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Partition Wall Lamp

The present invention relates to a partition wall lamp as in accordance with the preamble of the main claim.

From DE OS 3706110 it has been known to arrange lamps in the middle of, and within, a partition wall, which via a primary reflector provide illumination through the glazing into two neighboring rooms simultaneously. The disadvantage of such lamps is that they are exclusively designed as lamps and are not, by any means, suitable as partition wall high windows.

Partition wall high windows have a significant illumination function for the daylight. It is therefore that partition wall high windows are primarily built into partition walls between an interior space and a corridor in order to provide daylight illumination for the corridor. Further functions of a partition wall high window include the transparency and hence the dissolution of the opaque wall so that the corridor gains an optical enlargement in the ceiling area in that via the high window a larger ceiling area of the neighboring room becomes visible.

In order to fulfil such basic functions of light techniques and design, one cannot refer to a partition wall high window unless the latter has a certain minimum height and extends above the height of a lintel up to the ceiling.

Partition wall lamps according to DE OS 3706110 are neither suited to supply a corridor area with daylight nor to make optical space enlargement over the ceiling possible. The reason in particular is the disposition of the illuminant and of the reflectors within the glazing cross section. Even if the glazing permits transparency, it is only the reflectors and the illuminants which can be seen. The light gap between illuminant and reflectors is too small to make simultaneous daylight illumination via the partition walls possible

While the illuminant of DE OS 3706110 is arranged in the middle between a lower and an upper reflector, the reflectors used however are two primary reflectors exclusively. The light emitted from the illuminant is deflected, substantially horizontally, into the neighboring rooms while no secondary reflections occur. The lamps glare because it is not only the illuminant which is visible but also the reflectors which additionally guide the reflecting light into the observer's field of vision. By no means is it possible, based on such lamps, to fulfil the requirements of German Standard DIN 5034 as to glare protection.

In DE 324203, a partition wall lamp is shown which includes two illuminants facing each other, each wrapped by a concave primary reflector. Basically, the structure includes two independent lamps symmetrically facing each other and arranged without any optical functional connection. By no means will the concave reflector exert a sensible secondary reflection since light radiation from the opposite lamp is not, with a view to its concave shape, deflected into the interior space but rather into the illuminant and hence is destroyed.

The glazing in the partition wall lamps is shaped prismatically and does not permit any transparency. In addition, it has to be doubted that by means of the lamp considerable daylight amounts will penetrate into the neighboring room since the prismatic structure is designed to deflect the artificial light emitted from the lamps. Daylight inciding from the outside onto the glazing will, logically, be deflected by the prismatic glazing right into the lamps. That is why transparency is not safeguarded either. Vision is guided into the illuminant and into the reflectors, resulting in a heavy glare of the lamps. In addition, in view of the slot-like proportions, on one side, and in view of the disposition within a partition wall at a height of about 1.50 to 2.00 m, on the other, the lamps are certainly not suited to fulfil the functions of a partition wall high window.

While it has been known by DE 324203 to guide, via a partition wall-integrated illuminant, direct radiation onto a work place, this is in fact realized only by a second additional lamp disposed in the upper portion of the lamp.

Furthermore, it has been known from JP 08096620 A to dispose an indirect lamp within a wall niche. Lamps of this kind are offered on the market as wall built-in lamps in different

variations and are not suited as partition wall high window lamps since the reflector prevents transparency and light emission into the neighboring room.

From DE OS 19859936 A1, lamps have been known comprising a two-sided light exit including an illuminant provided at the front, which is partly surrounded by a primary reflector, wherein light radiation from the illuminants and light reflected at the primary reflector is deflected on a light distribution system of the kind of a wedge-shaped secondary reflector. The application of such structural principle on a partition wall high window is not possible since the wedge-like secondary reflector as the light distribution system does not only prevent transparency but also daylight transmission between the rooms. If the lamps are employed in the meaning of the following invention so that the illuminant is at the bottom and the wedge-like reflector is above, such secondary reflector would make possible a flat light deflection at the interior room ceiling exclusively without deflecting the light radiation onto the work place. While the lamp would be glare-free, the direct component of light deflection downwardly to the work place would be missing.

The same is the case if, as in DE 20001567, instead of a secondary reflector, a prismatic light deflection system is employed.

It is, therefore, the aim of the present invention to provide a partition wall high window lamp which, on one side, fulfils the following classical functions of a partition wall high window, viz.

- Transparency through the lamp as through a partition wall high window of two neighboring rooms
- Use of the partition wall high window lamp as daylight opening between two rooms.

Furthermore, the partition wall high window lamps will take the following functions relative to the artificial illumination:

- Light deflection from the partition wall high window lamp to the ceiling and onto the work place while employing only one illuminant each
- Use of the lamp as directly/indirectly radiating work place lamp.

The fulfillment of the problems as posed is obtained in accordance with the characterizing portion of the main claim.

The advantage of the present invention lies in the invisible integration of a directly/indirectly radiating work place lamp within the cross section of a partition wall. The classical lamp as spatial object above a desk is no longer necessary in view of the direct component of the secondary reflector in the ceiling area. At the same time, the lamp takes over the purpose of a prior art high window relative to daylight supply and transparency.

These advantages will be fulfilled by the teaching of the present invention if the primary reflector is so shaped that reflected light is deflected, as parallel to the pane as possible, to the secondary reflector. In view of the approximate pane-parallel light deflection and because of the flat angle of incidence onto the glass pane, reflection on it will occur and hence additional light deflection onto the secondary reflector.

It is, therefore, also the idea of the invention to make use of the transparent and light-permeable glass panes as a mirror by means of the particular light guidance within the lamp between primary and secondary reflectors while not mirror-coating the panes themselves. It is, therefore, also possible to dispose primary reflector and secondary reflector so far from each other at a distance D that the high window glazing simultaneously takes over the function of a window. The high window remains highly transparent for horizontally oncoming daylight.

The glazing of the partition wall high window becomes, by the light guidance of the primary reflector as in accordance with the invention, a concentrating mirror system for light guidance onto the secondary reflector. The centering radiation guidance of the primary reflector in combination with the glazing permits the unusually large distance D of the reflectors relative to their width b and hence the integration of the direct/indirect lamp within a partition wall high window. The relation D/b amounts to at least from 4:1 to 10:1 and larger. These unusual distances can be obtained only by the light guidance according to the invention while including the partition wall glazing in the function as light mirrors.

By light guidance and secondary reflector techniques, the invention saves one illuminant in the upper window area since it is now possible to deflect about half of the light flow from a lower lamp onto the secondary reflector and to use about 50 percent of the complete light flow as direct component and 50 percent as indirect component.

A further advantage is, therefore, the possibility of directly illuminating a working space via a secondary reflector near a partition wall without necessitating additional lamps above the disks. The light radiation coming from the high window lamp can, in accordance with the regulations of German Standard DIN 5034, be deflected, glare-free in angles of deflection $< 50^\circ$, by the secondary reflectors onto the work place. The secondary reflectors may be so shaped that the high window lamps are completely de-glared under angles of view $> 50^\circ$. The specific structure and the construction of the partition wall lamp qualify for all performance features of Class I according to German Standard DIN 5034.

Further advantages of the invention will become apparent from the description of the figures, wherein

- Figure 1 shows the section through a partition wall having one partition wall high window lamp,
- Figure 2 shows the central-perspective section through a typical partition wall lamp,
- Figure 3 shows a section through a partition wall high window lamp and the typical light guidance,
- Figure 4 shows the light guidance according to the invention of the primary reflector,
- Figure 4.1 shows a diagram relative to the surface reflection on glass,
- Figure 4.2 shows the alternative formation of a primary reflector
- Figure 5 shows a high window lamp having an asymmetric secondary reflector,
- Figure 6 shows the photograph of a light exit from the partition wall lamp,
- Figs 7 and 8 show the application of the partition wall high window lamp in small office units, in cross section and as ground plan.

Figure 1 shows a partition wall 100 consisting of a lower partition wall portion 101 and an upper glazed partition wall portion 102. Within the glazed partition wall portion, a lamp 103 is provided on a bar member separating the lower partition wall portion from the upper partition wall portion a lamp 103. Light emitted from that lamp is distributed into the neighboring rooms 104, 105 and onto the underside of the upper partition wall bar member, the secondary reflector 106.

Figure 2 shows the central-perspective cross section through a partition wall high window lamp. The lamp consisting of lamp 10, primary reflector 11 and secondary reflector 12 is integrated between two glass panes 13, 14 in a typical system wall under a ceiling 15.

Figure 3 shows the cross section through a high window of a system wall. The lamp is disposed as a light board 20 on a horizontal carrier profile 21. The illuminant is wrapped by primary reflector 23. The latter deflects light radiation 24, 25, 26, 27 exiting from the illuminant upward to a secondary reflector 28 which is secured underneath carrier profile 29. The horizontal carrier profile is solidly secured to ceiling 30. Secondary reflector 28 deflects light radiation 31, 32 at an exit-of-light angle γ , defined according to quality class, to a work place.

Figure 4 shows a typical design of a primary reflector 34. From a central illuminant 35 light rays are radially and tangentially exiting which are deflected as parallel as possible relative to the high window glazing upwardly to the secondary reflector.

The primary reflector is preferably parabola-shaped. The concave shape selected in Figure 4 includes a plurality of parabolas having two focal points in order to guide the radiation upwards as perpendicular as possible. The reflector may however be shaped differently as well. The teaching of the invention states only that the light radiation should be deflected upwardly as pane-parallel as possible, preferably at an angle $< 40^\circ$ relative to the vertical. The specific structure of Figure 4 shows that by means of two focal points B_1 and B_2 , it is even possible to guide the light flow upwardly at angles $< 25^\circ$.

In Figure 4.2, primary reflector 36 is disposed, saddle-shaped, on the light bar. The more precise the primary reflector deflects the radiation upwardly the larger may the distance D be selected in relation to width b of the reflectors. Typical size ratios are for instance 80 mm of reflector width and a distance D of 300 mm through 1,000 mm and more.

While without the partition wall glazing only few radiation portions would impinge on the secondary reflector, even in case of very precise light guidance, the inclusion of the partition wall glazing into the light guiding system of the lamp as in accordance with the invention permits that the light reflected at the primary reflector is almost completely deflected to the secondary reflector and is guided by the latter as a direct radiation portion onto the

work place. It is only those radiation portions which exit, unhindered, upwardly from the illuminant without impinging on the primary reflector, which constitute the indirect portion of the lamp.

Figure 4.1 is a diagrammatic representation of the reflection degree ρ of a thin glass pane ($n = 1.52$), directed at the angle of incidence ε of incident light

- a) polarized perpendicularly relative to the plane of incidence
- b) polarized in parallel relative to the plane of incidence
- c) non-polarized (resulting mean value).

It turns out that starting at about an irradiation angle $< 40^\circ$, the panes turn increasingly into a light reflector. The present invention makes use of this physical effect of surface reflection in the case of flat irradiation angles, utilizing the light-permeable glass high window itself as a radiation collector from the far-distant light source on the secondary reflector.

Figure 5 shows again a high window according to Figure 3 having, however, an asymmetric secondary reflector 37. Although the light source is disposed in the middle within the partition wall, the quantitative light distribution may in view of the specific formation of the secondary reflector be defined into the neighboring rooms. The secondary reflector, whether symmetric or asymmetric, is preferably formed of two concave reflectors having a common downwardly directing tip. Secondary reflectors having a width of about 80 mm will for instance build up a height h of from about 10 to 15 mm.

The secondary reflector may also be shaped having saw tooth like mirror prisms, similar to a Christmas tree profile. Moreover, the secondary reflector may be coated with additional prismatic light guiding elements of optically denser material or may be produced of it. The invention is not, however, restricted to a specific formation of the secondary reflector. In the meaning of the invention, a plane smooth reflector will serve as a secondary reflector as well provided that it will, at least partly, reflect light radiation impinging on it. The secondary reflector is preferably made of highly reflective, dull or brilliant, i.e. reflective, surfaces.

In order to de-glare the vertical sides of the partition wall lamp between primary and secondary reflector, they may also be made either dull-reflective or highly brilliant. This leads additionally to increased light deflection of the emitted light flow onto the secondary reflector.

Figure 6 shows the photograph of the light exit from a lamp according to Figure 3 having a symmetric secondary reflector. The partition wall lamp shows in the lower part an indirect light exit to the ceiling and at the secondary reflector a direct light deflection to the work place. The photograph shows that in view of the requirements of glare restriction of German Standard DIN 5034, the light exit may, without any difficulties, be restricted to $< 50^\circ$. Although the light source itself is arranged about 50 cm below the secondary reflector, about 50 percent of the light exit from the partition wall lamp passes via the secondary reflector onto the work place. Thereby, complete virtual illumination of an interior space can be safeguarded.

Figure 7 shows the cross section through several open-plan offices which are separated from each other by partition walls 40, 41, 42, 43 and each having above the lintel, as from a height of about 2.10 m up to the ceiling, partition wall lamps 44, 45, 46 and 47. The light exit as described with reference to Figure 6 is shown by light arrows. It shows that the interior spaces can virtually be illuminated exclusively via the partition wall lamp without the need of any additional work place lamp.

Figure 8 shows the ground plan defining lamps 200 through 214 within the partition wall elements. Providing the lamps with 36 w or 54 w luminescent lamps, the illumination level of from 300 to 500 lux on the work place as requested by the German DIN standard can easily be obtained.

The present invention relates to partition wall structures where the glazing is provided on only one wall flight and where the lamp is freely accessible from the other side. Further variants refer to additional metallization effects or printing on the glazing.

A particularly interesting application of the partition wall lamp is one in an exterior wall. In that case, the partition wall lamps are preferably disposed in a post-and-bar structure in a one-sheet or two-sheet construction. Whether one or two-sheet structure, the pane to-

wards the outer space will sensibly be executed as an insulation glass unit. Into such insulation glass unit, a venetian blind or a rigid daylight guiding system may be incorporated which additionally deflects the artificial illumination. Via the reflective properties of the glazing and additional light guiding elements in the glazing level, the light flow of the artificial illumination may be controlled in order to selectively deflect the artificial illumination preferably for instance into the inner or the outer space.

Patent Claims

1. *Light fixture* lamps to be arranged in a partition wall (100) between two rooms (104, 105), comprising glazings (13, 14) in the partition wall plane and, within said partition wall (100), horizontally disposed illuminants (103, 10, 22) in the lower lamp portion, said illuminants (103, 10, 22) partly being wrapped by primary reflectors (11, 23, 34); furthermore comprising secondary reflectors (12, 28, 37), characterized in that
 - a) Said primary reflectors (11, 23, 34, 36) are concave parabola-like formed so that light radiation (24, 25, 26, 27) reflected by them is upwardly deflected at flat angles, in a majority of the cases $< 40^\circ$ relative to the vertical, onto a secondary reflector,
 - b) Secondary reflectors are disposed above said illuminants within the partition wall cross sections in the *ceiling area*,
 - c) Light (31, 32) deflected at said secondary reflectors (12, 28, 37) is deflected downwardly onto the work place,
 - d) The distance D between said primary reflectors and said secondary reflectors amounts to at least the fourfold of reflector width b,
 - e) Said partition wall lamp is incorporated within the high window area of a partition wall at a minimum height of 1.90 m above top level of the ground floor.
2. *Light fixture* lamps according to claim 1, characterized in that said secondary reflectors (12, 28) are shaped of two concave symmetry halves.
3. *Light fixture* lamps according to claim 1, characterized in that said secondary reflectors (37) are non-symmetrically shaped.

4. lamps according to claim 1 or claim 2 or claim 3,
characterized in that said secondary reflectors are tooth-shaped.
5. lamps according to claim 1,
characterized in that said primary reflectors (34) have at least two focal points B_1
and B_2 .
6. lamps according to claim 1,
characterized in that the partition wall glazing is executed on one side only.
7. lamps according to claim 1,
characterized in that said partition wall glazing comprises metallizations and/or is
printed on.
8. lamps according to claim 1,
characterized in that within the levels of said glazing additional strip-like reflectors
for light deflection of artificial light and daylight are provided.
9. lamps according to claim 1,
characterized in that the vertical sides of said partition wall lamps are provided in
reflective or mirror like form.

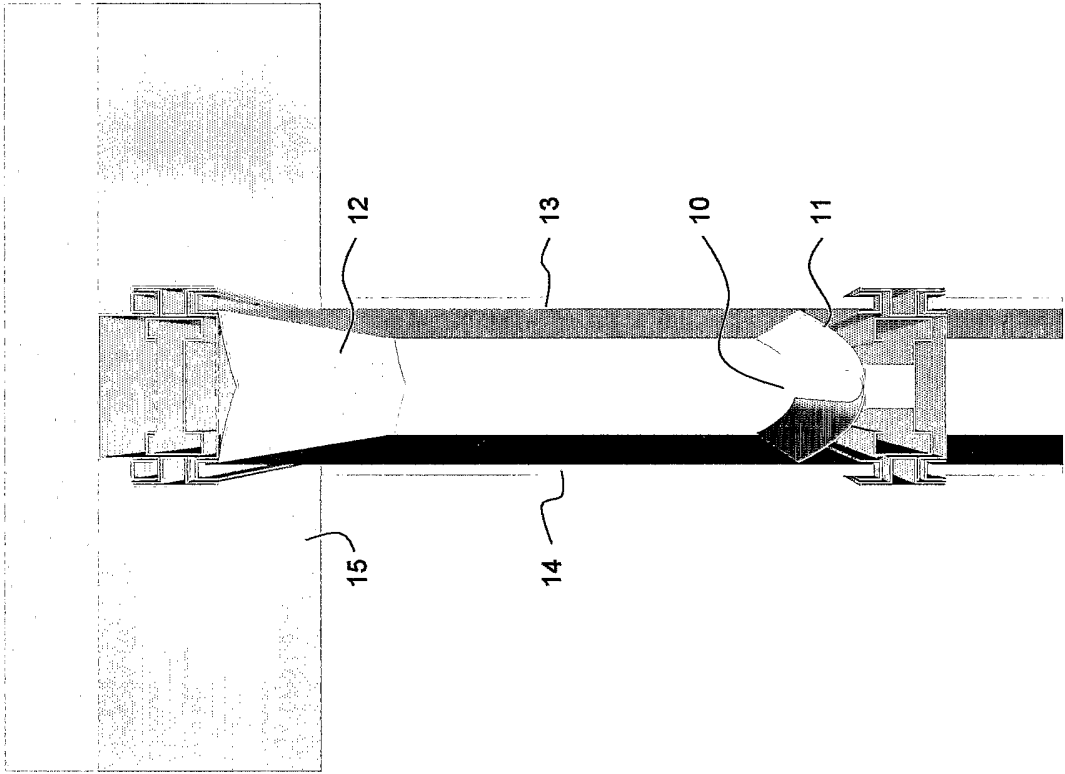


Abb. 2

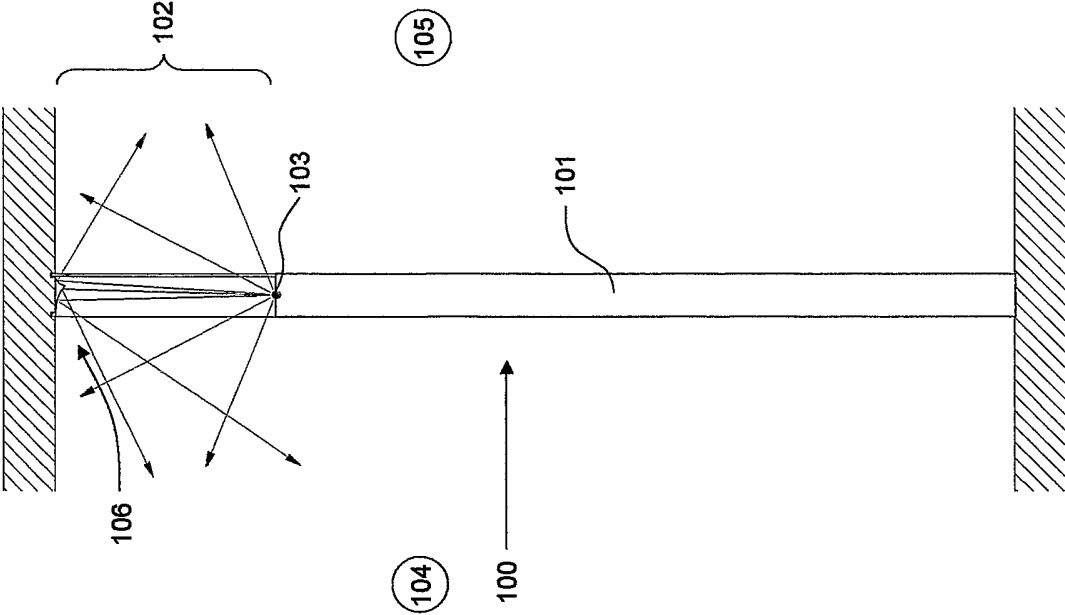


Abb. 1

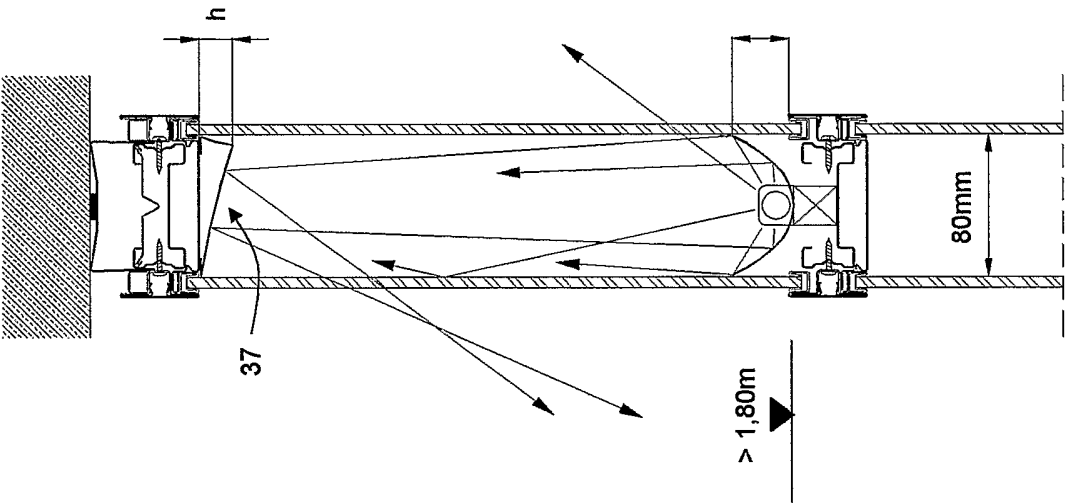


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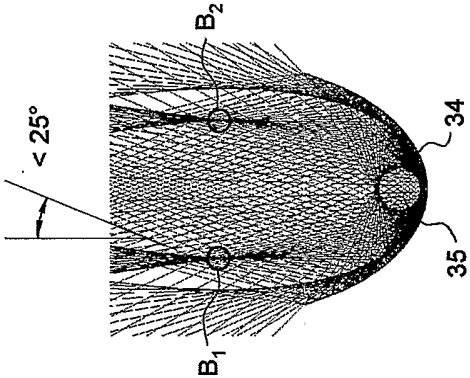


Abb. 4

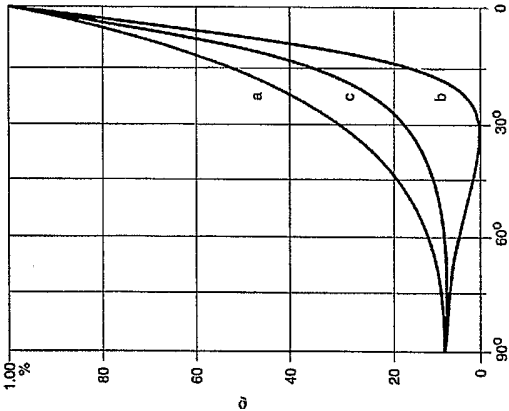


Abb. 4.1

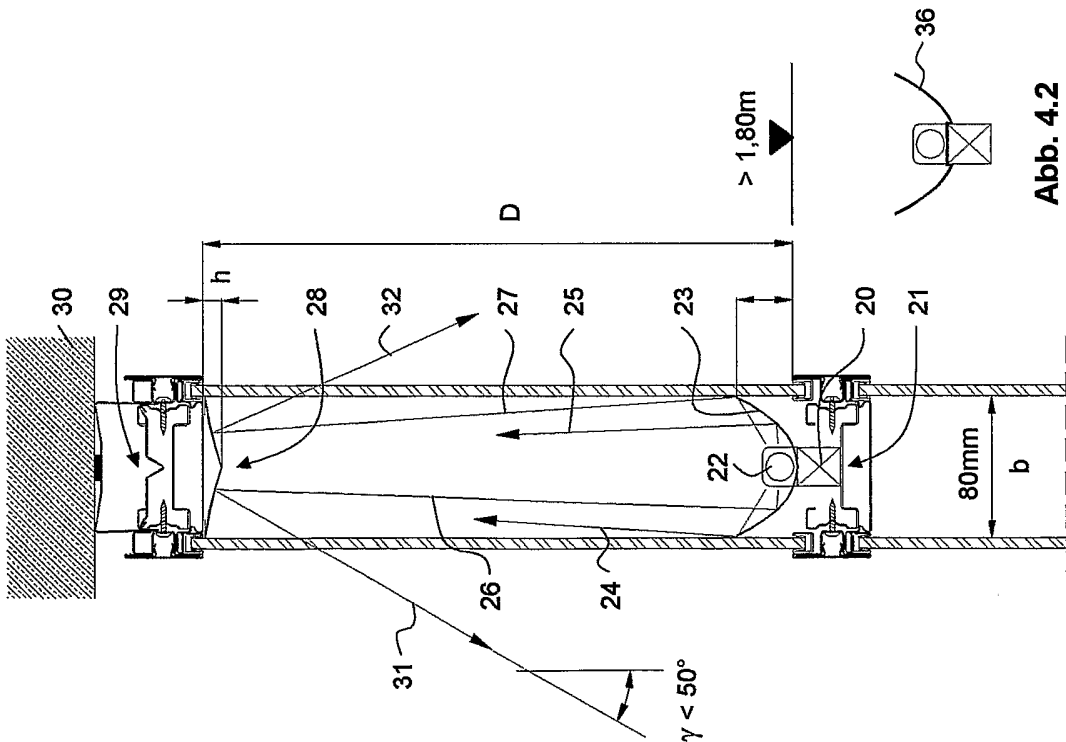
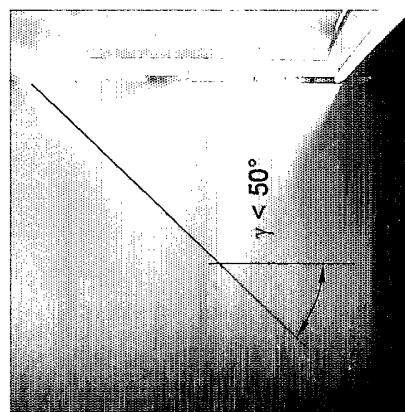
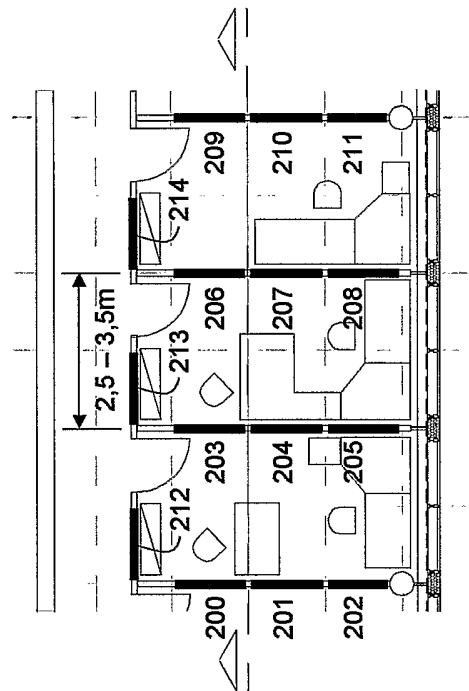
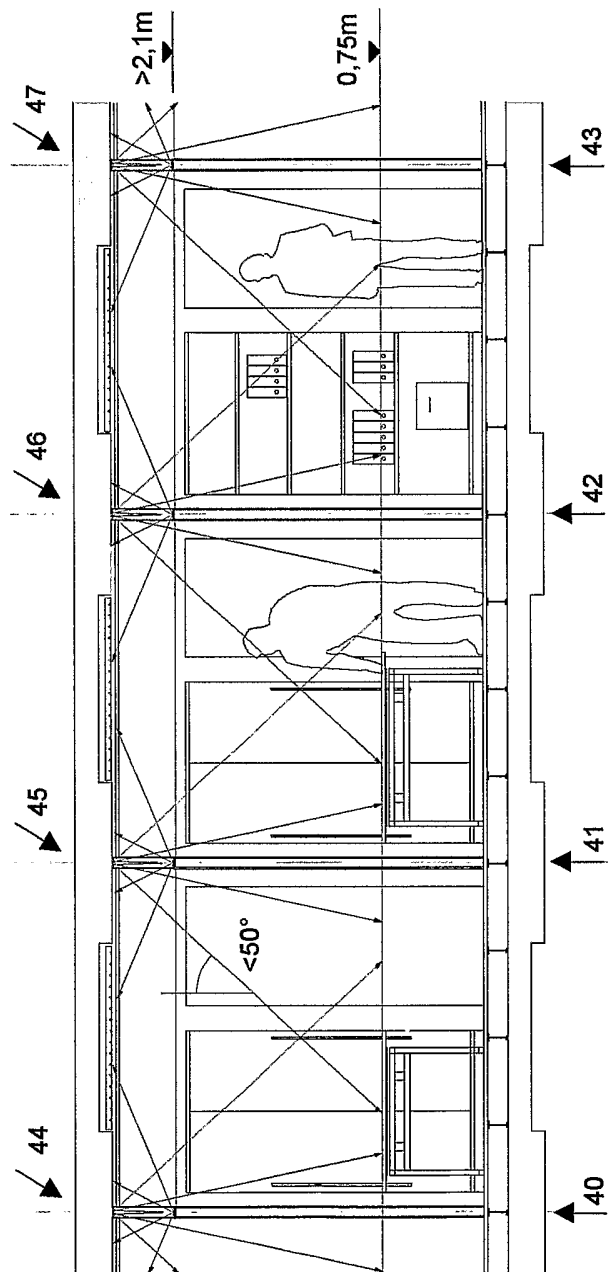


Abb. 3

Abb. 4.2



INTERNATIONAL SEARCH REPORT

Internal I Application No

PCT/IB 03/01179

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F21V7/00 F21V33/00 F21S19/00 F21S8/00

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)

IPC 7 F21V F21S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	US 3 389 246 A (SHEMITZ SYLVAN R) 18 June 1968 (1968-06-18) column 1, line 26 - line 30 column 1, line 60 -column 2, line 2 column 3, line 32 - line 54 figure 6	1-9

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Cosnard, D

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Internationa l Application No
PCT/IB 03/01179

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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