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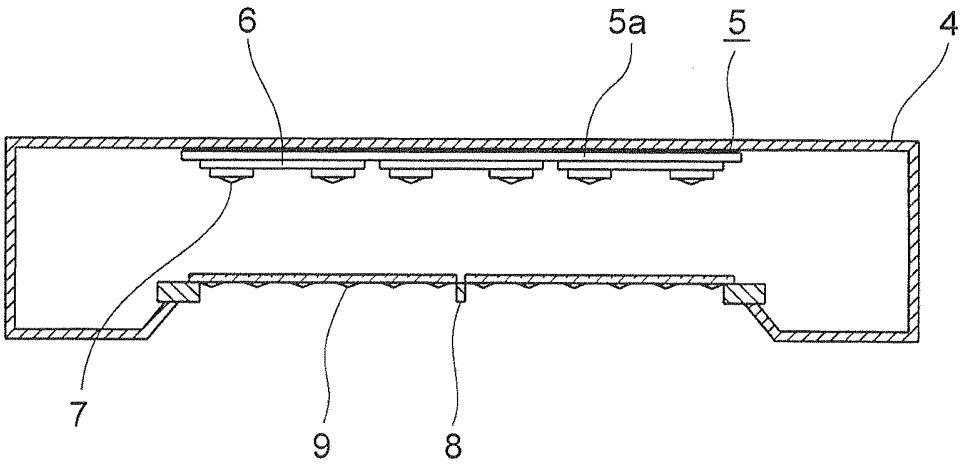
(54) **LIGHTING DEVICE FOR ELEVATOR CAR**

(57) The elevator cage lighting apparatus includes: a light source portion that shines light into a cage; and a prism-cut lighting plate that is disposed in front of the light source portion. The light source portion has a plurality of point light sources that are disposed so as to be spaced apart from each other. A plurality of prismatic indentations and protrusions are formed on the prism-cut lighting plate at a pitch that is less than or equal to a disposed pitch of the point light sources.

FIG. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to a cage lighting apparatus that is disposed on an elevator cage, and that uses a plurality of point light sources such as light-emitting diodes (LEDs), for example.

BACKGROUND ART

[0002] In conventional elevator cage lighting apparatuses, a plurality of colored fluorescent lamps that emit red, blue, and yellow light are mounted to side surfaces inside a frame body. A lighting plate on which a large number of perforations are disposed is disposed on a lower portion of the frame body. A plurality of auxiliary plates are mounted onto the lighting plate by means of a plurality of spacing members. A large number of perforations are also disposed on those auxiliary plates. Light that is emitted from the colored fluorescent lamps is reflected irregularly inside the frame body, and is admitted into the cage through the perforations as cocktail lights (see Patent Literature 1, for example).

CITATION LIST

PATENT LITERATURE

[0003]

[Patent Literature 1]
Japanese Patent Laid-Open No. HEI 11-189382 (Gazette)

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] In conventional cage lighting apparatuses such as that described above, in order to impart the impression of depth or an impression of three-dimensionality, it is necessary to form the lighting plate into a trapezoidal shape, and dispose some auxiliary plates together therewith so as to be inclined, making the configuration complicated. In order to achieve different lighting designs, it is necessary to modify the number and position of the perforations, spacing between the lighting plate and the auxiliary plates, the shape of the lighting plate, etc., making it difficult to increase lighting design variation.

[0005] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator cage lighting apparatus that can improve lighting design freedom and improve decorative design using a simple configuration.

MEANS FOR SOLVING THE PROBLEM

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator cage lighting apparatus including: a light source portion that has a plurality of point light sources that are disposed so as to be spaced apart from each other, and that shines light into a cage; and a transparent prism-cut lighting plate that is disposed in front of the light source portion, on which a plurality of prismatic indentations and protrusions are formed at a pitch that is less than or equal to a disposed pitch of the point light sources, and that transmits light from the point light sources.

According to another aspect of the present invention, there is provided an elevator cage lighting apparatus including: a light source portion that has a plurality of point light sources that are disposed so as to be spaced apart from each other, and that shines light into a cage; and a special coated lighting plate that is disposed in front of the light source portion, and that transmits light from the point light sources, a special coating in which color of transmitted light changes depending on viewing direction being applied to the special coated lighting plate.

EFFECTS OF THE INVENTION

[0007] In an elevator cage lighting apparatus according to the present invention, because a light source portion that includes a plurality of point light sources and a prism-cut lighting plate on which a plurality of prismatic indentations and protrusions are formed at a pitch that is less than or equal to the disposed pitch of the point light sources are combined, light from the point light sources is visible through the prism-cut lighting plates from inside the cage, and lighting design can be easily modified by altering the shape of the indentations and projections of the prism-cut lighting plate, enabling lighting design freedom to be improved and also enabling decorative design to be improved using a simple configuration.

In an elevator cage lighting apparatus according to the present invention, because a light source portion that includes a plurality of point light sources and a special coated lighting plate are combined, light from the point light sources is visible through the special coated lighting plate from inside the cage, and lighting design can be easily modified by changing shape, size, and position of the special coated lighting plate, enabling lighting design freedom to be improved and also enabling decorative design to be improved using a simple configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a configuration diagram that shows a cage according to Embodiment 1 of the present invention;
Figure 2 is a cross section of a lighting box from

Figure 1;
Figure 3 is a perspective that shows a first example of a prism-cut lighting plate from Figure 2;
Figure 4 is a perspective that shows a second example of a prism-cut lighting plate from Figure 2;
Figure 5 is a bottom plan that shows the lighting box from Figure 2;
Figure 6 is a bottom plan that shows a state in which a single prism-cut lighting plate is removed from the lighting box in Figure 5;
Figure 7 is a front elevation that shows a light source portion from Figure 2;
Figure 8 is an explanatory diagram that schematically shows a pattern of transmission and refraction of light that is formed by a prism-cut lighting plate from Figure 2; and
Figure 9 is a cross section of a cage lighting apparatus according to Embodiment 2 of the present invention.

DESCRIPTION OF EMBODIMENTS

[0009] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0010] Figure 1 is a configuration diagram that shows a cage according to Embodiment 1 of the present invention. In the figure, a cage 1 has a plurality of cage walls 2, and a ceiling 3. A lighting box 4 is disposed on the ceiling 3.

[0011] Figure 2 is a cross section of the lighting box 4 from Figure 1. A light source portion 5 that shines light into the cage 1 is fixed to an upper portion inside the lighting box 4. The light source portion 5 has: a radiating plate 5a; and a plurality of lighting unit substrates 6 that are mounted to the radiating plate 5a. The radiating plate 5a is made of steel, aluminum, or a resin that has a heat radiating function, for example.

[0012] A plurality of light-emitting diodes (LEDs) 7 that function as point light sources are mounted to the lighting unit substrates 6 so as to be spaced apart from each other. Basically, LEDs 7 that emit white light are used, but LEDs 7 that emit a light bulb color or other colors may also be used to fit in with a lighting design.

[0013] An opening that faces the light source portion 5 is disposed on the lighting box 4. A ceiling grid 8 is disposed on the opening of the lighting box 4. The ceiling grid 8 has: portions that lie alongside edge portions of the opening; and portions that cross the opening. A plurality of prism-cut lighting plates 9 are disposed in front of, i.e., below the light source portion 5 of the lighting box 4. The prism-cut lighting plates 9 are constituted by transparent plastic, for example, and transmit light from the LEDs 7 into the cage 1. Perimetric edge portions of each of the prism-cut lighting plates 9 are supported on the ceiling grid 8.

[0014] Figure 3 is a perspective that shows a first example of a prism-cut lighting plate 9 from Figure 2. A plurality of prismatic indentations and protrusions are formed (prism cut) on the prism-cut lighting plate 9 at a pitch that is smaller than the disposed pitch of the LEDs 7. In the first example, a large number of projecting portions that have triangular cross sections that extend consecutively in one direction are formed on a lower surface of the prism-cut lighting plate 9.

[0015] Figure 4 is a perspective that shows a second example of a prism-cut lighting plate 9 from Figure 2. In the second example, a large number of quadrangular pyramids (depicted simply as quadrangles in the figure) are formed on a lower surface of the prism-cut lighting plate 9 at a pitch that is smaller than the disposed pitch of the LEDs 7.

[0016] Figure 5 is a bottom plan (a view from inside the cage 1) that shows the lighting box 4 from Figure 2, Figure 6 is a bottom plan that shows a state in which a single prism-cut lighting plate 9 is removed from the lighting box 4 in Figure 5, and Figure 7 is a front elevation (a view from inside the cage 1) that shows a light source portion 5 from Figure 2. Downlights 10 are disposed in a vicinity of four corners of the lighting box 4. The LEDs 7 are arranged into a matrix. The cage lighting apparatus according to Embodiment 1 includes the lighting box 4, the light source portion 5, the ceiling grid 8, and the prism-cut lighting plates 9.

[0017] Figure 8 is an explanatory diagram that schematically shows a pattern of transmission and refraction of light that is formed by a prism-cut lighting plate 9 from Figure 2. Light that is emitted from a single LED 7 is refracted in various directions and diffused by the indentations and protrusions of the prism-cut lighting plates 9.

[0018] If a smooth lighting plate to which prism cutting has not been applied is used, then the light from the LEDs 7 can be captured visually only in a region that corresponds to a light distribution angle of the LEDs 7, making the visible region constant irrespective of the presence or absence of the lighting plate. If a smooth lighting plate is used, then there is also no change in the appearance of the light according to viewing angle.

[0019] In contrast to that, the light from the LEDs 7 that does not enter the visual angle in the smooth lighting plate can be visually captured when the prism-cut lighting plates 9 is used because the light is then refracted and diffused by the prism-cut portions. Consequently, play of light that corresponds to the cut shape is made possible, and changes in the three-dimensional appearance (the shape) of the light can also be brought about using the viewing angle.

[0020] In a cage lighting apparatus of this kind, because the light source portion 5 that uses the LEDs 7 and the prism-cut lighting plates 9 on which the prismatic indentations and protrusions are formed at a pitch that is smaller than the disposed pitch of the LEDs 7 are combined, the light from the LEDs 7 is visible through the prism-cut lighting plates 9 from inside the cage 1, and

lighting design can be easily modified by altering the shape of the indentations and projections of the prism-cut lighting plates 9, enabling lighting design freedom to be improved and also enabling decorative design to be improved using a simple configuration.

Embodiment 2

[0021] Next, Figure 9 is a cross section of a cage lighting apparatus according to Embodiment 2 of the present invention. In the figure, a plurality of special coated lighting plates 11 that transmit light from LEDs 7 are disposed between a light source portion 5 and prism-cut lighting plates 9. The special coated lighting plates 11 are disposed so as to face some of the LEDs 7.

[0022] A special coating in which the color of the transmitted light changes to rainbow colors (seven colors) depending on the viewing direction is applied to each of the special coated lighting plates 11. Specifically, the special coated lighting plates 11 diffuse and emit incident light depending on wavelength. PLEXIGLAS RADIANT (product name) that is manufactured by Evonik Degussa GmbH (Germany) can be used as special coated lighting plates 11 of this kind, for example. The rest of the configuration is similar or identical to that of Embodiment 1.

[0023] In a cage lighting apparatus of this kind, because the special coated lighting plates 11 are used, decorative design can be improved because the color of the LEDs 7 appears to change depending on the position of the passenger inside the cage 1. Lighting design can be easily modified by changing shapes, sizes, and positions of the special coated lighting plates 11, enabling lighting design freedom to be improved and enabling decorative design to be further improved using a simple configuration.

[0024] Moreover, in Embodiment 2, the special coated lighting plates 11 were disposed partially, but may also be disposed so as to face the entire light source portion 5. In Embodiment 2, the special coated lighting plates 11 were disposed between the light source portion 5 and the prism-cut lighting plates 9, but the position of the prism-cut lighting plates 9 and the position of the special coated lighting plates 11 may also be interchanged. In that case, the prism-cut lighting plates 9 may be disposed so as to face the entire light source portion 5 even if disposed partially. The prism-cut lighting plates 9 may also be omitted, also enabling the decorative design to be improved by only the special coated lighting plates 11.

[0025] In addition, in Embodiments 1 and 2, a certain amount of spacing was disposed between the LEDs 7 and the prism-cut lighting plates 9, but the LEDs 7 may also be placed in close proximity to the prism-cut lighting plates 9.

Furthermore, various modifications to the shape, number, and size of the indentations and protrusions that are formed on the prism-cut lighting plates 9 are possible, and the pitch of the indentations and protrusions of the prism-cut lighting plates 9 may also be made equal to the disposed pitch of the point light sources.

In Embodiments 1 and 2, only a single layer of prism-cut lighting plates 9 were disposed between the light source portion 5 and an interior portion of the cage 1, but a plurality of layers may also be disposed so as to be stacked. In that case, different types of prism-cut lighting plates 9 may be stacked, or similar or identical types of prism-cut lighting plates 9 may be stacked. The prism-cut lighting plates 9 may also be stacked so as to leave spacing therebetween, or without leaving spacing.

[0026] In addition, horizontal shapes, numbers, layouts, etc., of the prism-cut lighting plates 9 are not limited to those in Embodiments 1 and 2.

Different types of prism-cut lighting plates 9 may be disposed side by side in a common plane.

[0027] In Embodiments 1 and 2, the appearance of the lighting design changed depending on the position of the passenger inside the cage 1, but the appearance of the lighting design may also be changed actively by moving at least one of the light source portion 5, a prism-cut lighting plate 9, or a special coated lighting plate 11, by a driving means such as a motor, etc. Examples of driving methods of this kind include methods such as changing the angle of inclination of a prism-cut lighting plate 9 or a special coated lighting plate 11, or rotating a prism-cut lighting plate 9 in a horizontal plane, for example.

[0028] In addition, prism-cut lighting plates 9 and special coated lighting plates 11 can also be used for local lighting apparatuses such as the downlights 10 that are shown in Figure 5, or spotlights, for example. If applied to a spotlight, for example, a plurality of point light sources should be disposed inside a dome-shaped reflecting plate so as to be spaced apart from each other, and at least one prism-cut lighting plate 9 or special coated lighting plate 11 disposed therebelow. In such a construction, a pattern of light can be generated on a floor surface and wall surfaces inside the cage 1 that face the lighting apparatus, enabling decorative design to be improved throughout the cage 1.

[0029] Furthermore, in Embodiments 1 and 2, LEDs 7 were used as the point light sources, but the point light sources are not limited to LEDs 7, and may also be lensed incandescent lamps, for example. The light-emitting shape of the point light sources is also not limited to a conventional circular shape, and may also be ring-shaped (donut-shapes), quadrangular, or triangular, for example.

In Embodiments 1 and 2, a cage lighting apparatus according to the present invention was disposed on the ceiling 3, but the position of installation is not limited to the ceiling 3, and may be installed on the cage wall 2 or a car floor, for example.

Claims

1. An elevator cage lighting apparatus comprising:

a light source portion that has a plurality of point light sources that are disposed so as to be spaced apart from each other, and that shines light into a cage; and

a transparent prism-cut lighting plate that is disposed in front of the light source portion, on which a plurality of prismatic indentations and protrusions are formed at a pitch that is less than or equal to a disposed pitch of the point light sources, and that transmits light from the point light sources.

2. An elevator cage lighting apparatus according to Claim 1, wherein the point light sources are light-emitting diodes.

3. An elevator cage lighting apparatus according to Claim 1, further comprising a special coated lighting plate that is disposed between the light source portion and the prism-cut lighting plate and transmits light from the point light sources,

a special coating in which color of transmitted light changes depending on viewing direction being applied to the special coated lighting plate.

4. An elevator cage lighting apparatus comprising:

a light source portion that has a plurality of point light sources that are disposed so as to be spaced apart from each other, and that shines light into a cage; and

a special coated lighting plate that is disposed in front of the light source portion, and that transmits light from the point light sources,

a special coating in which color of transmitted light changes depending on viewing direction being applied to the special coated lighting plate.

FIG. 1

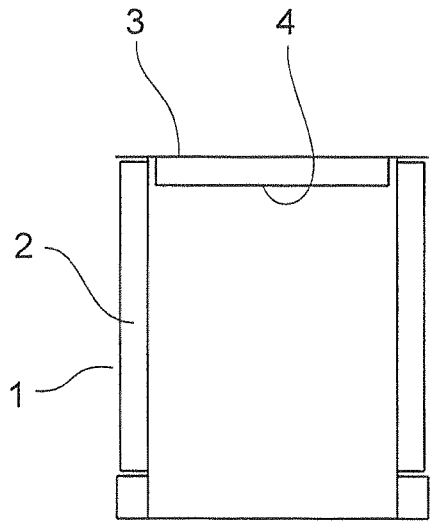


FIG. 2

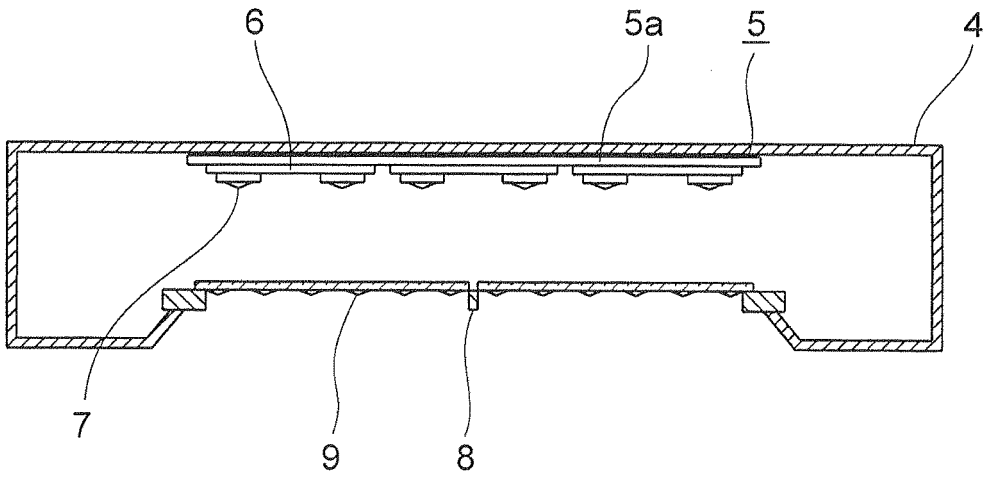


FIG. 3

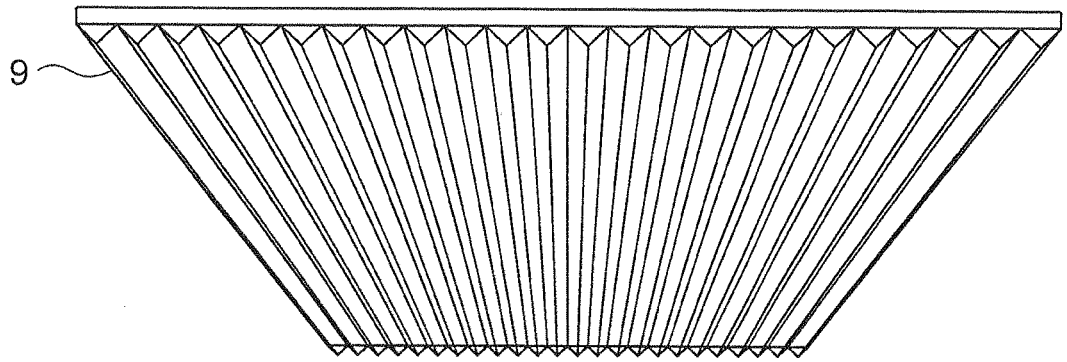


FIG. 4

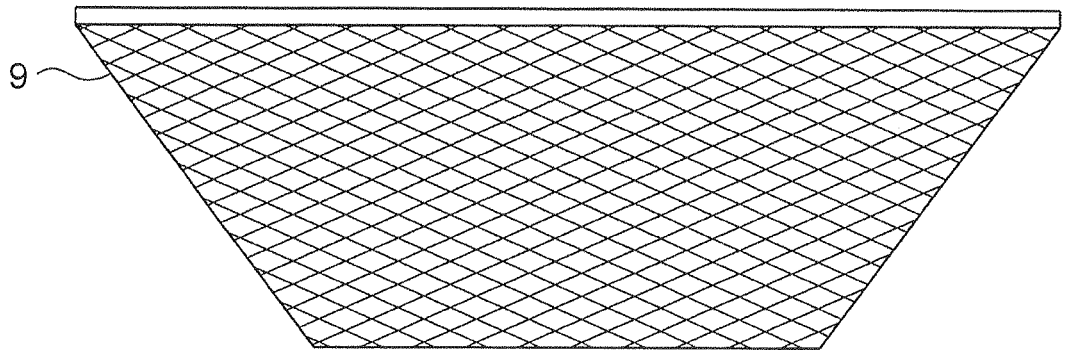


FIG. 5

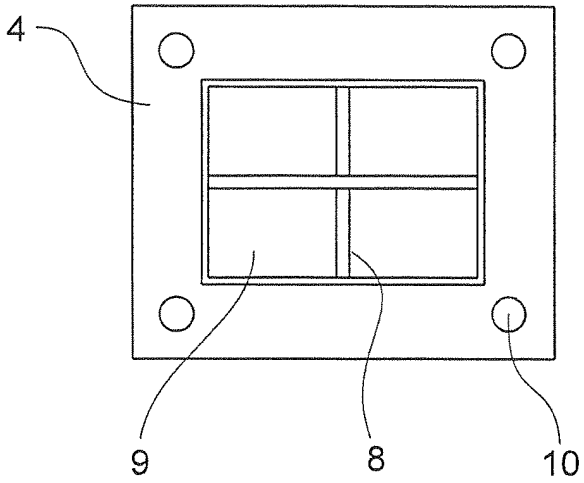


FIG. 6

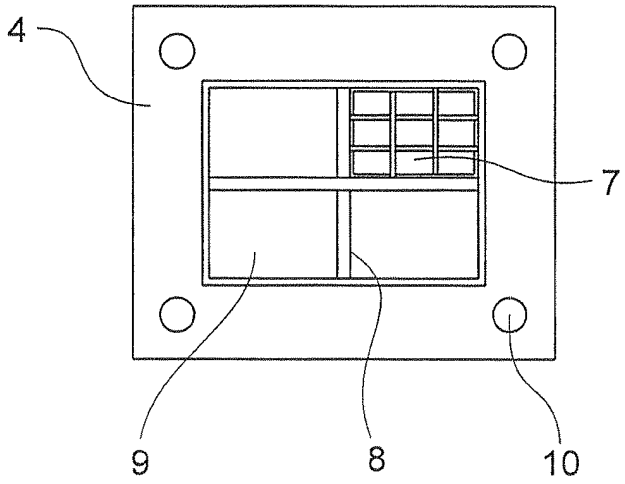


FIG. 7

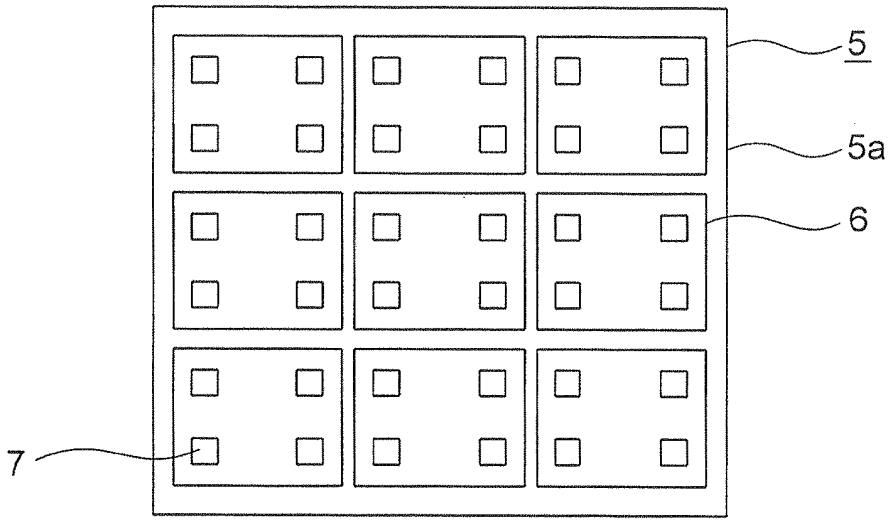


FIG. 8

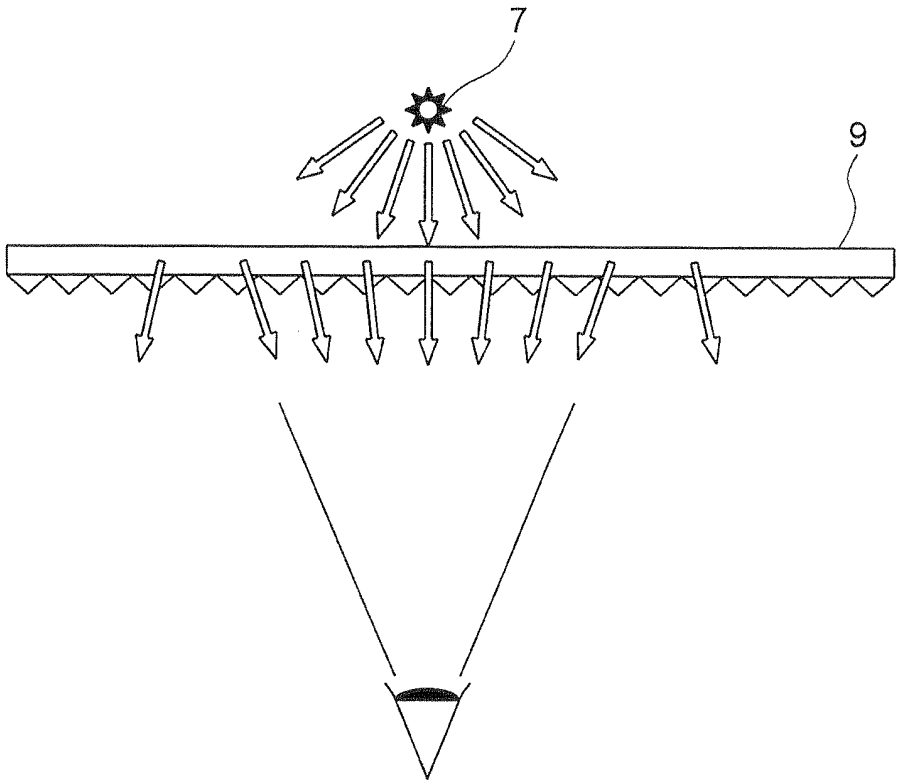
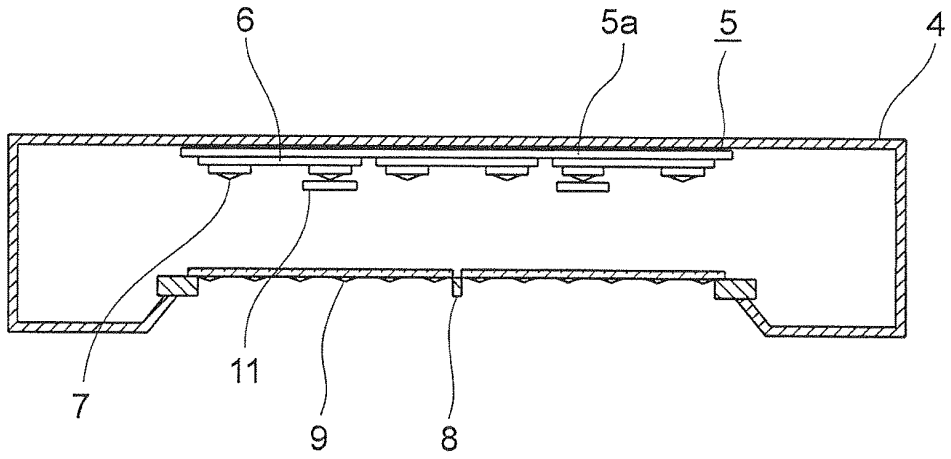


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/056817

A. CLASSIFICATION OF SUBJECT MATTER
B66B11/02(2006.01)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)
B66B11/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010
Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-338825 A (Toshiba Elevator and Building Systems Corp.), 02 December 2004 (02.12.2004), paragraphs [0025] to [0030]; fig. 1 to 3 (Family: none)	1-4
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 36845/1979(Laid-open No. 137404/1980) (Hitachi, Ltd.), 30 September 1980 (30.09.1980), entire text; all drawings (Family: none)	1-4

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

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Date of the actual completion of the international search	Date of mailing of the international search report
24 May, 2010 (24.05.10)	01 June, 2010 (01.06.10)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/056817

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 1996/1980(Laid-open No. 95206/1980) (Hitachi, Ltd.), 02 July 1980 (02.07.1980), entire text; all drawings (Family: none)	1-4
Y	JP 62-230591 A (Toshiba Corp.), 09 October 1987 (09.10.1987), entire text; all drawings (Family: none)	3-4
Y	JP 2006-140139 A (Barco, N.V.), 01 June 2006 (01.06.2006), paragraph [0046]; fig. 7 & US 2006/0075666 A1 & EP 1650729 A2 & CN 1760752 A	3-4

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP HEI11189382 B **[0003]**