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(54) **LED lighting apparatus having LED arrays turned on or off independently**

LED-Beleuchtungsvorrichtung mit unabhängig ein- oder ausschaltbaren LED-Gruppen

Appareil d'éclairage à DEL possédant des ensembles de DEL allumés ou éteints indépendamment

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates, in general, to LED lighting apparatuses used for landscape lighting, stage lighting, display lighting, task lighting, driving lighting, etc. and, more particularly, to an LED lighting apparatus having LED arrays turned on or off independently, in which LEDs of an LED module constitute a plurality of LED arrays that are independently turned on or off, so that, when an LED has a failure, only the LED array having the associated LED is turned off and other LED arrays are continuously turned on, thus preventing a problem from occurring in illumination, and in which waterproofing properties are enhanced, thus preventing moisture from permeating the LED module, and which makes it easy to adjust an illumination angle and to assemble components with each other.

2. Description of the Related Art

[0002] Recently, although LEDs are relatively expensive, they are widely used as a light source of a lighting apparatus because the LEDs have many advantages, namely, high efficiency, environmental friendliness, semi-permanency, high luminance, etc.

[0003] Even for lighting apparatus for illuminating a landscape, a stage, a product, or a driving direction in a vehicle, the LED is used.

[0004] The related art using the LED as the light source of a lighting apparatus used for landscape lighting, stage lighting, display lighting, task lighting, driving lighting, etc., is disclosed in Korean Patent No. 1115550 that is entitled "Outdoor LED Lighting Apparatus", Korean Patent Laid-Open Publication No. 2009-0023959 that is entitled "Lighting Apparatus For Display", and Korean U.M. Registration No. 0460370 that is created by the inventor of this invention and is entitled "Structure For Fixing Lighting Apparatus for Vehicles", for example.

[0005] The lighting apparatus using LEDs utilizes an LED module having a plurality of LEDs mounted on a PCB. The LEDs of the LED module are usually connected to each other in series in terms of a circuit. If there are many LEDs, among the LEDs connected to each other in series, a predetermined number of LEDs may be connected to each other in parallel.

[0006] When there is a failure in any one of the LEDs connected to each other in series, even the remaining LEDs are electrically disconnected or short-circuited, so that all the LEDs connected to each other in series may not be turned on or may be damaged. In a structure wherein some of the LEDS connected to each other in series are connected to each other in parallel, when disconnection or short circuit occurs in the LEDs of any one serial line, this negatively affects the whole LED module because a variation occurs in the whole load of the LED module. If the adverse effects are large, all the LEDs of the LED module may not be turned on or may be damaged.

[0007] Thus, there is a need to enable continuous illumination by preventing all of the LEDs of the LED module from being turned on or damaged when any one of the LEDs is out of order. Meanwhile, as for the related art such as Korean Patent No. 1115550 entitled "Outdoor LED Lighting Apparatus", Korean Patent Laid-Open Publication No. 2009-0023959 entitled "Lighting Apparatus For Display", and Korean U.M. Registration No. 0460370 that is created by the inventor of this invention and is entitled "Structure For Fixing Lighting Apparatus for Vehicles", the related art has no means for preventing all of the LEDs from being turned off or damaged when any one of the LEDs is out of order.

[0008] Since the lighting apparatus for landscape lighting, stage lighting, display lighting, task lighting, driving lighting, etc. is installed at the exterior, it is likely to make contact with moisture such as rainwater. Furthermore, the LED that is a semiconductor device is vulnerable to moisture.

[0009] Thus, a waterproofing property is very important in the lighting apparatus using the LED module. However, the related art does not concentrate on increasing the waterproofing property.

[0010] Moreover, the lighting apparatus, which is installed at the exterior and used for landscape lighting, stage lighting, display lighting, task lighting, driving lighting, etc., frequently needs to adjust its illumination angle, and needs to be stably secured at the adjusted angle to continuously perform illumination at the adjusted angle without being affected by external shocks or vibrations.

[0011] US 2012/063135 A1 relates to an LED light source automated luminaire with a LEDs mounted on a partitionable circuit board. The partitionable circuit board allows for less expensive service cost while maintaining lower costs of manufacture of the luminaire.

SUMMARY OF THE INVENTION

[0012] Accordingly, the present invention has been made keeping in mind the above problems occurring in the related art, and the present invention is intended to propose an LED lighting apparatus having LED arrays turned on or off independently, in which an LED module comprises a plurality of LED arrays that are independently turned on or off, so that, even if any individual LED has a problem, only the LED array having the associated LED is turned off and other LED arrays are continuously turned on, thus enabling stable illumination without interruption, and in which waterproofing properties are enhanced, thus preventing the LED, that is a semiconductor device vulnerable to moisture, from being in contact with the moisture and being damaged, thereby achieving high durability, and which makes it easy to adjust an illumination angle and can be stably fixed at the adjusted angle,

thus realizing excellent illumination quality.

[0013] The present invention is defined in the independent claim 1. The dependent claims define embodiments of the present invention.

[0014] An LED lighting apparatus having LED arrays turned on or off independently, includes:

an LED module including a PCB, and LEDs mounted on the PCB, the LEDs divided into a plurality of LED arrays that are independently turned on or off;
a heat dissipation unit, with the LED module mounted on a front of the heat dissipation unit; and
a locking bracket on which the heat dissipation unit is mounted.

[0015] The LED lighting apparatus may further include a protective cover for covering the LED module; a mounting frame surrounding an edge of the protective cover, and mounted to a front edge of the heat dissipation unit; and a waterproof packing provided on a rear edge of the protective cover, and pressurized against the front of the heat dissipation unit, thus sealing a gap between the protective cover and the heat dissipation unit.

[0016] The LED lighting apparatus may further include a light conversion plate having a collimated lens disposed in front of the LEDs of the LED module to convert light emitted from the LEDs into parallel beams; and a holder holding the collimated lens.

[0017] The LED lighting apparatus may further include a first hinge hole formed in a vertical part of the locking bracket; a guide hole formed in the vertical part to have a shape of an arc around the first hinge hole; a second hinge hole formed in a side surface of the heat dissipation unit to correspond to the first hinge hole; a locking hole formed in the side surface of the heat dissipation unit to correspond to the guide hole; a hinge pin inserted into the first hinge hole and the second hinge hole to hingedly couple the locking bracket to the heat dissipation unit; and an angle adjusting means passing through the guide hole to be fastened to the locking hole, guiding rotation of the heat dissipation unit, and locking the heat dissipation unit to the locking bracket.

[0018] As is apparent from the above description, the LED lighting apparatus having the LED arrays turned on or off independently is advantageous in that the LED module comprises the plurality of LED arrays that are independently turned on or off, so that, when any one of the LEDs has a problem, all of the LEDs are not affected negatively, but only the LED array having the defective LED is turned off and other LED arrays can stably continue an illuminating function, and in which waterproofing properties are enhanced, thus guaranteeing the illuminating function for a lengthy period of time without a damage resulting from moisture, and in which components are rapidly assembled with each other, thus achieving high productivity, and in which light beams emitted from the LED are radiated in parallel via a collimated lens, thus realizing excellent illumination quality. Consequently, this apparatus is very useful in industrial applications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIGS. 1A and 1B are perspective views showing an LED lighting apparatus having LED arrays turned on or off independently according to the present invention; and
FIGS. 2A and 2B are exploded perspective views of FIGS. 1A and 1B.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0020] Hereinafter, an LED lighting apparatus having LED arrays turned on or off independently according to the present invention will be described more specifically with reference to the accompanying drawings.

[0021] Before the present invention is described in detail, it should be noted that various changes may be made to the present invention, so aspects (or embodiments) of the present invention will be described in detail herein. However, it should be understood that the present invention is not limited to a specific embodiment, but embraces all changes, equivalents, and substitutes within the technical idea and scope of the present invention.

[0022] The same reference numerals throughout the drawings, that is, the same reference numerals in a second digit and a first digit, or in a second digit, a first digit, and an alphabet character denote elements having the same or similar function. If there is no special mention, the elements denoted by the reference numerals are to be comprehended as the elements complying with the above-mentioned reference scheme.

[0023] For clarity and convenience of description, the size or thickness of components shown in the drawings may be expressed to be exaggeratedly large (or thick) or small (or thin), or may be simplified. Furthermore, it should not be interpreted that the scope of this invention is limited to this size or thickness.

[0024] Terms employed herein are for the purpose of description of particular aspects (or embodiments), and are not intended to limit the present invention. Further, the singular forms "a" and "an" include plural referents unless the context clearly dictates otherwise. In this description, it should be understood that terms such as "include" or "comprise" are inclusive of characteristics, numerals, steps, operations, components, parts or combination thereof, but are not exclusive of one or more different characteristics, numerals, steps, operations, components, parts or combination thereof.

[0025] Unless the context clearly defines otherwise, all terms or words used herein have the same meaning as common meanings understood by those skilled in the art.

Terms defined in a dictionary are to be interpreted as having the same meaning as meanings used in the related art, and should not be interpreted ideally or excessively unless this application clearly defines otherwise.

[0026] As shown in FIGS. 1A, 1B, 2A and 2B, an LED lighting apparatus capable of adjusting its angle according to the present invention mainly includes an LED module 10, a light conversion panel 20, a heat dissipation unit 30, a protective cover 40, a mounting frame 50, a hinge pin 60, a locking pin 70, a locking bracket 80, a waterproof packing 90, and other components.

[0027] The LED module 10 includes LEDs 11, and a PCB 13 on which the LEDs 11 are mounted.

[0028] Each LED 11 may preferably comprise a chip-type LED 11 that is thin to occupy a small installation space and emits light of high luminance.

[0029] The LEDs 11 of the LED module 10 are divided into a plurality of LED arrays 11A, 11B and 11C, so that each LED array 11A, 11B, 11C is independently turned on or off without being affected by other LED arrays. Here, for reference, the LED array 11A, 11B, 11C means a combination of a plurality of LEDs 11 that are electrically connected to each other in series or in parallel to be supplied with the same power and are not electrically connected to the remaining LED arrays 11A, 11B, 11C.

[0030] Further, a power supply PS that supplies power to turn the LED module 10 on supplies power to the respective LED arrays 11A, 11B and 11C, independently. Thus, even if any one of the LED arrays 11A, 11B and 11C has a problem, the power supply PS can stably supply power to the remaining LED arrays 11A, 11B and 11C.

[0031] Furthermore, the PCB 13 may be divided into several portions corresponding to the respective LED arrays 11A, 11B and 11C. In other words, the PCB 13 of the LED module 10 may comprise unit PCBs 13A, 13B and 13C that are divided into each other to correspond to the respective LED arrays 11A, 11B and 11C. Alternatively, the PCB 13 may comprise a single PCB, with cut grooves 15 provided to allow the PCB to be divided into portions corresponding to the respective LED arrays 11A, 11B and 11C. Thereby, it is possible to remove only the unit PCB 13A, 13B, 13C on which the defective LED array 11A, 11B, 11C is mounted, or to cut away only the PCB on which the defective LED array 11A, 11B, 11C is mounted, by means of the cut grooves 15. As such, the PCB on which the defective LED array 11A, 11B, 11C is mounted is removed and then is replaced with a new PCB on which LEDs are mounted. In this way, only the defective portion has only to be replaced with a new one without the necessity of replacing the whole LED module with a new one, thus reducing maintenance cost.

[0032] The light conversion panel 20 is disposed in front of the LED module 10, and converts light, emitted from the LEDs 11, into parallel beams, thus uniformly radiating light to the front without diffusion or concentration and thereby enhancing an illumination quality.

[0033] The light conversion panel 20 surrounds the periphery of the LEDs 11 to allow the incidence of all of the light emitted from the LEDs 11 without loss. The light conversion panel 20 includes a collimated lens 21 that converts the incident light into parallel beams and then radiates them, a holder 25 that holds the collimated lens 21, and a mounting board 23 to which the holder 25 is mounted.

[0034] The LED module 10 is mounted to the front of the heat dissipation unit 30 in such a way as to be in contact therewith, and serves to dissipate heat, generated in the LED module 10, to the exterior.

[0035] The heat dissipation unit 30 is made of aluminum that is high in heat conductivity and superior in workability, so that the heat dissipation unit 30 is high in heat dissipation properties and may be produced by extrusion, thus ensuring high productivity.

[0036] On the front of the heat dissipation unit 30 are formed a bolt hole 31 and a through hole 32. A bolt is inserted into the bolt hole 31 to fasten the LED module 10 to the heat dissipation unit 30. A cable (not shown) for supplying power to the LED module 10 passes through the through hole 32.

[0037] On the rear of the heat dissipation unit 30 are provided a plurality of heat dissipation wings 33 and a guide block 39. The heat dissipation wings 33 serve to rapidly dissipate heat transferred from the LED module 10 to the exterior. The guide block 39 guides the cable connected to the power supply PS to the front.

[0038] On a side surface of the heat dissipation unit 30 are formed a hinge hole 34 and a locking hole 35. The hinge hole 34 is used to rotatably hinge the heat dissipation unit 30 to the locking bracket 80. The locking hole 35 is used to lock the heat dissipation unit 30 to the locking bracket 80.

[0039] The protective cover 40 covers the front of the heat dissipation unit 30 to protect the LED module 10 and the light conversion panel 20 accommodated therein.

[0040] A rear (inner) edge of the protective cover 40 is in contact with a front edge of the heat dissipation unit 30, with a packing groove 41 formed on a contact portion.

[0041] The waterproof packing 90 is inserted and seated in the packing groove 41. The waterproof packing 41 is pressurized by the protective cover 40 and the heat dissipation unit 30 to seal a gap therebetween, thus preventing moisture from penetrating into the lighting apparatus.

[0042] The mounting frame 50 surrounds an edge of the protective cover 40 and is fastened to the front edge of the heat dissipation unit 30 via a bolt (not shown). The mounting frame 50 fastened via the bolt tightens the protective cover 40 towards the heat dissipation unit 30, thus allowing the waterproof packing 90 to be pressurized and come into close contact with the protective cover 40 and the heat dissipation unit 30.

[0043] The hinge pin 60 hingedly joins the protective cover 40 to the mounting frame 50, thus allowing the protective cover 40 and the heat dissipation unit 30 coupled thereto to be rotated. Further, the hinge pin 60 tightens or loosens the protective cover 40, thus causing a

gear part 43 to engage with or disengage from a corresponding gear part 53. When the gear part 43 engages with the corresponding gear part 53, the protective cover 40 is not rotated and is fixed at this angle. In contrast, when the gear part 43 disengages from the corresponding gear part 53, the protective cover 40 is rotated to be adjusted at a desired angle.

[0044] The locking bracket 80 includes a horizontal part 85 that is secured to an exterior fixing structure, vertical part 87 that are vertically connected to both ends of the horizontal part 85 to allow an angle of the heat dissipation unit 30 to be adjusted, and a mounting part 89 on which the power supply PS for supplying power to the LED module 10 is mounted.

[0045] A plurality of bolt insert holes 86, each having the shape of an elongated hole, is formed in the horizontal part 85, so that fastening bolts for fastening the locking bracket 80 to the exterior fixing structure are inserted into the bolt insert holes 86. A hinge hole 81 is formed in the vertical part 87 in such a way as to correspond to the hinge hole 34 of the heat dissipation unit 30, with the hinge pin 60 inserted into the hinge hole 81. A guide hole 83 is formed in the vertical part 87 in such a way as to correspond to the locking hole 35 of the heat dissipation unit 30, so that the locking pin 70 is inserted into the guide hole 83, and thereby the guide hole 83 guides the movement of the locking pin 70.

[0046] Heads of the hinge pin 60 and the locking pin 70 are disposed outside the locking bracket 80, and inner ends thereof are screwed into the hinge hole 34 and the locking hole 35 of the heat dissipation unit 30, respectively, thus tightening or loosening the heat dissipation unit 30 to or from the locking bracket 80.

[0047] In the state where the hinge pin 60 and the locking pin 70 are loosened, the heat dissipation unit 30 may rotate via the hinge pin 60. The locking pin 70 moves along the guide hole 83 during the rotation of the heat dissipation unit 30, thus guiding the rotation of the heat dissipation unit 30. By the force of the hinge pin 60 and the locking pin 70 tightening the heat dissipation unit 30 and the locking bracket 80, they are fastened to each other. The heat dissipation unit 30 and the locking bracket 80 are simultaneously tightened at two places, so that stronger and more stable tightening force is obtained.

[0048] The hinge hole 81, the guide hole 83, the hinge hole 34, the locking hole 35, the hinge pin 60, and the locking pin 70 constitute the angle adjusting means.

[0049] Referring to the drawings, locking pins 70 are provided on opposite sides above and below the hinge pin 60, thus limiting an angle at which the heat dissipation unit 30 rotates forwards or rearwards. When a user desires to further rotate the heat dissipation unit 30 forwards or rearwards beyond the limited angle, he or she only has to remove the locking pin 70 above or below the hinge pin 60.

[0050] Further, in order to prevent a fastening force from being reduced when either of the locking pins 70 is removed and to prevent the fastening force for the heat dissipation unit 30 form being lowered due to the reduction in tightening force of the locking pin 70 and the hinge pin 60, an additional locking hole 38 is formed in the heat dissipation unit 30, and the locking bracket 80 has an additional bolt insert hole 88 corresponding to the additional locking hole 38, thus allowing the additional fastening bolt (not shown) to be fastened to the additional locking hole 38 and the additional bolt insert hole 88.

Claims

1. An LED lighting apparatus having LED arrays turned on or off independently, comprising:

   an LED module (10) including a PCB (13), and LEDs (11) mounted on the PCB (13), the LEDs (11) divided into a plurality of LED arrays (11A, 11B, 11C) that are independently turned on or off;
   a heat dissipation unit (30), with the LED module (10) mounted on a front of the heat dissipation unit (30); and
   a locking bracket (80) on which the heat dissipation unit (30) is mounted,
   the LED lighting apparatus further comprising angle adjusting means, the angle adjusting means comprising:

      a first hinge hole (81) formed in a vertical part (87) of the locking bracket (80);
      a guide hole (83) formed in the vertical part (87) to have a shape of an arc around the first hinge hole (81);
      a second hinge hole (34) formed in a side surface of the heat dissipation unit (30) to correspond to the first hinge hole (81);
      a locking hole (35) formed in the side surface of the heat dissipation unit (30) to correspond to the guide hole (83);
      a hinge pin (60) inserted into the first hinge hole (81) and the second hinge hole (34) to hingedly couple the locking bracket (80) to the heat dissipation unit (30);
      a locking pin (70) passing through the guide hole (83) to be fastened to the locking hole (35), guiding rotation of the heat dissipation unit (30), and locking the heat dissipation unit (30) to the locking bracket (80);
      an additional bolt insert hole (88) formed in the vertical part (87) at a location between the first hinge hole (81) and the guide hole (83);
      an additional locking hole (38) formed in the side surface of the heat dissipation unit (30) to correspond to the additional bolt insert hole (88); and
      an additional fastening bolt passing through

the additional bolt insert hole (88) and fastened to the additional locking hole (38).

2. The LED lighting apparatus as set forth in claim 1, further comprising:

a protective cover (40) for covering the LED module (10);
a mounting frame (50) surrounding an edge of the protective cover (40), and mounted to a front edge of the heat dissipation unit (30); and
a waterproof packing (90) provided on a rear edge of the protective cover (40), and pressurized against the front of the heat dissipation unit (30), thus sealing a gap between the protective cover (40) and the heat dissipation unit (30).

3. The LED lighting apparatus as set forth in claim 1 or 2, further comprising:

a light conversion plate (20), including:

a collimated lens (21) disposed in front of the LEDs (11) of the LED module (10) to convert light emitted from the LEDs (11) into parallel beams; and
a holder (25) holding the collimated lens (21).

Patentansprüche

1. LED-Beleuchtungsvorrichtung, welche LED-Felder aufweist, die unabhängig an- oder ausgeschaltet werden, umfassend:

ein LED-Modul (10), welches eine PCB (13) und auf der PCB (13) montierte LEDs (11) enthält, wobei die LEDs (11) in eine Mehrzahl von LED-Felder (11A, 11 B, 11 C) geteilt sind, die unabhängig an- oder ausgeschaltet werden;
eine Hitzeableitungseinheit (30), wobei das LED-Modul (10) an einer Vorderseite der Hitzeableitungseinheit (30) montiert ist; und
eine Feststellhalterung (80), an welcher die Hitzeableitungseinheit (30) montiert ist,
wobei die LED-Beleuchtungsvorrichtung ferner ein Winkeleinstellmittel umfasst, wobei das Winkeleinstellmittel umfasst:

ein erstes Scharnierloch (81), welches in einem vertikalen Teil (87) der Feststellhalterung (80) gebildet ist;
ein Führungsloch (83), welches in dem vertikalen Teil (87) derart gebildet ist, dass es eine Form eines Bogens um das erste Scharnierloch (81) aufweist;
ein zweites Scharnierloch (34), welches in einer Seitenoberfläche der Hitzeableitungseinheit (30) derart gebildet ist, dass es mit dem ersten Scharnierloch (81) übereinstimmt;
ein Verriegelungsloch (35), welches in der Seitenoberfläche der Hitzeableitungseinheit (30) derart gebildet ist, dass es mit dem Führungsloch (83) übereinstimmt;
einen Scharnierstift (60), welcher in das erste Scharnierloch (81) und das zweite Scharnierloch (34) derart eingeführt ist, dass die Feststellhalterung (80) mit der Hitzeableitungseinheit (30) schwenkbar gekoppelt ist;
einen Verriegelungsstift (70), welcher derart durch das Führungsloch (83) geht, dass er an dem Verriegelungsloch (35) befestigt ist, eine Drehung der Hitzeableitungseinheit (30) führt und die Hitzeableitungseinheit (30) an der Feststellhalterung (80) verriegelt;
ein zusätzliches Schraubeneinführungsloch (88), welches in dem vertikalen Teil (87) an einer Stelle zwischen dem ersten Scharnierloch (81) und dem Führungsloch (83) gebildet ist;
ein zusätzliches Verriegelungsloch (38), welches in der Seitenoberfläche der Hitzeableitungseinheit (30) derart gebildet ist, dass es mit dem zusätzlichen Schraubeneinführungsloch (88) übereinstimmt; und
eine zusätzliche Befestigungsschraube, welche durch das zusätzliche Schraubeneinführungsloch (88) geht und an dem zusätzlichen Verriegelungsloch (38) befestigt ist.

2. LED-Beleuchtungsvorrichtung nach Anspruch 1, ferner umfassend:

eine Schutzabdeckung (40) zum Abdecken des LED-Moduls (10);
einen Montagerahmen (50), welcher eine Kante der Schutzabdeckung (40) umgibt und welcher an einer Vorderkante der Hitzeableitungseinheit (30) montiert ist; und
eine wassergeschützte Verpackung (90), welche an einer Hinterkante der Schutzabdeckung (40) vorgesehen und gegen die Vorderseite der Hitzeableitungseinheit (30) gepresst ist, wodurch eine Lücke zwischen der Schutzabdeckung (40) und der Hitzeableitungseinheit (30) gedichtet wird.

3. LED-Beleuchtungsvorrichtung nach Anspruch 1 oder 2, ferner umfassend:

eine Lichtumwandlungsplatte (20), enthaltend:

eine kollimierende Linse (21), welche vor den LEDs (11) des LED-Moduls (10) derart angeordnet ist, dass von den LEDs (11) ausgestrahltes Licht in parallele Strahlen umgewandelt wird; und
einen Halter (25), welcher die kollimierende Linse (21) hält.

Revendications

1. Appareil d'éclairage à DEL comportant des ensembles de DEL indépendamment allumés ou éteints, comprenant :

un module de DEL (10) incluant une PCB (13), et des DEL (11) montées sur la PCB (13), les DEL (11) étant divisées en une pluralité d'ensembles de DEL (11A, 11B, 11C) qui sont indépendamment allumés ou éteints ;
une unité de dissipation de chaleur (30), avec le module de DEL (10) monté sur un avant de l'unité de dissipation de chaleur (30) ; et
un support de blocage (80) sur lequel est montée l'unité de dissipation de chaleur (30),
l'appareil d'éclairage à DEL comprenant en outre un moyen d'ajustement d'angle, le moyen d'ajustement d'angle comprenant :

un premier trou d'articulation (81) formé dans une partie verticale (87) du support de blocage (80) ;
un trou de guidage (83) formé dans la partie verticale (87) pour avoir une forme d'un arc autour du premier trou d'articulation (81) ;
un deuxième trou d'articulation (34) formé dans une surface latérale de l'unité de dissipation de chaleur (30) pour correspondre au premier trou d'articulation (81) ;
un trou de blocage (35) formé dans la surface latérale de l'unité de dissipation de chaleur (30) pour correspondre au trou de guidage (83) ;
un axe d'articulation (60) inséré dans le premier trou d'articulation (81) et le deuxième trou d'articulation (34) pour coupler de façon articulée le support de blocage (80) à l'unité de dissipation de chaleur (30) ;
un axe de blocage (70) passant à travers le trou de guidage (83) pour être fixé au trou de blocage (35), guidant la rotation de l'unité de dissipation de chaleur (30) et bloquant l'unité de dissipation de chaleur (30) sur le support de blocage (80) ;
un trou d'insertion de boulon supplémentaire (88) formé dans la partie verticale (87) au niveau d'un emplacement entre le premier trou d'articulation (81) et le trou de guidage (83) ;
un trou de blocage supplémentaire (38) formé dans la surface latérale de l'unité de dissipation de chaleur (30) pour correspondre au trou d'insertion de boulon supplémentaire (88) ; et
un boulon de fixation supplémentaire passant à travers le trou d'insertion de boulon supplémentaire (88) et fixé au trou de blocage supplémentaire (38).

2. Appareil d'éclairage à DEL selon la revendication 1, comprenant en outre :

un couvercle de protection (40) destiné à couvrir le module de DEL (10) ;
un cadre de montage (50) entourant un bord du couvercle de protection (40), et monté sur un bord avant de l'unité de dissipation de chaleur (30) ; et
une garniture imperméable (90) située sur un bord arrière du couvercle de protection (40), et mise sous pression contre l'avant de l'unité de dissipation de chaleur (30), scellant ainsi un espace entre le couvercle de protection (40) et l'unité de dissipation de chaleur (30).

3. Appareil d'éclairage à DEL selon la revendication 1 ou 2, comprenant en outre :

une plaque de conversion de lumière (20), incluant :

une lentille collimatée (21) disposée devant les DEL (11) du module de DEL (10) pour convertir la lumière émise depuis les DEL (11) en faisceaux parallèles ; et
un élément de retenue (25) retenant la lentille collimatée (21).

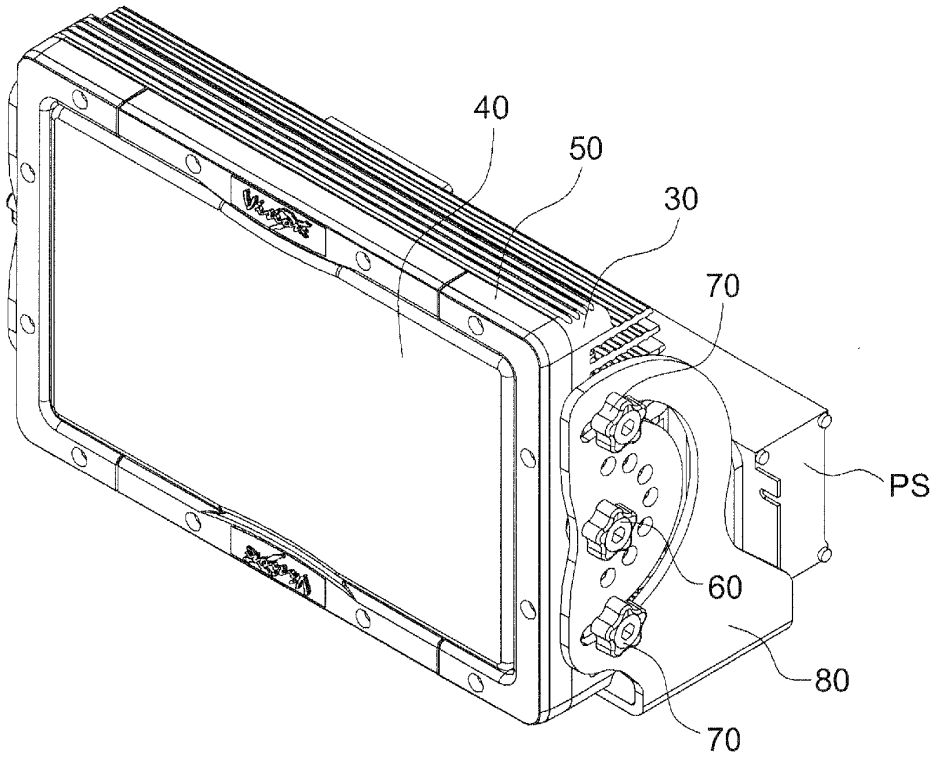


FIG. 1A

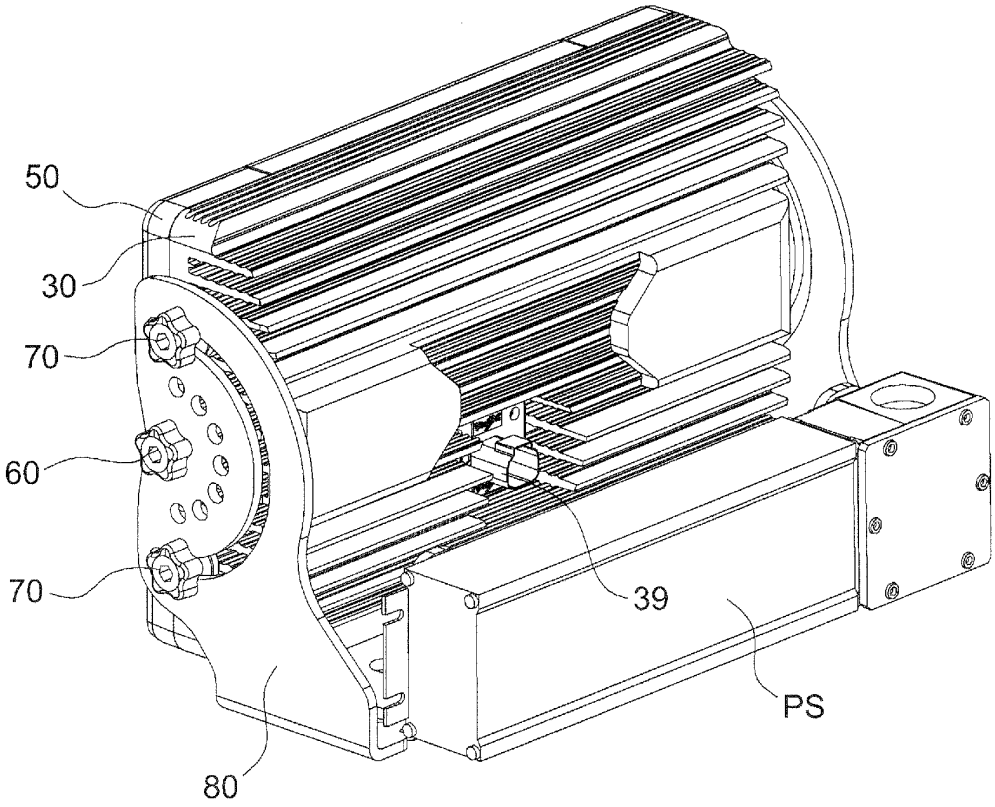


FIG. 1B

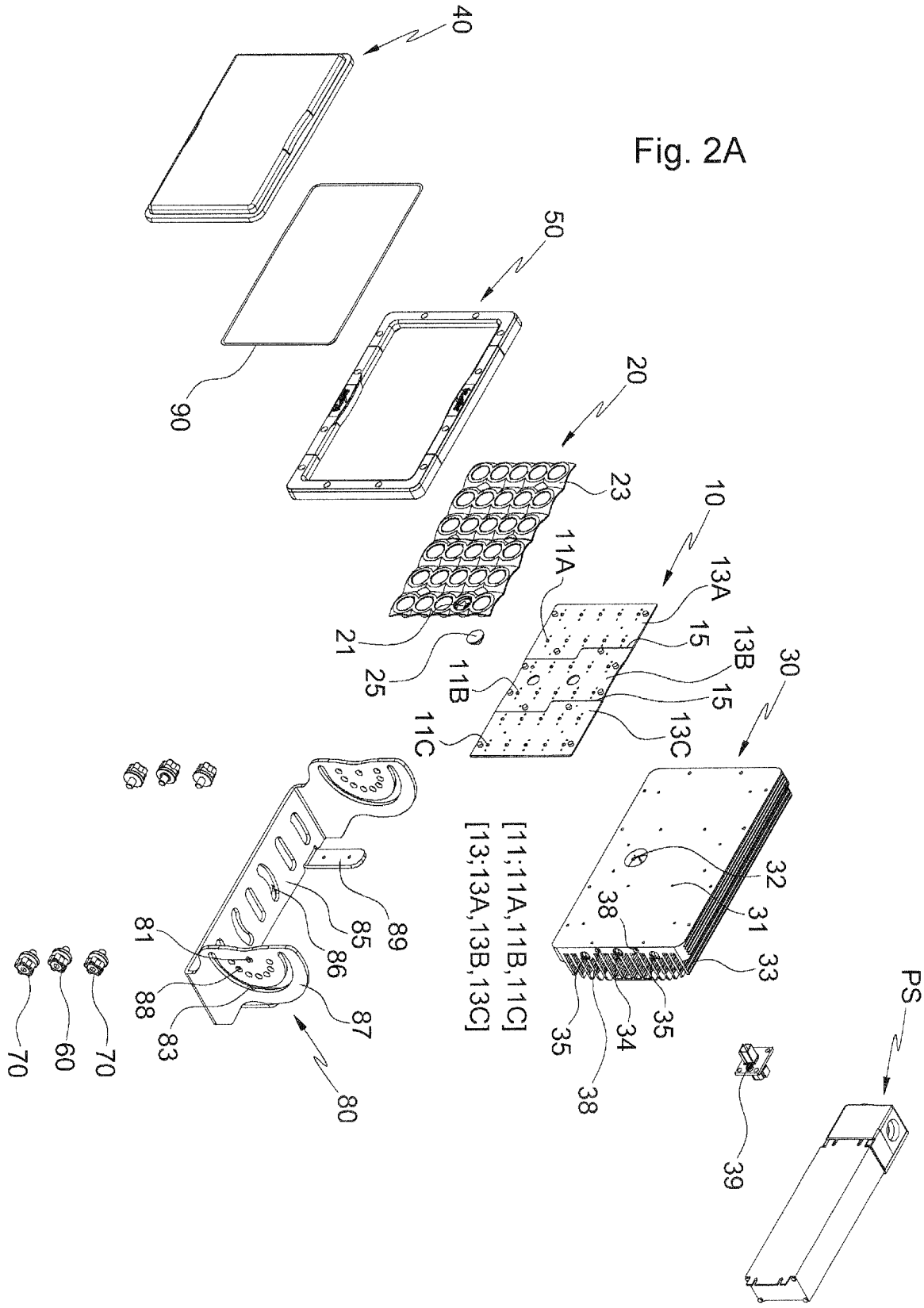
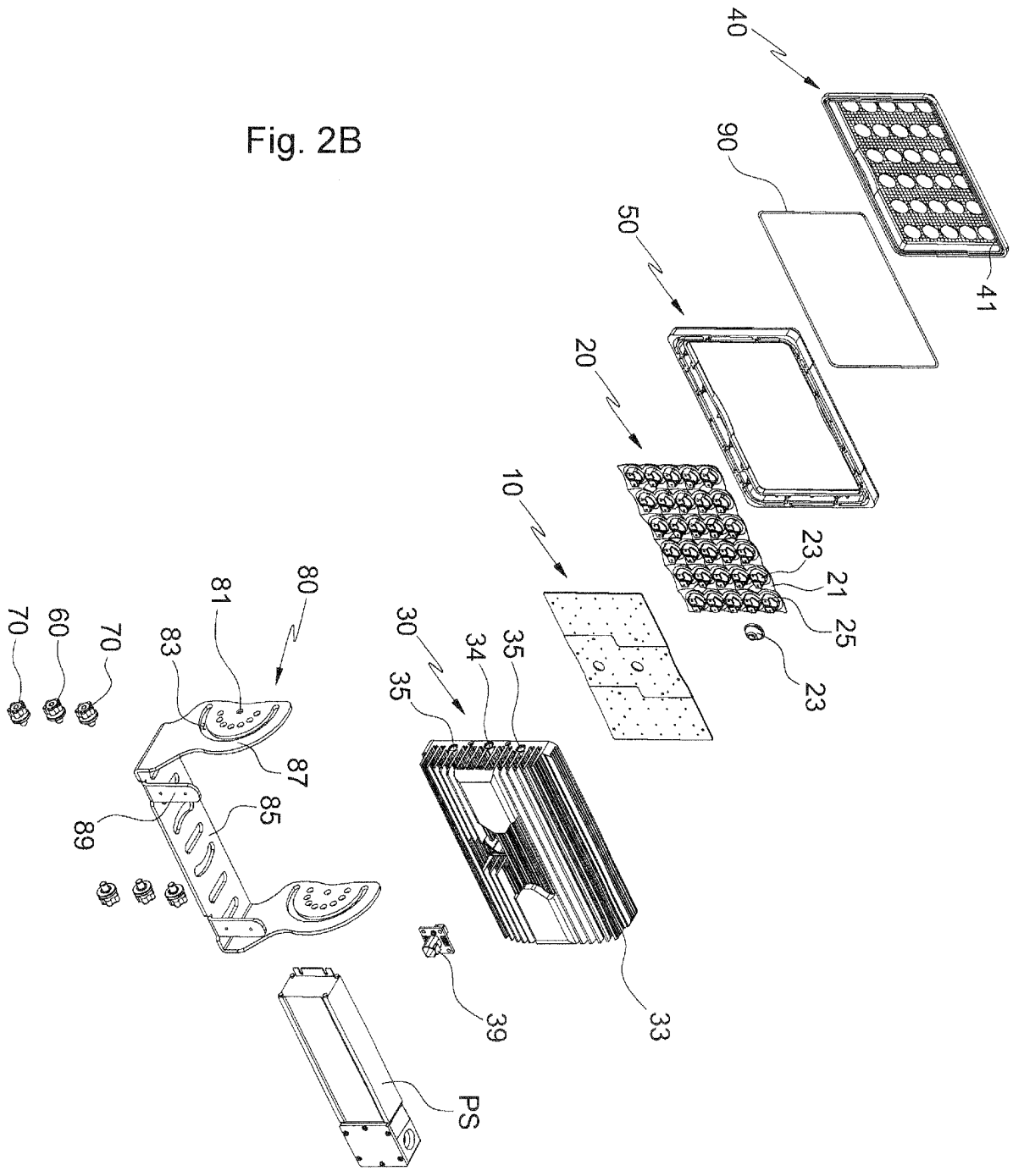

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11A
13A
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13B
15
13C
11C
11B
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25
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[11;11A,11B,11C]
[13;13A,13B,13C]
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Fig. 2A

Fig. 2B


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PS

REFERENCES CITED IN THE DESCRIPTION

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