

LIGHTING APPARATUS FOR AN ELEVATOR CAGEBACKGROUND OF THE INVENTION

The present invention relates to a lighting
5 apparatus for an elevator cage, and more particularly, to
a lighting apparatus for an elevator cage which enables
the ceiling of the elevator cage to be made higher.

In recent years, elevators have become essential for
usage as a means of up and down transportation in many
10 types of buildings and in addition to their function as a
means of movement between floors or through a height in a
short time, these elevators have the function of a living
space for the users and so it is necessary that there be
a comfortable space inside the elevator cage. Because of
15 this requirement, recent elevators have had many design
considerations made for their illumination apparatus,
doors, operation panels and other ancillary parts.

In elevators that have such functions, the limited
space inside the elevator cage must be effectively used
20 to the greatest extent but in a conventional elevator
cage, the illumination apparatus is mounted to the
ceiling portion inside the elevator cage to take up a
large amount of space and as a result, the lower surface
of the lighting apparatus places a restriction on the
25 height usable by the users and lessens the usable
capacity.

FIG. 1 shows an illumination apparatus for inside a
conventional elevator cage. In the figure, an elevator
cage 10 is supported on a cage support member 11 via
30 vibration proof rubber 12.

The cage support member 11 is provided with a pair
of left and right longitudinal frames 14 and 14 (with
only that on the left side being shown in the diagram) to
the top and bottom beams 13a and 13b and with bracing
35 members (not indicated in the figure) completing the
configuration so that the floor support frame 16 having a

substantially square shape and having the side walls 15 is mounted on the cage support member 11.

To the top portion of the floor support frame 16 of this cage support member 11 is disposed a plural number of vibration proof rubber 12 members at suitable intervals and on top of the vibration proof rubber 12 is disposed the elevator cage 10. The substantially square shaped floor 17 of the elevator cage 10 has mounted to it wall plates 19a, 19b, 19c and 19d (with 19d not shown in the diagram) and a ceiling plate 20 is provided to these wall plates 19a to 19d. The front plate 19a of the elevator cage 10 is provided with a door 21.

In addition, the ceiling plate 20 has mounted to it fluorescent light fittings 23 via the support platforms 22a, 22b and 22c, and these fluorescent light fittings 23 are mounted via a support fitting 25 and a support frame 26 and the like so as to be covered by an acrylic illumination cover 24.

Although it is not shown in the diagram, the ceiling plate 20 has mounted to it a trapdoor for use as an escape hatch.

However, the distance between the floor of the cage and the ceiling plate is normally a height of 2300 to 2500 millimeters and fluorescent lighting and other illumination apparatus are mounted to the ceiling plate of the cage.

It is necessary for the illumination apparatus to have a depth of at least 100 mm from the support platform to the fluorescent light itself, and the illumination cover that covers the support platform and the fluorescent light requires a drop of approximately 200mm from the ceiling plate 20, while the support fittings 25 have a length equivalent to this. Because of this, the effective height of the elevator cage is reduced by approximately 10% to be lowered to 2100 to 2300 mm and this means that it is not only not possible to effectively use the internal space of the elevator cage,

but that there is also the problem of claustrophobia being brought on by the low ceiling.

In order to solve this, there has been a proposal for mounting the ceiling plate 20 at a higher position. However, when the ceiling is raised, there is a restriction placed on the height of the elevator shaft at the top of the building and there is also the problem that repairs and inspection of the elevator at the portion on the top of the ceiling are made unsafe because of the little space available for the workers.

In addition to this, the fluorescent lights are also arranged at intervals on the ceiling and so there is the problem of the level of brightness not being uniform, and therefore creating an unpleasant sensation for the user.

In order to eliminate the problems described above, an object of the present invention is to provide an illumination apparatus for an elevator cage that does not lower the height of the elevator cage.

According to the invention there is provided a lighting apparatus for illuminating the interior of an elevator cage comprising:

a transparent panel of a material allowing transmission of light therethrough, being formed in a plate shape and having a predetermined thickness, and provided adjacent the ceiling of said cage;

a reflective film having a reflective surface which is adhered to an upper surface of said panel so that all light from directions other than said upper surface is reflected by said reflective surface; and

a light source for supplying a predetermined amount of light to a side or end surface of said panel so as to illuminate said cage by reflecting light, passing through said panel, from said reflective surface of said reflective film.

BRIEF DESCRIPTION OF THE DRAWINGS

5 In the appended drawings,

FIG. 1 is a sectional view showing an elevator cage to which a conventional lighting apparatus has been attached;

10 FIG. 2 is a sectional view showing an outline configuration of an elevator cage lighting apparatus relating to a first embodiment of the present invention;

FIG. 3 is a sectional view along the section lines III-III of FIG. 2 of an elevator cage lighting apparatus relating to a first embodiment of the present invention;

15 FIG. 4 is a sectional view along the section lines IV-IV of FIG. 4 of an elevator cage lighting apparatus relating to a first embodiment of the present invention, looking up from beneath;

20 FIG. 5 is a sectional view showing an outline configuration of an elevator cage lighting apparatus relating to a second embodiment of the present invention;

FIG. 6 is a view of the bottom surface of the main portions of the second embodiment shown in FIG. 5;

25 FIG. 7 is a view of the bottom surface, showing the outline configuration of an elevator cage lighting apparatus relating to a third embodiment of the present invention;

30 FIG. 8 is a sectional view showing an outline configuration of an elevator cage lighting apparatus relating to a fourth embodiment of the present invention;

FIG. 9 is a view of the bottom surface, showing the outline configuration of an elevator cage lighting apparatus relating to a fourth embodiment of the present invention;

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FIG. 10 is a sectional view along the section lines X-X of an elevator cage lighting apparatus relating to a fifth embodiment of the present invention;

FIG. 11 is a view of the bottom surface, showing the outline configuration of an elevator cage lighting apparatus relating to a sixth embodiment of the present invention;

FIG. 12 is a sectional view indicating the main portions of an elevator cage lighting apparatus relating to a seventh embodiment of the present invention; and

FIGS. 13 and 14 are a sectional view and an exploded perspective view respectively showing a transparent panel used in the elevator cage lighting apparatus relating to an eighth embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following is a detailed description of a first through an eighth embodiment of the elevator cage lighting apparatus relating to the present invention, with reference to the appended drawings.

Moreover, in the drawings, those portions that are the same as portions of the elevator cage lighting apparatus shown in FIG. 1 are indicated with the same numerals, and the corresponding description of them is omitted.

First will be a description of a first embodiment according to the present invention, with reference to FIG. 2 through FIG. 4. FIG. 2 shows an elevator cage 10. To the upper portions of the side plates 19a, 19b, 19c and 19d of the elevator cage 10 are provided protruding walls 30 forming the space portion 38 that protrudes towards the outside, and fluorescent lights 32 are provided so as to be supported by members 31 mounted to this space portion 38. The inside wall surface of the ceiling plate 20 that opposes these fluorescent lights 32 has mounted to it a plate-shape transparent panel 34 having a thickness of approximately 20-30 mm and to the rear side of which is adhered a reflective film 33

above support member 35. This ceiling plate 20 is mounted by a fascia plate of stainless steel or the like:

In addition, 36 is an opening and closing door for performing inspection of the fluorescent lights 32 and the like mounted to the left and right sides of the ceiling plate 20, and 37 is a colored film that is disposed on the front surface of the fluorescent lights 32.

The interior illumination of the elevator cage 10 is performed by lighting the fluorescent lights 32 so that the light is randomly reflected by the reflective film 33 via the transparent panel 34 and that reflected light performs the even illumination of the interior being led to inside the elevator cage 10 via the transparent panel 34. In this case, the colored film 37 is appropriately selected so as to color the light inside the elevator cage.

If this is performed, then the illumination apparatus of the elevator cage 10 can be performed by the left and right fluorescent lights 32 and the thin transparent panel 34 and so it is possible to increase the effective usage capacity of the elevator cage 10 and without having to lower the ceiling portion of the elevator cage 10.

The following is a description of a second embodiment according to the present invention, with reference to FIG. 5 and FIG. 6. In these figures, there is provided to the ceiling plate 20 a lattice 40a having many square openings and a transparent panel 34 is mounted to this ceiling plate 20 so that the light passes through the openings 40a of the ceiling plate 20 so as to perform internal illumination of the elevator cage 10. If this is done, then it is possible to change the illumination without thickening the illumination apparatus.

Moreover, the openings 40a do not have their shape limited to the lattice shaped squares described above,

but as shown in the third embodiment in FIG. 7, the ceiling plate 20 can have many round holes 40b punched at appropriate positions. Alternatively, the openings 40a and the holes 40b can be formed in a freely designed
5 manner and so as to be separately removable and not formed in the ceiling plate 20, and can be freely attached to and removed from the ceiling frame portion so that various different moods can be enjoyed.

The following is a description of a fourth
10 embodiment according to the present invention and with reference to FIG. 8.

FIG. 8 shows where louvers 45 have been mounted to the lower side of the transparent panel 34 so as to perform interior illumination of the elevator cage 10.
15 In this manner, it is possible for the light to be directed so that it does not directly enter the eyes of the passengers. Moreover, in this case, the fluorescent lights 32 are mounted by a support fitting 46 on the top portion of the transparent panel 34 and the light of the
20 fluorescent lights 32 performs indirect illumination when it is sent to the transparent panel 34 via the reflector plate 47.

FIG. 9 and FIG. 10 show a fifth embodiment of the present invention. This fifth embodiment uses a panel
25 having a configuration that differs from the transparent panel 34 used in the first through third embodiments. More specifically, as shown in the diagram, the substantially half size transparent panels 54 that have been divided into two are supported by the support
30 members 35 and 35. These support members 35 and 35 are substantially the same as those used in the first embodiment. The support member 55 is provided between the divided two transparent panels 54 and 54 and the end side of the long side of the panel 54 is fixed by a screw
35 to the ceiling plate 20 so that it is supported at its center. Moreover, in the same way as the panel 34 and the reflective film 33, two reflective films 53 and 53

are adhered to the surface of the side of the ceiling plate 20 of the panels 54 and 54.

The following is a description of a sixth embodiment according to the present invention, with reference to
5 FIG. 11. In this sixth embodiment, the support member 61 that supports the transparent panel 34 and the light source that irradiates light to the panel from the direction of the end side portion of the transparent panel 34 have configurations that are different from the
10 other embodiments.

More specifically, in FIG. 11, the panel 34 is supported at its four corners by the corner support members 61. Accordingly, the side end portions of the panels 34 are exposed between the support members 61.
15 The four outer sides of this exposed panel 34 that have mounting members 31a through 31d that enable light sources of various different types to be mounted. To the mounting members 31a and 31c on the entrance side on the inside of the elevator cage 10 and the side opposite this
20 are mounted a plural number of U-shaped fluorescent lights 62 that are different from the linear fluorescent lights 32. Moreover, the fluorescent lights on both sides when seen from the door are mounted so that the linear fluorescent lights 32 are the same as those of the
25 first through fifth embodiments.

Such differences in the embodiments enable the amount of light that enters from the side surface to the transparent panel 34 used for the apparatus of this sixth embodiment, to be much greater when compared to that of
30 the first through fifth embodiments, so that it is possible to significantly increase the degree of brightness inside the cage.

Moreover, in the first through sixth embodiments described above, the description was such that the panels
35 34 and 54 were both disposed parallel to the floor but the present invention is not limited in this respect, as for example, in the seventh embodiment shown in FIG. 12,

the transparent panels 64 and 64 can be mounted at a predetermined angle so as to produce a false ceiling.

In Fig. 12, the panel is divided into the two transparent panels 64 and 64 and are disposed at an angle.

5 To the central portion is provided a support member 61 and the panel 64 is supported by the support member 61 and the support members 62 and 62 fixed to the side walls 19b and 19d. Above the support member 61 in the center is mounted a fluorescent light 32 by a mounting member 65. This
10 enables the illumination angle to be changed and for the interior illumination of the elevator cage 10 to be lessened. Moreover, to the upper surface of the panel 64 is adhered reflective film 63. Moreover, in the first through 7th embodiments, the description was given with
15 the end portions of the transparent panels 34, 54 and 64 having the fluorescent lights 32 mounted to them but it is also possible to use by optical fiber to lead the light from a remote light source to the end portions of the transparent panel 34, 54 and 64.

20 Furthermore, the first through seventh embodiments all have an uniformly formed acrylic plate as the transparent panel 34, 54 and 64 but the present invention is not limited in this respect as the configuration can alternatively use a transparent panel 74
25 having a hollow center 70 as shown in the eighth embodiment shown in Fig. 13 and Fig. 14.

This hollow transparent panel 74 is configured from an upper half 71 and a lower half 75 and as shown in Fig. 14 for one example of the structure, a concave
30 portion 72 is formed in the surface of one plate, and reflective film 73 is adhered to the surface of the other so that a flat-shaped upper half 71 and a flat shaped lower half 75 formed with a concave portion 76
35 corresponding to the concave portion 72 previously described are first prepared. Then, the two halves 71 and 75 are adhered

together so that the concave portions 72 and 76 form the hollow transparent panel 74.

The transparent panel according to the eighth embodiment can be made considerably lighter since it is
5 hollow and so it is possible to effectively lighten the load that is applied to the support members 35 and 55 and at the same time reduce the amount of acrylic material that is the material for the panel. Still furthermore,
10 by enclosing chips having a reflective property inside the hollow portion, it is possible to have variations with respect to the light that passes through.

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CLAIMS

1. A lighting apparatus for illuminating the interior of an elevator cage comprising:

a transparent panel of a material allowing
5 transmission of light therethrough, being formed in a plate shape and having a predetermined thickness, and provided adjacent the ceiling of said cage;

a reflective film having a reflective surface which is adhered to an upper surface of said panel so that
10 all light from directions other than said upper surface is reflected by said reflective surface; and

a light source for supplying a predetermined amount of light to a side or end surface of said panel so as to illuminate said cage by reflecting light, passing
15 through said panel, from said reflective surface of said reflective film.

2. A lighting apparatus as claimed in Claim 1, wherein said transparent panel is mounted by support members to the ceiling of the elevator cage and via said
20 reflective film, and wherein said light source is located on the lower side of said ceiling and in an upper portion of the elevator cage on both sides of the elevator cage when seen from the door, and an upper portion of a side wall of the elevator cage is formed, on said both sides,
25 into a small cavity directed towards the outer side of the cage and is provided with a fluorescent lamp.

3. A lighting apparatus as claimed n Claim 2, wherein said support members are fixed to the ceiling



inside a second small cavity formed by bending outwards an upper portion of a side wall on the side facing the door side of said cage, said transparent panel being supported by a flange formed at a distal end.

5 4. A lighting apparatus as claimed in Claim 2, wherein said first interior cavity is provided with a coloured film between said fluorescent lamp and a side wall of the panel facing it.

5. A lighting apparatus as claimed in Claim 1,
10 wherein the ceiling of the elevator cage is supported at an edge portion by a curved portion on an outer portion of four side walls of said cage, and has a plurality of openings; said transparent panel is disposed so that a surface that is not a surface to which said reflective
15 film is adhered, is on the lower side and is in contact with said ceiling; and said light source is a fluorescent lamp mounted on a curved portion of said side walls via said edge portion of said ceiling.

6. A lighting apparatus as claimed in Claim 5,
20 wherein said fluorescent lamp is mounted via said ceiling edge portion on said curved portion of a top portion of two opposing side walls of said four side walls of said cage.

7. A lighting apparatus as claimed in Claim 5,
25 wherein four of said fluorescent lamps are mounted via said ceiling edge portion to all of a top portion of four side walls of said cage.

8. A lighting apparatus as claimed in Claim 6 or 7,



wherein said fluorescent lamps are of a linear type with a long dimension equivalent to the width of each side wall.

9. A lighting apparatus as claimed in Claim 5, wherein said opening portions formed in said ceiling are of square shape, and therefore form a lattice with crosspieces forming opening portions.

10. A lighting apparatus as claimed in Claim 9, wherein said crosspieces are inclined at a constant angle with respect to a frame which is said outer edge portion of said ceiling.

11. A lighting apparatus as claimed in Claim 5, wherein said opening portions formed in said ceiling are many circular punch openings.

12. A lighting apparatus as claimed in Claim 1, wherein said transparent panel is divided into two half panels, said light source being a fluorescent lamp provided at a side or end surface perpendicular to a dividing line dividing said transparent panel.

13. A lighting apparatus as claimed in Claim 12, wherein an end surface of said transparent panel is supported by a support member perpendicular to an end surface side provided with a fluorescent lamp, and central end portions of the half panels which are not supported by support members on both sides are supported from the ceiling by a third support member.

14. A lighting apparatus as claimed in Claim 1, wherein said transparent panel is supported from said ceiling by four corner support members supporting four



corners of said transparent panel, and said light source comprises fluorescent lamps mounted so as to oppose four side or end surfaces of said transparent panel.

15. A lighting apparatus as claimed in Claim 14,
5 wherein said fluorescent lamps are mounted on side walls of an entrance side and an opposite side of the elevator cage, and are formed as a pair of two U-shaped lamps opposing each other, with linear fluorescent lamps being mounted on both side walls.

10 16. A lighting apparatus as claimed in Claim 1, wherein said transparent panel is provided with many slats formed into a lattice shape on their downwards side.

17. A lighting apparatus as claimed in Claim 1, wherein said light source comprises linear fluorescent
15 lamps mounted at a position higher than the upper ends of the side walls of the elevator cage in a direction parallel to walls on both sides when seen from an entrance of said elevator cage, said transparent panel having end surfaces positioned immediately under said fluorescent
20 lamps and being divided into two transparent panels which are mounted so as to be inclined in the direction from said end surfaces to upper ends of both of said side walls.

18. A lighting apparatus as claimed in Claim 1,
25 wherein said transparent panel is a coloured panel manufactured from an acrylic material.

19. A lighting apparatus as claimed in Claim 1, wherein said transparent panel is hollow.



20. A lighting apparatus for an elevator cage, substantially as hereinbefore described with reference to Figures 2 to 14 of the accompanying drawings.

21. An elevator cage equipped with lighting
5 apparatus according to any one of the preceding claims.



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