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(54) **AUDITORIUM LED LIGHT SYSTEM**

LED-LICHTSYSTEM FÜR AUDITORIUM

SYSTÈME D'ÉCLAIRAGE À DEL EN AUDITORIUM

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(56) References cited:
WO-A1-2012/129243 **WO-A2-2011/139764**

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Description

BACKGROUND OF THE DISCLOSURE

Field of the Disclosure

[0001] The subject disclosure relates to electrical lighting systems and more particularly to a lighting system employing LED light fixtures to illuminate an auditorium or similarvenue.

R el ated Art

[0002] Incandescent lighting systems for illuminating theatres, auditoriums and the like have been used in the past.

[0003] WO2012/129243 discloses a light fixture having a plurality of LED light bars, each of which is individually dimmable.

SUMMARY

[0004] There is provided an auditorium lighting system comprising: a plurality of LED light fixtures located in a ceiling of the auditorium; a power control system; wherein each LED light fixture comprises a fixture body, each fixture body of each LED light fixture mounting a plurality of LED modules; characterised in that the plurality of LED modules comprise two different types of LED modules, comprising: first and second high intensity light LED modules for providing high intensity full level lighting, located at opposite ends of the fixture body; and one or more ambience LED modules for providing exclusively low level ambient lighting; and in that said power control system is configured to collectively switch said one or more ambience light LED modules of each LED light fixture 'on_ and 'off_ and separately to collectively switch said first and second high intensity LED modules 'on_ and 'off_ to thereby provide either low level ambient light or high intensity full level lighting to said auditorium.

[0005] There is also provided an electric lighting fixture comprising a fixture body mounting a plurality of LED modules, characterised in that the plurality of LED modules comprise two different types of LED modules, comprising: at least first and second high intensity light LED modules for providing high intensity full level lighting, one positioned at each opposite end of said fixture body; and at least one ambience light LED module for providing exclusively low level ambient lighting, positioned between said first and second high intensity light LED modules.

[0006] A selection of optional features are set out in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Fig. 1 is a side schematic view illustrating an auditorium lighting system according to an illustrative embodiment;

Fig. 2 is a perspective view of the lighting system of Fig. 1;

Fig. 3 is a perspective view of a lighting fixture employable in the system of Fig. 2;

Fig. 4 is a first cross-sectional view of the fixture taken at IV-IV of Fig. 3;

Fig. 5 is a second cross-sectional view of the fixture taken atV-V of Fig. 3;

Fig. 6 is a detail view illustrating cooperation of the fixture of Fig. 3 with adjacent sealingtile; and

Fig. 7 is a perspective end view showing an illustrative installation of the fixture of Fig. 3.

DETAILED DESCRIPTION

[0008] An auditorium lighting system 11 according to an illustrative embodiment is shown in Figs. 1 and 2. It should be understood that as used here, the term 'auditorium_ encompasses theaters such as conventional 'movie_ theaters.

[0009] The lighting system 11 employs a plurality of light fixtures 13 installed in or attached to a ceiling 15 above a floor 21. These light fixtures 13 can be installed at regular or irregular spacing intervals so as to achieve uniform illumination of the floor 21, which typically slopes downwardly in a multi-level, "stadium style" arrangement and on which a number of seats are positioned, typically separated by one or more aisles. In other applications, the floor 21 may be flat.

[0010] A junction box 16 containing a plurality of LED drivers, for example, three drivers, is shown attached to the front interior wall 17 of a projection booth 18. The junction box 16 may be positioned elsewhere in the projection booth 18 in various embodiments or in another easy-to-access location, such as, for example, above a T-bar grid at the cross aisles. The junction box 16 may include controls, dimmers, surge protection, emergency back-up equipment and supplies electrical power to the light fixtures 13, as well as dimming capability.

[0011] Fig. 2 schematically illustrates the power feeds 23 to the fixtures 13 from the junction box 16 as three dashed lines. Remote positioning of the power system as illustrated in Figs. 1 and 2 makes wiring, dimming, and maintenance easier to manage.

[0012] An illustrative light fixture 13 is shown in Fig. 3. The fixture 13 includes an elongated extrusion 29, which provides a mounting surface or surfaces 30 for a plurality of LED modules 31, 33, 35, 37, 39, 41. The extrusion 29 further has respective junction boxes 43, 45 and horizon-

tal flanges 47, 49; 51, 53 at each end. The junction or "splice" boxes 43, 45 provide faster and easier wiring, while the flanges 47, 49; 51, 53 assist in mounting the fixtures 13 to cooperate with adjacent ceiling tile. Fig. 6 illustrates the manner in which the flanges 47, 49; 51, 53 accommodate ceiling tile 81 in one illustrative embodiment.

[0013] The pairs of LED modules 31, 33; 39, 41 at opposite ends of the extrusion 13 are high intensity modules, which provide light for periods of cleaning or other maintenance. As illustrated in Figs. 4 and 5, the lighting system 11 employs high intensity modules, e.g., 31, 33 which are angled to the horizontal at an acute angle θ of, for example, 20° (degrees) and are aimed in opposing directions in order to increase the spread of light, thereby necessitating fewer fixtures in some embodiments. In addition, lenses or optics, e.g., 91, are employed in each high intensity module 31, 33 to produce a relatively intense light beam having, for example, a full width half maximum angle of 12 degrees.

[0014] Additionally, the center LED modules 35, 37 are ambient lighting modules configured to provide ambient light to illuminate the theater or auditorium, for example, during intermission periods. Other componentry shown in Figs. 4 and 5 includes the fixture housing extrusion 61, a bottom cover 78, a printed circuit board assembly ("PCBA") carrier 79, a PCBA carrier retention screw 75, a plastic dome lens 77, splice box 69 and splice box retention tab 67, electrical connector body 65, and ceiling tile flange 63. In one embodiment, the extrusion 61 may be an aluminum extrusion and the bottom cover 78 may be die cast aluminum. In one embodiment, the extrusion 61 and bottom cover 78 may be constructed as illustrated in U.S. Patent Publication 2013/0279180 A1 published October 24, 2013, the contents of which are incorporated in their entirety herein.

[0015] Each LED module 31, 33, 35, 37, 39, 41, may comprise a circuit board with one or more LED emitters mounted thereon. In one embodiment, the high intensity modules 31,33; 39, 41 employ 3 emitters e.g. 40, while the ambience modules 35, 37 employ 11 emitters. In one embodiment, each emitter of the ambience modules may have an output of 40 lumens at a full width half maximum angle of 120°.

[0016] The LED modules 31, 33, 35, 37, 39, 41 are configured in pairs and each may be six inches in length positioned in an extrusion 29 which is 42 inches in length, together with two splice boxes 69, resulting in a total fixture length of 47¾". Another embodiment may employ an eighteen inch long extrusion having three LED modules, together with two splice boxes 69, resulting in a total fixture length of 23¾". For example, such an embodiment may employ one central ambience LED module, flanked on either side by a high intensity LED module where the high intensity LED modules are angled at 20 degrees to the horizontal and oppositely directed.. In one embodiment, the relatively dim ambient intermission lighting may provide 2-4 foot candles of total light, while the full level, high intensity "cleaning" light modules may provide 6-9 foot candles of total light. In various embodiments, the light delivered by the modules may be adjusted based upon the ceiling height at the location where a particular fixture 13 is positioned.

[0017] The ambience modules 35, 37 may be collectively switched "on" or "off" at the same time, and the high intensity modules 31, 33; 39, 41 may also be collectively switched "on" or "off" at the same time. When the high intensity modules are collectively switched "on", each module 31, 33, 39, 41 is powered "on" and provides high intensity illumination. Similarly, when the ambience modules 35, 37 are collectively switched "on", each ambience modules 35, 37 is powered "on" and provides ambient illumination. In one embodiment, the ambience module 35, 37 are collectively switched or turned "on", while the high intensity modules 31, 33; 39, 41 are held or switched "off" and vice versa. In a dark state of the auditorium, all of the modules 31, 33, 35, 37, 39, 41 are in the "off" state.

[0018] Fig. 7 illustrates an attachment eyelet 51 on splice box 43 for attaching a fixture 13 by fasteners, e.g. 52, to a cooperating ceiling grid structure 84. Fixtures 13 may also be suspended by wires which terminate at structural elements of the building above the ceiling grid or by other mechanisms. Fig. 7 further illustrates electrical power cable 85 and cable sheath 87 held in place by a clamp 87. In one embodiment, two-circuit wiring is provided to enable individual on-off and dimming control of the high intensity modules 31, 33; 39, 41 and the ambient lighting modules 35, 37. In one embodiment, the junction boxes 43, 45 permit lead wires from the power supply to be connected by simply "poking" them in, and one fixture can be readily electrically interconnected to the next ("daisy chained"). After electrical connections are made, splice box lids, e.g. 82, are put in place and secured to the splice box, e.g. 43, by fasteners, e.g. 83. Low voltage or line voltage embodiments can be constructed in accordance with the above teachings.

[0019] Thus, those skilled in the art will appreciate that various adaptations and modifications of the just described preferred embodiment can be configured without departing from the scope of the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described herein.

Claims

1. An auditorium lighting system comprising:

a plurality of LED light fixtures (13) located in a ceiling of the auditorium;
a power control system;
wherein each LED light fixture (13) comprises a fixture body, each fixture body of each LED light fixture mounting a plurality of LED modules (31,

33, 35, 37, 39, 41);
characterised in that the plurality of LED modules (31, 33, 35, 37, 39, 41) comprise two different types of L E D modules, comprising:

first and second high intensity light LED modules (31, 41) providing high intensity full level lighting, located at opposite ends of the fixture body; and
oneormoreambienceLED modules (35, 37) providing exclusively low level ambient lighting; and **in that** said power control system is configured to collectively switch said one or more ambience light LED modules (35, 37) of each LED light fixture 'on_ and "off_ and separately, to collectively switch said first and second high intensity LED modules (31, 41) of each LED light fixture 'on_ and 'off_ to thereby provide either low level ambient light or high intensity full level lighting to said auditorium

2. The auditorium lighting system of claim 1, wherein said low level ambient lighting is used during an intermission period and said high intensity lighting is used during a cleaning period of said auditorium.

3. The auditorium lighting system of claim 1 or 2, wherein at least one of said one or more ambience LED modules (35, 37) is configured to be dimmable.

4. The auditorium lighting system of any of claims 1 to 3, wherein at least one of said first and second high intensity light LED modules (31, 33, 39, 41) is configured to be dimmable.

5. The auditorium lighting system of any of claims 1 to 4, wherein a pair of said high intensity light LED modules (31, 33) are angled so as to direct light in opposite directions.

6. The auditorium lighting system of any of claims 1 to 5, wherein a first of said high intensity light LED modules (31, 33, 39, 41) directs light at an angle of 20 degrees to the horizontal; while a second of said high intensity light LED modules (31, 33, 39, 41) directs light at an angle of 20 degrees to the horizontal in a direction opposite to that at which said first high intensity light LED module (31, 33, 39, 41) directs light.

7. The auditorium lighting system of any of claims 1 to 6, wherein one or more of said first and second high intensity LED modules (31, 33, 39, 41) is configured to produce a light beam having a full width half maximum angle in the range of 12 to 35 degrees.

8. The auditorium lighting system of any of claims 1 to 7, wherein said ambience LED modules (35, 37) provide 21.53 to 43.06 lux (2 to 4 foot candles) of light and said high intensity light LED modules (31, 33, 39, 41) provide 64.58 to 96.88 lux (6 to 9 foot candles) of light.

9. The auditorium lighting system of any of claims 1 to 8, wherein said power control system is positioned in an area separate from the plurality of LED light fixtures (13).

10. An electric lighting fixture comprising:

a fixture body mounting a plurality of LED modules (31, 33, 35, 37, 39, 41), characterised intthe plurality of LED modules (31, 33, 35, 37, 39, 41) comprise two different types of L E D modules, comprising:

at least first and second high intensity light LED modules (31, 33, 39, 41), providing high intensity full level lighting, one positioned at each opposite end of said fixture body; and
at least one ambience light LED module (35, 37) providing exclusively low level ambient lighting, positioned between said first and second high intensity light LED modules (31, 33, 39, 41).

11. The electric lighting fixture of claim 10 wherein said first and second high intensity LED modules (31, 33, 39, 41) are configured to provide high intensity light suitable for illuminating an auditori um for cleaning.

12. The electric lighting fixture of claim 10 or 11 wherein said at least one ambience LED module (35, 37) is configured to provide low level light suitable for use during intermission periods.

13. The electric lighting fixture of any of claims 10 to 12 further comprising a pair of high intensity light LED modules (31, 33, 39, 41) angled so as to direct light in opposite di recti ons.

14. The electric lighting fixture of any of claims 10 to 13, wherein a first of said high intensity light LED modules (31, 33, 39, 41) directs light at an angle of 20 degrees to the horizontal; while a second of said high intensity light LED modules (31, 33, 39, 41) directs light at an angle of 20 degrees to the horizontal in a direction opposite to that at which said first high intensity light LED module (31, 33, 39, 41) directs light.

Patentansprüche

1. Auditoriumsbeleuchtungssystem, umfassend:

eine Vielzahl von LED-Leuchten (13), die in einer Decke des Auditoriums angeordnet sind;
ein Energiesteuersystem;
wobei jede LED-Leuchte (13) einen Grundkörper umfasst, wobei jeder Grundkörper einer jeden LED-Leuchte eine Vielzahl von LED-Modulen (31,33,35, 37, 39, 41) hält;
dadurch gekennzeichnet, dass die Vielzahl von LED-Modulen (31, 33, 35, 37, 39, 41) zwei unterschiedliche Typen von LED-Modulen umfassen, die Folgendes umfassen:

erste und zweite LED-Module mit Licht hoher Intensität (31, 41), die eine starke Beleuchtung mit hoher Intensität bereitstellen und an entgegengesetzten Enden des Grundkörpers angeordnet sind; und
ein oder mehrere Umgebungs-LED-Module (35, 37), die ausschließlich eine schwache Umgebungsbeleuchtung bereitstellen; und dadurch, dass das Energiesteuersystem konfiguriert ist, das eine oder die mehreren Umgebungs-LED-Module (35, 37) einer jeden LED-Leuchte zusammen 'ein_ und 'aus_ zu schalten, und die ersten und zweiten LED-Module mit hoher Intensität (31, 41) einer jeden LED-Leuchte 'ein_ und 'aus_ zu schalten, um somit entweder schwaches Umgebungslicht oder eine starke Beleuchtung mit hoher Intensität für das Auditorium bereitzustellen.

2. Auditoriumsbeleuchtungssystem nach Anspruch 1, wobei die schwache Umgebungsbeleuchtung während eines Unterbrechungszeitraums verwendet wird und die Beleuchtung mit hoher Intensität während eines Reinigungszeitraums des Auditoriums verwendet wird.

3. Auditoriumsbeleuchtungssystem nach Anspruch 1 oder 2, wobei mindestens eines des einen oder der mehreren Umgebungs-LED-Module (35, 37) konfiguriert ist, dimmbar zu sein.

4. Auditoriumsbeleuchtungssystem nach einem der Ansprüche 1 bis 3, wobei mindestens eines der ersten und zweiten LED-Module mit Licht hoher Intensität (31, 33, 39, 41) konfiguriert ist, dimmbar zu sein.

5. Auditoriumsbeleuchtungssystem nach einem der Ansprüche 1 bis 4, wobei ein Paar der LED-Module mit Licht hoher Intensität (31, 33) abgewinkelt ist, damit Licht in entgegengesetzte Richtungen gestrahlt wird.

6. Auditoriumsbeleuchtungssystem nach einem der Ansprüche 1 bis 5, wobei ein erstes der LED-Module mit Licht hoher Intensität (31, 33, 39, 41) Licht in einem Winkel von 20 Grad zur Horizontalen strahlt; während ein zweites der LED-Module mit Licht hoher Intensität (31, 33, 39, 41) Licht in einem Winkel von 20 Grad zur Horizontalen in einer Richtung strahlt, die der, in der das erste LED-Modul mit Licht hoher Intensität (31, 33, 39, 41) Licht strahlt, entgegengesetzt ist.

7. Auditoriumsbeleuchtungssystem nach einem der Ansprüche 1 bis 6, wobei eines oder mehrere der ersten und zweiten LED-Module mit hoher Intensität (31, 33, 39, 41) konfiguriert sind, einen Lichtstrahl zu erzeugen, der eine maximalen Vollbreiten-Halbwinkel im Bereich von 12 bis 35 Grad aufweist.

8. Auditoriumsbeleuchtungssystem nach einem der Ansprüche 1 bis 7, wobei die Umgebungs-LED-Module (35, 37) Licht mit 21,53 bis43,06 lux (2 bis4 Footcandle) bereitstellen und die LED-Module mit Licht hoher Intensität (31, 33, 39, 41) Licht mit 64,58 bis 96,88 lux (6 bis 9 Footcandle) bereitstellen.

9. Auditoriumsbeleuchtungssystem nach einem der Ansprüche 1 bis 8, wobei das Energiesteuersystem in einem Bereich angeordnet ist, der von der Vielzahl von LED-Leuchten (13) getrennt ist.

10. Elektrische Leuchte, umfassend:

einen Grundkörper, der eine Vielzahl von LED-Modulen (31, 33, 35, 37, 39, 41) hält, **dadurch gekennzeichnet, dass** die Vielzahl von LED-Modulen (31, 33, 35, 37, 39, 41) zwei unterschiedliche Typen von LED-Modulen umfassen, die Folgendes umfassen:

mindestens erste und zweite LED-Module mit Licht hoher Intensität (31, 33, 39, 41), die eine starke Beleuchtung mit hoher Intensität bereitstellen, wobei eins an jedem entgegengesetzten Ende des Grundkörpers angeordnet ist; und
mindestens ein Umgebungs-LED-Modul (35, 37), das ausschließlich eine schwache Umgebungsbeleuchtung bereitstellt und zwischen den ersten und zweiten LED-Modulen mit Licht hoher Intensität (31, 33, 39, 41) angeordnet ist.

11. Elektrische Leuchte nach Anspruch 10, wobei die ersten und zweiten LED-Module mit hoher Intensität (31, 33, 39, 41) konfiguriert sind, Licht mit hoher Intensität bereitzustellen, das zum Beleuchten eines Auditoriums zur Reinigung geeignet ist.

12. Elektrische Leuchte nach Anspruch 10 oder 11, wobei das mindestens eine Umgebungs-LED-Modul (35, 37) konfiguriert ist, schwaches Licht bereitzu-

stellen, das zur Verwendung während Unterbrechungspausen geeignet ist.

13. Elektrische Leuchte nach einem der Ansprüche 10 bis 12, die ferner ein Paar LED-Module mit Licht hoher Intensität (31, 33, 39, 41) umfasst, die abgewinkelt sind, damit Licht in entgegengesetzte Richtungen gestrahlt wird.

14. Elektrische Leuchte nach einem der Ansprüche 10 bis 13, wobei ein erstes der LED-Module mit Licht hoher Intensität (31, 33, 39, 41) Licht in einem Winkel von 20 Grad zur Horizontalen strahlt; während ein zweites der LED-Module mit Licht hoher Intensität (31, 33, 39, 41) Licht in einem Winkel von 20 Grad zur Horizontalen in einer Richtung strahlt, die der, in der das erste LED-Modul mit Licht hoher Intensität (31, 33, 39, 41) Licht strahlt, entgegengesetzt ist.

Revendications

1. Système d'éclairage d'auditorium comprenant :

une pluralité d'appareils d'éclairage DEL (13) situés dans un plafond d'auditorium ;
un système de commande de puissance ;
dans lequel chaque appareil d'éclairage DEL (13) comprend un corps d'appareil, chaque corps d'appareil de chaque appareil d'éclairage DEL montant une pluralité de modules DEL(31, 33, 35, 37, 39, 41) ;
caractérisé en ce que la pluralité de modules DEL (31, 33, 35, 37, 39, 41) comprend deux types différents de modules DEL, comportant :

des premier et second modules DEL de lumière de forte intensité (31, 41) fournissant un éclairage de plein niveau de forte intensité situésaux extrémités opposées du corps d'appareil ; et
un ou plusieurs modules d'ambiance DEL (35, 37) fournissant exclusivement un éclairage ambiant de faible niveau et ledit système de commande de puissance est configuré pour commuter collectivement lesdits un ou plusieurs modules de lumière d'ambiance DEL (35, 37) de chaque appareil d'éclairage DEL sur « marche » et « arrêt » et, séparément, pour commuter sélectivement lesdits premier et second modules DELde forte intensité (31, 41) de chaque appareil d'éclairage DELsur « marche » et « arrêt » pour ainsi fournir une lumière ambiante de faible niveau ou un éclairage de plein niveau de forte intensité audit auditorium.

2. Système d'éclairage d'auditorium selon la revendication 1, dans lequel ledit éclairage ambiant de faible niveau est utilisé au cours d'une période d'intermittence et ledit éclairage de forte intensité est utilisé au cours d'une période de nettoyage dudit auditorium.

3. Système d'éclairage d'auditorium selon la revendication 1 ou 2, dans lequel au moins l'un desdits un ou plusieurs modules d'ambiance DEL (35, 37) est configuré pour être en lumière estompée.

4. Système d'éclairage d'auditorium selon l'une quelconque des revendications 1 à 3, dans lequel au moins l'un desdits premier et second modules DEL de lumière de forte intensité (31, 33, 39, 41) est configuré pour être en lumière estompée.

5. Système d'éclairage d'auditorium selon l'une quelconque des revendications 1 à 4, dans lequel une paire desdits modules DEL de lumière de forte intensité (31, 33) forme un angle de manière à diriger de la lumière dans des sens opposés.

6. Système d'éclairage d'auditorium selon l'une quelconque des revendications 1 à 5, dans lequel un premier desdits modules DELde forte intensité (31, 33, 39, 41) dirige de la lumière sous un angle de 20 degrés avec l'horizontale ; tandis qu'un second desdits modules DEL de lumière de forte intensité (31, 33, 39, 41) dirige de la lumière sous un angle de 20 degrés avec l'horizontale dans un sens opposé à celui où ledit premier module DELde lumière de forte intensité (31, 33, 39, 41) dirige de la lumière.

7. Système d'éclairage d'auditorium selon l'une quelconque des revendications 1 à 6, dans lequel un ou plusieurs desdits premier et second modules DELde forte intensité (31, 33, 39, 41) est configuré pour produire un faisceau de lumière ayant un demi-angle maximal de pleine largeur dans la plage de 12 à35 degrés.

8. Système d'éclairage d'auditorium selon l'une quelconque des revendications 1 à 7, dans lequel lesdits modules d'ambiance DEL (35, 37) fournissent 21,53 à 43,06 lux (2 à 4 unités d'éclairage) de lumière et lesdits modules DELde lumière de forte intensité (31, 33, 39, 41) fournissent 64,58 à 96,88 lux (6 à 9 unités d'éclairage) de lumière.

9. Système d'éclairage d'auditorium selon l'une quelconque des revendications 1 à 8, dans lequel ledit système de commande de puissance est positionné dans une zone séparée de la pluralité d'appareils d'éclairage DEL (13).

10. Appareil d'éclairage électrique comprenant :

un corps d'appareil montant une pluralité de modules DEL (31, 33, 35, 37, 39, 41), **caractérisé en ce que** la pluralité de modules DEL (31, 33, 35, 37, 39, 41) comprend deux types différents de modules DEL, comportant :

au moins des premier et second modules DEL de lumière de forte intensité (31, 33, 39, 41), fournissant un éclairage de plein niveau de forte intensité, l'un positionné sur chaque extrémité opposée dudit corps d'appareil ; et
au moins un module DELde lumière d'ambiance (35, 37) fournissant exclusivement un éclairage ambiant de faible niveau positionné entre ledit premier et ledit second modules DELde lumière de forte intensité (31, 33, 39, 41).

11. Appareil d'éclairage électrique selon la revendication 10, dans lequel lesdits premier et second modules DELde forte intensité (31, 33, 39, 41) sont configurés pour fournir de la lumière de forte intensité convenant à l'éclairage d'un auditorium pour le nettoyage.

12. Appareil d'éclairage électrique selon la revendication 10 ou 11, dans lequel ledit au moins un module d'ambiance DEL(35, 37) est configuré pour fournir un éclairage de faible niveau convenant à une utilisation au cours de périodes d'intermittence.

13. Appareil d'éclairage électrique selon l'une quelconque des revendications 10 à 12, comprenant en outre une paire de modules DELde lumière de forte intensité (31, 33, 39, 41) faisant un angle de manière à diriger de la lumière dans des sens opposés.

14. Appareil d'éclairage électrique selon l'une quelconque des revendications 10 à 13, dans lequel un premier desdits modules DELde lumière de forte intensité (31, 33, 39, 41) dirige de la lumière sous un angle de 20 degrés avec l'horizontale ; tandis qu'un second desdits modules DELde lumière de forte intensité (31, 33, 39, 41) dirige de la lumière sous un angle de 20 degrés avec l'horizontale dans un sens opposé à celui où ledit premier module DELde lumière de forte intensité (31, 33, 39, 41) dirige de la lumière.

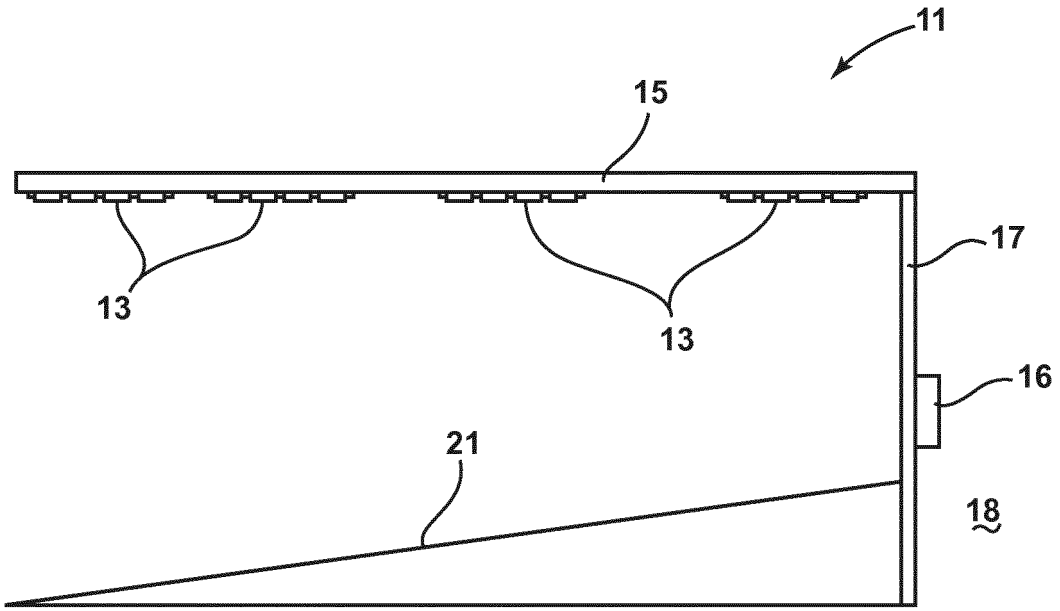


FIG. 1

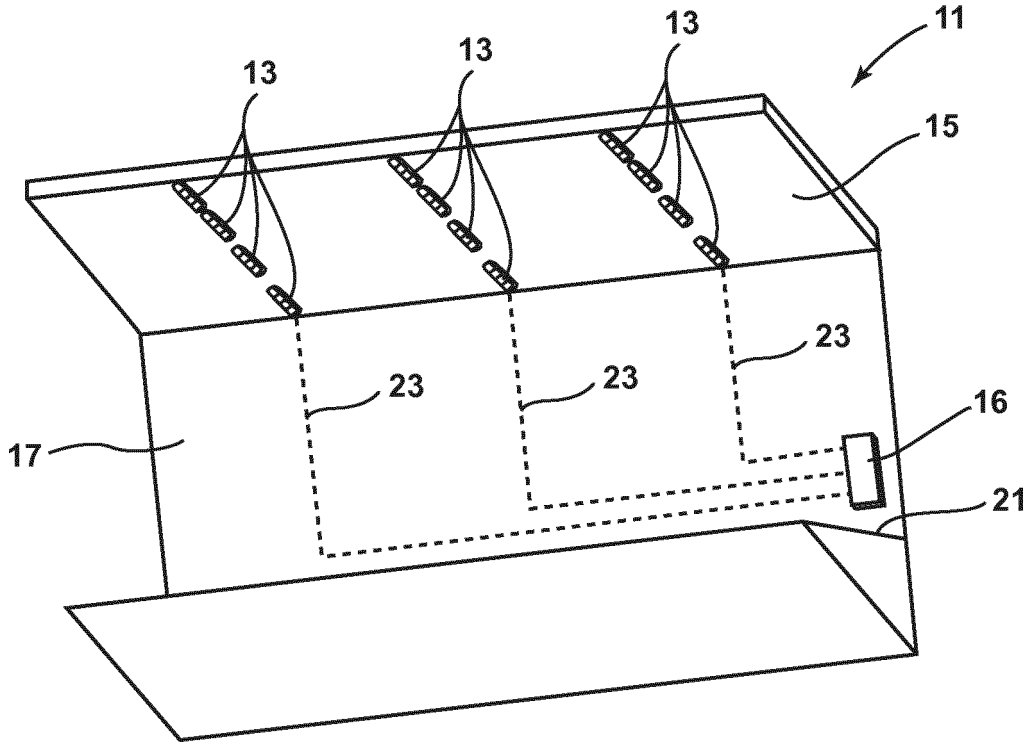


FIG. 2

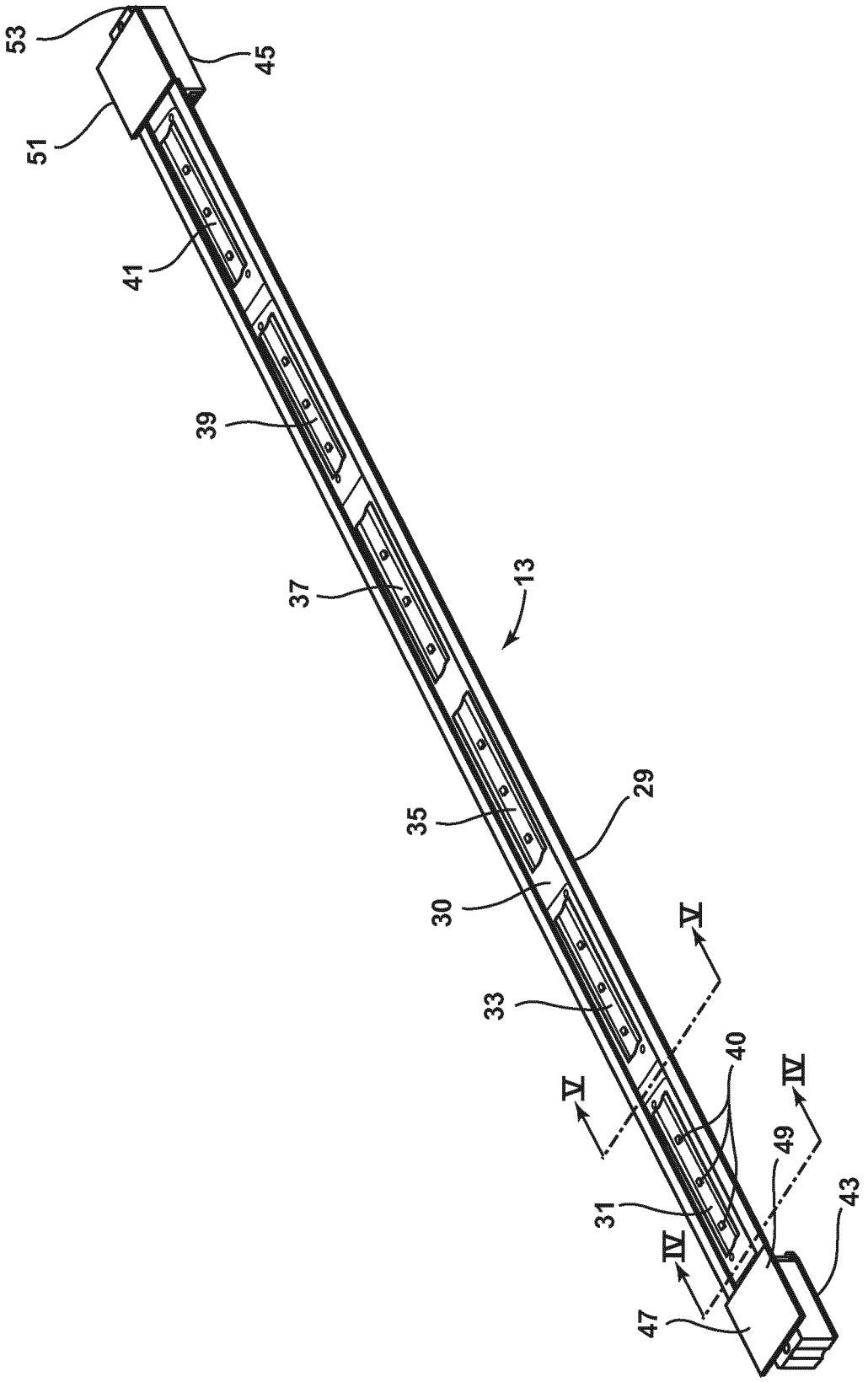


Fig. 3

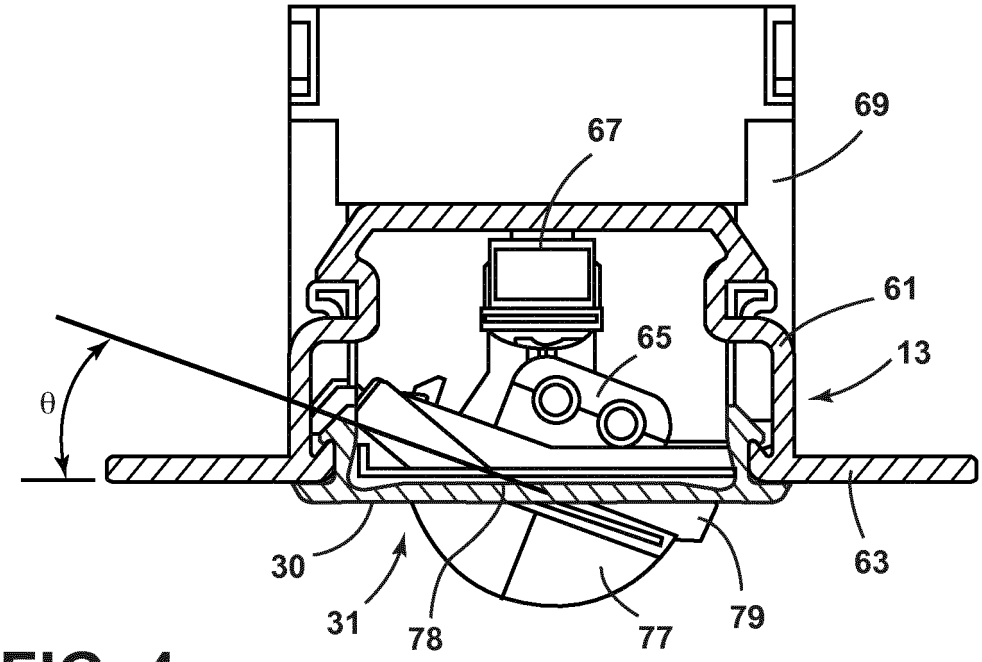


FIG. 4

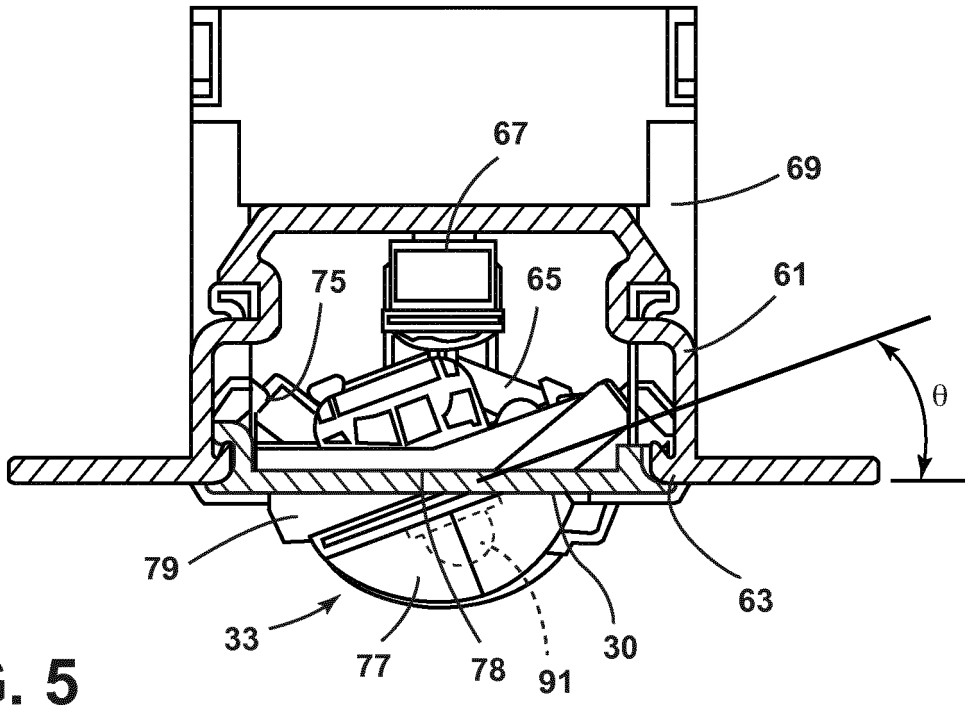


FIG. 5

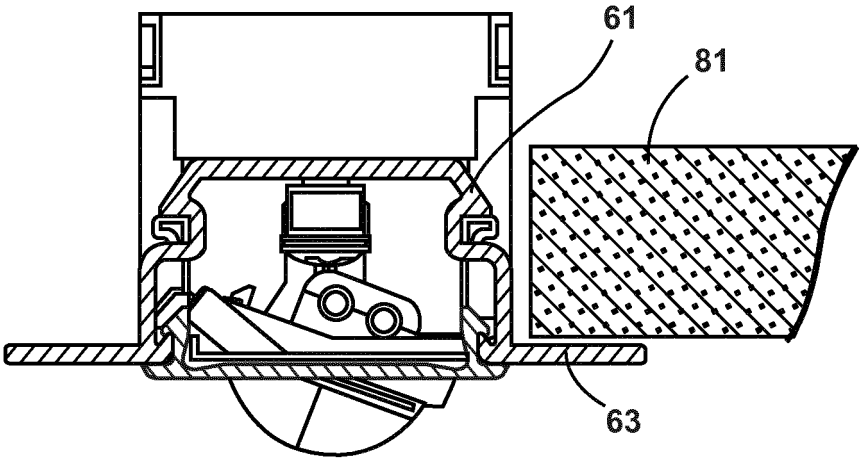


FIG. 6

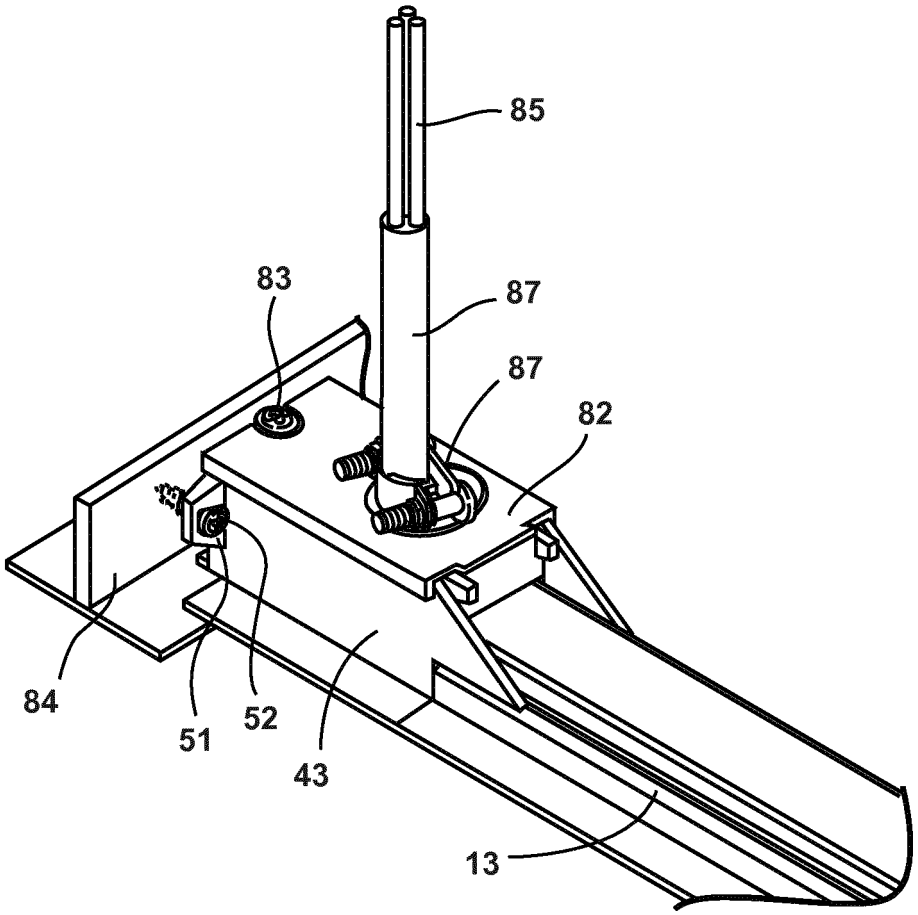


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- US 20130279180 A1 **[0014]**