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(54) **Display apparatus**

(57) A display apparatus (1) is provided comprising a display arrangement having a front side (F), further comprising a light source (3) and at least one divergent reflector (6). In the apparatus, the light source is configured for illuminating at least a portion of the divergent reflector and for thus producing reflected light. At least

the divergent reflector is arranged at a distance in front of the front side of the display arrangement and is configured for illuminating at least a portion of the front side of the display arrangement with the reflected light.

A method of illuminating a display arrangement and a method of modifying a display apparatus comprising a display arrangement are also disclosed.

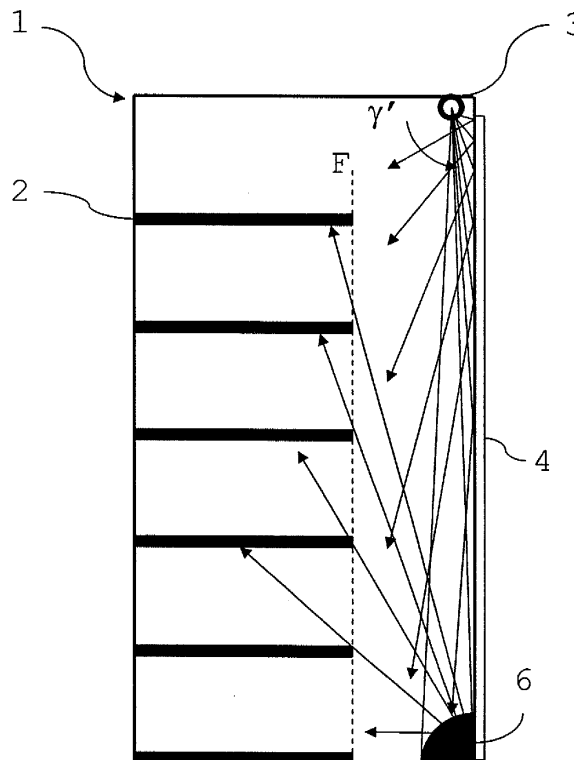


Fig. 4

Description

[0001] The present invention relates to a display apparatus, in particular a vending cabinet, more in particular a chilled vending machine.

[0002] It is widely known to illuminate display arrangements, such as posters or products displayed on shelves, with artificial light. Typical examples are display cases, vending cabinets and vending machines. The artificial light serves for drawing attention to, increasing attraction for and/or generally increasing a level of light for the displayed products.

[0003] However, in such display arrangements shelves, side walls and other objects may cast shadows on products. This is in particular a problem for closed display cabinets.

[0004] In addition, in a display apparatus space and energy consumption are at a premium. Furthermore, especially in chilled display apparatus, heat generated by the light sources should be kept at a minimum as the heat must be carried away by the cooling mechanism and nearby objects or products may be adversely affected or even harmed by the heat.

[0005] In the art, various illumination arrangements have been provided to address these issues, in particular for display arrangements comprising shelves.

[0006] US 6,550,269 discloses a dispensing apparatus with directional Light Emitting Diode (LED) lighting. One or more LEDs are positioned within the apparatus which serve to illuminate an interior portion of the apparatus and the products positioned therein.

[0007] EP 1 321 076 discusses a lighting system employing bi-directional optics for illuminating a product display unit including at least first and second product display shelves and a lighting system. The lighting system comprises an illumination source mounted on the first shelf and being adapted to generate light directed toward the second shelf and at least one light control element for redirecting the light to illuminate from substantially the front portion to the rear portion of the product supporting surface of the first shelf.

[0008] Further, WO 2006/028802 describes a refrigeration system comprising a display case defining a display space with a front viewing area and a back area. A light source is located near the back area. A reflector is spaced from the light source and reflects light through the display space.

[0009] However, these known systems require individual light sources for each shelf. This complicates the systems and renders them relatively expensive. It also causes a relatively high energy consumption.

[0010] It is further known to use one or more luminescent light tubes arranged in front of a plurality of shelves and extending along the width of the shelves and/or across a plurality of shelves to illuminate these shelves. In such cases the light tubes may be mounted in a door frame of a display cabinet, e.g. as described in US 6,406,108.

[0011] However, the resulting illumination patterns are still not optimal, as products placed closer to the light source or light sources are lit brighter than products positioned further away, e.g. more to the centre of the display. The known illumination arrangements further tend to produce rather sharply defined shadows. Thus such known illumination arrangements may appear unnatural, uneven and/or harsh to a consumer and may therefore be considered relatively unattractive.

[0012] Thus, there remains a desire for a display apparatus which is illuminated in a fashion that reduces or solves one or more of the problems outlined above.

[0013] To that end, a display apparatus is provided comprising a display arrangement having a front side, further comprising a light source and at least one divergent reflector. In the apparatus, the light source is configured for illuminating at least a portion of the divergent reflector and for thus producing reflected light. At least the divergent reflector is arranged at a distance in front of the front side of the display arrangement and is configured for illuminating at least a portion of the front side of the display arrangement with the reflected light.

[0014] Advantageously, the reflector comprises a reflecting area and the light source is configured for illuminating substantially the entire reflective area.

[0015] Preferably also the light source is arranged at a distance in front of the display arrangement. This reduces thermal load of displayed products due to the light source and may prevent obstacles in the optical path between the light source and the reflector.

[0016] The light incident on the divergent reflector has a first angular range or opening angle and the reflected light has a second angular range or opening angle which is larger than the first angular range. The different opening angles are primarily determined by the configuration of the light source, the shape and the illuminated area of the reflector and the relative separation and position of the light source and the reflector.

[0017] The light of the light source may thus be directed towards and distributed over a portion of the front side of the display arrangement which is different and relatively larger than would have been illuminated by the light source without the divergent reflector. Arranging the divergent reflector in front of the front side of the display arrangement allows illuminating a relatively large area with light originating from a relatively small reflective area which in turn is illuminated with a relatively narrow angular range relative to arranging the reflector relatively close to the front side of the display arrangement. In other words, a relatively small reflector may effectively distribute the light of a light source with a relatively narrow light cone, e.g. a bright spot light. It may also mimic a light source with a relatively wide opening angle at a location where a direct light source such as a lamp would be impossible or undesirable, e.g. for reasons of size or heat.

[0018] Thus, the apparatus provides an improved illumination.

[0019] The reflector may further serve for usefully re-

flecting light otherwise lost.

[0020] An existing display apparatus may be provided or retrofitted with a light source and a divergent reflector according to the invention. Hence, another aspect of the invention is the method of claim 11.

[0021] The invention and its diverse benefits will hereafter be explained in more detail with reference to the appended exemplary drawings, in which

Fig. 1 is a schematic cross sectional view of a display apparatus;

Fig. 2 is a schematic cross sectional view of an improved display apparatus;

Figs. 3 and 4 show further embodiments;

Figs. 5A-5E show two different divergent reflectors and their effects, 5A, 5B, 5D and 5e being cross sectional views and 5C being a schematic drawing in perspective.

[0022] Fig. 1 and 2 show a schematic cross sectional view of a closed display cabinet 1, such as a chilled vending machine. Parts of the apparatus not relevant to the present disclosure, e.g. a refrigerator, products or product placement devices, e.g. partition walls etc. are not shown, but will be obvious to the skilled person. In the Figures, like elements are indicated with like reference numerals

[0023] The shown display cabinet 1 comprises a plurality of shelves 2 for positioning articles to be displayed and a light source 3. A portion of each shelf 2, preferably essentially the entire shelf surface, serves as a product display area in which the products may be visible for a potential consumer. The assembly of shelves 2 forms a display arrangement having a front side F and a rear side R. The vending cabinet 1 further comprises a front window 4 which may be (part of) a door.

[0024] The light source 3 is arranged at a distance in front of the front side F of the display arrangement. The light source 3 is arranged at a relatively high position with respect to the display arrangement, and is configured for directing light towards the shelves 2 and illuminating at least a portion of the product display area on each shelf 2. The light source 3 provides a directed light cone with an opening angle α . The substantially downward direction of the light cone provides for a substantially naturally looking illumination.

[0025] As may be apparent from Fig. 1, substantially the entire surface of the top shelf 2 is illuminated by the light source 3. Lower lying shelves 2 are increasingly poorer illuminated, as higher lying shelves 2 cast shadows 5.

[0026] Furthermore, one or more side walls and/or partition walls of the cabinet in the display arrangement may also serve as a product display area, e.g. substantially vertical product display areas such as for propped-up or hanging products, which may also be at least partially illuminated by the light source 3. Thus, different portions of the product display arrangement may suffer from shadows

cast by the shelves 2 and/or by the respective walls.

[0027] As indicated above, products placed on relatively low shelves 2 may be relatively poorly visible. A relatively high product arranged on a shelf 2 may reach close to the bottom of a shelf 2 directly above it. Thus a portion of such products may be in a shadow. For the lowermost shelves 2, this may already occur for the frontmost row of products. Similar holds for product display areas behind side walls or partition walls. This may result in a relatively unattractive display. In the prior art, this effect is prevented by employing additional light sources arranged throughout the display apparatus, which is considered undesirable as outlined above.

[0028] Conventional (chilled) vending machines may comprise screw worms (not shown) for positioning products. Upon buying a selected product the corresponding screw worm(s) rotate for advancing the selected product towards the front side F of the shelf 2 and dropping the product off the shelf 2 into an exit portion (not shown). In the same operation, a subsequent product is advanced towards the front side F of the shelf. Thus, in such vending machines at least a portion of the available displayed products is consistently positioned at the frontmost portions of each shelf 2. In particular for such vending machines a proper illumination of a portion towards front side F of the display arrangement is important, whereas illumination towards the rear side R of the arrangement may be less important or even undesired, since in such a case the technical aspects of the machine may distract attention from the products to be sold.

[0029] Fig. 2 shows an embodiment of an improved display cabinet 1. Compared to the cabinet of Fig. 1, the cabinet of Fig. 2 is provided with a divergent reflector 6 arranged at a relatively low position with respect to the light source 3. The light source has an opening angle β which is slightly wider than that of the cabinet of Fig. 1. However, the light cone of a light source is generally not crisply defined and the light source 3 of Fig. 2 may be substantially identical to that of Fig. 1.

[0030] A portion of the light of the light source 3 having an opening angle γ illuminates the reflector 6 and is reflected off it. Due to the shape of the reflector 6 the reflected light has a relatively large angular range or opening angle δ . The opening angle δ mainly depends on the combination of the shape of the reflector 6 and its surface area that is illuminated. The opening angle δ may extend for substantially any desired angle, preferably it is about 90 degrees for illuminating a relatively large portion of the front side F of the display arrangement, preferably the entire front side, and penetrates into the shadow areas 5 towards the rear side R of the display arrangement for illuminating products placed further backwards on a product display area. The reflected light enhances the homogeneity of the illumination light on the front side F of the display arrangement.

[0031] Thus the attractiveness of the display arrangement and of the displayed products is increased.

[0032] Since the reflector 6 distributes the light incident

on it over a relatively large angular range δ , the light source 3 may be configured for providing a light cone with only the relatively small opening angle γ and with a main illumination direction oriented towards the divergent reflector 6. This facilitates providing a bright light source having a substantially homogenous brightness over its light cone. The light reflected off the reflector 6 therefore may provide a relatively homogeneous illumination of at least the front side F of the display arrangement.

[0033] For improving illumination further towards the rear side R of the display arrangement, if desired, one or more shelves may comprise a bottom surface having at least one reflective portion 7 for reflecting light incident thereon from the divergent reflector 6, as shown in Fig. 3. The reflective portion 7 may have various desired reflection characteristics, e.g. mirroring, scattering into plural bright spots e.g. for a playful effect, or diffusing the incident light such as by being a bright substantially white portion.

[0034] Reflective portions 7 on different shelves 2 may be different in shape, size and/or reflection characteristics. Each portion 7 may in itself comprise sub-portions with relatively different shapes, sizes and/or reflection characteristics.

[0035] The horizontal separation between the front side F and the reflector 6 may be determined by the available space within the display apparatus. In a screw worm-type chilled vending machine discussed above the separation may be of the order of about 10-20 cm, typically in the range 10-15 cm such as about 13-14 cm, which is mainly determined by the space required for dropping a product off a shelf and into an exit tray. The shelves 2 in such an apparatus are typically about 50-70 cm deep (in the direction front side to rear side) usually about 60 cm and about 1-1.5 m wide (in a direction substantially perpendicular to the plane of the Figures). The panel or window 4 protects the display arrangement from outside influences, acting as a thermal barrier and providing protection against theft, vandalism etc.

[0036] However, the display apparatus need not be a screw worm-type vending machine and it may be a display apparatus comprising a display arrangement without shelves, e.g. for displaying a single object or comprising a vertical display area or even a poster. Still, it is preferred that the display apparatus comprises a substantially translucent, preferably transparent, panel, such as a window 4, arranged at a distance in front of the front side of the display arrangement and that the light source 3 and the divergent reflector 6 are arranged in the space between the panel 4 and the display arrangement. This assists maintaining the arrangement of the light source 3 and the reflector 6. Moreover, it reduces light losses by reflection and/or absorption of the panel 4 from a light source outside the cabinet 1.

[0037] A translucent but not transparent panel 4 may be used in case it is considered unnecessary or undesired to make details in the display arrangement visible, e.g. in case the display apparatus is to be used as a

general advertising object or light source which should be illuminated substantially homogeneously. An example would be a poster of which only the general contours of portions with different colours should be visible through the panel 4, but no details. Alternatively, the display arrangement may be a substantially uniform, preferably substantially white, object, e.g. for providing a substantially homogeneous illumination for a back-lit object or poster arranged in front of the display apparatus, possibly in front of the panel 4.

[0038] A particularly advantageous apparatus is shown in Fig. 4. In this embodiment the light source 3 and the divergent reflector 6 are arranged vertically over each other at substantially the same separation from the front side F of the display arrangement. The light source 3 and the divergent reflector 6 are arranged with respect to the window 4 such that a portion of the light from the light source 3 is reflected off the window 4 towards the divergent reflector 6. This can be achieved also with a light source 3 which is configured to provide a relatively narrow light cone with opening angle γ' for illuminating substantially only the divergent reflector. This embodiment improves the homogeneity of the illumination of the reflector 6, due to the light reflected off the window 4. In this embodiment the light incident on the reflector 6 comprises a substantially larger angular range per illuminated portion of the reflector 6 compared to the angular range provided by direct, substantially vertical, illumination of the light source 3. Hence, the illumination of the front side F of the display arrangement is even more homogeneous.

[0039] The opening angle γ' of the light source 3 may be such that also a portion of the light is reflected by the window 4 directly towards the front side F of the display arrangement. This is also shown in Fig. 4. The resulting illumination of the embodiment of Fig. 4 is substantially homogenous throughout the front side of the display arrangement as the apparent point of origin of the light rays is shifted to the point of their reflection on the window 4. Harsh shadows are thus prevented and the light penetrates relatively equally far and evenly towards the rear side of the cabinet 1 in between each set of shelves 2.

[0040] A reflective coating or the like may be provided on the window 4 for optimising the aforementioned effect. However, when the light source 3 is placed close to the window 4, e.g. substantially against the window, the angle of incidence of the light with respect to the window may be such that a relatively large fraction of the light is reflected by the step in refractive index at the boundary air - window material (e.g. glass) alone, obviating a reflective coating.

[0041] The substantially vertical arrangement of the light source 3 and the reflector 6 with respect to each other and the fact that the light source may have only a very narrow light cone facilitates installation of the apparatus and alignment of the parts 3, 6. In particular when the reflection off the window 4 is also employed the illumination of the front side F has proven surprisingly in-

sensitive to the alignment of the parts 3, 6. This substantially improves customer-friendliness and facilitates modifying and/or retro-fitting a display apparatus.

[0042] Cross sectional view of two suitable embodiments of a divergent reflector 6 are shown in Figs. 5A and 5B, respectively. The reflector 6 of Fig. 5A has a convex reflecting surface 8 and the reflector 6 of Fig. 5B has concave reflecting surface 8. Each reflector 6 has a length ℓ extending in a direction substantially normal to the cross section of Figs. 5A, 5B, respectively, and a width w , as shown schematically in perspective in Fig. 5C for the reflector 6 of Fig. 5A. The reflectors 6 have a substantially constant cross sectional shape along their length ℓ .

[0043] The reflective effects of both geometries of Figs. 5A and 5B are substantially similar, as schematically shown for substantially parallel vertically incident light in Figs. 5D and 5E, respectively. The cross sectional shape of the reflecting surface 8 preferably is a circle-segment following a single radius. The tangent to the curvature of the reflecting surface 8 at its opposite ends in the width-wise direction (w) may advantageously be chosen in accordance with the relative positions of the light source 3, the reflector 6 and (the front side of the display arrangement). In case the light source 3 is arranged substantially vertical above the reflector 6 and the desired illumination direction is substantially to the side and above of the reflector 6, as indicated in Figs. 1-4, it has proven advantageous when on the one side furthest away from the front side F of the display arrangement the tangent makes an angle ε with respect to the horizontal in the range of about 0-20 degrees preferably about 5-15 degrees, e.g. 10 degrees, whereas on the other side the tangent makes an angle η with respect to the horizontal of about 30 degrees or larger, preferably about 45 degrees. A small tangent angle ε substantially prevents light being reflected past the display arrangement and therewith substantially lost for illumination. A tangent angle η of 45 degrees reflects light incident substantially vertically in a direction substantially 90 degrees to the direction of incidence, which may amount to being substantially horizontally (see Figs. 5D, 5E).

[0044] The reflector 6 may be relatively narrow, having a width w in the range of about 1-4 cm, preferably about 2-3 cm, e.g. about 2.5 cm. Such sizes may be placed or integrated in the frame of a window 4 and/or be mounted relatively inconspicuously in or on a door of the cabinet 1. The length ℓ of the reflector 6 may advantageously be about equal to the length of the display arrangement to be illuminated and/or to the interior size of the window frame in which the reflector is to mounted or integrated.

[0045] A diffusely reflecting reflector, e.g. having a smooth but not shiny-polished reflecting surface 8 or a white reflecting surface may be used for providing a homogenous reflected illumination. However, the reflector 6 preferably is highly reflective for optimising the amount of reflected light and minimising light losses. The reflector 6 may suitably comprise a substantially smooth carrier

structure provided with a reflective layer or coating, e.g. plating. A cost-efficient reflector may be an extrusion profile or the like, e.g. an aluminium profile, which may be polished. A suitable way of mounting a reflector, in particular when retro-fitting a display apparatus, may be to use double-sided adhesive tape, which facilitates mounting relatively small objects with a flat surface substantially even on another substantially flat surface. However, other mounting techniques such as gluing, screwing etc. will address themselves to the skilled person, dependent on aspects such as the reflector material and -size, and/or the available mounting position and -space.

[0046] It is also possible to form one or more portions of the display apparatus, e.g. a portion on a door or a window frame as a divergent reflective portion from the outset, e.g. by appropriately shaping one or more portions and coating them.

[0047] The concept of the invention may be extended to other directions, e.g. providing a plurality of divergent reflectors such as along one or more different sides of the window 4, e.g. all around the window frame. This provides an even more homogeneous illumination of (the front side of) the display arrangement.

[0048] In addition, an existing display apparatus may be improved by providing it with one or more divergent reflectors in accordance with the above explanation.

[0049] It has proven surprisingly effective to illuminate the reflector with a light source comprising one or more high-brightness LEDs (Light Emitting Diodes), configured to emit relatively narrow light cones, e.g. by combining an LED with one or more reflectors and or lenses.

[0050] LEDs may provide very high brightness light, the emission direction and opening angle of which is relatively easy to control and/or focus. At the same time, LEDs require relatively little space, consume relatively little power, produce relatively little heat and have a relatively long operational life time, in particular when compared with incandescent lamps but also clearly when compared with luminescent lamps such as TL-tube lighting. Each one of these aspects, and in particular a combination thereof, make LEDs ideally suited for use in the present display apparatus. In addition, LEDs and LED assemblies comprising a plurality of single LEDs within a housing or an envelope are available with various light colours and colour temperatures which may be adjustable, possibly using a programmable controller, for providing different illumination effects. Illuminating the reflector with a particular colour can provide a homogeneous colouring to an otherwise white-illuminated display.

[0051] The opening angle of the light cones may be about 10 degrees or smaller, e.g. about 5-7 degrees. One or more LEDs may be configured to emit a substantially elliptical beam, e.g. having a first opening angle in a first direction of less than 10 degrees, e.g. about 5-7 degrees and having a second opening angle in a second direction substantially perpendicular to the first direction of about 20 degrees or even up to about 45 degrees. In the latter case, the wider direction preferably corresponds sub-

stantially with the longitudinal direction (along the length ℓ) of the reflector.

[0052] One or more different LEDs, and/or combinations of LEDs with reflectors and/or lenses may be combined to provide a single compound light source 3, in which all LEDs or combinations may be configured for emitting substantially in the same direction with respect to the front and rear sides of the cabinet 1 but preferably with somewhat different directions substantially with respect to the longitudinal direction (along the length ℓ) of the reflector. All LEDs emitting substantially in the same front/rear direction may be particularly useful in a substantially vertical illumination arrangement of the light source 3 and reflector 6 relative to a display arrangement arranged to the side thereof, as has been set out above.

[0053] The invention is not restricted to the above described embodiments which can be varied in a number of ways within the scope of the claims. For instance, instead of a substantially smooth reflector, a multi-faceted reflector is also conceivable, which may provide an inhomogeneous but playful illumination.

[0054] Various reflectors with different radii or reflectors having portions with different radii may be used to provide particular illumination effects.

[0055] The divergent reflector may be divergent in more than one general direction, e.g. by having a curvature in two substantially perpendicular directions, e.g. both length ℓ and width w of the reflector, and/or having a substantially ellipsoidal shape.

[0056] The light source and the reflector may be, but need not be, arranged in substantially one plane which is substantially parallel to the front side of the display arrangement and/or a front window.

[0057] Moreover, elements and aspects of different embodiments may be suitably combined within the scope of the appended claims.

Claims

1. Display apparatus (1) comprising a display arrangement having a front side (F), a light source (3) and at least one divergent reflector (6), wherein the light source is configured for illuminating at least a portion of the divergent reflector for producing reflected light and wherein at least the divergent reflector is arranged at a distance in front of the front side of the display arrangement and is configured for illuminating at least a portion of the front side of the display arrangement with the reflected light.
2. Display apparatus (1) according to claim 1, wherein the light source (3) is arranged at a distance in front of the front side (F) of the display arrangement and at a relatively high position with respect to the display arrangement and the divergent reflector (6) is arranged at a relatively low position with respect to the display arrangement.
3. Display apparatus (1) according to any one of the preceding claims, wherein the light source (3) is configured for providing a light cone with a relatively small opening angle (γ) and a main illumination direction oriented towards the divergent reflector (6).
4. Display apparatus (1) according to any one of the preceding claims, wherein the display arrangement comprises a plurality of shelves (2) for displaying articles.
5. Display apparatus (1) according to claim 6, wherein at least one of the shelves (2) comprises a bottom surface having at least one portion (7) for reflecting light incident thereon.
6. Display apparatus (1) according to any one of the preceding claims where the display apparatus comprises a substantially translucent panel (4) arranged at a distance in front of the front side of the display arrangement and wherein the light source (3) and the divergent reflector (6) are arranged in the space between the panel and the display arrangement.
7. Display apparatus (1) according to claim 6, wherein the light source (3) and the divergent reflector (6) are arranged with respect to the translucent panel (4) such that at least a portion of the light from the light source is reflected off the translucent panel towards the divergent reflector.
8. Display apparatus (1) according to any one of the preceding claims, wherein the display apparatus is a vending cabinet such as a chilled vending machine.
9. Display apparatus (1) according to any one of the preceding claims, wherein the divergent reflector (6) is arranged in or on a door of the display apparatus.
10. Display apparatus (1) according to any one of the preceding claims, comprising a plurality of divergent reflectors (6).
11. Method of modifying a display apparatus (1) comprising a display arrangement having a front side (F) and a light source (3), the method comprising providing the display apparatus with a divergent reflector (6), and arranging at least the divergent reflector at a distance in front of the front side of the display arrangement such that the light source is configured for illuminating the divergent reflector producing reflected light and at least a portion of the front side of the display arrangement is illuminated with the reflected light.
12. Method of claim 11, further comprising arranging the light source (3) and the divergent reflector (6) with respect to a translucent panel (4) arranged in front

of the front side (F) of the display arrangement such that at least a portion of the light from the light source is reflected off the translucent panel towards the divergent reflector.

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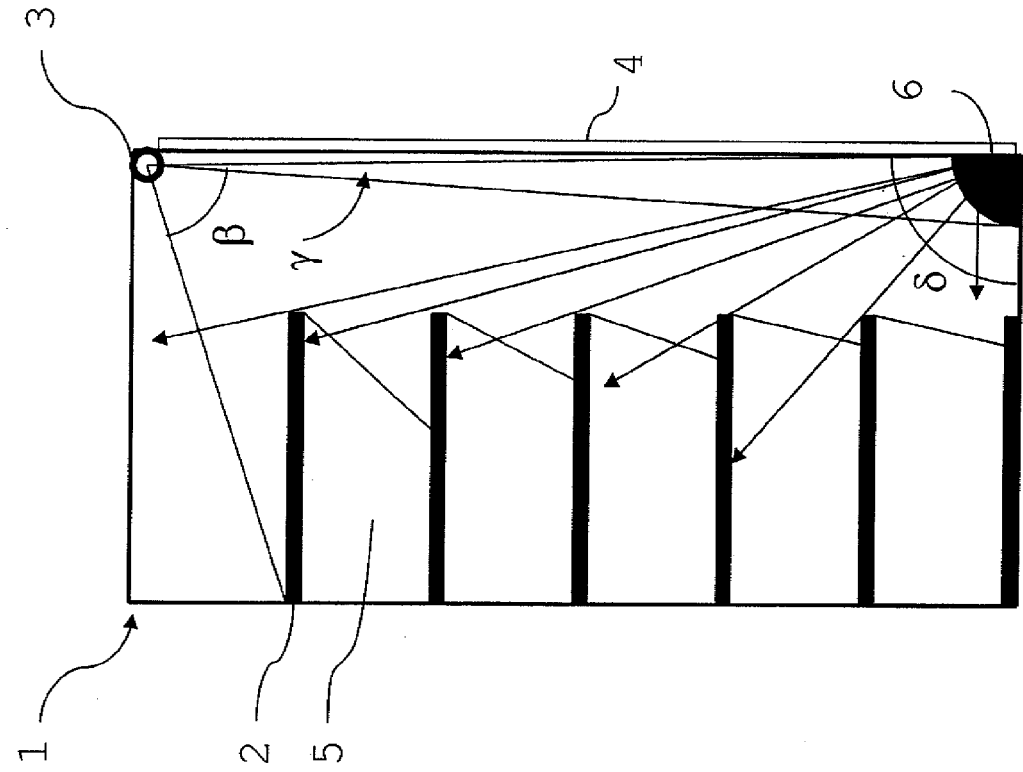


Fig. 1

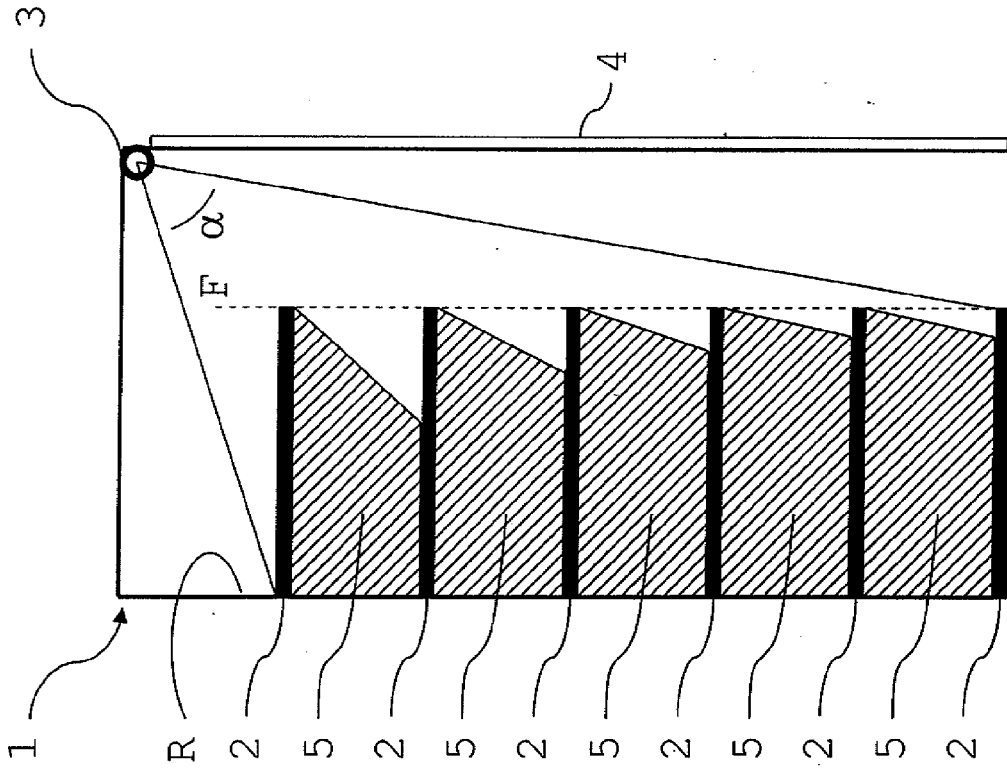


Fig. 2

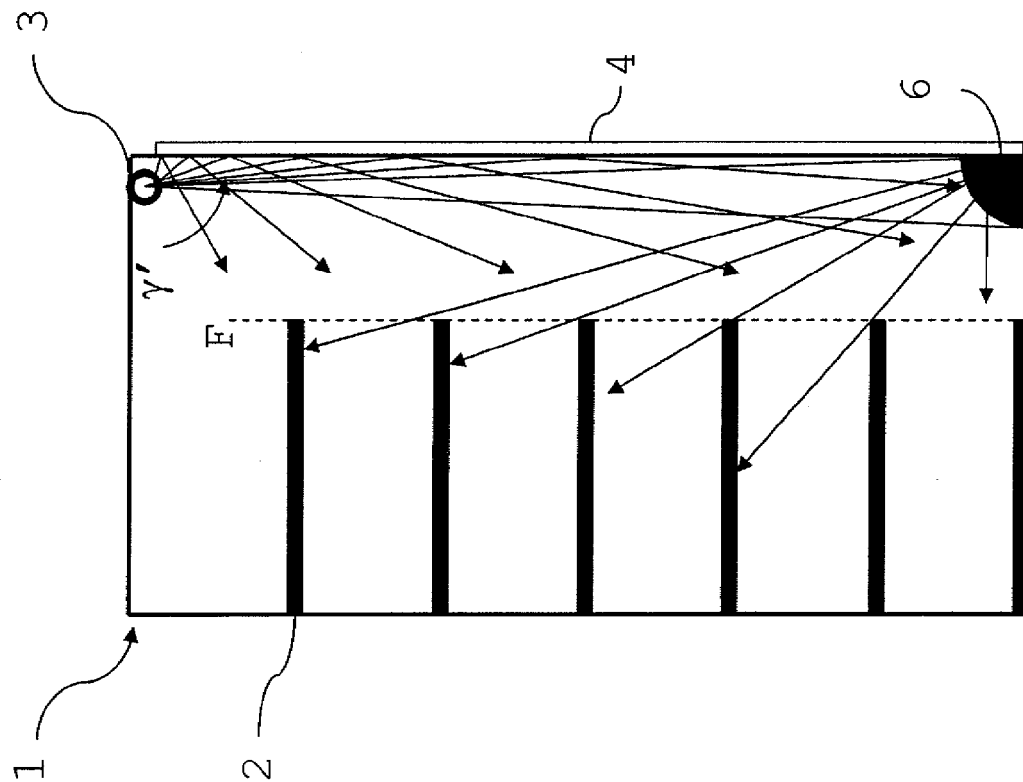


Fig. 3

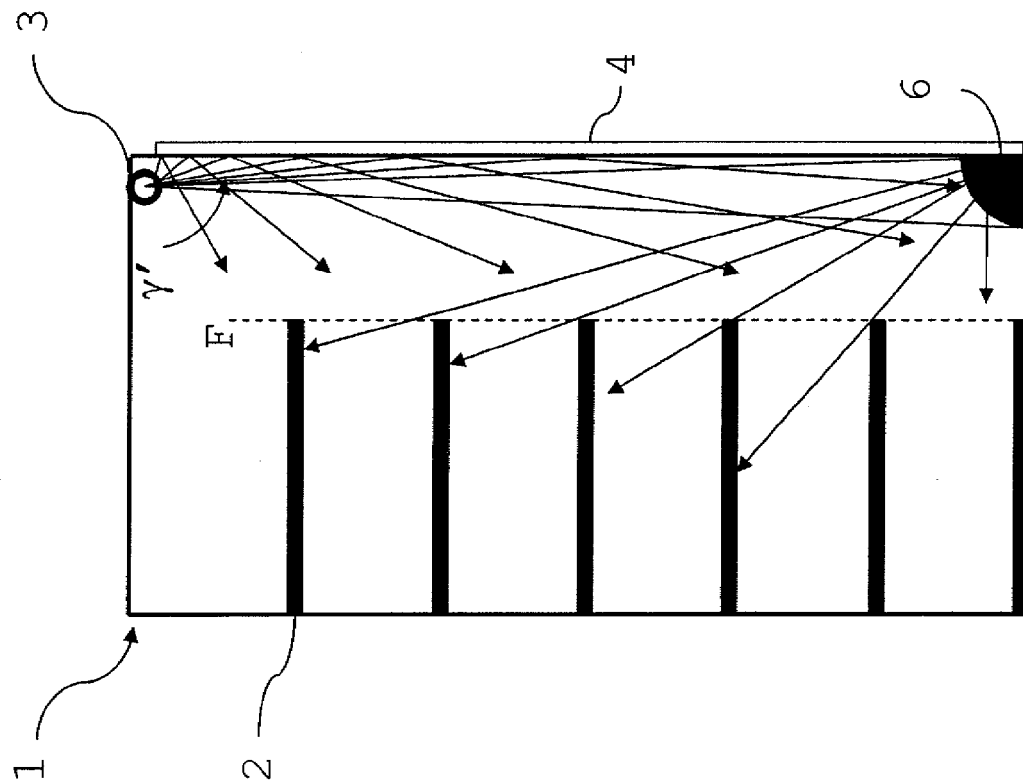


Fig. 4

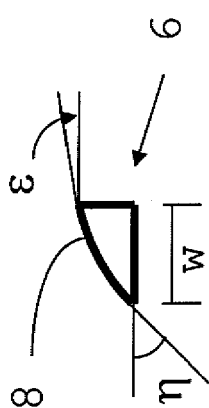


Fig. 5A

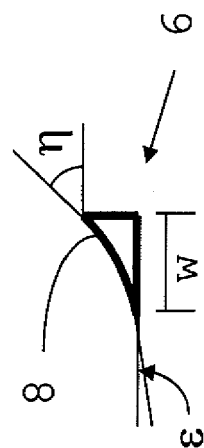


Fig. 5B

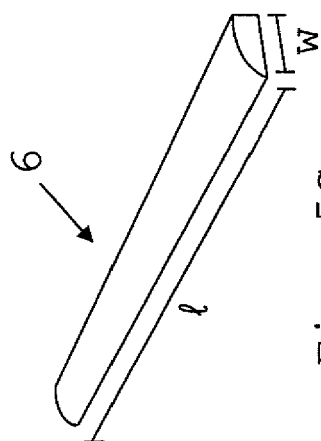


Fig. 5C

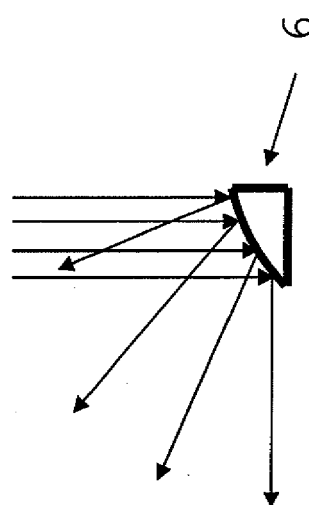


Fig. 5D

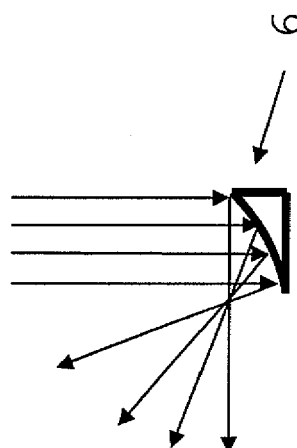


Fig. 5E



EUROPEAN SEARCH REPORT

Application Number
EP 08 16 5516

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/101559 A (CARRIER CORP) 28 September 2006 (2006-09-28) * paragraphs [0037], [0038]; claim 12; figures 1,2,4 *	1,2,4, 6-12	INV. A47F11/10
X	NL 1 022 656 C2 (ETAP NV) 16 August 2004 (2004-08-16) * page 10, line 29 - page 11, line 4; figure 1 * * page 12, line 1 - line 2 *	1,4-6, 9-11	
X	DE 43 05 208 A1 (SWAROVSKI & CO) 25 August 1994 (1994-08-25) * column 2, line 26 - line 29; figure 1 * * column 2, line 56 - line 64 *	1-3,6, 10,11	
X	DE 10 2005 057154 A1 (BSH BOSCH SIEMENS HAUSGERAETE) 31 May 2007 (2007-05-31) * paragraph [0033] - paragraph [0035]; figures 1,2 *	1,4,6, 9-11	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 February 2009	Examiner Jacquemin, Martin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 16 5516

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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24-02-2009

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