



PATENT SPECIFICATION

(11) S85667

(21) Application No. S2009/0055

(22) Date of Filing of Application: 19/01/2009

(45) Specification Published: 05 January 2011

(51) Int. Cl. (2009)
F21S 8/04
F21V 5/00
F21V 19/02

(54) Title: A luminaire apparatus

(72) Inventor: GERARD FRANCIS HAMILTON

(73) Patent Granted to: GERARD FRANCIS HAMILTON, An Irish citizen, Patina Mart Lane
Foxrock, Dublin 18, Ireland

The present invention relates to a luminaire apparatus suitable for commercial environments.

5

There are a large selection of luminaries used in commercial environments, particularly where light sources are typically mounted at between 2 meters and 5 meters. Usually in such luminaries the light source comprises an arrangement of one or more fluorescent tubes. Typically the fluorescent tubes vary in length from 0.6m (2ft) to 1.5m (5ft). When
10 used at these heights, the fluorescent tubes are normally surrounded by high reflection louvers in an attempt to improve optical efficiencies. Despite this fact the light output ratio for conventional luminaries are between 50 and 60%. There are also problems with glare, shading and light control.

15 In some environments it is preferable to cover or enclose these light sources with refractors or diffusers in order to protect the area beneath the light source in the event of tube damage. Whilst use of diffusers or prismatic materials has the benefit of addressing the problem of glare, such diffusers create the further problem of reducing the light output ratio thus reducing the optical efficiencies of the luminaire further.

20

It is an object of the present invention to provide a more energy and optically efficient luminaire apparatus and to seek to alleviate the aforementioned problems.

According to the invention, there is provided a luminaire apparatus comprising optical
25 elements and electrical elements, the optical elements comprising a reflector unit having a longitudinal axis and comprising an arcuate base member and a separable frame member, the frame member comprising two opposing spaced apart end members and two opposing spaced apart elongate side members wherein the end members adjoin the side members to form a closed frame, the optical elements further comprising at least one bulb
30 mountable centrally along the said longitudinal axis of the reflector unit by means of at least one lampholder positioned in or adjacent one or both end members of the frame member of the reflector unit wherein the frame member and base member seat together to form a reflector unit having an inverted substantially parabolic cross sectional profile wherein the at least one light source is positioned in the interior of the reflector unit
35 adjacent the arcuate base member.

The advantage of this luminaire apparatus is that the optical efficiency of the apparatus is significantly increased over known luminaire apparatus. The arrangement of the reflector unit of the present invention improves the light output ratio beyond levels achieved by conventional luminaire apparatus using high reflection louvers. For example the light output ratio on existing conventional like luminaire apparatus is at levels between 50 and 60%. In contrast the light output ratio on the luminaire apparatus of the invention is at levels between 70 and 80%.

Furthermore there are significant energy efficiencies as the energy required to power the luminaire apparatus of the invention is significantly lower.

Conveniently the provision that the separate components of the reflector unit seat together to form a substantially parabolic shaped reflector provides a reflector with minimal angles and smooth flow characteristic which further contributes to the efficiency of the light output ratio whilst ensuring reduced glare and allows for better light control.

In one embodiment of the invention the luminaire apparatus is contained within housing. Preferably the housing has a door having an open panel. Optionally the open panel may be sized so as to form the door of the housing. Preferably the door of the housing is hinged for ease of maintenance. Conveniently the open panel of the door of the housing may be covered using a refractive material. Ideally the refractive material is a prism refractor which is designed to scatter light in different directions. Preferably the refractive material would also provide a deglaring influence in accordance with the standards pertaining to the office and commercial environment.

Preferably the refractive material is designed to disperse the light emitted from the light source and reflected by the reflector unit through 360° in the horizontal plane or 180° in a vertical plane beneath luminaire apparatus when the luminaire is mounted in or on a ceiling.

Optionally the refractive material comprises a clear material which acts as a light diffuser. Alternatively the refractive material comprises a polarising material. It is of course understood that any combination of refractive, diffusive or polarising material could be used to cover the open panel thereby forming a sealed unit.

An advantage of covering the open panel is that it ensures that glass and/or fragments are contained within the apparatus should a bulb break.

- 5 In a further embodiment of the luminaire apparatus the frame member of the reflector unit is positioned adjacent to the refractor material such that the frame member of the reflector unit and the refractor material are contiguous to each other. Advantageously in the preferred embodiment of the invention the refractor material and the frame member of the reflector unit are fixed to the door of the housing. Ideally the arcuate base member of the reflector unit is attached to the housing such that when the door of the housing is in the closed position the arcuate base member and the frame member of the reflector unit seat together to form the inverted substantially parabolic cross sectional profile.

- 15 In a further embodiment of the invention the open panel within the door of the housing is not covered. In this embodiment of the invention the luminaire apparatus provides a higher downward light output ratio. In such environments it is preferable that the light distribution is directed by means of the angles and geometry of the reflector unit.

- 20 Optionally in a further embodiment of the luminaire apparatus the door of the housing is provided with a lip which projects at 90 degrees from the door into the interior of the housing. Advantageously the depth of the lip projecting from the door is variable. It is preferable to ensure that the lip is of sufficient depth to prevent split light phenomena from occurring. Split light phenomena occurs when light from the light source emanates from the opening between the door and the frame of the housing in addition to the light being distributed through either the refractive material or the open panel within the door of the housing.

- 30 The material of the reflectors generally will be slightly semi-specular so as to provide a diffuse light which will be refracted through the prismatic refractive material. Examples of such semi-specular materials include Miro 4 Alanod TM Material or high purity Miro 5 TM material. It is of course understood that the reflector material is not limited to the aforementioned examples and that any suitable material known to a person skilled in the art can be used. Ideally the materials used in both the refractor and reflector unit maintain the levels of glare within the parameters of the Chartered Institute of Building Services Engineers guidelines and recommendations.
- 35

Ideally the luminaire apparatus is configured for use with linear light source at a variety of wattages. Optionally the luminaire apparatus has a one lamp-way configuration which comprises two lamps per reflector or alternatively a two lamp-way configuration comprising four lamps and two reflectors. It is of course understood that the luminaire apparatus is not limited to the type of arrangement and that any suitable arrangement known to a person skilled in the art can be used. For example, in one arrangement of the luminaire apparatus the linear light source comprises a T5 light bulb at any one of 14, 24, 28 or 54Watts.

10

Preferably the luminaire apparatus of the invention is suitable for being recessed into a variety of suspended ceilings in a number of formats. In this embodiment of the invention the luminaire apparatus is provided with the following standard dimensions to facilitate a recessed format 600 X 300mm; 600 X 600mm; 1200 X 600mm and 1200 X 300 mm.

15

Preferably the luminaire apparatus of the invention is also suitable for being surface mounted. In this embodiment of the invention the luminaire apparatus is provided with the following standard dimensions to facilitate a surface mounted format; 1500 x 200mm; 1200 x 200mm and 1200 x 600mm

20

Optionally the luminaire apparatus of the invention further comprises a sensor for optimizing energy efficiency through daylight dimming and occupancy control. The unique parameters of the range of sensors allows for a significant number of functions to cater for the demands of production and the office environment. Ideally the sensor detects levels of light within the building and indeed external influences which would affect the level of illumination required within the building.

25

Conveniently the sensor device is controlled using an integrated intellect system, which facilitates programming of the apparatus and enables the apparatus to readily accept a command. Conveniently the apparatus can be programmed using a remote PC or handheld unit at commissioning stage or alternatively while in place to set different lighting programmes.

30

Ideally the user is able to program the intellect system so that when the illuminated area is unoccupied, illumination levels are reduced to a minimum light level. The advantage of

35

this system for the user is that the intellect system provides background lighting while offering a minimal energy consumption e.g. after businesses have shut, retail, commercial or otherwise, it may be preferable to offer background lighting for cleaning of work areas or general highlight of merchandising.

5

Conveniently the intellect system further provides instantaneous responses to changes in occupancy and natural light which in turn provides for efficient use of the apparatus thus energy during periods of non-occupancy by either switching down or switching off the apparatus. Ideally the intellect system is provided with a default mechanism which
10 enables the lighting apparatus to reduce its power consumption from 100% to 5%, thus maintaining lighting to all apparatus while enhancing lighting quality.

Optionally a program can be uploaded and addressed to either individual lighting apparatuses or globally to all of the apparatuses in place.

15

In a further embodiment of the invention the luminaire apparatus is provided with additional sealing. This ensures that the luminaire apparatus is sufficiently protected from the ingress of minute particles. Thus the ingress protection level is at a higher rating than that demanded of the typical office interior. This allows the apparatus of the invention to
20 be used in areas where the room requires a positive air pressure such as clean room applications such as production areas within the pharmaceutical, packaging, processing industries.

The advantage of this arrangement of the luminaire apparatus is that the improvements to
25 the apparatus achieve greater energy efficiency by virtue of the increased light output ratio and photometric performance.

The invention will hereinafter be more particularly described with reference to the accompanying drawings which illustrate by way of example only, one embodiment of the
30 luminaire apparatus of the invention.

In the drawings:

Figure 1 is a plan view of the bottom of the luminaire apparatus of the invention;

Figure 2 is a perspective view of the of the luminaire apparatus of the invention in an open position;

5 Figure 3a is a cross sectional end view of the frame or the reflector member and the refractive member of the luminaire apparatus of the invention;

Figure 3b is a cross sectional end view of the base member and the light bulbs of the luminaire apparatus of the invention;

10 Figure 3c is a cross sectional end view of the components of Figures 3a and 3b when seated together;

Figure 4a is a cross-sectional side view of the luminaire apparatus of the invention in an open position;

15 Figure 4b is a cross-sectional side view of the luminaire apparatus of the invention in a closed position; and

20 Figure 5 is a graphical representation of the projected photometric data of the luminaire apparatus of the invention.

Referring to the drawings and in particular to Figures 1 to 4b, there is shown a luminaire apparatus 1 comprising a reflector unit 10 having a longitudinal axis X-X, Figure 4b.

25 The reflector unit 10 comprises two separable portions, an arcuate base member 11 and a frame member 12. The frame member 12 is a closed framework comprising two opposing spaced apart end members 12a and 12b adjoining two opposing spaced apart elongate side members 12c and 12d.

30 The frame member 12 and base member 11 of the reflector unit 10 seat together to form a reflector unit 10 having an inverted substantially parabolic cross sectional profile, Figure 3c.

35 Each of the side members 12c and 12d of the frame member 12 are curved. The degree by which the side members 12c and 12d curve is complimentary to the curvature of the

arcuate base portion 11 thereby ensuring that when the frame member 12 and base member 11 of the reflector unit 10 seat together, the reflector unit 10 has minimal angles and displays smooth flow characteristics.

- 5 Luminaire apparatus 1 further comprises bulbs 13 mounted within the luminaire apparatus 1 by means of lamp holders 14. The bulbs 13 are mounted such that they are positioned centrally along the longitudinal axis of the reflector unit 10 and are contained within the reflector unit 10.
- 10 Luminaire apparatus 1 optionally comprises a refractive material which is attached to the frame member 12 of the reflector unit 10 as shown in Figure 3a. In a further embodiment of the invention, the edge of the frame member 12 remote from the arcuate base member 11 is bent towards the interior of the reflector unit 10 thereby forming a planar portion (not shown in the drawings) such that the planar portion of frame member 12 and the refractive
- 15 material 16 lie in the same plane. In this embodiment of the invention refractor 16 abuts the planar portion of frame member 12.

- Referring now specifically to Figure 2, luminaire apparatus 1 is contained within housing 15, wherein housing 15 comprises a door 15a hinged to a body 15b of housing 15.
- 20 Refractor 16 and frame member 12 are attached to door 15a of housing 15, specifically refractor 16 is positioned within the open panel of door 15a and abuts the edge of the frame member 12 remote from the arcuate base member 11, in a similar fashion to that shown in Figure 3a. End members 12a and 12b have a cut away portion to facilitate correct positioning of bulbs 13 within the reflector unit 10. Lamp holders 14 are positioned
 - 25 within the housing 15 of the luminaire apparatus 1 adjacent the end member 12b of the frame member 12. Arcuate base member 11 is positioned within the body 15b of housing 15 behind bulbs 13 so that when the door 15a of the housing is in a closed position the frame member 12 and base member 11 of the reflector unit 10 seat together. When door 15a is opened the two separable parts of reflector unit 10 separate thus opening the
 - 30 luminaire apparatus 1. Also shown are the electrical components 17 of the luminaire apparatus.

Door 15a of housing 15 is provided with a lip 15c which projects at 90 degrees from the door into the interior of the housing. Housing 15 is further provided with a locking

mechanism 15d which secures door 15a in a closed position. Door 15a cannot be opened unless a release means within the locking mechanism 15d is activated.

Luminaire apparatus 1 is configured for use with linear light source for example a T5 light bulb at either 14 Watts or 24 Watts

Luminaire apparatus 1 is suitable for being recessed into a variant of suspended ceilings. In this embodiment of the invention the luminaire apparatus is provided with the following standard dimensions 600 X 600mm to facilitate the recessed format. The luminaire apparatus is also provided in the following dimensions and is suitable for being recessed in a suspended ceiling 600 X 300mm; 1200 X 600mm and 1200 X 300 mm. In an alternative embodiment the luminaire apparatus is also suitable for being surface mounted. In this embodiment of the invention the luminaire apparatus is provided with the following standard dimensions to facilitate a surface mounted format; 1500 x 200mm; 1200 x 200mm and 1200 x 600mm

Luminaire apparatus 1 further comprises a sensor 18 for optimizing energy efficiency through daylight dimming and occupancy control.

Referring now to Figure 5 the projected photometric performances listed in Table 1 below are displayed in a graphical diagram showing the increased light output ratio levels of the luminaire apparatus of the invention.

SUMMARY OF ARRANGEMENT OF LUMINAIRE APPARATUS FEATURES:

1. Reflector arrangement of present invention with Microprism Panel.
2. Lamps: 14W Linear Fluorescent
3. Lamp Lumen Output 1200lm
4. No of Lamps: 4

TABLE ONE

ANGLE/°	AVERAGE LUMINOUS INTENSITIES (cd/Klm)	
	TRANSVERSE PLANE	AXIAL PLANE
0	344.08	344.08
5	347.86	334.16
10	312.34	347.67
15	309.88	358.95

ANGLE/°	AVERAGE LUMINOUS INTENSITIES (cd/Klm)	
	TRANSVERSE PLANE	AXIAL PLANE
20	313.97	356.06
25	291.87	363.77
30	226.82	361.99
35	190.63	345.59
40	143.26	310.27
45	85.73	264.28
50	78.71	199.91
55	55.03	97.55
60	33.18	81.31
65	28.13	63.31
70	15.78	37.25
75	19.51	30.34
80	29.04	30.78
85	17.37	24.65
90	1.96	5.30
95	3.09	13.06
100	1.81	14.09
105	1.46	12.72
110	1.74	13.81
115	4.30	10.89
120	3.65	10.51
125	3.56	10.69
130	3.01	13.58
135	9.46	15.73
140	12.35	13.67
145	13.69	13.50
150	17.08	15.10
155	7.11	4.99
160	2.04	2.94
165	1.30	2.25
170	1.08	1.39
175	0.76	0.66

ANGLE/°	AVERAGE LUMINOUS INTENSITIES (cd/Klm)	
	TRANSVERSE PLANE	AXIAL PLANE
180	0.90	0.90

Light output ratios: Up 0.07
Down 0.69
TOTAL 0.76 (76%)

5

It will of course be understood that the invention is not limited to the specific details described herein, which are given by way of example only, and that various modifications and alterations are possible within the scope of the invention.

10

MACLACHLAN & DONALDSON
Applicant's Agents,
47 Merrion Square,
DUBLIN 2

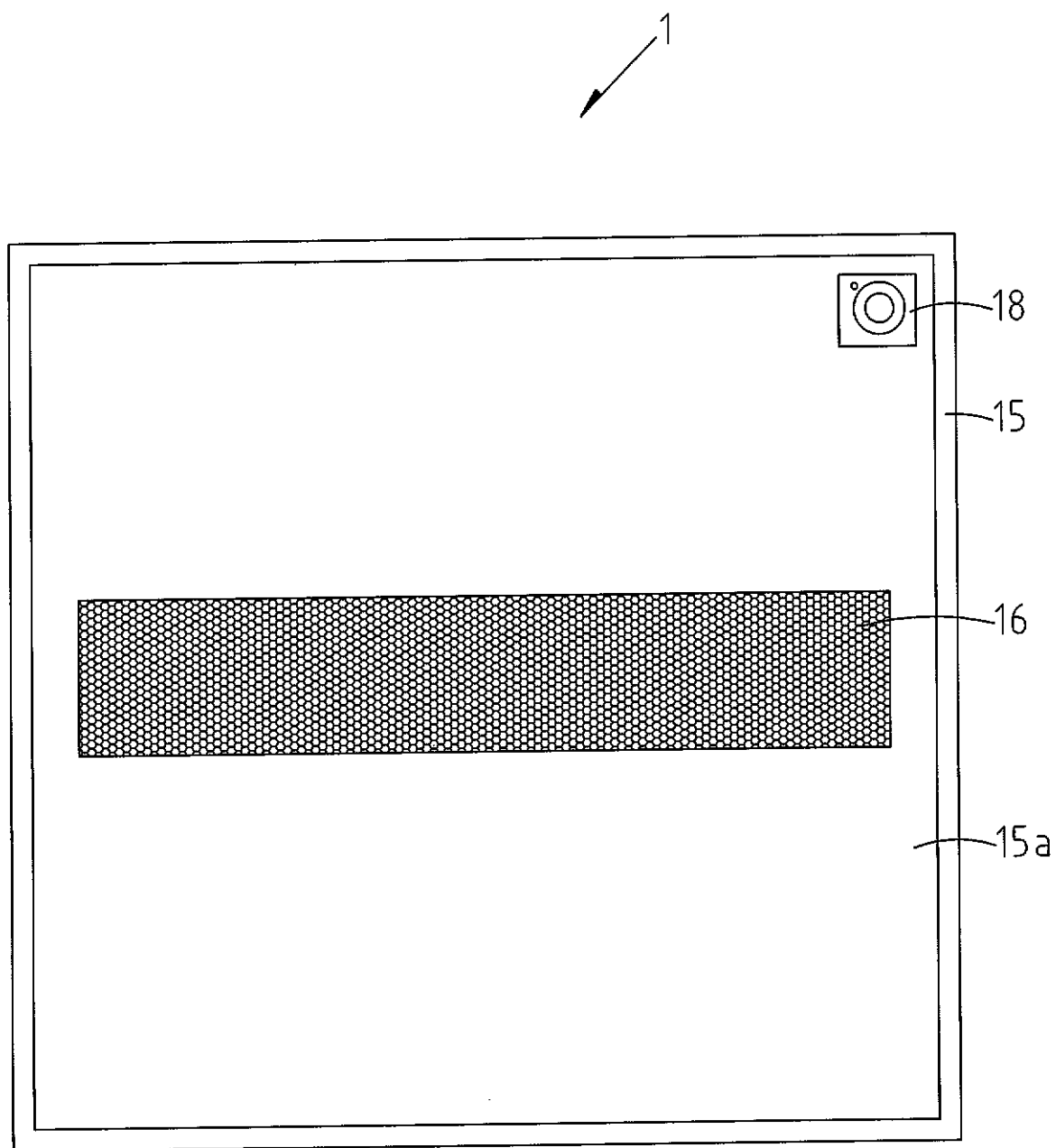
15

CLAIMS:

1. A luminaire apparatus comprising optical elements and electrical elements, the optical elements comprising a reflector unit having a longitudinal axis and comprising an arcuate base member and a separable frame member, the frame member comprising two opposing spaced apart end members and two opposing spaced apart elongate side members wherein the end members adjoin the side members to form a closed frame, the optical elements further comprising at least one bulb mountable centrally along the said longitudinal axis of the reflector unit by means of at least one lampholder positioned in or adjacent one or both end members of the frame member of the reflector unit wherein the frame member and base member seat together to form a reflector unit having an inverted substantially parabolic cross sectional profile wherein the at least one light source is positioned in the interior of the reflector unit adjacent the arcuate base member.
2. A luminaire apparatus as claimed in Claim 1, wherein the luminaire apparatus is contained within a housing which comprises a door having an open panel, a lip which projects perpendicularly from the door into the interior of the housing, and the luminaire apparatus further comprises sealing means to prevent ingress of minute particles.
3. A luminaire apparatus as claimed in Claim 2, wherein the housing further comprises a refractor covering the open panel wherein the refractor comprises a refractive material designed to disperse the light emitted from the light source and reflected by the reflector unit through 360° in the horizontal plane or 180° in a vertical plane beneath luminaire apparatus when the luminaire is mounted in or on a ceiling; the refractor further comprises a diffusive material or a polarising material; the luminaire apparatus is configured for use with a linear light source; and further comprises a sensor for optimizing energy efficiency.
4. A luminaire apparatus as claimed in Claim 3, wherein the frame member of the reflector unit is positioned adjacent to the refractor such that the frame member of the reflector unit and the refractor are contiguous to each other; and
the refractor and the frame member of the reflector unit are fixed to the door of the housing and the arcuate base member of the reflector unit is attached to the housing such that when the door of the housing is in the closed position the arcuate base member and the frame member of the reflector unit seat together to form the inverted substantially parabolic cross sectional profile.

5. A luminaire apparatus as herein described with reference to and/or as shown in the accompanying drawings.

1/6

Fig. 1

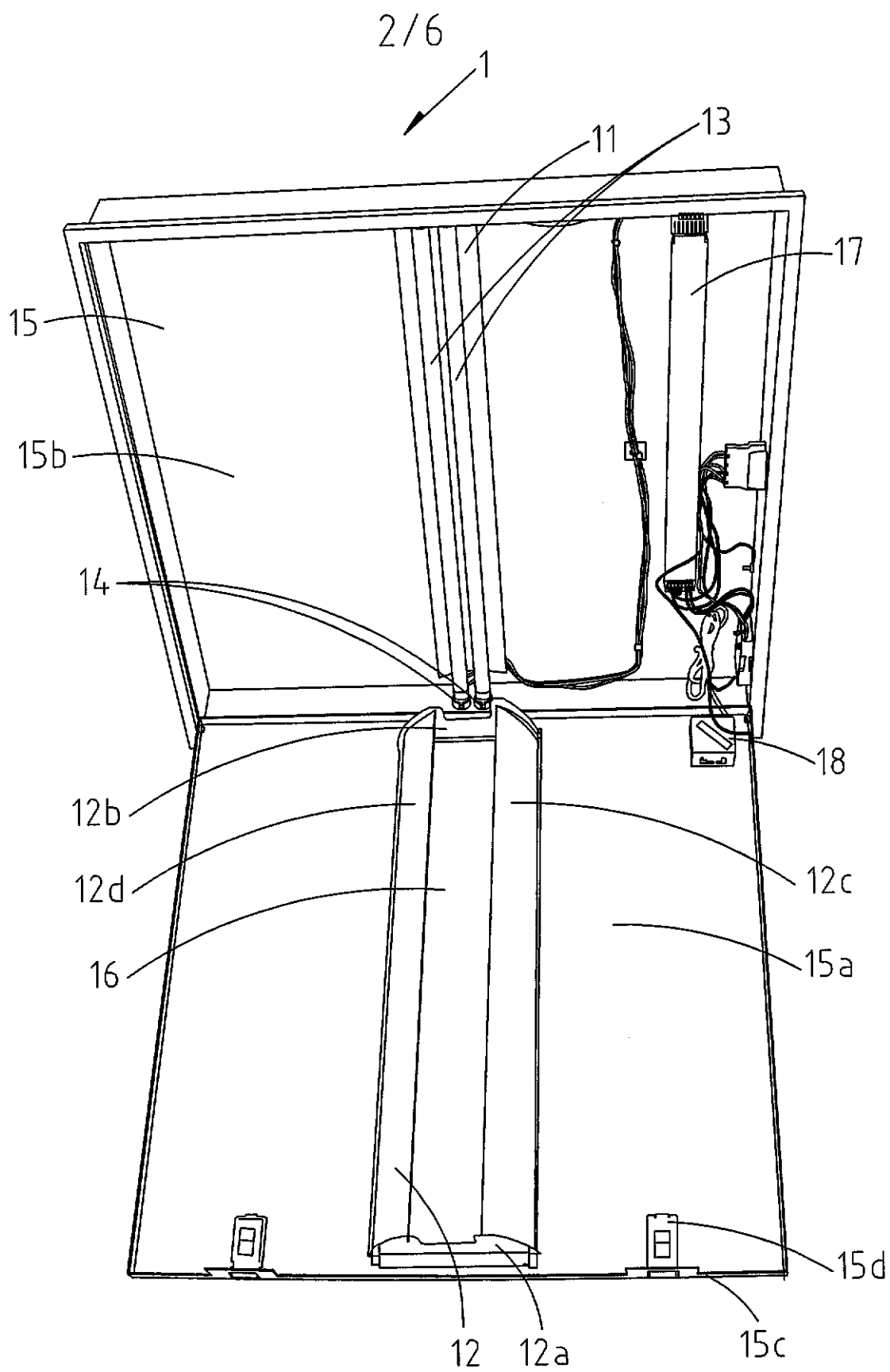


Fig. 2

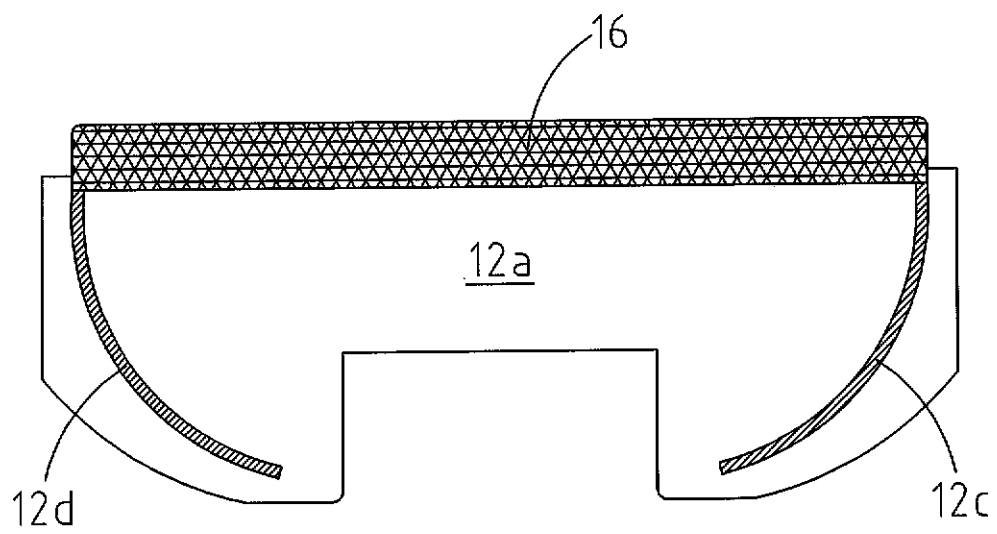


Fig. 3a

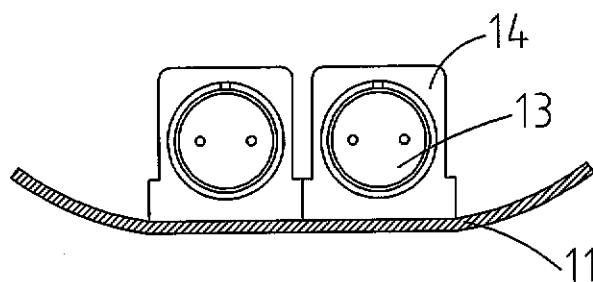
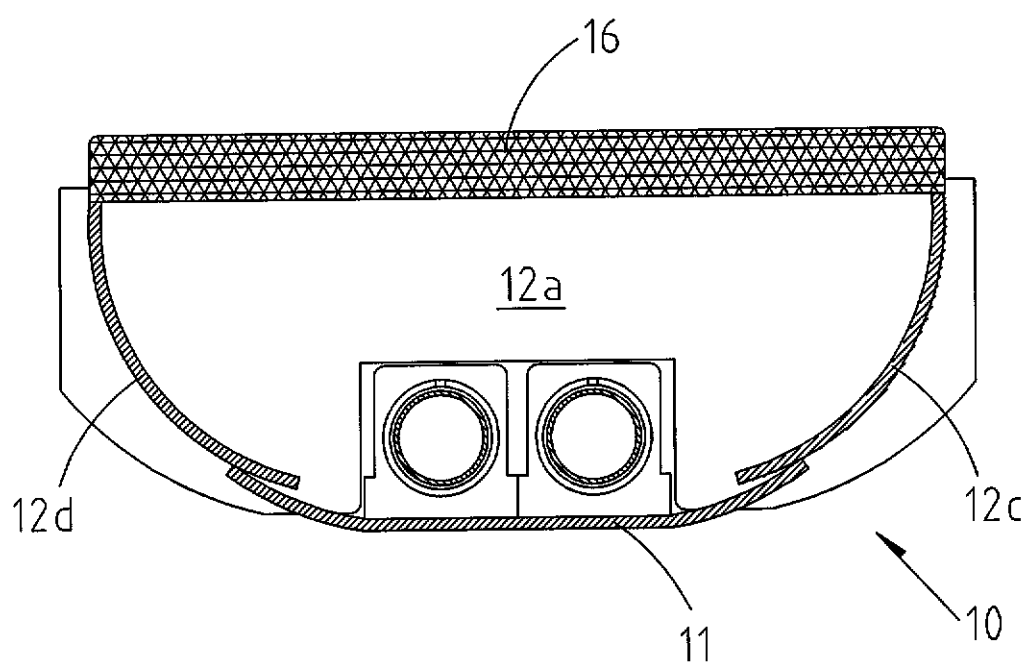
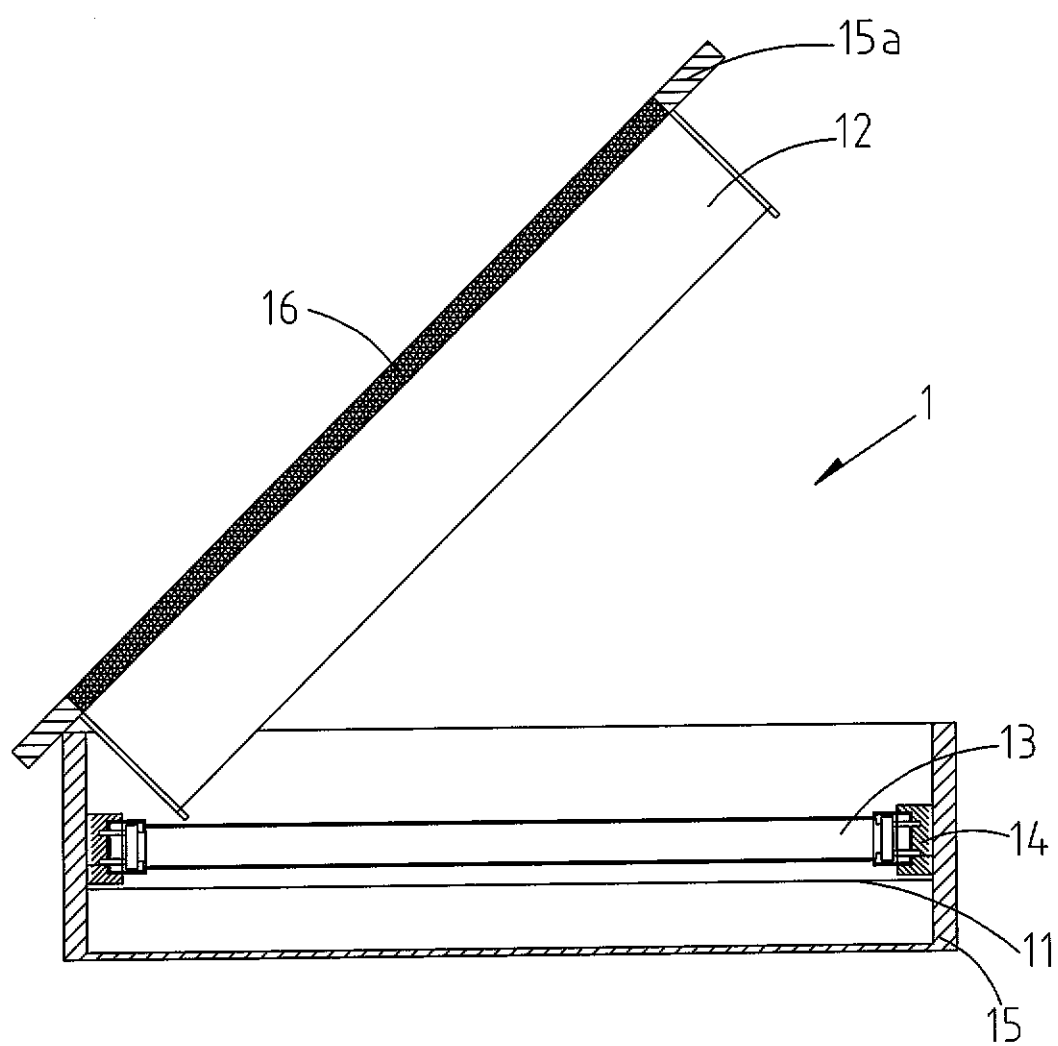
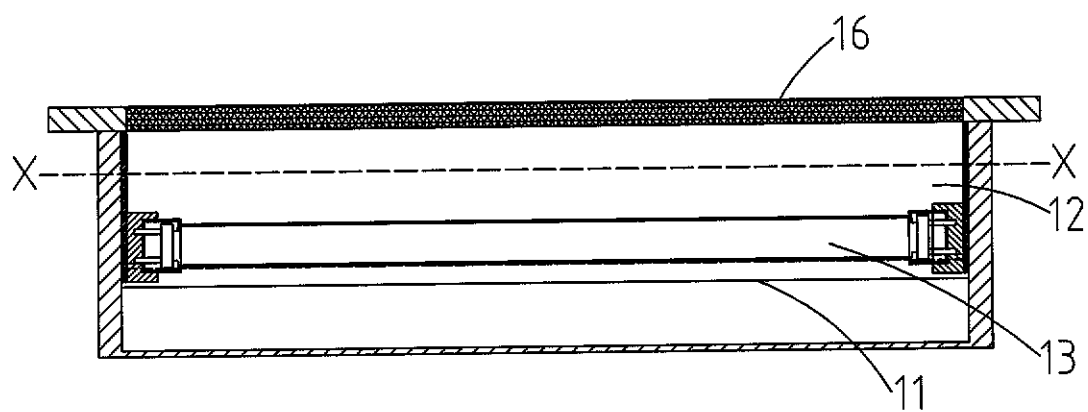


Fig. 3b

4/6

Fig. 3c

5/6

Fig. 4aFig. 4b

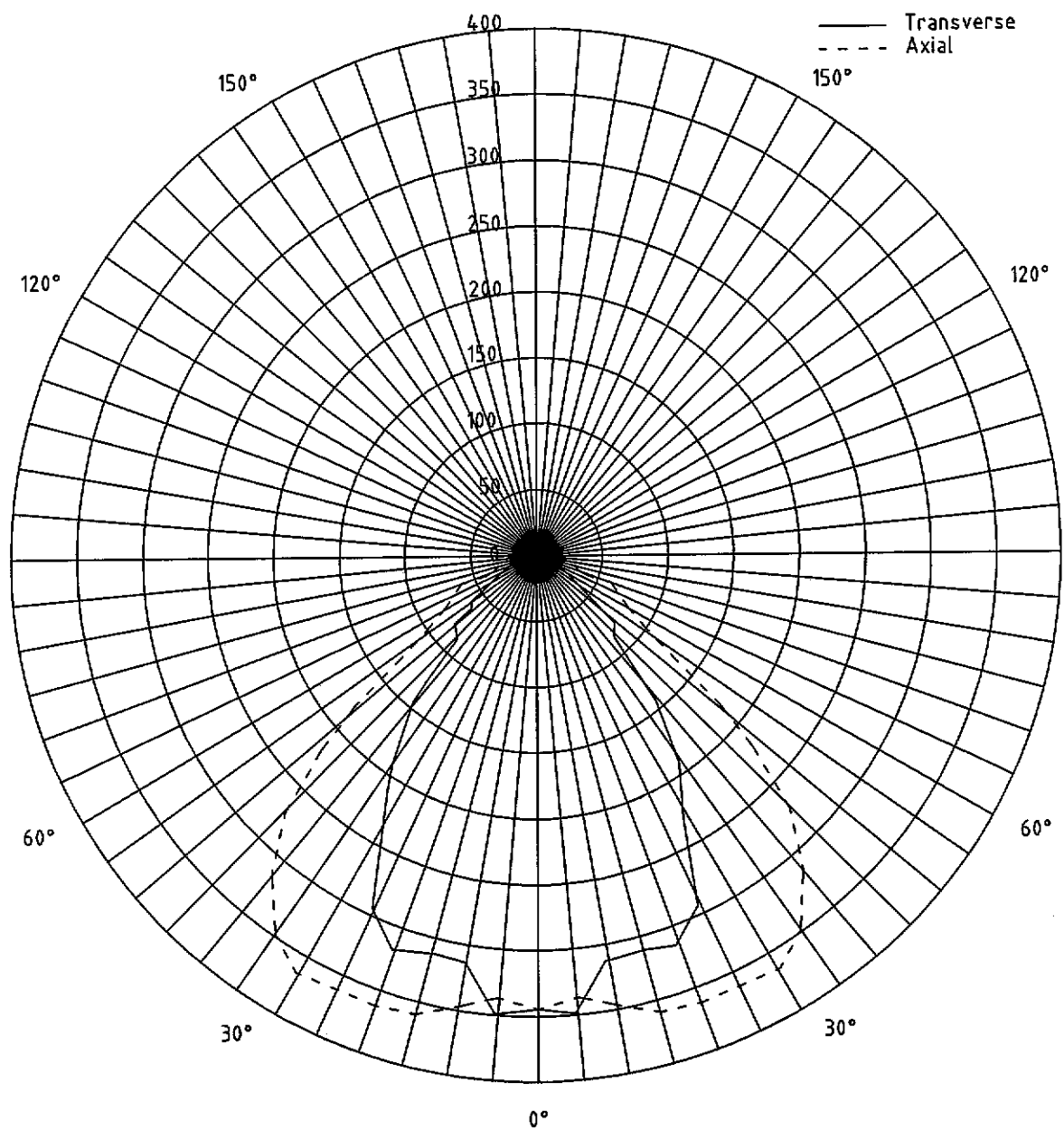


Fig. 5