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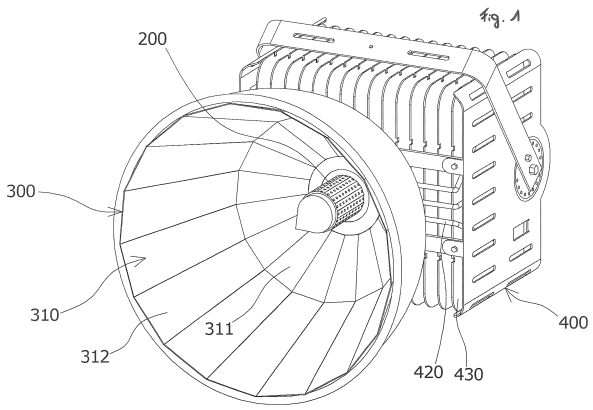
(54) COB LIGHTING DEVICE HAVING IMPROVED LIGHT-DISTRIBUTION, ILLUMINANCE, AND HEAT -DISSIPATION EFFICIENCY

(57) The present invention relates to a COB lighting device having improved light-distribution, illuminance, and heat-dissipation efficiency that: can reflect emitted light with a reflective plate to prevent glare caused by direct rays of the light; can allow the light traveling forwards from the reflector to have travel paths similar to each other to minimize the amount of light leaked out of an illuminated area, thereby improving luminous intensity; and can allow the light to be uniformly supplied rather than being limited to one point, the COB lighting device comprising: a polygonal prismatic heat-dissipation rod having a thermal conductor formed on at least one of the inside and the outside thereof; a plurality of lighting modules attached to the outer circumferential surface of the heat-dissipation rod in the longitudinal direction, each of which has a plurality of lighting elements arranged in a line; a reflector having the shape of a container that is open at an opposite end thereof, wherein the heat-dissipation rod is fixedly inserted into the central portion of the reflector, and the reflector has a plurality of planar reflective plates that are formed such that side surfaces thereof are in constant contact with each other; a heat-dissipation plate assembly that is in contact with an end portion of the heat-dissipation rod and releases, to the outside, heat conducted from the heat-dissipation rod; and a stabilizer provided on a side of the heat-dissipation plate assembly to supply power to the lighting modules.



EP 3 315 855 A1

Description

Technical Field

[0001] The present invention relates to a COB (Chip-on-Board)-type lighting device having improved light distribution, illuminance, and heat dissipation efficiency. More particularly, the present invention relates to a COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency so as to be capable of preventing glare due to direct light radiation by reflecting emitted light with a reflective plate, improving luminous intensity by minimizing the amount of light that is radiated outside an illumination area by making light rays radiated forward from a reflector travel along similar paths, and uniformly radiating light rather than concentrating light on one point.

Background Art

[0002] A lighting device is a device that supplies light from a light source, and there are various kinds of light sources, such as an incandescent electric lamp, a fluorescent lamp, and a halogen lamp. Recently, lighting devices using, as a light source, LEDs, which can reduce energy consumption and minimize maintenance costs due to the long lifespan thereof, have been increasingly popularized.

[0003] However, lighting devices using LEDs as a light source have a drawback related to heat dissipation. An LED converts about 15% of all energy supplied thereto into light and discharges the remaining energy as heat. Accordingly, in the LED lighting devices, the LEDs may overheat, which may directly influence the performance of the LEDs.

[0004] That is, there is a problem in that color changes, low light output, reduction of the amount of light, a short effective lifespan etc. are caused by overheating of the LEDs.

[0005] Further, when a heat dissipation rod is provided on LEDs to dissipate heat, it is required to perform separate insulating treatment on the LEDs because the heat dissipation rod is made of metal. Accordingly, there is a problem in that the heat dissipation ability of the heat dissipation rod is reduced due to the insulating treatment.

[0006] In order to solve this problem, a COB (Chip-On-Board) LED that generates less heat by minimizing resistance at a circuit-bonding portion in an SMD (Surface-Mount Device) LED that is soldered as an individual device on a substrate has been developed. The COB LED generates less heat than the SMD LED, so a plurality of LEDs can be arranged on a substrate and the insulating ability can be improved by forming a special transparent silicon layer. Accordingly, high luminous intensity can be achieved by increasing the degree of integration. However, to date it has been impossible to completely eliminate the characteristic heat generation of LEDs.

[0007] Meanwhile, even the COB LED cannot solve the problem of straight propagation of light by LEDs, so there remains a problem in that it is difficult to efficiently distribute light radiated from a lighting device, whereby light is concentrated on a specific point.

[0008] Therefore, there is a need to develop a COB LED lighting device that has excellent heat dissipation ability and can uniformly distribute and concentrate light.

[Documents of Related Art]

[Patent Document]

[0009]

(Patent Document 1) KR10-0997172 B1
(Patent Document 2) KR10-2011-Q108269 A

Detailed Description of the Invention

Technical Problem

[0010] An object of the present invention is to provide a COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the device being able to prevent glare due to direct light radiation by reflecting emitted light with a reflective plate.

[0011] Another object of the present invention is to provide a COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the device being able to improve luminous intensity by minimizing the amount of light that is radiated outside an illumination area by making light rays radiated forward from a reflector travel along similar paths.

[0012] Another object of the present invention is to provide a COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the device being able to uniformly radiate light rather than concentrating light on one point.

Technical Solution

[0013] A COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency of the present invention includes: a polygonal prismatic heat dissipation rod having a thermal conductor on any one or more of the inside and the outside thereof; a plurality of lighting modules each formed by arranging a plurality of lighting elements in a line, and longitudinally attached to the outer side of the heat dissipation rod; a reflector formed in a bowl shape having an open second side, having the heat dissipation rod inserted and fixed in the center, and formed by continuously arranging a plurality of reflective plates with their sides in contact with each other; a heat dissipation plate assembly disposed in contact with an end of the heat dissipation rod to dissipate heat conducted from the heat dissipation rod to the outside; and a stabilizer disposed at a side of the heat dissipation plate assembly to supply power to the light mod-

ules.

[0014] Further, in the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the reflective plates are composed of first reflective plates and second reflective plates bending and extending from second ends of the first reflective plates.

[0015] Further, in the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the angle between the second reflective plates and the longitudinal direction of the heat dissipation rod is smaller than the angle between the first reflective plates and the longitudinal direction of the heat dissipation rod.

[0016] Further, in the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the length of the first reflective plates projected on the longitudinal axis of the heat dissipation rod is larger than the length of the lighting modules.

[0017] Further, in the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, a plurality of heat dissipation bars is disposed in the heat dissipation rod to absorb heat generated from the lighting modules and transfer the heat to the heat dissipation plate assembly.

[0018] Further, in the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the heat dissipation plate assembly includes: a heat sink having a flat second end; a plurality of heat pipes inserted through a side of the heat sink and extending outside; and a plurality of heat dissipation plates through which the heat pipes are disposed and passed portions of which are in contact with outer sides of any one or more of the heat pipes, and the outer sides of the heat pipes are partially exposed outside through the second end of the heat sink so as to be in contact with the heat dissipation bars.

[0019] Further, in the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the heat pipes are disposed through the heat dissipation plates from different directions or different positions.

Advantageous Effects

[0020] According to the present invention having the configuration described above, since the lighting modules emit light perpendicular to or at an angle with respect to the longitudinal direction of the heat dissipation rod and the emitted light is reflected from the reflective plate, it is possible to prevent glare due to direct light radiation.

[0021] Further, according to the present invention, since the light rays emitted from the lighting modules are reflected from the first reflective plates and are then reflected from the second reflective plates, which bend and extend from the first reflective plates and are arranged at a smaller angle than the first reflective plates, the light rays radiated forward from the reflector have similar paths, so it is possible to increase the quantity of light by minimizing the loss of light traveling outside an illumination area.

[0022] Further, according to the present invention, light is radiated by the lighting modules and by reflective plates, the number of which is the same as the number of lighting modules, whereby it is possible to uniformly radiate light without concentrating the same on one point.

Brief Description of the Drawings

[0023]

FIG. 1 is a perspective view of a COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency according to an embodiment of the present invention;

FIG. 2 is an exploded perspective view of the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency according to an embodiment of the present invention;

FIG. 3 provides a side view and a cross-sectional view of the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency according to an embodiment of the present invention; and

FIG. 4 is an exemplary view showing the state in which a lighting module is mounted in the COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency according to an embodiment of the present invention.

Mode for Carrying Out the Invention

[0024] Hereinafter, an embodiment of the present invention is described in detail with reference to the accompanying drawings.

[0025] The present invention includes a polygonal prismatic heat dissipation rod 100 having a thermal conductor on any one or more of the inside and the outside thereof, a plurality of lighting modules 200 each formed by arranging a plurality of lighting elements in a line and longitudinally attached to the outer side of the heat dissipation rod 100, a reflector 300 formed in a bowl shape having an open second side, having the heat dissipation rod 100 inserted and fixed in the center, and formed by continuously arranging a plurality of reflective plates 310 with their sides in contact with each other, a heat dissipation plate assembly 400 disposed in contact with an end of the heat dissipation rod 100 to dissipate heat conducted from the heat dissipation rod 100 to the outside, and a stabilizer 500 disposed at a side of the heat dissipation plate assembly 400 to supply power to the light modules 200.

[0026] The heat dissipation rod 100, which has a polygonal prismatic shape, has a regular polygonal shape, preferably a regular hexadecagonal shape when viewed perpendicular to the longitudinal direction, and is made of a material having high thermal conductivity. It is usually

preferable for the heat dissipation rod 100 to be made of aluminum, but it may be made of metal such as gold, silver, tungsten, or copper, and may be made of any one or more materials selected from among various materials having high thermal conductivity.

[0027] The lighting modules 200 are longitudinally disposed on the outer side of the heat dissipation rod 100 around the heat dissipation rod 100. Accordingly, the heat dissipation rod 100 absorbs heat generated by the lighting modules 200 and transmits the heat to the heat dissipation plate assembly 400, whereby it is possible to prevent reduction of luminance efficiency and lifespan of the lighting modules 200 due to the heat generation.

[0028] A plurality of heat dissipation holes is formed through the heat dissipation rod 100. Three heat dissipation holes are formed in the drawings of the present invention, but the invention is not limited thereto, and two, or alternatively four or more, heat dissipation holes may be formed. Heat dissipation bars 110 are disposed in the heat dissipation holes. The heat dissipation bars 110 are made of a material having excellent thermal conductivity and rapidly conduct the heat absorbed by the heat dissipation rod 100 to the heat dissipation plate assembly 400.

[0029] The heat dissipation bars 110 are preferably exposed outside at an end of the heat dissipation rod 100 so as to be bent at the end of the heat dissipation rod 100 to form a surface with the end of the heat dissipation rod 100, and thus heat can be more effectively transmitted to a heat sink 410 of the heat dissipation plate assembly 400.

[0030] The heat dissipation bars 110 are preferably forcibly fitted into the heat dissipation rod 100, and thermal grease etc. may be applied between the heat dissipation rod 100 and the heat dissipation bars 110 for stable thermal conduction.

[0031] A cover hole 101 is formed in the center of the heat dissipation rod 100 and a cover 120 is fitted into the cover hole 101 so that the external appearance is improved and the light reflected from the reflector 300 can travel in a specific direction rather than being irregularly reflected. A coupling projection 121 is formed on the bottom of the cover 120 and is forcibly fitted into the cover hole 101.

[0032] The lighting modules 200 each have a plurality of lighting elements 210 arranged in a line in a COB (Chip-On-Board) type and are each formed by arranging a plurality of LEDs 210 on a straight band-shaped substrate. A plurality of lighting modules 200 is longitudinally attached to the heat dissipation rod 100 around the heat dissipation rod 100. Ceramic plates are further disposed around the outer side of the heat dissipation rod 100, so the light modules 200 can be insulated from the heat dissipation rod 100 and the heat from the lighting modules 200 can be more effectively transmitted to the heat dissipation rod 100. When ceramic plates are provided, a number of ceramic plates the same as the number of lighting modules 200 may be attached to the outer side of the heat dissipation rod 100, and the lighting modules 200 may be attached to the ceramic plates.

[0033] The lighting modules 200 can be attached to all sides of the polygonal prismatic heat dissipation rod 100, and when the heat dissipation rod 100 has a hexadecagonal shape, sixteen lighting modules 200 are provided. Further, the lighting elements 210, that is, LEDs 210, are arranged in each of the lighting modules 200, and it is possible to vary the (arrangement of the) lines and the number of LEDs 210, for example, one line, two lines, and three lines, to satisfy a desired luminous intensity.

[0034] The reflector 300 is formed in a bowl shape with one side open and has the heat dissipation rod 100 inserted and fixed in the center. The reflector 300 reflects light emitted from the lighting modules 200 such that the light travels through the opening, and to this end, a number of reflective plates 310 the same as the number of lighting elements 200 is continuously arranged with their sides in contact with each other. A reflector housing 320 may be further provided to protect the reflector 300 from external shocks by covering the outer side of the reflector 300.

[0035] The reflective plates 310 are composed of first reflective plates 311 and second reflective plates 312 bending and extending from second ends of the first reflective plates 311. First ends of the first reflective plates 311 are directly coupled to the outer side of the heat dissipation rod 100 or are connected to a heat dissipation seat 313 in which the heat dissipation rod 100 is inserted. It is preferable that the reflective plates 310 have a shape that becomes wider moving to the second end from the first end so as to have a bowl shape when they are arranged with their sides in contact with each other.

[0036] It is preferable for the reflective plates 310 to be formed such that the angle between the second reflective plates 312 and the longitudinal direction of the heat dissipation rod 100 is smaller than the angle between the first reflective plates 311 and the longitudinal direction of the heat dissipation rod 100. This serves to enable the light emitted from the lighting modules 200 to travel outside through the open side of the reflector 300 at as small an angle as possible with respect to the longitudinal direction of the heat dissipation rod 100, and to reflect light at a larger angle from the first reflective plates 311.

[0037] Meanwhile, the light emitted from the lighting modules 200 is diffused and radiated at a predetermined angle, so the first reflective plates 311 are formed longer than the lighting modules 200 to reflect the light, which is longitudinally emitted from the lighting modules 200, forward though the opening. Preferably, the length of the first reflective plates 311 when the first reflective plates 311 are projected to the longitudinal axis of the heat dissipation rod 100 is larger than the length of the lighting modules 200.

[0038] According to the configuration of the reflective plates 310, the light rays emitted from the lighting modules 200 are reflected first from the first reflective plates 311, after which light rays reflected at angles that are too

large with respect to the longitudinal direction of the heat dissipation rod 100 are reflected again from the second reflective plates 312 bent from the first reflective plates 311 and then travel toward the opening of the reflector 300 at smaller angles with respect to the longitudinal direction of the heat dissipation rod 100. In the light rays emitted from the lighting modules 200, light rays diffused at angles out of the first reflective plates 311 are directly reflected from the second reflective plates 312, in which the diffusion angles from the lighting modules 200 are already large enough, so the reflective angles from the second reflective plates 312 can be sufficiently small with respect to the longitudinal direction of the heat dissipation rod 100.

[0039] Accordingly, all the light rays emitted from the lighting modules 200 are reflected from the reflective plates 310 and then radiated outside, so glare is prevented. Further, the paths of the light rays radiated forward from the reflector 300 are not very different from one another, so it is possible to secure a larger light quantity by minimizing the loss of light traveling outside a target illumination area. Further, the lighting modules 200 correspond one-to-one to the reflective plates 310, so the ratios and angles of the light rays reflected from the reflective plates 310 after being emitted from the lighting modules 200 are the same. Accordingly, it is possible to obtain uniform luminous intensity without concentrating the light rays on a single point.

[0040] The angles between the first and second reflective plates 311 and 312 and the longitudinal direction of the heat dissipation rod 100 and the lengths of the first and second reflective plates 311 and 312 may be selectively determined depending on the range of the illumination area. For example, in order to concentrate light on a small area, by making the angle between the first reflective plates 311 and the longitudinal angle of the heat dissipation rod 100 very large and making the angle between the second reflective plates 312 and the longitudinal direction of the heat dissipation rod 100 very small, it is possible to reflect inward again light rays reflected from the first reflective plates 311 if the light rays are in the range of the second reflective plates 312 of the corresponding reflective plates 310. Accordingly, it is possible to concentrate light on the center, and thus the lighting device can irradiate a small area far away. Alternatively, in order to concentrate the light on a large illumination area, by making the angle between the first reflective plates 311 and the longitudinal angle of the heat dissipation rod 100 very small and making the angle between the second reflective plates 312 and the longitudinal direction of the heat dissipation rod 100 very large, light rays reflected from the first reflective plates 311 are reflected from the second reflective plates 312 of other reflective plates 310 at reflective angles toward the outside. Accordingly, the lighting device can irradiate a large nearby area. Further, it is possible to have several such reflectors having various reflective plate angles and replace them, if necessary, and the angle of the reflective plates 310 can be determined in accordance with calculation results based on the diffusion angle of the LEDs 210 of the lighting modules 200 and the lengths of the first reflective plates 311 and the second reflective plates 312.

[0041] The heat dissipation plate assembly 400 includes a heat sink 410 having a flat second end, a plurality of heat pipes 420 inserted through a side of the heat sink 410 and extending outside, and a plurality of heat dissipation plates 430 through which the heat pipes 420 pass, with the passed portions in contact with the outer sides of any one or more of the heat pipes 420.

[0042] The heat sink 410 fixes the heat pipes 420 and transmits the heat from the heat dissipation rod 100 to the heat pipes 420, and to this end, the second end of the heat sink 410 is made of metal and formed flat such that the flat surface is in contact with a first end of the heat dissipation rod 100.

[0043] The heat pipes 420 are inserted through a side of the heat sink 410 such that the outer sides of the inserted heat pipes 420 are partially exposed outside through the second end of the heat sink 410. This serves to directly receive heat from the heat dissipation rod 100 or the heat dissipation bars 110. The second end of the heat sink is in contact with the heat dissipation rod 100 to supplement the portion where the heat pipes 420 are not in direct contact with the heat dissipation rod 100 or the heat dissipation bars 110. It is possible to assist heat transfer at the spaced portion by applying thermal grease etc. between the second end of the heat sink 400 and the first end of the heat dissipation rod 100.

[0044] The heat pipes 420 are inserted through a side of the heat sink 410 and extend outside. The heat pipes 420 may be formed by filling pipes made of copper etc. with a heat transfer medium so as to be able to rapidly transmit heat, or they may be made of copper, silver, or aluminum etc. in a metal rod shape without a heat transfer medium.

[0045] It is preferable for the outer sides of the heat pipes 420 to be partially exposed outside the second end of the heat sink 410 at the portions inserted into the heat sink 410, and the heat dissipation rod 100 or the heat dissipation bars 110 may be in direct contact with the exposed portions. To this end, the exposed portions of the heat pipes 420 are arranged parallel to each other, and the exposed portions of the heat pipes 420 and the second end of the heat sink may form a plane.

[0046] The heat pipes 420 are disposed through the heat dissipation plates 430. According to this configuration, the outer sides of the heat pipes 420 are in contact with the heat dissipation plates 430, so the heat conducted through the heat pipes 420 is transmitted to the heat dissipation plates 430 to be able to be dissipated to the atmosphere through the heat dissipation plates 430. Further, the heat pipes 420 may be disposed through different positions of the heat dissipation plates 430 from different directions.

[0047] All of the heat pipes 420 disposed through the

heat dissipation plates 430 may be in contact with the heat dissipation plates 430, but since the heat pipes sequentially pass through the heat dissipation plates 430, when all of the heat pipes 420 are in contact with all of the heat dissipation plates 430, heat is concentrated on the outer heat dissipation plates 430, so heat cannot be effectively dissipated. Accordingly, it is preferable for any one of the heat pipes 420 to be selectively in contact with a heat dissipation plate 430 and for another heat pipe 420 not in contact with the heat dissipation plate 430 to be in contact with the next heat dissipation plate 430.

[0048] The heat dissipation plates 430, which are plates made of metal having high thermal conductivity such as silver, copper, and aluminum, are formed in a group in which they are spaced apart from each other with sides facing each other. The heat pipes 420 pass through the heat dissipation plates 430 and the outer sides of any one or more of the heat pipes 420 are in contact with the heat dissipation plates 430.

[0049] Protective plates facing the heat dissipation plates 430 are disposed outside the heat dissipation plates 430 with a gap therebetween to prevent damage to the heat dissipation plate 430. The protective plates are disposed outside both sides of the group of the heat dissipation plates 430 and may be directly fixed to the heat dissipation plates 430 or to the reflector 300 etc.

[0050] The stabilizer 500 supplies electric energy for operating the lighting modules 200. To this end, the stabilizer 500 is disposed at first sides of the heat dissipation plates 430, preferably, at second ends of the heat dissipation plates 430, and is spaced from the heat dissipation plates 430 so that heat generated from the stabilizer 500 does not reduce the heat dissipation efficiency of the heat dissipation plates 430 and so that heat from the heat dissipation plates 430 does not reduce the operation efficiency of the stabilizer 500.

[0051] According to the present invention having the configuration described above, since the lighting modules 200 emit light perpendicular to or at an angle with respect to the longitudinal direction of the heat dissipation rod 100 and the emitted light is reflected from the reflective plate 310, it is possible to prevent glare due to direct light radiation.

[0052] Further, according to the present invention, since the light rays emitted from the lighting modules 200 are reflected from the first reflective plates 311 and are then reflected from the second reflective plates 312 bending and extending from the first reflective plates 311 and arranged at a smaller angle than the first reflective plates 311, the light rays radiated forward from the reflector 300 have similar paths, so it is possible to increase the quantity of light by minimizing the loss of light traveling outside an illumination area.

[0053] Further, according to the present invention, because light is radiated by the lighting modules 200 and reflected by reflective plates 310 provided in a number the same as the number of lighting modules 200, it is possible to uniformly radiate light without concentrating the same on one point.

Reference Numerals

[0054]

100 : heat dissipation rod 110 : heat dissipation bar
200: lighting module 210: LED
300 : reflector 310 : reflective plate
311 : first reflective plate 312 : second reflective plate
400 : reflective plate assembly 410 : heat sink
420 : heat pipe 430 : heat dissipation plate
500 : stabilizer

Claims

1. A COB lighting device having improved light distribution, illuminance, and heat dissipation efficiency, the device comprising:

   a polygonal prismatic heat dissipation rod having a thermal conductor on any one or more of an inside and an outside thereof;
   a plurality of lighting modules formed by arranging a plurality of lighting elements in a line and longitudinally attached to the outer side of the heat dissipation rod;
   a reflector formed in a bowl shape having an open second side, having the heat dissipation rod inserted and fixed in a center, and formed by continuously arranging a plurality of reflective plates with sides thereof in contact with each other;
   a heat dissipation plate assembly disposed in contact with an end of the heat dissipation rod to dissipate heat conducted from the heat dissipation rod to the outside; and
   a stabilizer disposed at a side of the heat dissipation plate assembly to supply power to the light modules.

2. The device of claim 1, wherein the reflective plates are composed of first reflective plates and second reflective plates bending and extending from second ends of the first reflective plates.

3. The device of claim 2, wherein an angle between the second reflective plates and a longitudinal direction of the heat dissipation rod is smaller than an angle between the first reflective plates and the longitudinal direction of the heat dissipation rod.

4. The device of claim 3, wherein a length of the first reflective plates projected on a longitudinal axis of the heat dissipation rod is greater than a length of the lighting modules.

5. The device of claim 4, wherein a plurality of heat dissipation bars is disposed in the heat dissipation rod to absorb heat generated from the lighting modules and transfer the heat to the heat dissipation plate assembly.

6. The device of claim 5, wherein the heat dissipation plate assembly includes:

a heat sink having a flat second end;
a plurality of heat pipes inserted through a side of the heat sink and extending outside; and
a plurality of heat dissipation plates through which the heat pipes are disposed and passed portions of which are in contact with outer sides of any one or more of the heat pipes, and
the outer sides of the heat pipes are partially exposed outside through the second end of the heat sink to be in contact with the heat dissipation bars.

7. The device of claim 6, wherein the heat pipes are disposed through the heat dissipation plates from different directions or different positions.

Fig. 1

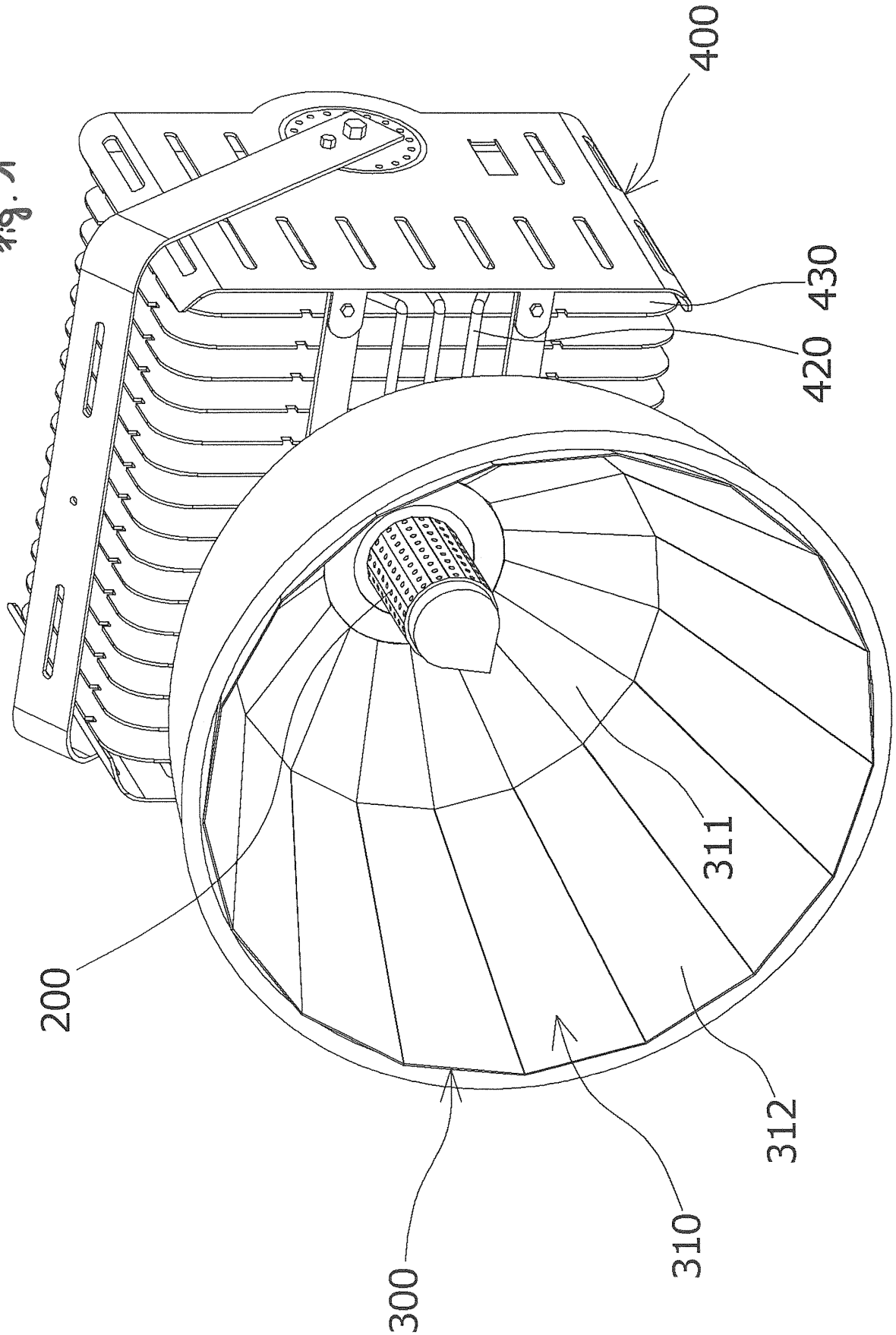


Fig. 2

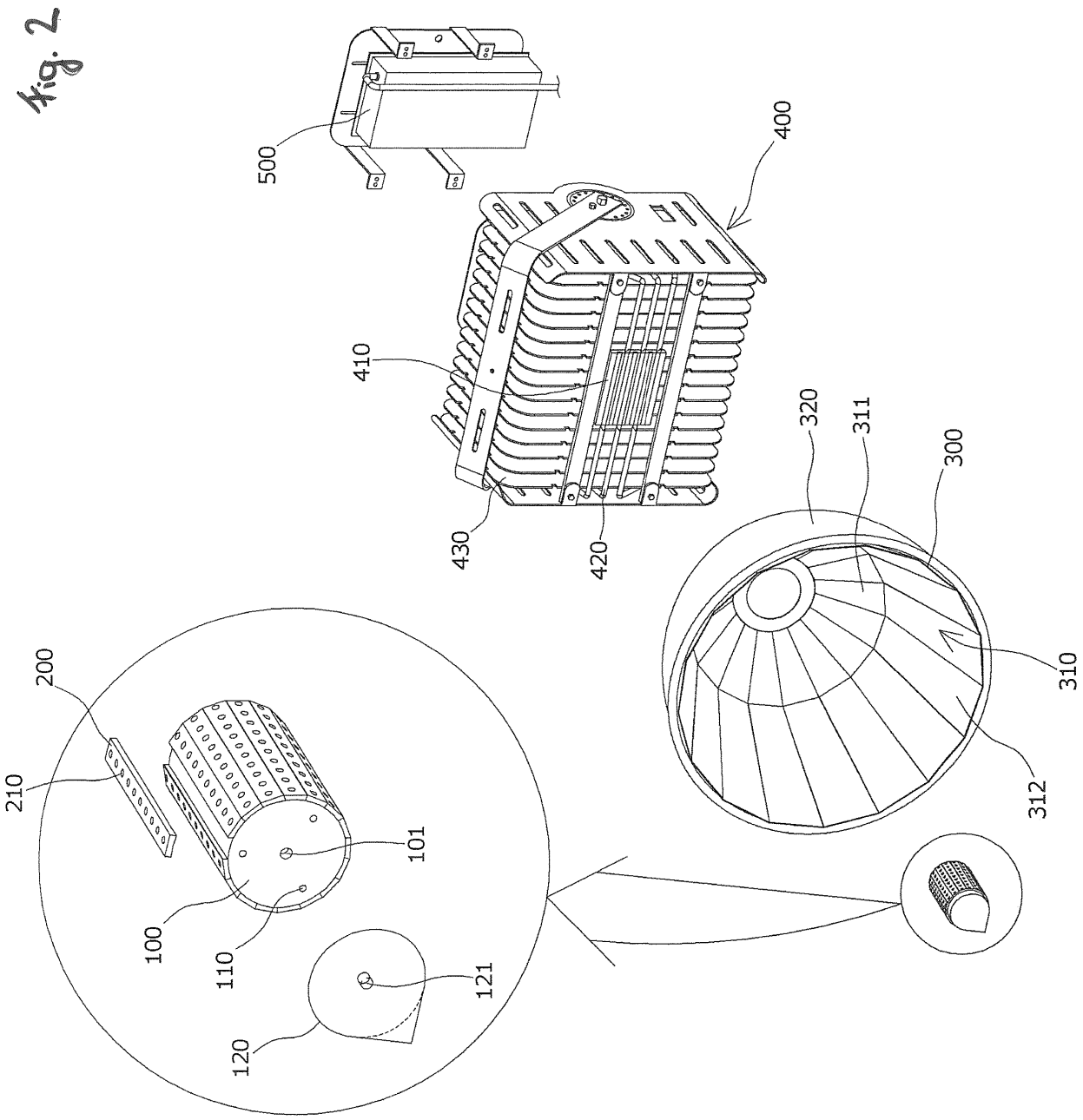

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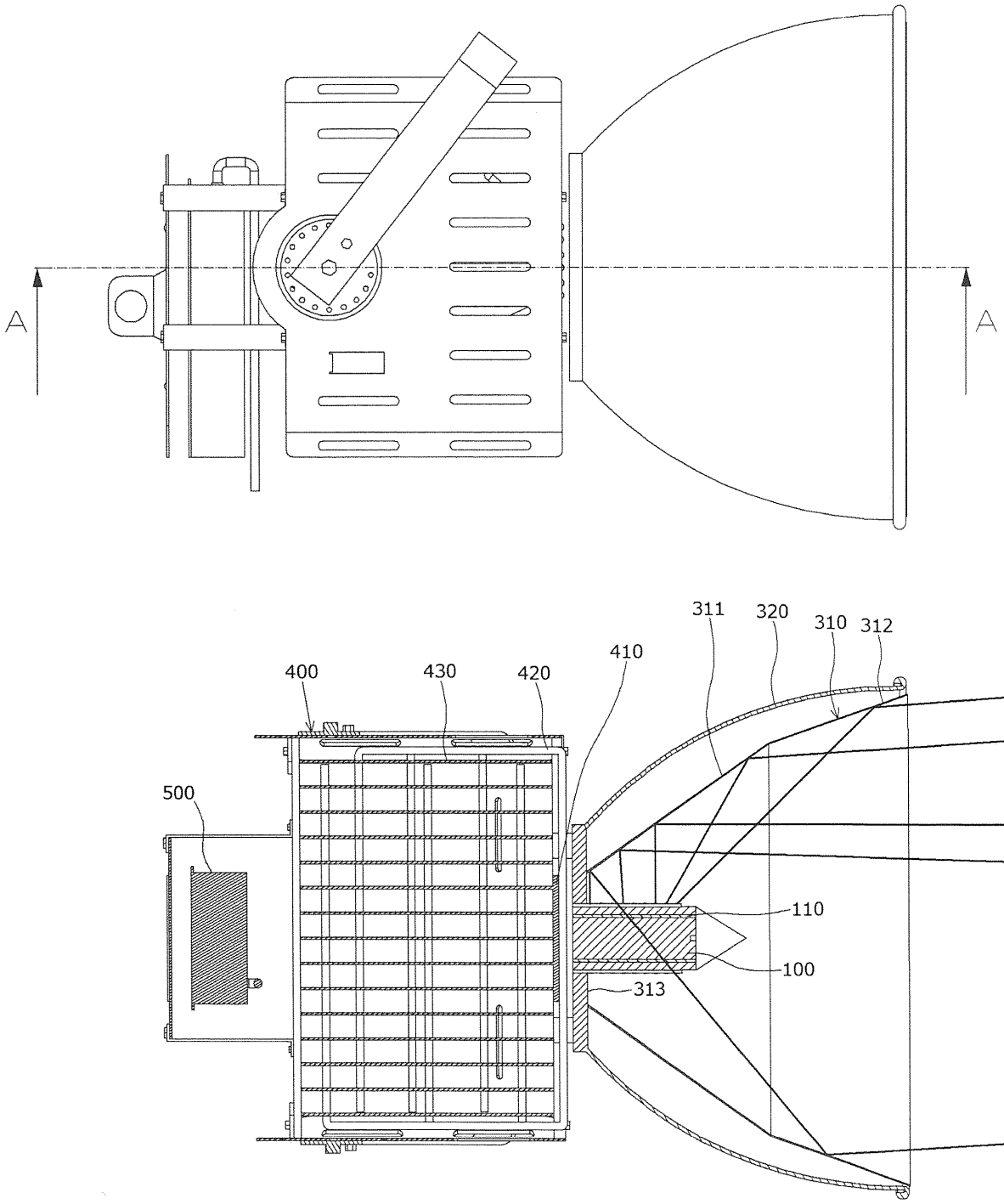
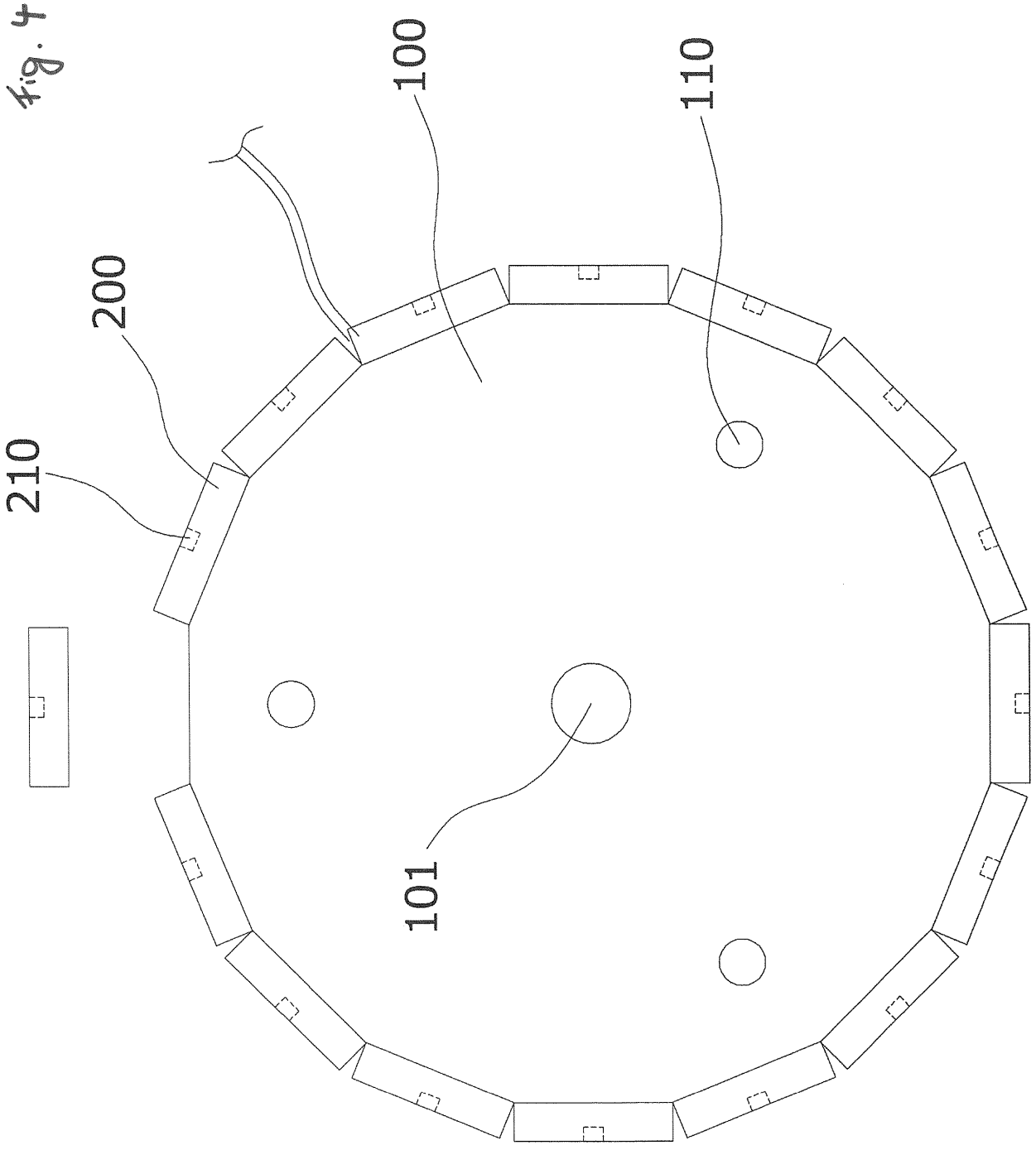
fig. 3



A-A cross-section

fig. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2015/012779

A. CLASSIFICATION OF SUBJECT MATTER
F21V 7/00(2006.01)i, F21K 99/00(2010.01)i, F21V 29/70(2014.01)i, F21S 9/00(2006.01)i, F21V 1/12(2006.01)i, F21V 29/00(2006.01)i, F21V 29/71(2014.01)i
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F21V 7/00; F21V 29/00; F21S 2/00; F21V 17/00; F21V 1/00; F21Y 101/02; F21V 8/00; F21K 99/00; F21V 29/70; F21S 9/00; F21V 1/12; F21V 29/71

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: heat-radiation rod, lamp, reflective plate, reflecting shade, stabilizer, heat sink, illumination, light distribution

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-1368205 B1 (AN, Chol Jong et al.) 12 March 2014 See paragraphs [26]-[30], claim 1, and figure 2.	1-7
Y	KR 20-0442041 Y1 (H-MAX CO., LTD.) 08 October 2008 See paragraphs [27]-[34], and figures 2-3.	1-7
Y	KR 10-1131989 B1 (KUMHO ENG. CO., LTD.) 29 March 2012 See paragraphs [29]-[34], claim 2, and figure 2.	2-7
A	JP 3159384 U (SACOS CORP. et al.) 20 May 2010 See paragraphs [13]-[15], claim 1, and figure 1.	1-7
A	KR 10-2014-0097800 A (PERNG, Li - Hsiang) 07 August 2014 See paragraphs [9]-[10], claims 1-3, and figure 1.	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search	Date of mailing of the international search report
21 MARCH 2016 (21.03.2016)	**21 MARCH 2016 (21.03.2016)**

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2015/012779

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REFERENCES CITED IN THE DESCRIPTION

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