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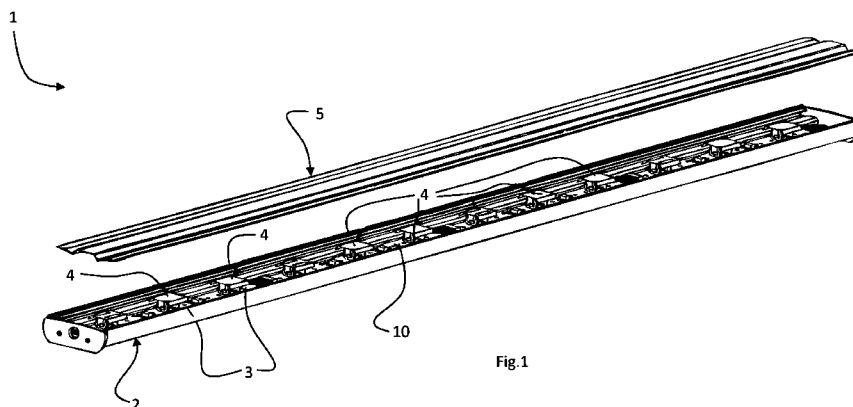


Fig.1

(57) Abstract: A luminaire (1) comprises an elongate structure (2) extending along a longitudinal axis, and a linear array of light emitting diodes (3) mounted on a substrate (10) and extending along the longitudinal axis. There are top reflectors (4) adapted to reflect light emitted by the LEDs to both transverse sides of the luminaire while blocking light in a region between the two transverse sides. The top reflector comprises a pair of longitudinal reflective surfaces (15, 16), one on each side of the longitudinal axis of the luminaire, and these surfaces (15) meet at an inner end at an apex pointing towards the diode. Also, there are transverse reflective surfaces (17) for deflecting emitted light substantially parallel to the plane of the substrate and away from the longitudinal axis of the luminaire. The luminaire is particularly suitable for illuminating a display cabinet, as it avoids need for two separate linear arrays of LED for illuminating for example above and below a product shelf.



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“A Display Cabinet Luminaire”INTRODUCTION5 Field of the Invention

The invention relates to luminaries for display of products, such as in refrigerated cabinets.

10 It is known to use luminaires with light emitting diodes (LEDs) to illuminate products in cabinets such as refrigerated cabinets or on open shelves. It is important for the retailer to ensure that products are well presented and fully visible. However a major problem in the past has been that where fluorescent tubes are used they are unreliable and generate heat. The latter is a particular problem for illumination of products in refrigerated cabinets as they at best increase power consumption of the refrigeration equipment and at worst cause food products in proximity to be
15 spoiled by not being retained below the maximum temperature level.

Our prior published patent application numbers EP1828677 and WO2008/047335 describe LED-based luminaires which reduce power consumption while providing effective product illumination.

20

US7559672 (Inteled) describes a refrigerator luminaire having two mutually tilted lines of LEDs and a Fresnel lens over both lines of LEDs.

The invention is directed towards achieving improved energy efficiency and/or more uniform
25 spread of illumination, and/or simpler manufacture and installation in such luminaries.

Summary of the Invention

According to the invention, there is provided a luminaire comprising

30

an elongate structure extending along a longitudinal axis,

a linear array of light emitting diodes mounted on a substrate and extending along the longitudinal axis, and

35

a top reflector means adapted to reflect light emitted by said array to both transverse sides of the luminaire while blocking light in a region between the two transverse sides.

5 In one embodiment, the top reflector means comprises a discrete reflector for each diode or cluster of diodes.

In another embodiment, each discrete reflector is mounted on the substrate in an arched configuration around and over the diode or diode cluster.

10 In a further embodiment, the top reflector means comprises a pair of longitudinal reflective surfaces, one on each side of the longitudinal axis of the luminaire.

In one embodiment, said surfaces meet at an inner end at an apex pointing towards the diode.

15 In another embodiment, at an outer end each of said surfaces joins an outer longitudinal surface.

In a further embodiment, each of said outer longitudinal surfaces extends at a shallower angle to a plane of the substrate.

20 In one embodiment, the top reflector means comprises transverse reflective surfaces for deflecting emitted light substantially parallel to the plane of the substrate and away from the longitudinal axis of the luminaire.

25 In another embodiment, there is a pair of two opposed transverse reflective surfaces on each side of the longitudinal axis.

In a further embodiment, there are two pairs of opposed transverse reflective surfaces for each diode or diode cluster, the pairs being on either side of the diode or diode cluster along said longitudinal axis.

30

In one embodiment, the discrete reflector is removably mounted by legs on the substrate.

In another embodiment, the luminaire further comprises a side reflector means arranged to reflect some light emitted from the LEDs or reflected from the top reflector means.

35

In a further embodiment, the side reflector is arranged to reflect some light into the space from which light is blocked by the top reflector means.

5 In one embodiment, the side reflector comprises a reflective strip removably mounted onto the structure on each side of the longitudinal axis.

In another embodiment, transverse sides of the side reflectors snap-fit into grooves in the structure.

10 In a further embodiment, the luminaire further comprises a cover over the LEDs, configured to act as dispersing lens.

In one embodiment, the structure is configured to act as a mullion.

15 In another embodiment, the structure comprises a front part providing a mullion external surface, and an internal part supporting the substrate.

In a further embodiment, a side of the structure opposed to the diodes has longitudinal ridges and grooves to allow snap-fitting of a cover.

20

In one embodiment, said cover is a label.

In another embodiment, the luminaire comprises a flexible seal extending from the structure on each side of the longitudinal axis in a rearward direction away from the diodes.

25

In a further embodiment, the seal is of silicone material.

In one embodiment, each seal is configured to snap fit into a longitudinal groove of the structure.

30 In another aspect there is provided a luminaire comprising:

an elongate structure extending along a longitudinal axis,

a linear array of light emitting diodes mounted on a substrate and extending along the
35 longitudinal axis, and

a flexible seal extending from the structure on each side of the longitudinal axis in a rearward direction away from the diodes, said seals being configured to enclose a space between the structure and a cabinet structural member.

5

In one embodiment, the seal is of moulded construction, configured to fit into a longitudinal groove or around a longitudinal ridge of the structure.

10 In another aspect there is provided a display case comprising a luminaire as defined above and a product support shelf, the luminaire being mounted so that the shelf is closest to a central plane extending through the longitudinal axis, working distance increases with angle of divergence from the central plane, and the top reflector means causes illumination intensity to increase with angle of divergence from said central plane.

15 In one embodiment, the luminaire is mounted such that the shelf is substantially normal to said central plane.

In another embodiment, the luminaire is mounted on a sliding door support over said shelf.

20 In a further embodiment, the luminaire is mounted vertically between display case frame members.

In one embodiment, the luminaire is mounted behind hinges of two opposed doors, diverging light from the luminaire illuminating products behind both of the doors.

25

In another aspect, the invention provides a display cabinet comprising a plurality of structural members and a luminaire having seals as defined above in any embodiment, wherein said seals enclose a space between the luminaire structure and a structural member along at least part of the length of the luminaire.

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Detailed Description of the Invention

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only with reference to the accompanying
35 drawings in which:-

Fig. 1 is an exploded perspective view of a luminaire of the invention;

5 Figs. 2 and 3 are perspective and side views of an individual LED and associated top reflector;

Fig. 4 is an end view of the luminaire;

10 Fig. 5 is a diagram showing mounting of two luminaries at cabinet mullions and the line of sight of a person;

Fig. 6 is a set of plots showing illumination patterns

15 Fig. 7 is a diagram showing a display cabinet incorporating a luminaire of the invention, directed downwardly to uniformly illuminate products in a horizontal plane,

20 Fig. 8 is a plot showing approximate luminaire-observed surface area across the width of the cabinet, Fig. 9 is a plot showing approximate light emission intensity across the width of the cabinet, and Fig. 10 is a plot showing approximate light intensity at the working distance;

Figs. 11 and 12 are diagrams showing vertical mounting of a luminaire of the invention behind a door of a cabinet;

25 Fig. 13 is set of views showing mounting of a luminaire of the invention at the edge of a shelf, achieving illumination above and below the shelf; and

Fig. 14 is an end view of an alternative luminaire.

30 Description of the Embodiments

Referring to Figs. 1 to 4 there is shown a luminaire 1 comprising a main structure 2 which also acts as a mullion for a refrigerated display cabinet. The luminaire 1 is of elongate shape, and its length can be chosen to suit any cabinet configuration. A PCB 10 runs along the length of the
35 luminaire, and a one-dimensional linear array of LEDs 3 is mounted on the PCB 10. There is a

discrete top reflector 4 mounted over and around each LED 3. A shaped lens 5 is clipped onto the structure 2 and also extends along the length of the luminaire so that it is operative for all of the LEDs 3.

5 The substrate 10 has drive circuits for the LEDs 3, and these may be according to our prior published specification no. WO2008/047336 for example.

Referring to Figs. 2 and 3 each discrete reflector 4 presents eight polished reflective surfaces to the LED 3. These are the internal surfaces of the following walls on each side of a longitudinal
10 axis through the LEDs 3:

a wall 15 which extends in a direction having upward and transverse components with respect to the PCB 10,

a wall 16 extending as a continuation of a wall 15 but at a shallower angle to the plane of the PCB 10, and

15 two vertical end walls 17 each of which extends in a direction having longitudinal and transverse components with respect to the PCB luminaire.

Thus, there are four reflective surfaces on each side of this axis, giving eight in total, and the top reflector 4 is arranged in the general form of an arch around and over each LED 3. The material
20 of the top reflector 4 is moulded plastics, the reflective surfaces of which are coated in aluminium in a vapour deposition process for good reflectivity. Also, each top reflector 4 is supported by legs 20 which engage in corresponding apertures in the substrate 10.

Referring particularly to Fig. 4 the luminaire 1 also comprises an elongate removable lower
25 cover 30 having opposed lips 31 snap-fitting over opposed ridges 32 of the structure 2. At the top side the structure 2 comprises two pairs of opposed ridges 33 and 34, which retain between them a side reflector 40 and the lens 5. The arrangement of the structure 2 allows flexibility as the side reflector 40 can be removed for some applications. For example, referring to Fig. 5 two luminaries 50 are spaced-apart in the vertical plane in a cabinet behind mullions 51. The
30 luminaries 50 do not have side reflectors in this embodiment. Also, the structure 2 supports a pair of opposed snap-fitted silicone seals 52 shaped to cover the gap between the luminaire body and the mullion 51 on each side of the longitudinal axis. The seals span the gap from the structure 2 to the mullion 51, creating a barrier preventing the movement of air from behind the mullion into the freezer. Also, the seals 52 define a closed space between them. This space is
35 heated by heat conduction through the structure 2 and radiation from it. The seals 52 therefore

essentially channel the heat towards the mullion 51 while preventing it from entering the space around the luminaire 50. This reduces or eliminates the need for dedicated (typically resistive) heating in the mullion to prevent condensation (“sweating”) on the outside of the cabinet, or even frost on a surface of the mullion. In addition, it prevents air that has been heated by the luminaire from circulating into the freezer, decreasing the energy consumption of the freezer. Finally, it prevents food residues or other particles from entering the space created between mullion and luminaire.

Fig. 5 also shows that the structure 2 blocks laterally-directed light so that a customer does not look directly into emitted light; it only illuminates the products within the cabinet. In this way, the structure acts a visor on each side.

The luminaire 1 shapes the light output to provide substantially uniform light across a cabinet with minimum losses of light.

15

The side reflectors 40 run along the entire length of the luminaire, on two sides of the light engine (assembly of electronic boards carrying the linear array of LEDs), of discrete reflectors, located over the LEDs, and fixed onto the boards (in our case they clip in through two little holes in the board) and of a plastic extrusion cover acting as dispersing lens.

20

Each discrete reflector 4 exhibits the following specific properties and attributes and carries the following functions:

- The size of the reflector 4 is appropriate for the scale of the LED, such that the LED cannot be considered a point source relative to the reflector.
- It deflects all light emitted directly vertically from the LED 3, such that little or no light is reflected towards the LED or the substrate 10 on which the LED is placed.
- It deflects all light going along the axis of the luminaire.
- It projects light on and close to a plane parallel to the plane defined by the substrate 10.
- It enables variability and flexibility in the pitch of LEDs 3 along the luminaire.
- It can be clipped by the legs 20 onto the substrate 10. In another embodiment, it may be placed by pick-and-place machine during surface mount technology process (SMT) when the boards are being populated.

30

The side reflectors 40 are positioned on either side of the light engine in some embodiments, to channel some of the emitted the light towards the centre of the cabinet. These reflectors run

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along the entire length of the luminaire, and are therefore independent of the LED pitch. They reflect light coming directly from the LED towards the back of the mullion, behind the discrete reflectors 4. Also, they reflect the light reflected from the discrete reflectors towards the middle of the cabinet. They are held up in place by the light engine (electronics boards) and the extruded cover.

The lens 5 increases the uniformity of the light normal to the axis of the luminaire. It consists of a plastics extruded material containing grooves running along the length of the luminaire. On the inner side of the extrusion, two grooves are present on either side of the position determined by the discrete reflector 4. The start of these grooves coincides with the edge of the discrete reflector. On the upper side of the extrusion, a series of four grooves is present above each underside grooves. The grooves have the function of dispersing light, similarly to a dispersing lens.

Thus in general if one considers that each LED emits light in a substantially hemispherical shape, the top reflector 4 blocks from the hemisphere a large region above the LED. The full intensity of emitted light is hence combined into two regions transversely of the longitudinal axis of the luminaire. If one considers that there is a plane extending through the LED linear array and the top reflectors 4, then the top reflector reflects light away from a region including this plane. A major benefit is that a single linear array of LEDs effectively provides illumination of two separate regions on each transverse side of the luminaire, avoiding need for two separate linear arrays of LEDs and hence reducing cost and power consumption. Some applications of this are described below, from which it will be seen that there is excellent flexibility. Furthermore, the invention provides the benefit of, where desired, allowing a certain amount of illumination in the otherwise blacked-out region by use of the side reflectors. This provides flexibility, as it allows the luminaire to be configured on site for use where a low level of intensity is required in the plane through the LEDs and top reflectors. The fact that the intensity is low in this region is compensated for because the product to be illuminated is closest to the luminaire along this plane.

30

The effect of the optical setup consisting of the discrete reflectors 4, the side reflectors 40 and the lens 5 is shown in Fig. 6. The dotted line shows the output without reflectors, the continuous line that for the output with both top and side reflectors. Of course, if the side reflectors are omitted, then the centre would be darker, and so use of the side reflectors can be decided upon according to the manner in which the luminaire is mounted in the cabinet

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Referring to Fig. 7 another example of use of the luminaire 1 is illustrated. It is in a refrigerated cabinet 150 having curved sliding doors 151 on a cabinet body 152. The illuminator 1 is directly over the product giving an observed surface area profile of Fig. 8. Because of the top reflectors 4 within the luminaire 1 there is a much lower emission directly beneath it (Fig. 9). However, due to the range of distances of product on a horizontal shelf below the doors from the luminaire as illustrated by distances D1 and D2 in Fig. 7 there is a substantially uniform product surface illumination as shown in Fig. 10, even at wide angles to the plane through the LEDs and the top reflectors. These diagrams are approximate only.

10

In another example, shown in Figs. 11 and 12, a luminaire 1 of the invention is mounted vertically between bottom and top display case frame member 201, and behind doors 202. The luminaire 1 provides structural support to the frame, and has features 210 and 211 at its front side for attachment of an item such as a heater element to prevent door glass condensation, or a label. These may be attached in a manner akin to snap-fitting of the rear casing part 30 shown in Fig. 4. In this example, the luminaire 1 is behind flexible door seals 203, next to the door hinges 204. The door opening direction is shown by the arrow A.

15

Referring to Fig. 13, the luminaire 1 may be mounted along the front edge of a shelf S. Here, it provides illumination both above and below the shelf. As shown, a price tag 120 may be supported, again in a manner akin to the rear casing part 30.

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Referring to Fig. 14 in a luminaire 300 a simple lens 303 is shown placed over a series of reflectors 4. The lens 303 is snap-fitted into grooves 302. In this embodiment, there are no side reflectors.

25

The invention is not limited to the embodiments described but may be varied in construction and detail. For example, where the luminaire is mounted behind cabinet doors, it may be behind doors which open in the same sense, rather than behind opposed doors as illustrated. In another embodiment, the lens is structured for more physical conformity with the external shape of the reflectors as viewed in cross-section. Also, the arrangement of side seals to define an enclosure between the luminaire and a mullion may be employed in a luminaire without a top reflector. Further the luminaire may extend along a longitudinal axis which is curved instead of being straight. The linear array of LEDs may be more than one LED across in some embodiments. For example instead of there being a single LED under each top reflector, there may be a small

35

cluster, possibly of different colours chosen according to colour mixing (eg. CRI or colour temperature) requirements. The LEDs may be bare or encapsulated. Further, it is envisaged that, though the embodiments described above are preferred, the top reflector need not have flat planar surfaces. For example they could be curved, either concave or convex. Indeed it is
5 envisaged that they may not meet at a discrete apex, instead being in a single continuous curve.

Claims

1. A luminaire comprising
5 an elongate structure (2) extending along a longitudinal axis,

a linear array of light emitting diodes (3) mounted on a substrate (10) and extending
along the longitudinal axis, and

10 a top reflector means (4) adapted to reflect light emitted by said array to both transverse
sides of the luminaire while blocking light in a region between the two transverse sides.
2. A luminaire as claimed in claim 1, wherein the top reflector means comprises a discrete
reflector (4) for each diode (3) or cluster of diodes.
- 15 3. A luminaire as claimed in claim 2, wherein each discrete reflector (4) is mounted on the
substrate (10) in an arched configuration around and over the diode (3) or diode cluster.
4. A luminaire as claimed in any preceding claim, wherein the top reflector means
20 comprises a pair of longitudinal reflective surfaces (15, 16), one on each side of the
longitudinal axis of the luminaire.
5. A luminaire as claimed in claim 4, wherein said surfaces (15) meet at an inner end at an
apex pointing towards the diode.
- 25 6. A luminaire as claimed in claims 4 or 5, wherein at an outer end each of said surfaces
(15) joins an outer longitudinal surface (16).
7. A luminaire as claimed in claim 6, wherein each of said outer longitudinal surfaces
30 extends at a shallower angle to a plane of the substrate.
8. A luminaire as claimed in any preceding claim, wherein the top reflector means
comprises transverse reflective surfaces (17) for deflecting emitted light substantially
parallel to the plane of the substrate and away from the longitudinal axis of the luminaire.

9. A luminaire as claimed in claim 8, wherein there is a pair of two opposed transverse reflective surfaces (17) on each side of the longitudinal axis.
- 5 10. A luminaire as claimed in claim 9, wherein there are two pairs of opposed transverse reflective surfaces for each diode or diode cluster, the pairs being on either side of the diode or diode cluster along said longitudinal axis.
- 10 11. A luminaire as claimed in any of claims 2 to 10, wherein the discrete reflector is removably mounted by legs on the substrate.
12. A luminaire as claimed in any preceding claim, wherein the luminaire further comprises a side reflector means arranged to deflect some light emitted from the LEDs or reflected from the top reflector means.
- 15 13. A luminaire as claimed in claim 12, wherein the side reflector is arranged to reflect some light into the space from which light is blocked by the top reflector means.
- 20 14. A luminaire as claimed in claims 12 or 13, wherein the side reflector comprises a reflective strip removably mounted onto the structure on each side of the longitudinal axis.
- 25 15. A luminaire as claimed in claim 14, wherein transverse sides of the side reflectors snap-fit into grooves in the structure.
- 30 16. A luminaire as claimed in any preceding claim, wherein the luminaire further comprises a cover over the LEDs, configured to act as dispersing lens.
- 35 17. A luminaire as claimed in any preceding claim, wherein the structure is configured to act as a mullion.
18. A luminaire as claimed in claim 17, wherein the structure comprises a front part providing a mullion external surface, and an internal part supporting the substrate.
19. A luminaire as claimed in any preceding claim, wherein a side of the structure opposed to the diodes has longitudinal ridges and grooves to allow snap-fitting of a cover.

20. A luminaire as claimed in claim 19, wherein said cover is a label.
21. A luminaire as claimed in any preceding claim, wherein the luminaire comprises a
5 flexible seal extending from the structure on each side of the longitudinal axis in a rearward direction away from the diodes.
22. A luminaire as claimed in claims 21, wherein the seal is of silicone material.
- 10 23. A luminaire as claimed in either of claims 21 or 22, wherein each seal is configured to snap fit into a longitudinal groove of the structure.
24. A luminaire comprising:
- 15 an elongate structure (2) extending along a longitudinal axis,
a linear array of light emitting diodes (3) mounted on a substrate (10) and extending along the longitudinal axis, and
- 20 a flexible seal (52) extending from the structure (2) on each side of the longitudinal axis in a rearward direction away from the diodes, said seals being configured to enclose a space between the structure and a cabinet structural member.
- 25 25. A luminaire as claimed in claim 24, wherein the seal is of moulded construction, configured to fit into a longitudinal groove or around a longitudinal ridge of the structure.
26. A display case comprising a luminaire of any preceding claim and a product support
shelf, the luminaire being mounted so that the shelf is closest to a central plane extending
30 through the longitudinal axis, working distance increases with angle of divergence from the central plane, and the top reflector means causes illumination intensity to increase with angle of divergence from said central plane.
27. A display case as claimed in claim 26, wherein the luminaire is mounted such that the
35 shelf is substantially normal to said central plane.

28. A display case as claimed in claim 27, wherein the luminaire is mounted on a sliding door support over said shelf.
- 5 29. A display case as claimed in claims 26 or 27, wherein the luminaire is mounted vertically between display case frame members.
30. A display case as claimed in claim 29, wherein the luminaire is mounted behind hinges of two opposed doors, diverging light from the luminaire illuminating products behind both
10 of the doors.
31. A display case comprising a plurality of structural members and a luminaire of claim 24, wherein said seals enclose a space between the luminaire structure and a structural member along at least part of the length of the luminaire.

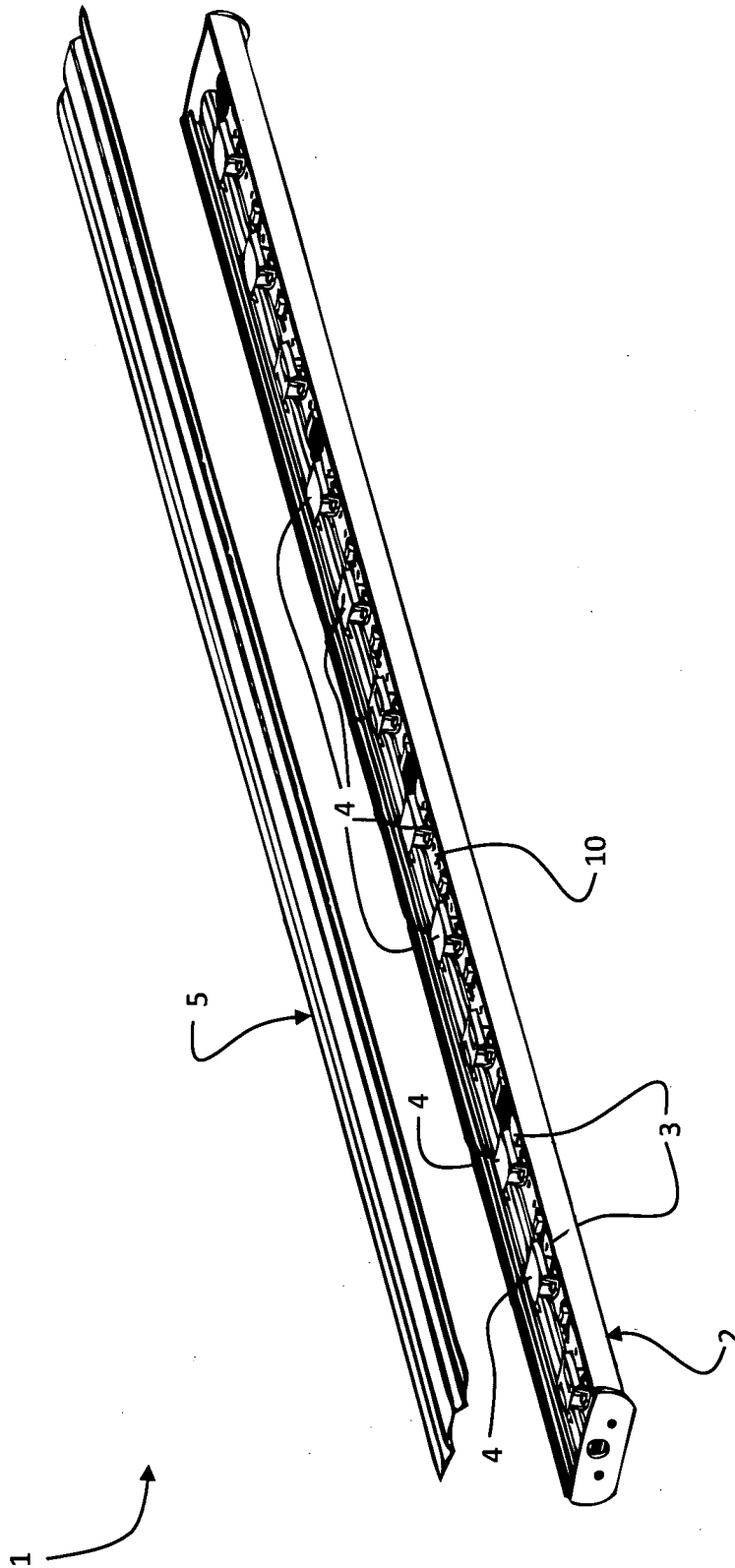


Fig.1

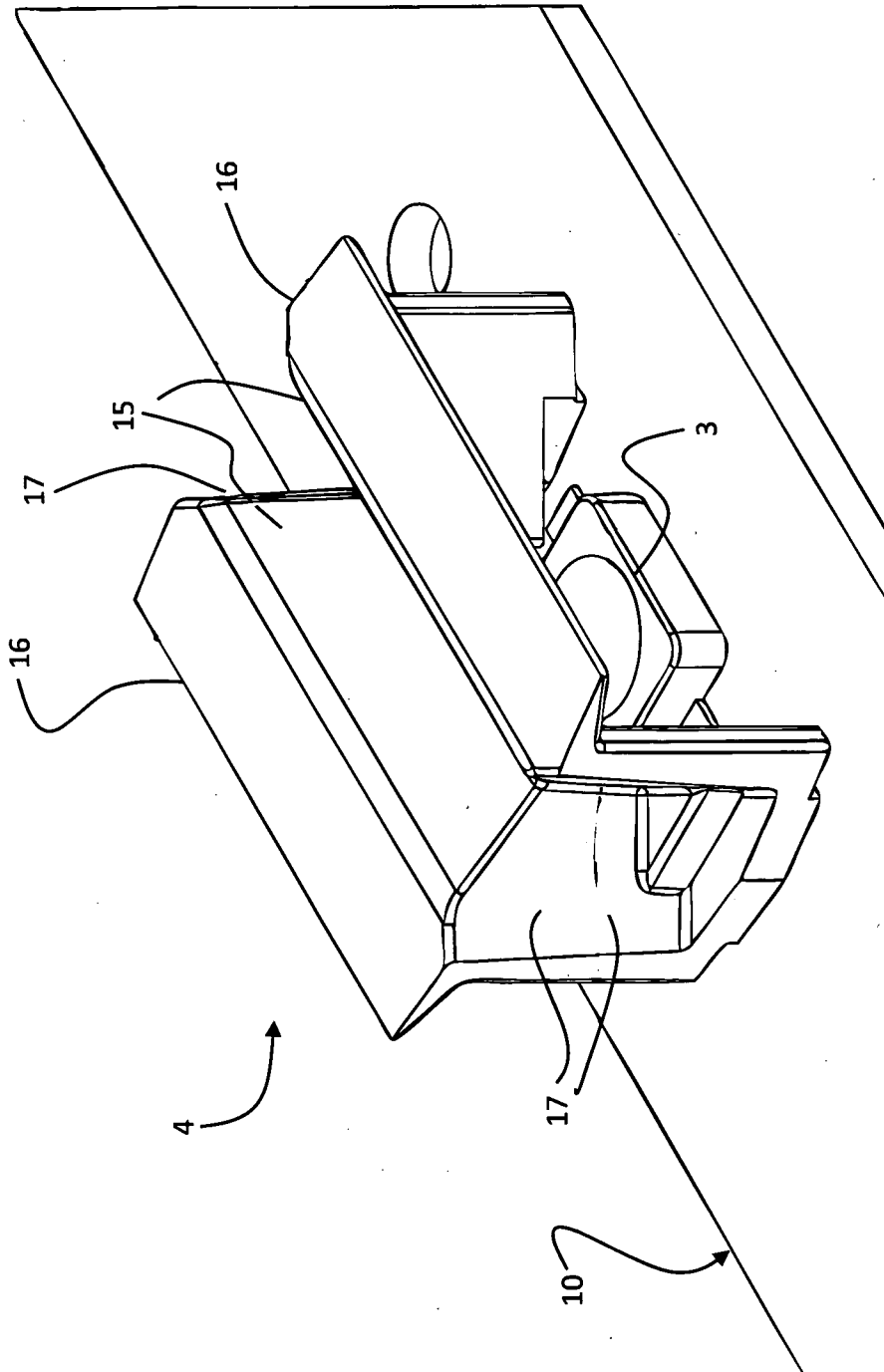


Fig.2

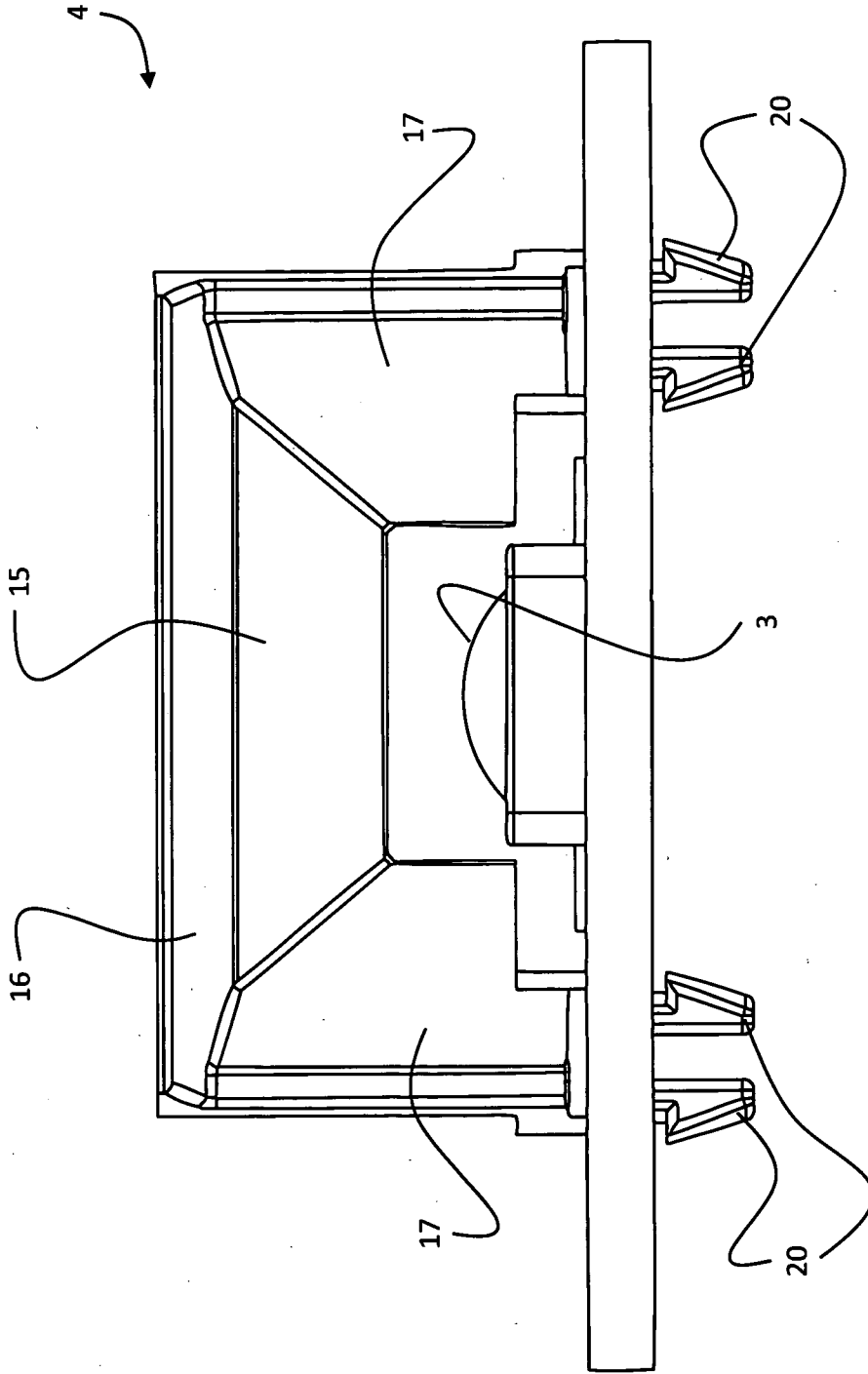


Fig.3

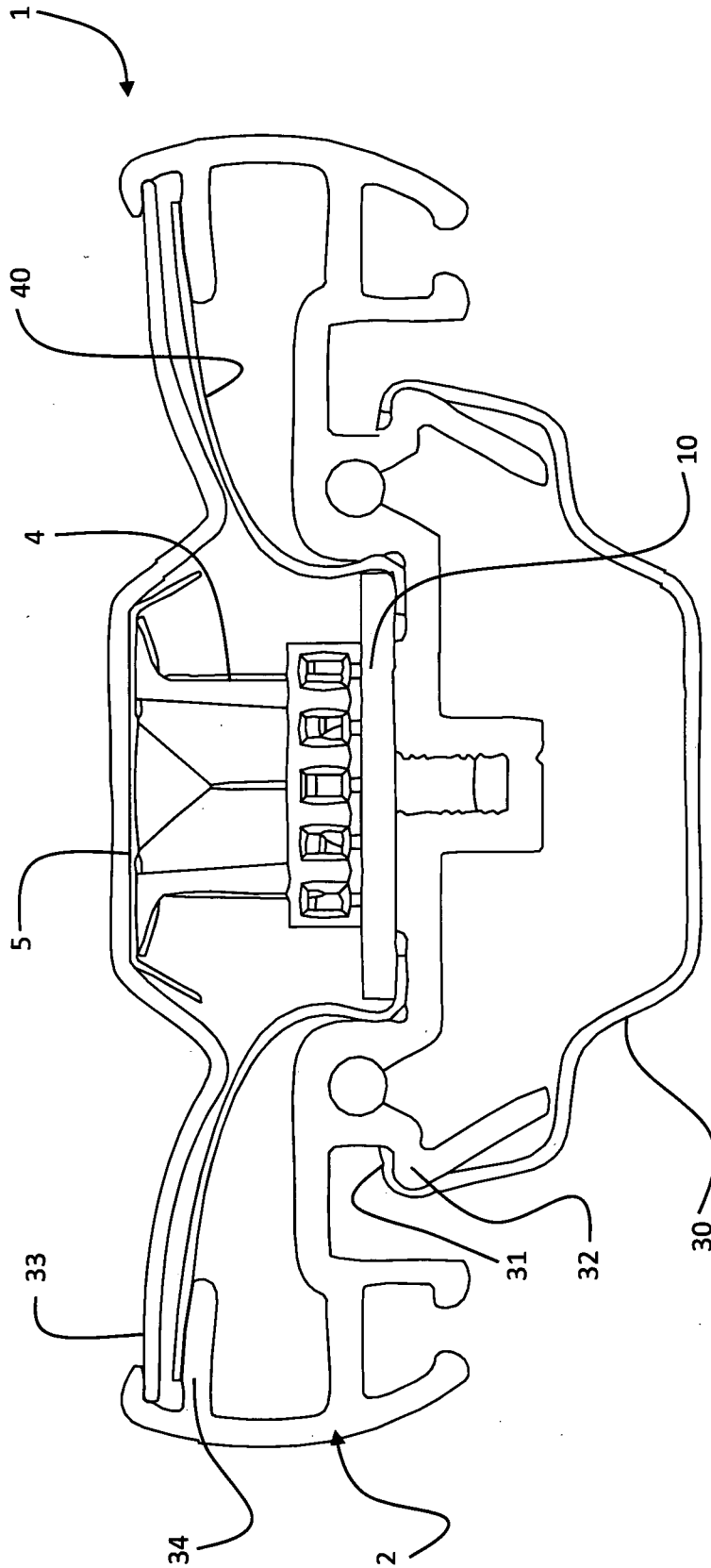


Fig.4

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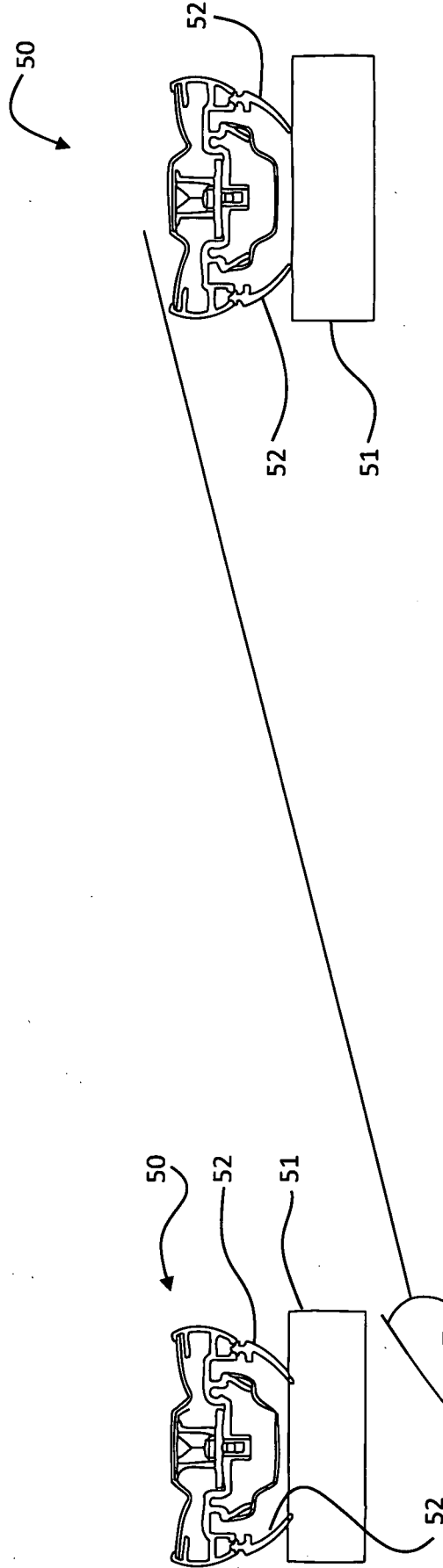


Fig.5

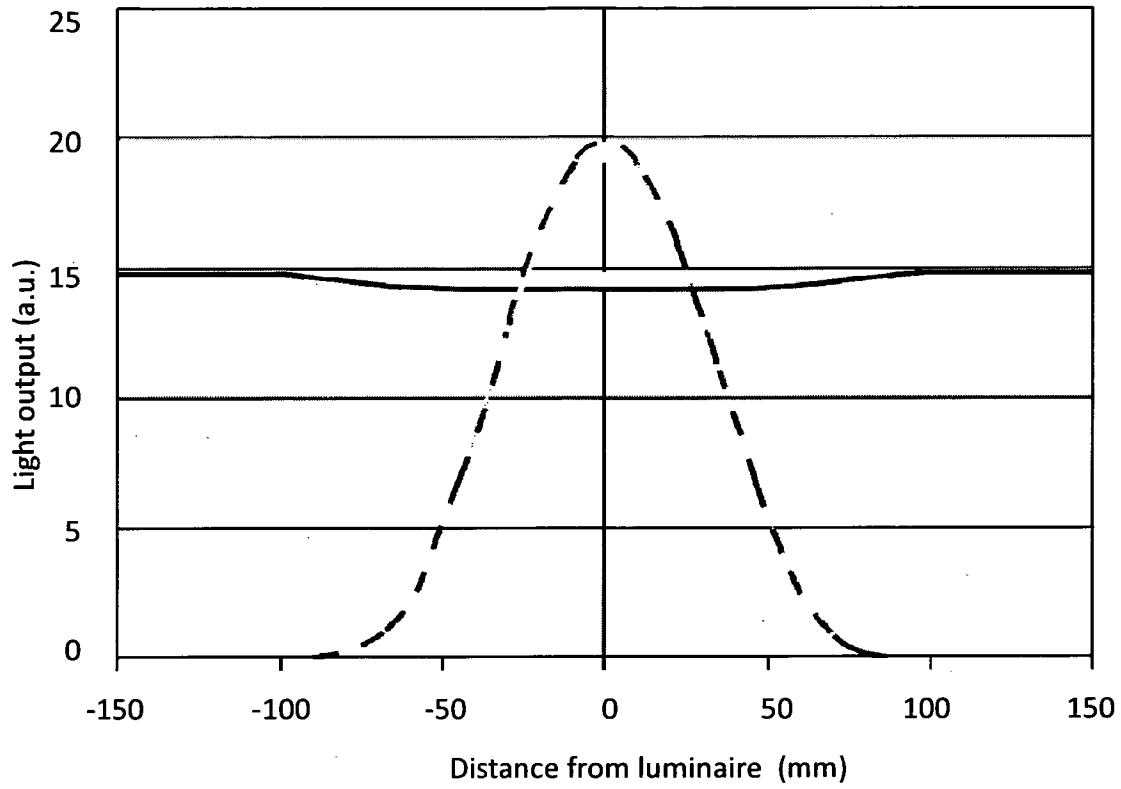
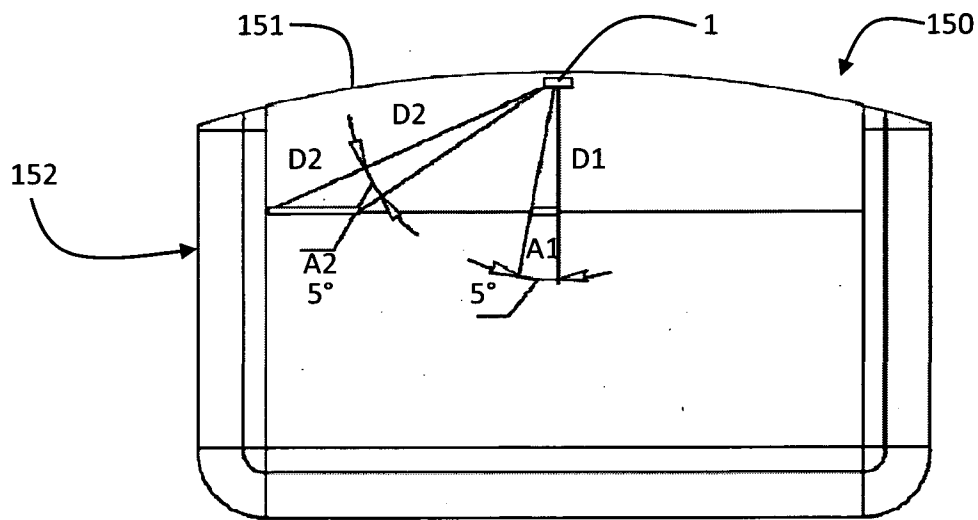


Fig.6



With A =Luminaire observed surface are as function of angle
 D =Distance of luminaire to product illumination level

$$D2 > D1$$

$$A2 > A1$$

Fig.7

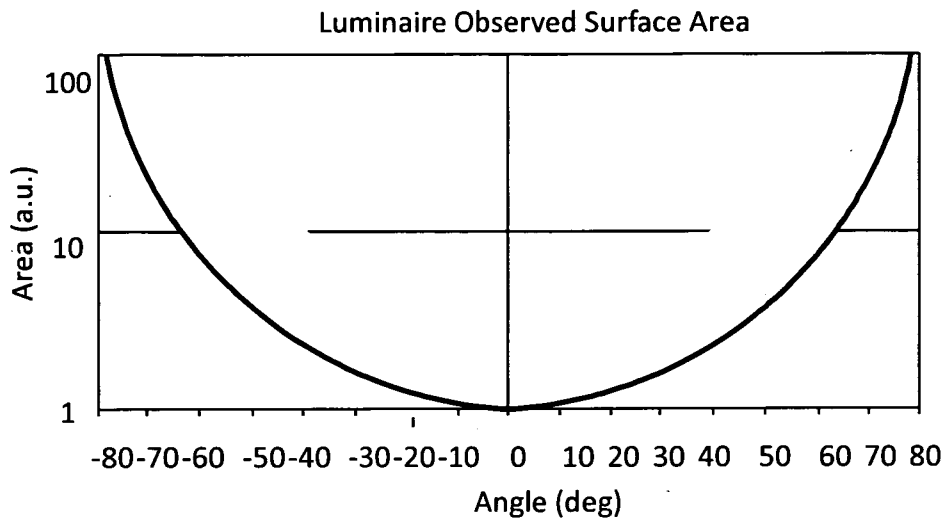


Fig.8

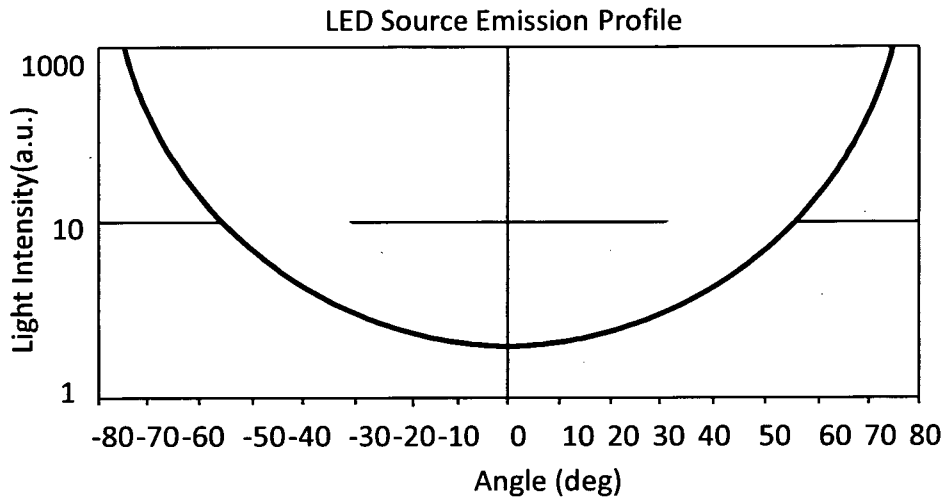


Fig.9

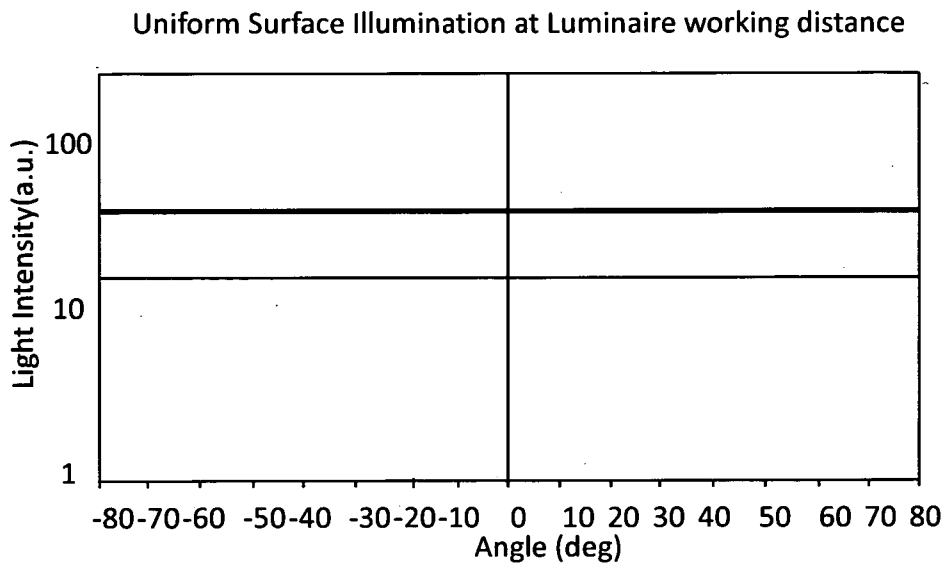


Fig.10

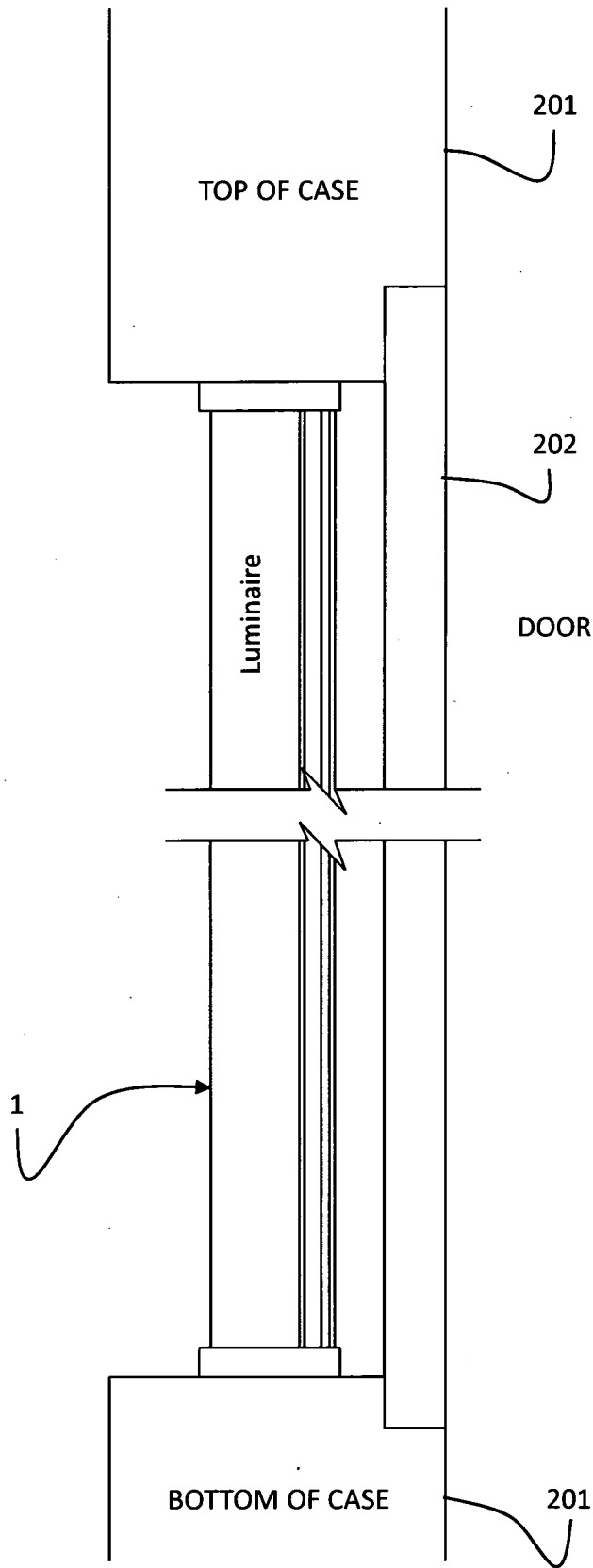


Fig.11

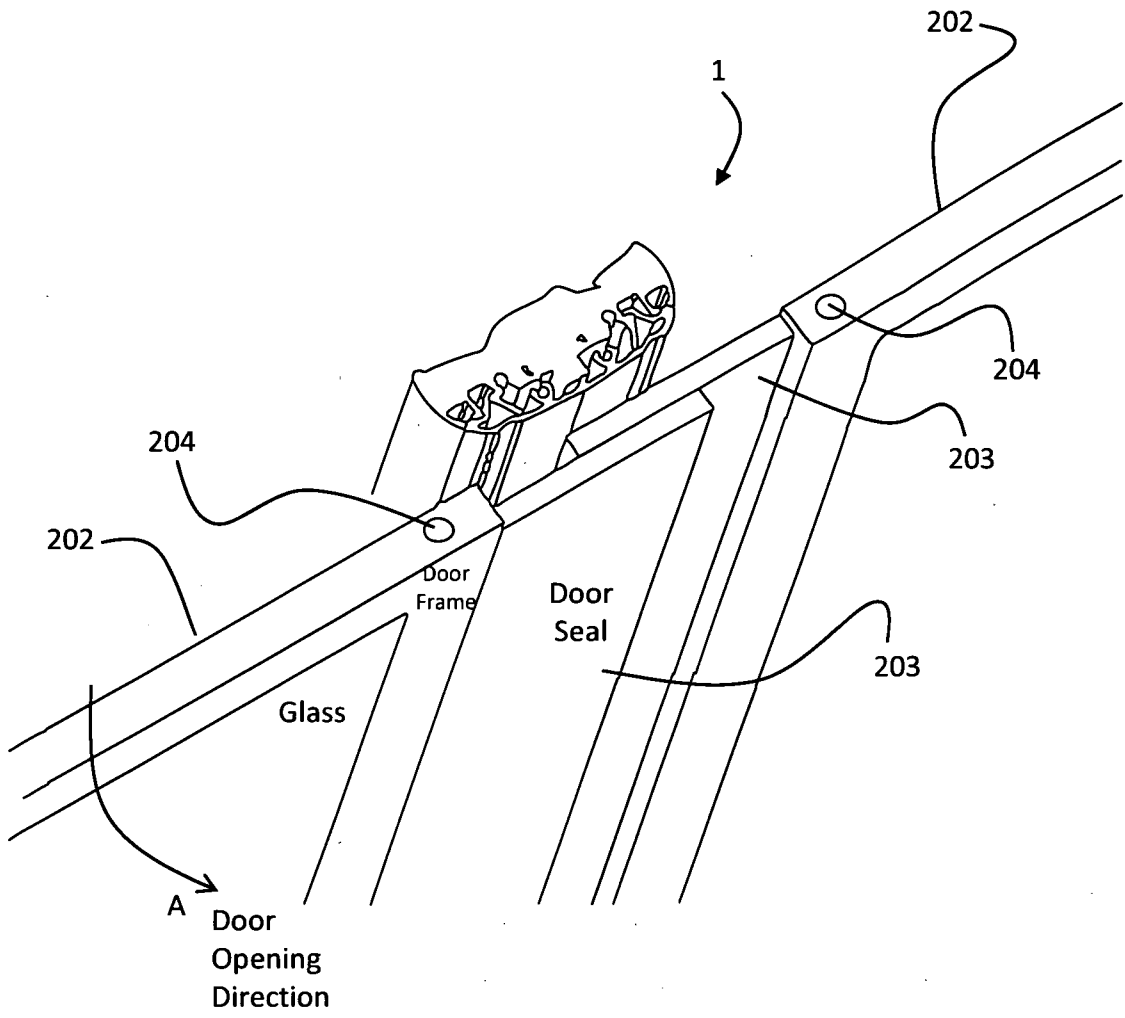


Fig.12

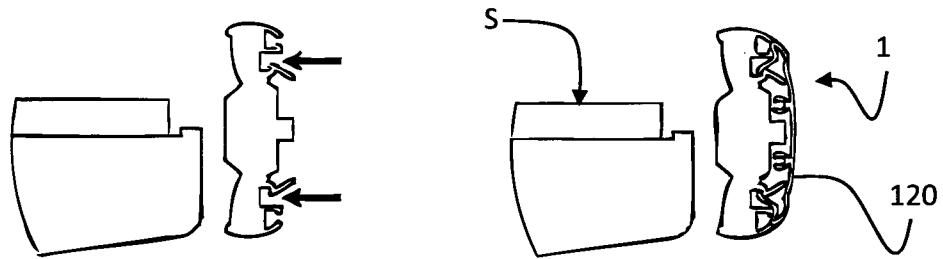
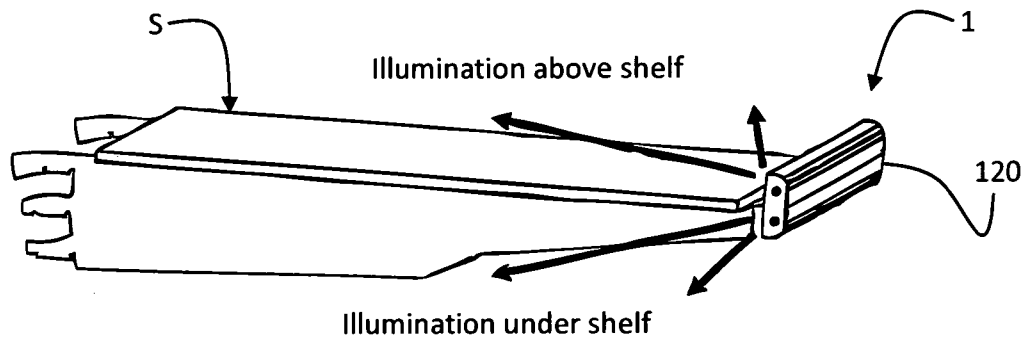


Fig.13

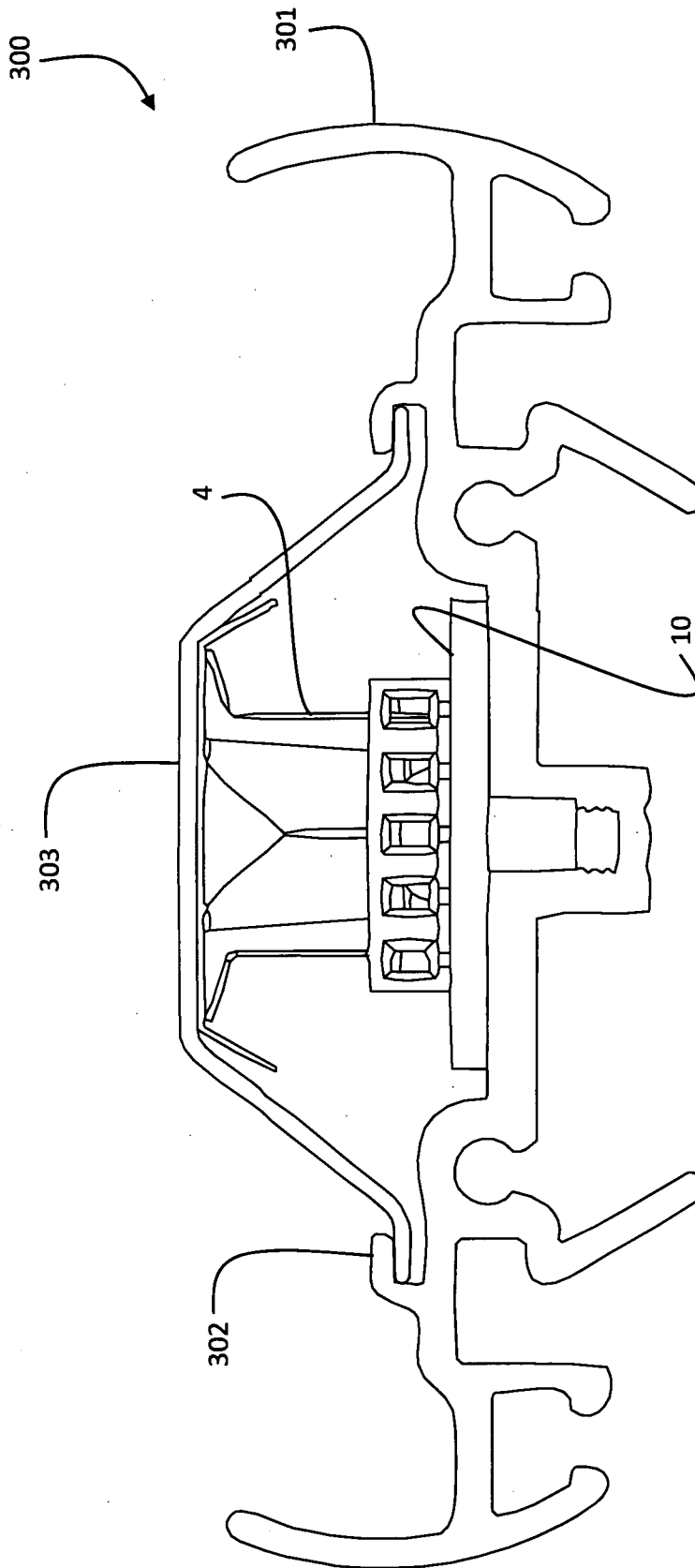


Fig.14

INTERNATIONAL SEARCH REPORT

International application No
PCT/IE2009/000073

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F21S4/00 F21V7/09
 ADD. F21Y101/02 F21W131/305 F21W131/405

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)
 F21S F21V

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.
X	WO 01/07828 A1 (TELEDYNE LIGHTING & DISPLAY [US]) 1 February 2001 (2001-02-01) page 3, line 25 - page 5, line 17	1-3, 11, 20
Y	page 6, line 33 - page 7, line 31 page 8, line 32 - line 35 figures 1,2,8	8-10, 16, 19-20
X	WO 2008/027314 A2 (LUMINATION LLC [US]) 6 March 2008 (2008-03-06)	1
Y	paragraphs [0027] - [0033] figures 2,3,4,8	8-10
X	US 2006/146531 A1 (REO ANN [US] ET AL) 6 July 2006 (2006-07-06)	1, 11
Y	paragraph [0049] figures 2,3	16, 19-20
	----- -/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

8 December 2009

Date of mailing of the international search report

09/03/2010

Name and mailing address of the ISA/

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Authorized officer

Cosnard, Denis

INTERNATIONAL SEARCH REPORT

International application No

PCT/IE2009/000073

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/206375 A1 (PIEPGRAS COLIN [US] ET AL LYS IHOR A [US] ET AL) 6 September 2007 (2007-09-06) paragraph [0123] figure 20 -----	1,4,5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IE2009/000073

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-23, 26-30

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-23, 26-30

Luminaire with elongated structure, linear array of light emitting diodes and top reflector means

2. claims: 24-31

Luminaire with elongated structure, linear array of light emitting diodes and flexible seal extending from the structure on each side of the structure in a direction away from the diodes

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IE2009/000073

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0107828	A1	01-02-2001	AT 380971 T 15-12-2007
			AU 6202600 A 13-02-2001
			CA 2402037 A1 01-02-2001
			DE 60037427 T2 05-02-2009
			EP 1200772 A1 02-05-2002
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			JP 2003505835 T 12-02-2003
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US 2006146531	A1	06-07-2006	NONE
US 2007206375	A1	06-09-2007	NONE