

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 869 229 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.10.1998 Bulletin 1998/41

(51) Int Cl.⁶: **E04D 13/03**, E04D 13/035

(21) Application number: **98301682.5**

(22) Date of filing: **06.03.1998**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **31.03.1997 JP 81602/97**

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(54) Lighting device

(57) A lighting device may readily be installed in low cost. A lighting sleeve body 9 is rotatably mounted on a horizontal upper edge portion 4b of a sleeve-like mounting base 4 mounted on a roof. The lighting sleeve body 9 may be drivingly rotated in response to a position of the sun by a lighting sleeve body rotary drive mechanism 17 on the horizontal upper edge portion 4b of the mounting base 4. A plurality of reflector plates 19 are

disposed rotatably around horizontal shafts 20 to reflect the sunshine within a lighting opening portion 9a at a slanted upper portion of the lighting sleeve body 9 and introduce lights into the interior of the room through inner passages 9b and 4c of the lighting sleeve body 9 and the mounting base 4. A reflecting angle of the reflector plates 19 may be changed in response to the position of the sun by a reflector plate rotary drive mechanism 27.

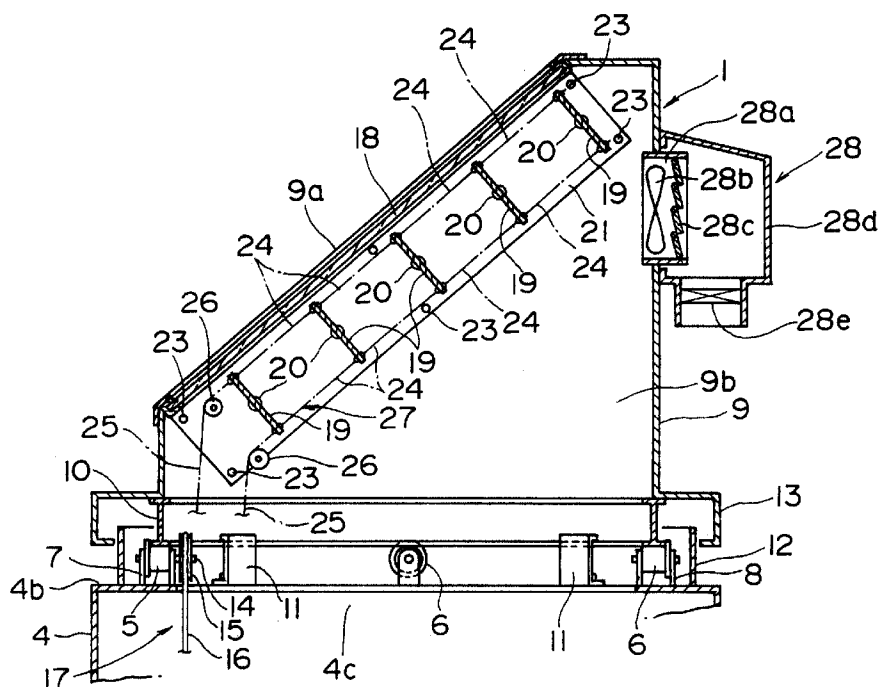


FIG. 3.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a lighting device provided on a roof for introducing light into a room.

2. Description of the Related Art

Conventionally, a general lighting device for opening a part of a roof of a building and for introducing light through the opening portion is well known as a lighting device provided on the roof. For this type lighting device, there are a structure in which a transparent plate such as a glass plate or the like is simply fitted into the opening portion formed in the roof, and a structure in which a reflector plate or the like is used for introducing light more effectively. Any type of the lighting devices is to be installed after it is assembled at an installation site on the roof.

However, since the thus constructed lighting device is assembled and installed on the roof, it requires a long time and a large amount of labor therefor, resulting in an increase of cost.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a lighting device that may be installed with ease in low cost.

Another object of the present invention is to provide a lighting device in which a reflector plate is miniaturized so that a height of a lighting sleeve body is reduced as much as possible.

Still another object of the present invention is to provide a lighting device that may ventilate an interior of a room by utilizing sunshine.

A lighting device according to a first aspect of the invention is comprised of: a sleeve-like mounting base having a lower surface for being mounted on a roof in conformity with a gradient of the roof; a lighting sleeve body rotatably mounted on an upper edge portion of the mounting base; a lighting sleeve body rotary drive mechanism for drivingly rotating the lighting sleeve body on the upper edge portion of the mounting base; a transparent plate provided for covering a slanted lighting opening portion at an upper portion of the lighting sleeve body; at least one reflector plate rotatably disposed under the transparent plate within the lighting sleeve body for introducing light into an interior of a room through inner passages of the lighting sleeve body and the mounting base by reflecting sunshine; and a reflector plate rotary drive mechanism for changing a reflecting angle of the reflector plate in response to a position of the sun.

The lighting device is formed as a unit. Accordingly,

it is possible to carry it on the site and to install it for a short period of time in low cost with ease in comparison with the conventional device.

In use, the lighting sleeve body is manually rotated and the lighting opening portion is directed toward the sun by the drawing operation on either side of the right and left lighting sleeve body manipulating string of the lighting sleeve body rotary drive mechanism. Also, the reflecting angle of the respective reflector plates is manually adjusted and the reflecting light is introduced into the room through the inner passages of the lighting sleeve body and the mounting base by the drawing operation on either side of the right and left of the reflector plate manipulating strings of the reflector plate rotary drive mechanism. When the sun moves, the lighting sleeve body rotary drive mechanism and the reflector plate rotary drive mechanism are adjusted so that the reflecting light may be continuously introduced into the interior of the room. Thus, although it depends upon the installation site of the lighting device, it is possible to always introduce the sunshine into the interior of the room whenever the sun appears in the case where the installation site is under a good condition.

According to a second aspect of the invention, in the lighting device, a plurality of reflector plates are juxtaposed in parallel with each other in conformity with a slant angle of the slanted lighting opening portion, and the reflector plate rotary drive mechanism simultaneously rotates the reflector plates while keeping the same reflecting angle.

It is possible to make smaller the size of each reflector plate than the case where the single large reflector is used for lighting. Also, the height of the lighting sleeve body incorporating the reflector plates may be reduced as much as possible.

According to a third aspect of the invention, in the lighting device, the lighting sleeve body is characterized by further comprising a ventilation opening portion.

The ventilation opening portion is formed on the side surface of the lighting sleeve body. It is thus possible to discharge the ascending air within the room through the ventilation opening portion by utilizing the convection of the air warmed within the room by the sunshine. Thus, it is possible to perform the ventilation by utilizing the sunshine.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig. 1 is a perspective view showing an embodiment in which a lighting device according to the present invention is installed on a roof of a building;

Fig. 2 is a perspective view showing the lighting device in accordance with the embodiment of the present invention;

Fig. 3 is a cross-sectional view taken along the line X-X of Fig. 2;

Fig. 4 is a perspective view showing a part of a structure of a lighting sleeve body rotary drive mechanism used in the embodiment;

Fig. 5 is a perspective view showing a part of a structure of reflector plates and a reflector plate rotary drive mechanism used in the embodiment; and

Fig. 6 is an illustration of the operation of Fig. 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1 to 6 show a lighting device in accordance with one embodiment of the present invention.

The lighting device 1 is manufactured as a unit in advance and is mounted on a roof 3 of a building 2. In this lighting device 1, a rectangular sleeve-like mounting base 4 to be mounted on the roof 2 with its lower surface in conformity with a slant angle of the roof 2 is used. The lower surface of the mounting base 4 is formed into a slant surface 4a in conformity with the slant angle of the roof 2, whereas an upper edge portion 4b thereof is formed horizontally. The mounting base 4 is fixed to the roof 2 by a suitable means for surrounding a rectangular hole formed in the roof 2 so that the mounting base is water-tightly mounted and is not blown away by wind. On the upper edge portion 4b of the mounting base 4, a single drive roller 5 and a plurality of driven rollers 6 are rotatably provided in the form of a ring with brackets 7 and 8 while surrounding a vertically extending inner passage 4c of the mounting base 4. The drive roller 5 is made of rubber or the like to increase a frictional resistance of its surface. The driven rollers 6 are formed so that their surfaces have a lower frictional resistance.

A rectangular sleeve-like lighting sleeve body 9 is rotatably provided through an annular rail 10 on the respective rollers 5 and 6 of the horizontal upper edge portion 4b of the mounting base 4. The rail 10 is formed of an H-shaped steel or the like and fixed to a lower portion of the lighting sleeve body 9 by welding or the like. U-shaped retainers 11 for retaining the rail 10 are mounted, after factory assembly, on the upper edge portion 4b of the mounting base 4 so that the lighting sleeve body 9 is not raised by wind pressure. Also, an annular upright wall 12 is provided vertically to surround the rollers 5 and 6 on the upper edge portion 4b of the mounting base 4 so that raindrops will not enter into the house through a joint position between the mounting base 4 and the lighting sleeve body 9. A cover member 13 is provided at the lower portion of the lighting sleeve body 9 so as to cover the upright wall 12.

Also, a V-groove pulley 15 is fixed to a rotary shaft 14 of the drive roller 5. A lighting sleeve body manipulating string 16 for rotating the V-groove pulley 15 is laid in the V-groove on the upper side of the V-groove pulley 15 and suspended downwardly. A lighting sleeve body rotary drive mechanism 17 for manually drivingly rotating the lighting sleeve body 9 in the horizontal plane on the horizontal upper edge portion 4b of the mounting

base 4 in response to a position of the sun is constituted by the drive roller 5, the rotary shaft 14, the V-groove pulley 15 and the lighting sleeve body manipulating string 16.

A slanted lighting opening portion 9a is formed in an upper portion of the lighting sleeve body 9. The lighting opening portion 9a is covered by a transparent plate 18 such as a glass plate or the like so that raindrops will not enter thereinto.

A plurality of reflector plates 19 are juxtaposed in parallel with each other in conformity with a slant angle of the slanted lighting opening portion 9a under the transparent plate 18 within the lighting sleeve body 9 so that the sunshine may be reflected and introduced into the interior of the room through the inner passage 9b of the lighting sleeve body 9 and the inner passage 4c of the mounting base 4. Horizontal support shafts 20 are provided at both ends of each reflector plate 19 and are disposed between parallel mounting plates 21 so that the horizontal support shafts 20 are rotatably supported to the mounting plates 21 by bearings 22.

Thus, the mounting plates 21 rotatably supporting the plurality of reflector plates 19 are mounted by fastening means such as screws on facing inner walls of the lighting sleeve body 9 at positions of mounting holes 23. Both ends, in a transverse direction, of the respective adjacent reflector plates 19 may be drivingly rotated together simultaneously at the same angle while keeping the parallel condition to relative to each other by connecting strings 24. Reflector plate manipulating strings 25 are connected at both ends, in the transverse direction, of the lowermost reflector plate 19 and are suspended downwardly through guide rollers 26 provided on the mounting plates 21. A reflector plate rotary drive mechanism 27 for changing a reflecting angle of each reflector plate 19 in response to the position of the sun is constituted by the connecting strings 24, the reflector plate manipulating strings 25 and the guide rollers 26.

A ventilation opening portion 28 is formed in a side surface of the lighting sleeve body 9. The ventilation opening portion 28 is composed of a ventilation fan 28b provided on an opening portion 28a passing through a side wall of the lighting sleeve body 9, a plurality of wind pressure opening/closing plates 28c disposed on the discharge side of the ventilation fan 28a for opening/closing by the wind pressure, a cover sleeve body 28d mounted on the side surface of the lighting sleeve body 9 and opened downwardly in communication with the opening portion 28a for receiving the wind pressure opening/closing plates 28c, and a filter 28e made of fine mesh or the like provided transversely at the lower portion within the cover sleeve body 28d.

The lighting device 1 is formed as a unit. It is therefore possible to install it for a short period of time in low cost with ease in comparison with the conventional device. The lighting device 1 is dismounted into the mounting base 4 side and the lighting sleeve body 9 side and is carried to the site. In the site, first of all, the mounting

base 4 is fixed to the opening portion of the roof 3 of the building 2 so that the raindrop will not enter into the house and the device will not be blown away by wind pressure. Next, the lighting sleeve body 9 side is laid through the rail 10 on the respective rollers 5 and 6 on the mounting base 4. The rail 10 is retained at the mounting base 4 by the retainers 11 after the factory assembly so that the lighting sleeve body 9 side will not be raised by the wind pressure. With such a relatively easy operation, it is possible to mount the lighting device 1 on the roof 3 of the building 2 for a short period of time in low cost.

In use of such a lighting device 1, the lighting sleeve body 9 is manually rotated and the lighting opening portion 9a is directed toward the sun by the drawing operation on either side of the right and left lighting sleeve body manipulating string 16 of the lighting sleeve body rotary drive mechanism 17. Also, the reflecting angle of the respective reflector plates 19 is manually adjusted and the reflecting light is introduced into the room through the inner passages 9b and 4c of the lighting sleeve body 9 and the mounting base 4 by the drawing operation on either side of the right and left of the reflector plate manipulating strings 25 of the reflector plate rotary drive mechanism 27. When the sun moves, the lighting sleeve body rotary drive mechanism 17 and the reflector plate rotary drive mechanism 27 are adjusted so that the reflecting light may be continuously introduced into the interior of the room. Thus, although it depends upon the installation site of the lighting device 1, it is possible to always introduce the sunshine into the interior of the room whenever the sun appears in the case where the installation site is under a good condition.

Also, a single large reflector plate 19 may be used. However, in particular, if, as in the embodiment, a plurality of reflector plates are juxtaposed in parallel with each other in conformity with the slant angle of the slanted lighting opening portion 9a and the reflecting angle of the reflector plates 19 are simultaneously rotated at the same angle by the reflector plate rotary drive mechanism 27, it is possible to make smaller the size of each reflector plate 19 than the case where the single large reflector is used for lighting. Also, the height of the lighting sleeve body 9 incorporating the reflector plates 19 may be reduced as much as possible.

Also, if the ventilation opening portion 28 is formed on the side surface of the lighting sleeve body 9, it is possible to discharge the ascending air within the room through the ventilation opening portion 28 by utilizing the convection of the air warmed within the room by the sunshine. Thus, it is possible to perform the ventilation by utilizing the sunshine. In particular, it is possible to perform the ventilation effectively if the ventilation fan 28 is used.

In the above-described example, the lighting sleeve body rotary drive mechanism 17 and the reflector plate rotary drive mechanism 27 are both manually operated.

However, if motors are used therefor, it is possible to operate the mechanisms automatically. In particular, if the respective reflector plates 19 are connected to each other by the connecting strings 24 or the like, it is advantageous that all the reflector plates 19 may be operated by a single drive source. Also, lighting sleeve body rotary drive mechanism 17 and the reflector plate rotary drive mechanism 27 are not limited to those shown in the embodiment.

The lighting device according to the present invention is formed as a unit. Accordingly, it is possible to carry it on the site and to install it for a short period of time in low cost with ease in comparison with the conventional device.

Also, in the lighting device, since the lighting sleeve body is rotatably mounted on the mounting base and the lighting sleeve body is drivingly rotated by the lighting sleeve body rotary drive mechanism, it is possible to direct the slanted lighting opening portion at the upper portion of the lighting sleeve body to the sun with ease.

Furthermore, since the reflector plates are rotatably disposed about the horizontal shafts in the slanted lighting opening portion at the upper portion of the lighting sleeve body, and the reflecting angle of the reflector plates is changed by the reflector plate rotary drive mechanism, it is possible to change the reflecting angle of the reflector plates in response to the position of the sun with ease.

Various details of the invention may be changed without departing from its spirit nor its scope. Furthermore, the foregoing description of the embodiments according to the present invention is provided for the purpose of illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

Claims

1. A lighting device comprising:

- a sleeve-like mounting base having a lower surface for being mounted on a roof in conformity with a gradient of the roof;
- a lighting sleeve body rotatably mounted on an upper edge portion of said mounting base;
- a lighting sleeve body rotary drive mechanism for drivingly rotating said lighting sleeve body on the upper edge portion of said mounting base;
- a transparent plate provided for covering a slanted lighting opening portion at an upper portion of said lighting sleeve body;
- at least one reflector plate rotatably disposed under said transparent plate within said lighting sleeve body for introducing light into an interior of a room through inner passages of said lighting sleeve body and said mounting base by re-

flecting sunshine; and
a reflector plate rotary drive mechanism for
changing a reflecting angle of said reflector
plate in response to a position of the sun.

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2. The lighting device according to claim 1, wherein a plurality of reflector plates are juxtaposed in parallel with each other in conformity with a slant angle of said slanted lighting opening portion, and said reflector plate rotary drive mechanism simultaneously rotates said reflector plates while keeping the same reflecting angle.

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3. The lighting device according to claim 1 or 2, wherein said lighting sleeve body further comprises a ventilation opening portion.

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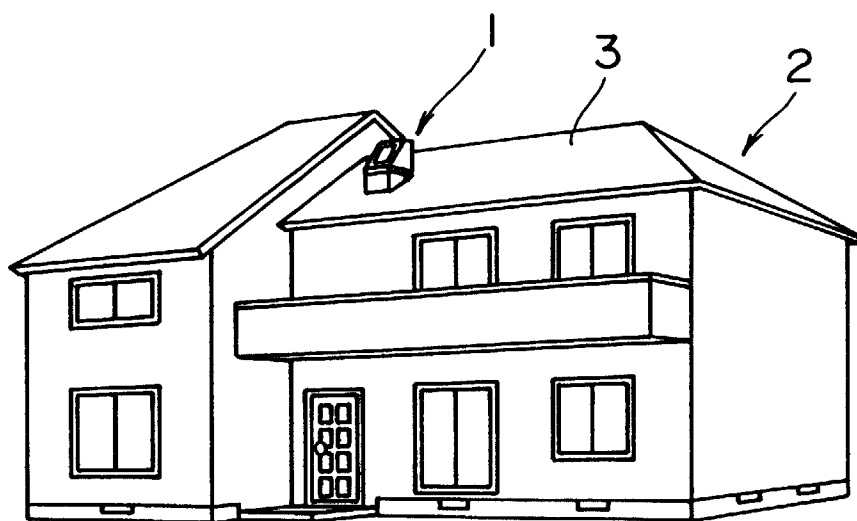


FIG. 1

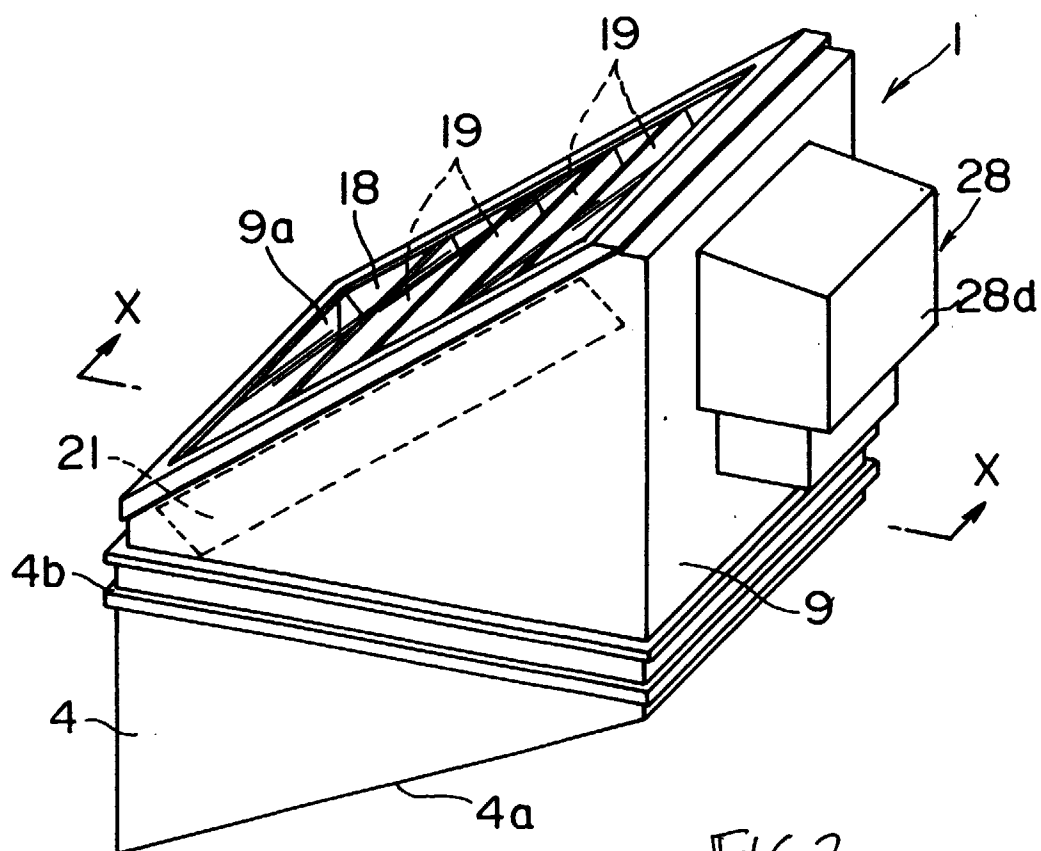
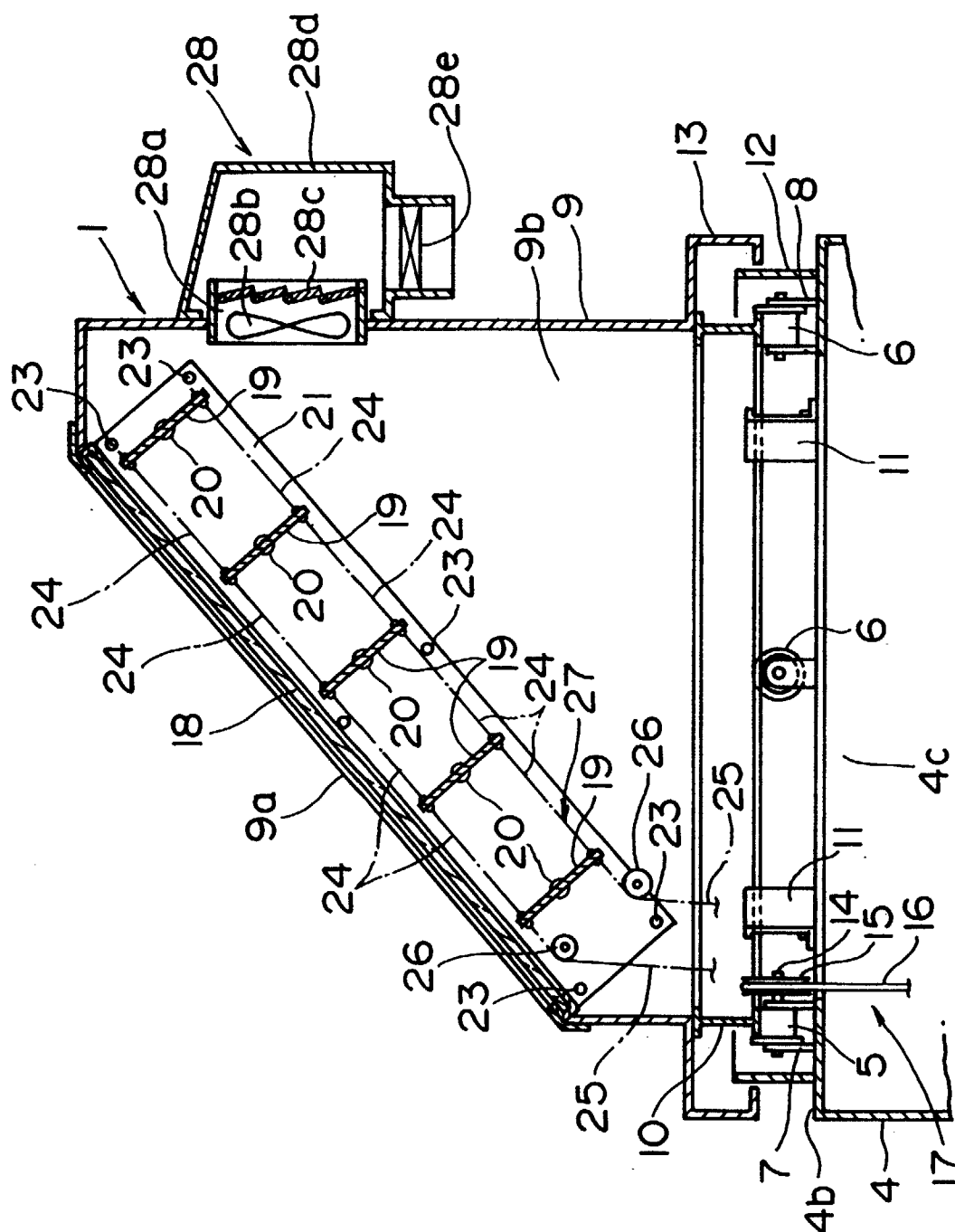
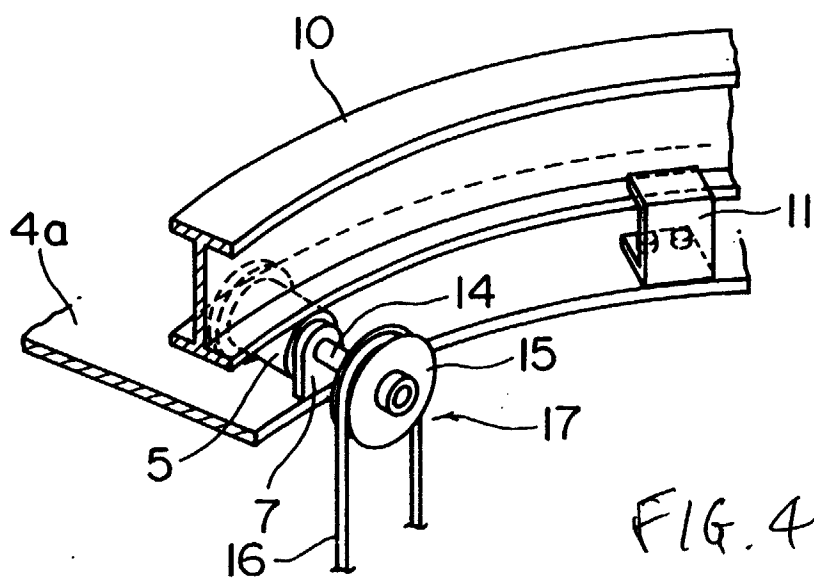
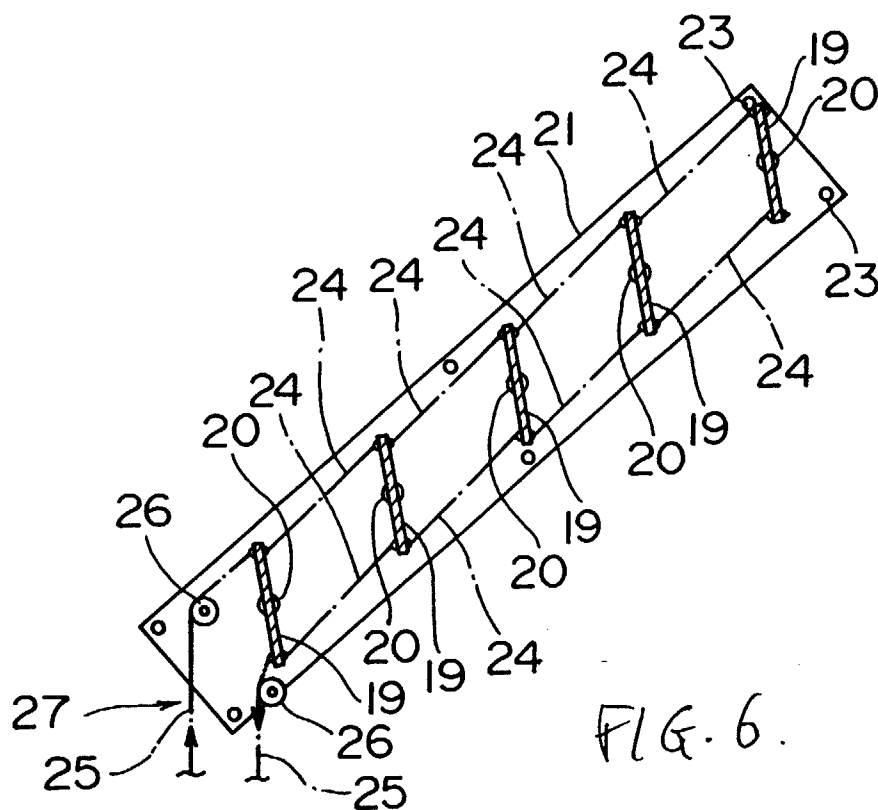


FIG. 2



F/G.3.



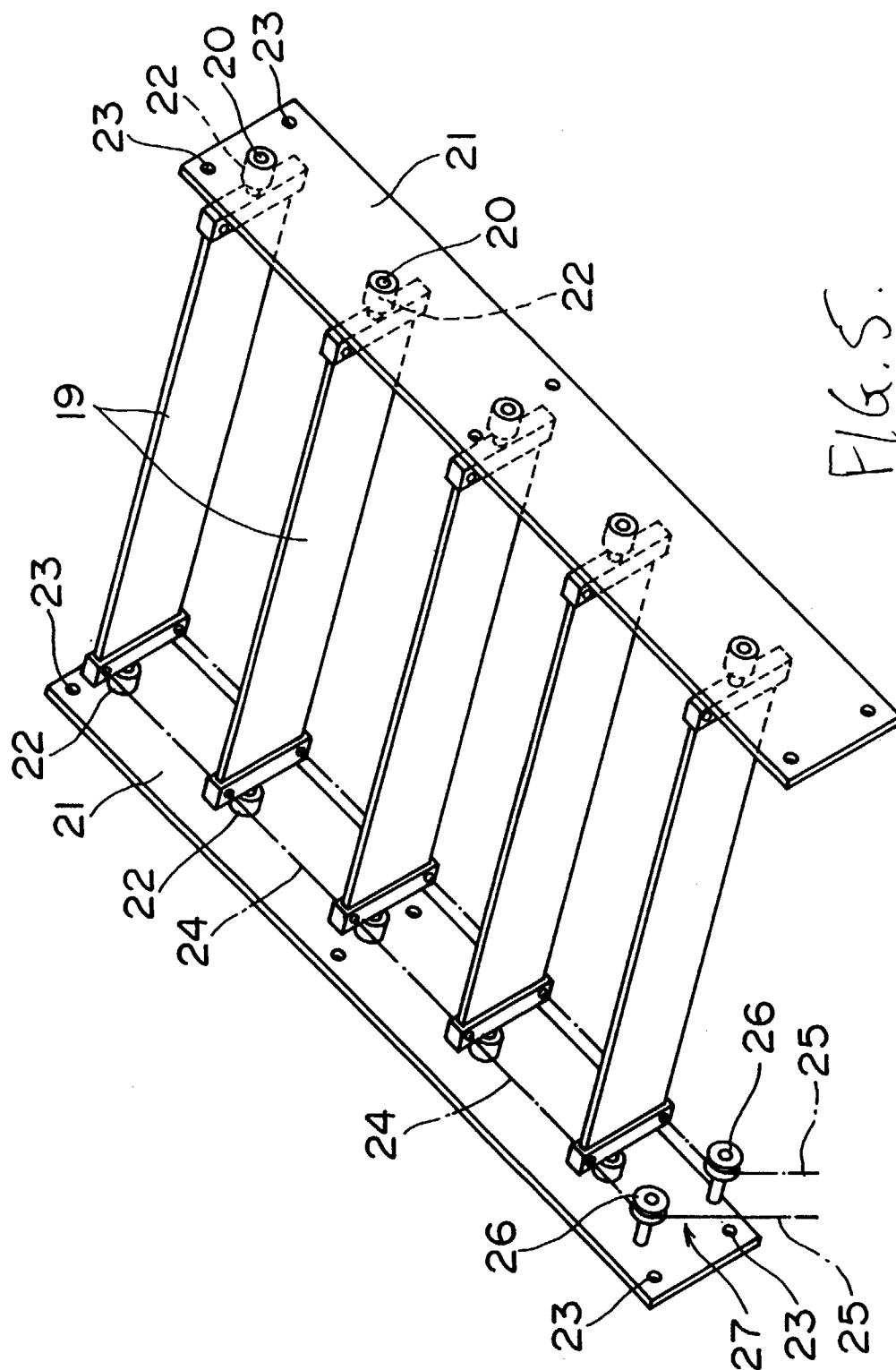


FIG. 5.