further includes a connection terminal mounted on the heat radiation plate forming the wiring path to thereby be electrically connected to the semiconductor optical device.

16. The optical semiconductor based illuminating apparatus of claim **12**, wherein the heat sink part further includes:

first grooves depressed in facing surfaces of the pair of partition walls, respectively; and

an auxiliary cover having both end portions detachably coupled to the first grooves to cover a lower portion of the wiring path.

17. The optical semiconductor based illuminating apparatus of claim **13**, wherein the heat sink part further includes:

first grooves depressed in facing surfaces of the pair of partition walls, respectively; and

an auxiliary cover having both end portions detachably coupled to the first grooves to cover a lower portion of the wiring path.

18. The optical semiconductor based illuminating apparatus of claim **14**, wherein the respective connection terminals of the heat sink parts adjacent to each other are connected to each other by a detachable connector.

IPR2025-01016 EX1017

19. The optical semiconductor based illuminating apparatus of claim **15**, wherein the respective connection terminals of the heat sink parts adjacent to each other are connected to each other by a detachable connector.

20. The optical semiconductor based illuminating apparatus of claim **1**, wherein one or more light emitting modules having the same size and shape are disposed so as to be in parallel with each other in the housing.

21. The optical semiconductor based illuminating apparatus of claim **8**, wherein a plurality of light emitting modules are disposed so as to be in parallel with the fixing plates.

22. The optical semiconductor based illuminating apparatus of claim **8**, wherein a plurality of light emitting modules are disposed so as to be perpendicular to the fixing plates.

23. The optical semiconductor based illuminating apparatus of claim **16**, wherein the auxiliary cover includes:

a cover piece covering the wiring path while contacting edges of upper end portions of the partition walls; and

auxiliary hooks protruded from a lower surface of the cover piece in a length direction of the cover piece and having end portions coupled to the first grooves.

24. The optical semiconductor based illuminating apparatus of claim **17**, wherein the auxiliary cover includes:

a cover piece covering the wiring path while contacting edges of upper end portions of the partition walls; and

auxiliary hooks protruded from a lower surface of the cover piece in a length direction of the cover piece and having end portions coupled to the first grooves.

25. The optical semiconductor based illuminating apparatus of claim **16**, wherein the auxiliary cover includes:

a cover piece contacting edges of upper end portions of the partition walls of the heat sink parts disposed in plural so as to cover the wiring path formed by the partition walls; and

auxiliary hooks protruded from a lower surface of the cover piece in a length direction of the cover piece and having end portions coupled to a plurality of first grooves formed in the plurality of partition walls.

26. The optical semiconductor based illuminating apparatus of claim **17**, wherein the auxiliary cover includes:

a cover piece contacting edges of upper end portions of the partition walls of the heat sink parts disposed in plural so as to cover the wiring path formed by the partition walls; and

auxiliary hooks protruded from a lower surface of the cover piece in a length direction of the cover piece and having end portions coupled to a plurality of first grooves formed in the plurality of partition walls.

27. The optical semiconductor based illuminating apparatus of claim **7**, wherein the outer frame of the housing includes side frames having second grooves formed in a length direction thereof and having a shape corresponding to those of fixing bars protruded on both side surfaces of the support.

28. The optical semiconductor based illuminating apparatus of claim **27**, wherein the outer frame further includes a side bracket having a third groove formed at an upper portion of an inner side surface thereof in the length direction, a step formed at a lower portion of the inner side surface thereof, and fixing bars formed on an outer side surface thereof and corresponding to the second grooves to thereby be coupled to the side frame.

29. The optical semiconductor based illuminating apparatus of claim **28**, wherein the outer frame further includes a connection frame having fixing pieces protruded from both end portions thereof, respectively, and having a shape corresponding to that of a coupling space formed by the fixing bars and the second grooves.

30. The optical semiconductor based illuminating apparatus of claim **6**, further comprising a cover covering an upper portion of the light emitting module and having both end portions coupled to the outer frame.

31. The optical semiconductor based illuminating apparatus of claim **30**, wherein the cover includes:

a plate covering the upper portion of the light emitting module;

connection pieces extended from both end portions of the plate and bent toward the outer frame; and

catching hooks extended from end portions of the connection pieces to thereby be detachably coupled to the third grooves.

32. The optical semiconductor based illuminating apparatus of claim **31**, wherein the cover further includes reinforcing structures protruded inwardly along connection portions between the plate and the connection pieces.

33. The optical semiconductor based illuminating apparatus of claim **31**, wherein the cover further includes step parts formed at lower portions of the connection pieces so as to be stepped and having upper end portions seated on edges of an upper portion of the outer frame, and

the catching hooks are formed at lower end portions of the step parts.

34. The optical semiconductor based illuminating apparatus of claim **32**, wherein the reinforcing structure includes:

a body protruded from the connection portion between the plate and the connection piece; and

a hollow part cut inwardly in a length direction of the body and formed in a cylindrical shape at the center of the body to thereby be expanded or contracted according to elastic deformation of the connection piece.

35. The optical semiconductor based illuminating apparatus of claim **1**, wherein the light emitting modules adjacent to each other or the outermost light emitting module and the housing are disposed so as to be spaced apart from each other.

36. The optical semiconductor based illuminating apparatus of claim **3**, wherein the cover includes:

connection pieces extended from both end portions of a plate covering the upper portion of the light emitting module and bent toward the housing to thereby be elastically deformed so as to approach each other or be spaced apart from each other while facing each other; and

catching hooks extended from end portions of the connection pieces to thereby be detachably coupled to an upper portion of an inner side surface of the housing, and

wherein the vent unit is formed in the plate.

37. The optical semiconductor based illuminating apparatus of claim **36**, wherein the plate further includes a plurality of grooves formed in a direction corresponding to a direction in which the plurality of light emitting modules embedded in the housing are disposed, and

the vent unit is formed between the grooves adjacent to each other.

38. The optical semiconductor based illuminating apparatus of claim **37**, wherein the vent unit includes vent holes formed at equidistance so as to penetrate through the plate in the direction in which the light emitting modules are disposed.

IPR2025-01016 EX1017

39. The optical semiconductor based illuminating apparatus of claim **38**, wherein the vent holes penetrate through the plate in a slit shape so as to be in parallel with a plurality of heat radiation fins protruded from the light emitting module and disposed at equidistance.

40. The optical semiconductor based illuminating apparatus of claim **38**, wherein the vent holes penetrate through the plate in a slit shape so as to be perpendicular to a plurality of heat radiation fins protruded from the light emitting module and disposed at equidistance.

41. The optical semiconductor based illuminating apparatus of claim **38**, wherein the vent holes penetrate through the plate at positions corresponding to positions at which the semiconductor optical devices included in the light emitting module are disposed.

42. The optical semiconductor based illuminating apparatus of claim **38**, wherein the vent unit further includes a vent guide extended from an edge of one side of the vent hole upwardly of the plate to cover an upper portion of the vent hole and having an outlet provided at the other side thereof.

43. The optical semiconductor based illuminating apparatus of claim **39**, wherein the vent unit further includes a vent guide extended from an edge of one side of the vent hole upwardly of the plate to cover an upper portion of the vent hole and having an outlet provided at the other side thereof.

44. The optical semiconductor based illuminating apparatus of claim **40**, wherein the vent unit further includes a vent guide extended from an edge of one side of the vent hole upwardly of the plate to cover an upper portion of the vent hole and having an outlet provided at the other side thereof.

45. The optical semiconductor based illuminating apparatus of claim **41**, wherein the vent unit further includes a vent guide extended from an edge of one side of the vent hole upwardly of the plate to cover an upper portion of the vent hole and having an outlet provided at the other side thereof.

46. The optical semiconductor based illuminating apparatus of claim **42**, wherein an edge of the outlet side of the vent guide is disposed on a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole.

47. The optical semiconductor based illuminating apparatus of claim **43**, wherein an edge of the outlet side of the vent guide is disposed on a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole.

48. The optical semiconductor based illuminating apparatus of claim **44**, wherein an edge of the outlet side of the vent guide is disposed on a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole.

49. The optical semiconductor based illuminating apparatus of claim **45**, wherein an edge of the outlet side of the vent guide is disposed on a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole.

50. The optical semiconductor based illuminating apparatus of claim **42**, wherein an edge of the outlet side of the vent guide passes through a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole and is then extended to the plate in the vicinity of the edge of the other side of the vent hole.

51. The optical semiconductor based illuminating apparatus of claim **43**, wherein an edge of the outlet side of the vent guide passes through a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole and is then extended to the plate in the vicinity of the edge of the other side of the vent hole.

52. The optical semiconductor based illuminating apparatus of claim **44**, wherein an edge of the outlet side of the vent guide passes through a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole and is then extended to the plate in the vicinity of the edge of the other side of the vent hole.

53. The optical semiconductor based illuminating apparatus of claim **45**, wherein an edge of the outlet side of the vent guide passes through a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole and is then extended to the plate in the vicinity of the edge of the other side of the vent hole.

54. The optical semiconductor based illuminating apparatus of claim **3**, wherein the vent unit includes a plurality of vent holes penetrating through the plate of the cover covering the upper portion of the light emitting module.

55. The optical semiconductor based illuminating apparatus of claim **54**, wherein the vent unit further includes a vent guide extended from an edge of one side of the vent hole upwardly of the plate to cover an upper portion of the vent hole and having an outlet provided at the other side thereof.

56. The optical semiconductor based illuminating apparatus of claim **55**, wherein an edge of the outlet side of the vent guide is disposed on a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole.

57. The optical semiconductor based illuminating apparatus of claim **55**, wherein an edge of the outlet side of the vent guide passes through a virtual straight line extended in a direction perpendicular to an edge of the other side of the vent hole and is then extended to the plate in the vicinity of the edge of the other side of the vent hole.

58. The optical semiconductor based illuminating apparatus of claim **4**, wherein the distributor includes:

a distributor body connected to the main power line;

a cable jacket extended from the other side of the distributor body by a predetermined length; and

a plurality of distribution cables led from the distributor body, passing through the cable jacket, and then connected to each of the plurality of light emitting modules.

59. The optical semiconductor based illuminating apparatus of claim **58**, wherein the distributor body includes:

a power distribution printed circuit board having terminals connected to the main power line and the distribution cables and a power distribution circuit connected to the terminals; and

a molding part formed to cover the entire power distribution PCB.

60. The optical semiconductor based illuminating apparatus of claim **59**, wherein the cable jacket is extended from an inner portion of the molding part to an outer portion thereof.

61. The optical semiconductor based illuminating apparatus of claim **58**, wherein the housing includes an auxiliary space separated from a main space by a partition wall,

the distributor body is positioned at the auxiliary space,

the cable jacket passes through the partition wall and is then extended into the main space, and

the distribution cables are branched from the cable jacket in the main space.

IPR2025-01016 EX1017

62. The optical semiconductor based illuminating apparatus of claim **61**, wherein the cable jacket is assembled to a cable gland installed at the partition wall.

63. The optical semiconductor based illuminating apparatus of claim **58**, wherein the plurality of light emitting modules include a heat sink provided at the rear thereof, and

the heat sink includes a path at which at least one of the distribution cables is positioned and heat radiation fins formed in the vicinity of the path.

64. The optical semiconductor based illuminating apparatus of claim **63**, wherein the plurality of light emitting modules are disposed so as to be in parallel with each other, such that the paths are continuously connected to each other.

65. The optical semiconductor based illuminating apparatus of claim **58**, wherein the distribution cables have different lengths.

66. The optical semiconductor based illuminating apparatus of claim **58**, wherein the distributor receives direct current power from a switch mode power supply (SMPS) connected to the main power line, the SMPS being positioned inside the housing.

67. The optical semiconductor based illuminating apparatus of claim **58**, wherein the distributor receives direct current power from an SMPS connected to the main power line, the SMPS being positioned outside the housing.

68. The optical semiconductor based illuminating apparatus of claim **7**, wherein the housing includes:

a pair of rails formed on an inner surface of the support;

a power supply (hereinafter, referred to as an SMPS) disposed at an upper portion of the rail; and

a bracket having both end portions reciprocating along the pair of rails and fixing the SMPS.

69. The optical semiconductor based illuminating apparatus of claim **68**, wherein the housing further includes a seat jaw disposed between the pair of rails and having the SMPS seated thereon.

70. The optical semiconductor based illuminating apparatus of claim **69**, wherein the rails are formed along both edges of the seat jaw.

71. The optical semiconductor based illuminating apparatus of claim **68**, wherein the bracket includes:

a first piece contacting an upper surface of the SMPS;

second pieces extended from both end portions of the first piece, respectively; and

third pieces extended from end portions of the second pieces, respectively, to contact the rails.

72. The optical semiconductor based illuminating apparatus of claim **68**, wherein the housing further includes fixtures formed on an inner surface of the support and fixing both sides of one end portion of the SMPS.

73. The optical semiconductor based illuminating apparatus of claim **71**, wherein the bracket further includes at least one bolt detachably coupled to the first piece to contact or be spaced apart from the upper surface of the SMPS.

74. The optical semiconductor based illuminating apparatus of claim **72**, wherein the fixture includes a pair of blocks detachably coupled to the inner surface of the support and having a shape corresponding to those of cut parts formed at both sides of one end portion of the SMPS, respectively.

75. The optical semiconductor based illuminating apparatus of claim **72**, wherein the fixture includes:

fourth pieces that are in parallel with the inner surface of the support and disposed at both sides of one end portion of the SMPS, respectively; and

blocking walls extended to an inner side surface of the support along two edges of the fourth pieces meeting each other and contacting both sides of one end portion of the SMPS.

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IPR2025-01016 EX1017