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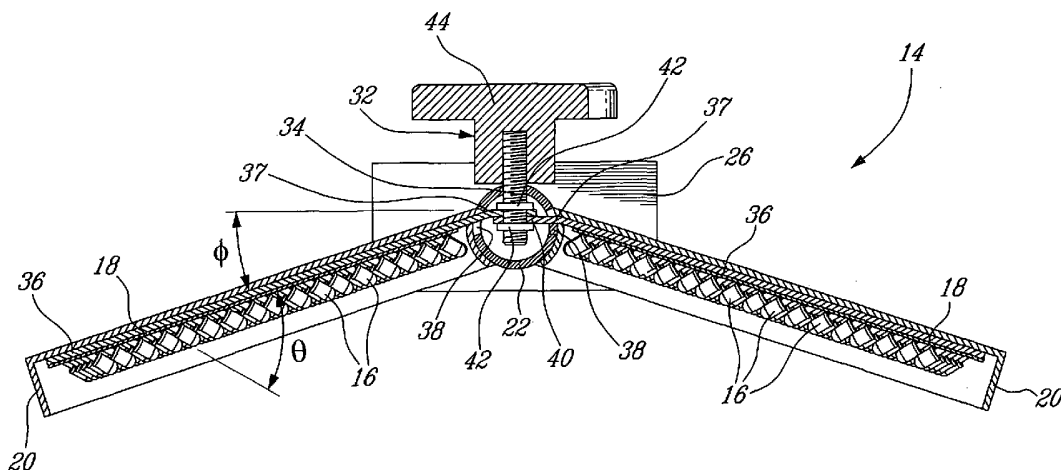
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(54) Title: ASSEMBLY OF LIGHT EMITTING DIODES FOR LIGHTING APPLICATIONS



(57) Abstract: An assembly of light emitting diodes for a streetlight or the likes comprises a first board having a first matrix of light emitting diodes (LEDs) mounted thereon defining a first light projection plane and at least another board having a second matrix of LEDs mounted thereon defining a second light projection plane. The other boards are mounted to the first board so as to define an angle therebetween. The LEDs can be mounted to the boards so as to independently define an angle therewith. They can also be oriented towards privileged directions. The present assembly allows providing a more uniform light distribution.

TITLE OF THE INVENTION

ASSEMBLY OF LIGHT EMITTING DIODES FOR LIGHTING
APPLICATIONS

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FIELD OF THE INVENTION

The present invention relates to lighting. More specifically,
the present invention is concerned with an assembly of light emitting
10 diodes for lighting applications such as in streetlights.

BACKGROUND OF THE INVENTION

Conventional streetlights include a metal halide, mercury or
15 sodium light bulb. Even though such conventional streetlights light usually
include a reflector to project the light towards an area to illuminate, a first
drawback of conventional streetlights is that they waste energy since the
light bulb illuminates in all direction, even though illumination is only
required towards the street. Another drawback of streetlights provided with
20 a light bulb is that they generate a high luminosity right below the bulb
which diminishes quickly as the distance from the bulb increases.

A partial solution to these drawbacks has been proposed
with the introduction of streetlights 10 provided with a light emitting diode
25 (LEDs) assembly 12. Examples of such streetlights are shown in Figure 1
of the appended drawings.

The streetlights 10 share the second drawback of the bulb light-based streetlight in that they generate a high luminosity right below the bulb which diminishes quickly as the distance from the bulb increases. Also, with such a light assembly, a high percentage of light is still lost.

5

Finally, a common drawback of both bulb-based light assemblies and of current LEDs assemblies is that they cause light pollution by providing light where it is not desired.

10

A streetlight providing a more uniform light distribution is thus desirable.

OBJECTS OF THE INVENTION

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An object of the present invention is therefore to provide a streetlight free of the above-mentioned drawbacks:

Another object of the invention is to provide an improved assembly of light emitting diodes for a light.

20

SUMMARY OF THE INVENTION

More specifically, in accordance with the present invention, there is provided an assembly of light emitting diodes for a light comprising:

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a first board having a first matrix of light emitting diodes (LEDs) mounted thereon defining a first light projection plane;

a second board having a second matrix of LEDs mounted thereon defining a second light projection plane; the second board being mounted to the first board so as to define a first angle therebetween.

5 According to a second aspect of the present invention, there is provided an assembly of light emitting diodes for a light comprising:

 at least one board including a plurality of light emitting diodes (LEDs) mounted thereon; a first group of the plurality of LEDs being mounted to the board so as to define a first acute angle therewith; the first
10 group of the plurality of LEDs defining a first light projection plane.

 According to a third aspect of the present invention, there is provided an assembly of light emitting diodes for a light comprising:

 at least one board of light emitting diodes (LEDs) defining a
15 light projection plane; at least some LEDs of at least one of the at least one board of LEDs defining an angle with at least one of the at least one board of LEDs.

 According to a fourth aspect of the present invention, there is
20 provided an assembly of light emitting diodes for a light comprising:

 a first board including a first set of light emitting diodes (LEDs) mounted thereon;

 at least one other board including a second set of LEDs mounted thereon; the at least one other board being mounted to the first
25 board so as to define an angle therewith.

 Finally, according to a fifth aspect of the present invention,

there is provided an assembly of light-emitting diodes (LEDs) for a light comprising:

a plurality of slats pivotably mounted to a frame so as to define a loover assembly; each the slats including a matrix of LEDs mounted thereto; and

a mechanism for pivoting each the slats relative to the frame, thereby allowing to define and modify relative angles between the slats and the frame.

Other objects, advantages and features of the present invention will become more apparent upon reading the following non restrictive description of preferred embodiments thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the appended drawings:

Figure 1, which is labeled "Prior Art" is a perspective view of a streetlight according to the prior art;

Figure 2 is a perspective view of an assembly of light emitting diodes for a streetlight according to a first illustrative embodiment of the present invention;

Figure 3 is a bottom plan view of the assembly from Figure 2;

Figure 4 is a cross-section of the assembly from Figure 2, taken along line 4-4 on Figure 3;

Figure 5 is a schematic view illustrating the uniform light
5 distribution obtained by the assembly from Figure 2;

Figures 6A-6B are schematic views illustrating the effect of the orientation of the LEDs of the assembly from Figure 2;

10 Figure 7 is a schematic partial cross-section of two facing boards with LEDs from the assembly of Figure 2, illustrating the angle θ between the LEDs and the boards;

Figure 8 is a perspective view of an assembly of light emitting
15 diodes for a streetlight according to a second illustrative embodiment of the present invention;

Figure 9 is a cross section of an assembly of light emitting
20 diodes for a streetlight according to a third illustrative embodiment of the present invention;

Figure 10 is a cross section of an assembly of light emitting
25 diodes for a streetlight according to a fourth illustrative embodiment of the present invention;

Figure 11 is a cross section of an assembly of light emitting diodes for a streetlight according to a fifth illustrative embodiment of the

present invention;

Figure 12 is a perspective view of an assembly of light emitting diodes for a streetlight according to a sixth illustrative embodiment
5 of the present invention;

Figure 13 is a perspective schematic view of an assembly of light emitting diodes for a streetlight according to a seventh illustrative embodiment of the present invention;
10

Figure 14 is a perspective schematic view of an assembly of light emitting diodes for a streetlight according to an eighth illustrative embodiment of the present invention;

15 Figure 15 is a side schematic view of an assembly of light emitting diodes for a streetlight according to a ninth illustrative embodiment of the present invention;

20 Figure 16 is a front perspective view of an assembly of light emitting diodes for a light according to a tenth illustrative embodiment of the present invention; and

25 Figure 17 is a graph showing comparison results between lights according to the prior art and a light provided with an assembly of LEDs according to an eleventh illustrative embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An assembly 14 of light emitting diodes 16 for a streetlight (not shown) according to a first illustrative embodiment of the present invention will now be described with reference to Figures 2-4.

The assembly 14 comprises two pairs of boards 18, each including a matrix of light emitting diodes (LEDs) 16 mounted thereon, each pair of boards 18 being mounted in a respective flat casing or panel 20 defining a respective light projection plane. The two panels 20 are pivotably mounted to one another via a central shaft 22 so as to be movable between a first extended position, wherein the two panels 20 lay generally in the same plane, and a second partially closed position, wherein the two panels 20 define an angle $(180^\circ - 2\Phi)$ therebetween.

The assembly 14 is secured to the horizontal pole 24 of a streetlight pole (not shown) via its central shaft 22 so that the panels 20 are generally oriented towards the area to illuminate. A system for controlling the matrix of LEDs 16 is provided between the utility line (not shown) and the matrix of LEDs 16. As can be better seen from Figures 2 and 3, such controlling system 26, which includes a power converter, can be mounted at the proximate end of the shaft 22.

As can be better seen from Figure 4, each LED 16 is mounted to a respective board 18 so as to be tilted towards the board in the direction of the central shaft 22, defining a first angle θ with the board 18. According to the first illustrated example, this first angle θ is about 45

degrees. As illustrated in Figure 7, the first angle θ is selected so as to yield a maximum line of sight for each LED 16, providing the maximum illumination and minimizing the lost of lumens. This maximum illumination is however achieved when the boards 18 are angled relatively to the area
5 to illuminate as will now be explained.

Returning to Figure 4, each panel 20 is partially closed so as to define a second angle Φ with the plane defined by the first extended position of the panels 20. It has been found that, for a given lumen per
10 LED, a maximum luminosity can be achieved with the LEDs 16 tilted to an angle θ of about between 20 to 90 degrees and the panels 20 partially closed so as to yield a second angle Φ of about 15 to 20 degrees. The panels 20 generally define a concave light projector.

15 Indeed, as it has been mentioned hereinabove, the use of a single board having LEDs perpendicularly mounted thereon generates a high luminosity right below the bulb which however diminishes quickly as the distance from the bulb increases. As illustrated in Figure 5, the tilting of the LEDs from about 45 degrees for example yields an illumination
20 distance about three times the height of the pole. This illumination distance is only two times the height of the pole for a matrix of LEDs oriented parallel to the surface to illuminate.

Each tilted LED 16 is further pivoted from an angle α away
25 from the horizontal pole 24. This pivoting of the LED 16 allows directing the light incoming from the LEDs 16 towards a more specific area to illuminate.

This is schematically illustrated in Figures 6A and 6B. Figure 6A illustrates a top plan view of the assembly of LEDs 14 positioned on top of a sidewalk 28 and a street 30, just at the boundary thereof. Figure 6B shows that pivoting the LEDs 16 in the direction of the street 30, yields a substantial increase of illumination on the street side 30 compare to the sidewalk side 28.

A mechanism 32 is provided to modify the angle Φ of the panels 20 including the boards 18, allowing to vary the illumination from a more intense illumination below the light assembly 10 to a more distribute illumination.

Returning to Figure 4, the mechanism 32 comprises a screw 34 rotatably inserted in a complementary aperture on top of the hollow shaft 22 and two side plates 36 each having a respective rod portion 37 extending therefrom and received in a respective lateral slot 38 in the hollow shaft 22. The proximal ends of the rod portions 37 include an annular portion 40 for complementary engagement with the screw 34. Washers 42 are also provided for securing the annular portions 40 and therefore the two side plates 36 to the screw 34. The mechanism 32 further comprises a knob 44, secured to portion of the screw 34 extending out of the hollow shaft 22.

In operation of the mechanism 32, rotation of the knob 32 in a first direction allows to move the panels 20 towards one another, thereby increasing the angle Φ , while rotation of the knob 32 in an opposite

direction allows moving the panels 20 away from each other thereby minimizing the angle Φ . It is reminded that the angle θ remains fixed during the operation of the mechanism 32.

5 The assembly 14 includes a typical density of 70 mm² per LED. Of course, the number of LEDs 16 per boards, of boards 18 and of panels 20 may vary without departing from the spirit and nature of the present invention. The general configuration of the assembly may also vary as will be described furtherin.

10

Turning now to Figure 8, an assembly 46 of LEDs for a streetlight according to a second illustrative embodiment of the present invention will now be described. Since the assembly 46 is very similar to the assembly 14 from Figures 2-4, and for concision purposes, only the
15 differences between the two assemblies will be described herein in more details.

According to this second illustrative embodiment, the controlling system (not shown) is included in the panels 20', for example
20 between the boards (not shown) and the panels 20'.

According to this second illustrative embodiment, the panels 20' are hingedly mounted to the shaft 50 and the angle Φ of the panels 20' can be adjusted manually. A lock mechanism (not shown) operatively
25 coupled to the panels 20' allows to lock the selected position of the panels. The lock mechanism includes an input slot 52, operable via an allen key or another tool.

An assembly 54 of LEDs 16 for a streetlight according to a third illustrated embodiment of the present invention will now be described with reference to Figure 9.

5

The assembly 54 comprises two adjacent boards 56 of LEDs pivotably mounted in a casing 58 via a board mounting and adjustable mechanism 60. The open side of the casing 58 is provided with a transparent wall 62 made of glass, acrylic or polycarbonate for example.

10

Each LED 16 is mounted to a respective board 56 so as to be tilted towards the adjacent board 56, defining a first angle θ of about 45 degrees.

15

Of course, the assembly 54 further comprises a LED controlling system (not shown) for connecting the LEDs 16 to the utility line (not shown).

The two boards 56 are joined by a hinge 64.

20

The board mounting and adjustable mechanism 60 comprises a screw 66 rotatably secured to the top wall 68 of the casing 58 and lever arms 70 (two shown) for pivotably mounting the boards 56 to the screw 66. More specifically, the distal end of each lever arm 70 is pivotably mounted to a respective board 56 via a first pivot joint 72. The proximate end of each lever arm 70 is pivotably secured to the screw 66 via a bolt assembly 74 having second pivot joints 76 mounted on its periphery.

25

A knob 78 is provided at the end of the screw 66 extending from the casing 58.

5 In operation, rotation of the screw 66 (arrow 80) in a first direction using the knob 78 causes the downward translation of the bolt 74, which in turn causes the boards 56 to move between a first extended position (illustrated in Figure 9), wherein the two boards 56 lay both in a horizontal plane, and a second partially closed position, wherein each of
10 the two boards 56 defines an angle Φ with the horizontal (illustrated in dashed line in Figure 9). Rotation of the screw 66 in the opposite direction allows diminishing the angle Φ .

 Of course, the number and configuration of the boards 56
15 may vary. The board mounting and adjustable mechanism 60 may also be modified without departing from the spirit and nature of the present invention.

 For example, as illustrated in Figure 10, the length of lever
20 arms 84 securing one of the boards 86 can be different than the other lever arms 70, thereby allowing to modify the angle Φ' between the board 86 and the horizontal at a different pace than the other angle Φ upon rotation of the knob 78.

25 An assembly 88 of LEDs 16 for a streetlight according to a fifth embodiment of the present invention will now be described with reference to Figure 11.

Since the assembly 88 is very similar to the assembly 54, and for concision purposes, only the differences between the two assemblies will be described herein in more detail.

5

According to this fifth illustrative embodiment, each of the boards of LEDs 56 is secured to the casing 58 via an independent board mounting and adjustable mechanism 90 allowing to independently adjust the angle between the board 56 and the horizontal for example.

10

Even though the mechanisms 90 to adjust the angle of the boards of LEDs according to the above illustrated embodiments are all manually activated, a motor (not shown) can also be provided to tilt the boards of LEDs 56. This motor can be activated using a button or another user's input means provided on the assembly of LEDs 88 or provided on a remote control. Of course, in that case, a wireless receiver (not shown) would be included with or connected to the LEDs controlling system.

15

An assembly 92 of light emitting diodes for a streetlight according to a sixth illustrative embodiment of the present invention will now be described with reference to Figure 12.

20

The assembly 92 comprises a receptacle 94, including a side aperture 96 for mounting to the horizontal pole of a street pole (both not shown), a plurality of boards of LEDs 98-104 secured to the receptacle 94 and a system for controlling the LEDs (not shown) received in the receptacle 94.

25

More specifically, the assembly 92 comprises a central board of LEDs 98 to be positioned generally parallel to the area to illuminate and defining a first light projection plane. The assembly 92 further comprises
5 two lateral boards of LEDs 100 mounted to the first board of LED so as to define an angle therewith and defining second and third light projection plane. Front and back boards of LEDs 102 and 104 are each secured to the two lateral boards 100 therebetween and to the central board 98 at opposite ends thereof. The boards of LEDs 98-104 together define a
10 convex light projector. Each LED 106 is secured to its respective board so as to extend perpendicularly therefrom.

The number and configuration of the boards of LEDs may of course vary. Figures 13 and 14 illustrate two general configurations of
15 assembly of LEDs for a streetlight according respectively to a seventh and an eight illustrative embodiment of the present invention.

According to a further embodiment of the present invention, there is provided a casing or a support frame (not shown) having a plurality
20 of grooves, channels or any other means to adjustably receive boards of LEDs. According to this embodiment, different assemblies of LEDs can be achieved by inserting the boards in different grooves or channels. Different means can be provided to removably, secure the boards in place, including snap fitting, fasteners, etc.

25

Figure 15 illustrates an assembly 108 of LEDs for a streetlight according to an eight illustrative embodiment of the present

invention.

5 The assembly 108 comprises two boards of LEDs 110 mounted adjacent one another so as to define an acute angle therebetween. It is to be noted that the assembly 108 is only schematically illustrated in Figure 15. It further includes a frame or a casing (not illustrating) for receiving and supporting the boards 110 and a system for controlling the LEDs (not shown) to be connected to the utility line.

10 The assembly 108 may further include a mechanism (not shown) for modifying the angle Φ between the two boards 110. It is to be noted that, contrarily to the assembly 14 where the LEDs 16 are mounted on facing sides of the boards 18 for adjacent panels 20, the LEDs 16 are mounted on opposite sides of the boards 110.

15

The angle Φ between the two boards 110 is only limited by the dimensions of the boards 110 with the LEDs 16 and thus can have typically any values from near zero (0) degrees to more than 340 degrees. The same can be said when the LEDs are mounted on facing sides of the boards as illustrated, for example, in Figure 4.

20

Turning now to Figure 16, an assembly 112 of light emitting diodes for a lighting application according to a tenth illustrative embodiment of the present invention will now be described.

25

The assembly 112 comprises a plurality of slats 114 (four illustrated) pivotably mounted to a frame 116 so as to define a looper.

Each slat 114 includes a matrix of LEDs 118. Each of the LEDs is of course to be connected to a power source (not shown) via controlling system (not shown).

5 A mechanism (not shown) is provided to adjust the angle of the slats 114. Since such mechanism allowing to simultaneously or independently adjusting the angles of the slats 114 are believed to be well-known in the art, and for concision purposes, they will not be described herein in more detail.

10

 The three (3) rows of LEDs near the longitudinal edges of the slats 114 are mounted to the slats 114 so as to define an angle therewith. More specifically, the angle is inversely proportional with the distance from the nearest side edge of the frame 116. This configuration of LEDs allows
15 providing a more distribute illumination by orienting some of the light on the lateral sides of the assembly 112.

 Of course, the number slats 116 and the number of LEDs 118 on each slat 116 may vary. The slats 116 may also be mounted to any
20 structure so as to yield the louvers functionality.

 Also, any configuration of LED angle on each slat is possible and is not limited to the one illustrated.

25 Experimental results have been compared between a two-board assembly of LEDs according to an eleventh illustrative embodiment of the present invention and Type II and II Cobra lights from the Cooper

Lighting society. The results have been obtained considering the assembly according to the present invention and the Cobra lights mounted on top of a 25 feet pole.

5	Type of LED		Typical Intensity	
	(20 deg) Brite Led BL-LBUW5N20C		12600 mcd	
	(45 deg) C9045ULWW (45)		5311 mcd	
10	BOARD #1	Aim X	Aim Y	Qty of LEDS
	Brite Led BL-LBUW5N20C	-60	10	130
	Brite Led BL-LBUW5N20C	-60	30	150
	C9045ULWW (45)	-22	26	120
	C9045ULWW (45)	-10	-8	60
15	Brite Led BL-LBUW5N20C	0	30	30
	Brite Led BL-LBUW5N20C	0	10	10
20	BOARD #2	Aims X	Aim Y	Qty of LEDS
	Brite Led BL-LBUW5N20C	60	10	130
	Brite Led BL-LBUW5N20C	60	30	150
	C9045ULWW (45)	22	26	120
	C9045ULWW (45)	10	-8	60
25	Brite Led BL-LBUW5N20C	0	30	30
	Brite Led BL-LBUW5N20C	0	10	10

where "Aim X" represents the point on the ground where the LEDs are aimed at (parallel to the street); and

"Aim Y" represents the point on the ground where the LEDs are aimed at (perpendicular to the street).

The light distribution obtained with the above LED assembly as been compared with two 100W HPS 9200 Lumen clear lens light from

Cooper Lighting. The first one is a type II medium cut-off, model HPRC-GL-2-100-T-LL and the second one is a type III medium cut-off, model HPRC-GL-#-100-T-LL.

5 The comparison results are illustrated in Figure 17, which clearly show that a more distribute illumination is obtained with the assembly of LEDs according to the present invention.

10 As enlighten by the last example, an assembly of LEDs for a light according to the present invention can be provided with different types of LEDs, even on a same board. For example, some LEDs may have a 20 degrees light pattern, wherein an intensity of 50 percent is obtained at 10 degrees from the longitudinal axis, while other LEDs may have 30, 40, 45 or 60 degrees pattern with different maximum intensity for example. Since
15 such LED pattern is believed to be well known in the art, and for concision purposes, they will not be described herein in more detail. Also, LEDs having different colors can also be provided in the assembly or in a single board.

20 Even though the present invention has been described by way of reference to illustrative embodiments where all LEDs on a board are bent or tilted so as to define a common angle, an assembly according to the present invention is not limited in such a way. Indeed, a single board may include different LEDs tilted so as to define different angles to
25 simultaneously illuminate in different directions.

Also, even though the present invention has been described

by way of references to boards of LEDs having a plurality of columns and lines of LEDs, an assembly of LEDs according to the present invention including boards of LEDs having a single line of LEDs mounted thereon can also be provided.

5

According to the present invention, boards of LEDs wherein the tilt of each line or column of LEDs can independently be adjusted can also be provided.

10

Even though the present invention has been described with reference to assembly of LEDs for a streetlight, an assembly of LEDs according to the present invention can be used in any type of lights and for any lighting applications.

15

Although the present invention has been described hereinabove by way of preferred embodiments thereof, it can be modified without departing from the spirit and nature of the subject invention, as defined in the appended claims.

WHAT IS CLAIMED IS:

1. An assembly of light emitting diodes for a light comprising:
5 a first board having a first matrix of light emitting diodes (LEDs) mounted thereon defining a first light projection plane;
 a second board having a second matrix of LEDs mounted thereon defining a second light projection plane; said second board being mounted to said first board so as to define a first angle therebetween.
10
2. An assembly as recited in claim 1, wherein at least a first LED from said first and second matrices of LEDs is tilted towards said respective first or second board so as to define a second angle therewith.
- 15 3. An assembly as recited in claim 2, wherein at least a second LED from said first and second matrices of LEDs is tilted towards said respective first or second board so as to define a third angle therewith.
- 20 4. An assembly as recited in claim 2, wherein each said LEDs of said first and second matrices of LEDs are tilted towards said respective first and second boards so as to define a second angle therewith; each said LEDs of said first matrix being generally oriented towards said second board; each said LEDs of said second matrix being
25 generally oriented towards said first board.
5. An assembly as recited in claim 4, wherein said first angle

angle is within a range between about 0 to 340 degrees and said second angle is within a range between about 20 to 90 degrees.

6. An assembly as recited in claim 4, wherein said LEDs
5 from said first matrix of LEDs are further oriented along a first direction; said LEDs from said second matrix of LEDs being further oriented along a second direction.

7. An assembly as recited in claim 6, wherein said first and
10 second directions share a common third direction;
whereby, in operation, said orientation of said LEDs along said common third direction allows directing lights incoming from said LEDs towards said common third direction.

8. An assembly as recited in claim 1, wherein each of said
15 first and second boards are mounted in respective first and second panels.

9. An assembly as recited in claim 1, wherein said second
20 board is hingedly mounted to said first board so as to allow selectively modifying said first angle.

10. An assembly as recited in claim 9, wherein at least a first
LED from said first and second matrices of LEDs is tilted towards said
25 respective first or second boards so as to define a second angle therewith.

11. An assembly as recited in claim 10, wherein at least a second LED from said first and second matrices of LEDs is tilted towards said respective first or second boards so as to define a third angle therewith.

5

12. An assembly as recited in claim 9, wherein each said LEDs of said first and second matrices of LEDs are tilted towards said respective first and second boards so as to define a second angle therewith; each said LEDs of said first matrix being generally oriented towards said second board; each said LEDs of said second matrix being generally oriented towards said first board.

10

13. An assembly as recited in claim 9, further comprising at least one mechanism for modifying said first angle.

15

14. An assembly as recited in claim 9, further comprising a casing provided with an opening; said first and second boards being mounted in said casing so that said first and second projected planes are generally oriented towards said opening.

20

15. An assembly as recited in claim 14, further comprising at least one angle modifying mechanism secured to said casing for modifying said first angle.

25

16. An assembly as recited in claim 15, wherein said at least one angle modifying mechanism including respective first and second lever arms respectively pivotably mounted to said first and second boards;

said first and second lever arms being of different lengths allowing modifying orientations of said first and second boards relatively to said casing at a different pace.

5 17. An assembly as recited in claim 15, wherein said at least one angle modifying mechanism is coupled to said first board for modifying an orientation of said first board relatively to said second board, thereby modifying said first angle.

10 18. An assembly as recited in claim 15, wherein said at least one angle modifying mechanism includes first and second angle modifying mechanisms, coupled respectively to said first and second boards for respectively modifying an orientation of said first board and second boards relatively to said casing, thereby modifying said first angle.

15 19. An assembly as recited in claim 9, wherein said first and second boards are movable between a first extended position wherein said first and second boards lay generally in a common plane and a second partially closed position wherein said first and second boards
20 define said first angle therebetween.

 20. An assembly as recited in claim 9, wherein said second board is hingedly mounted to said first board via a central shaft, thereby allowing to selectively modify said first angle.

25 21. An assembly as recited in claim 20, further comprising an angle modifying mechanism to modify said first angle.

22. An assembly as recited in claim 21, wherein said central shaft is hollow and includes two opposite lateral slots; said angle modifying mechanism including a screw rotatably mounted in said central shaft adjacent said two opposite lateral slots, and two rods inserted through a
5 respective one of said two opposite slots, each secured to a respective one of said first and second boards and to said screw;
whereby, in operation, rotation of said screw in a first direction increases said first angle, and rotation of said screw in a second direction decreases
10 said first angle.

23. An assembly as recited in claim 20, wherein said shaft includes a lock mechanism to lock said first and second boards in a configuration defining said first angle therebetween.
15

24. An assembly as recited in claim 20, further comprising a system connected to said first and second matrix of LEDs for controlling said first and second matrix of LEDs.

20 25. An assembly as recited in claim 24, wherein said system for controlling said first and second matrix of LEDs is mounted in an enclosure secured at a distal end of said central shaft.

25 26. An assembly as recited in claim 25, wherein each of said first and second boards are mounted in respective first and second panels; said system for controlling said first and second matrix of LEDs being mounted within at least one of said first and second panels.

27. An assembly as recited in claim 1, further comprising a casing including boards-receiving means for removably and selectively receiving said first and second boards;

5 whereby, different assembly configurations can be achieved by inserting said first and second boards in different boards-receiving means.

28. An assembly as recited in claim 27, wherein said boards-receiving means includes at least one of grooves and channels.

10

29. An assembly as recited in claim 1, wherein said LEDs include at least two different types of LEDs.

30. An assembly as recited in claim 29, wherein said at least
15 two different types of LEDs are characterized by at least one of a colour, an angle of light pattern, and intensity.

31. An assembly as recited in claim 29, wherein said different types of LEDs are provided on a same one of said at least said
20 first and said second boards.

32. An assembly as recited in claim 1 for a streetlight.

33. An assembly of light emitting diodes for a light
25 comprising:

at least one board including a plurality of light emitting diodes (LEDs) mounted thereon; a first group of said plurality of LEDs being

mounted to said board so as to define a first acute angle therewith; said first group of said plurality of LEDs defining a first light projection plane.

34. An assembly as recited in claim 33, wherein a second
5 group of said plurality of LEDs are mounted to said at least one board so as to define a second acute angle therewith; said second group of said plurality of LEDs defining a second light projection plane.

35. An assembly as recited in claim 33, wherein said LEDs
10 include at least two different types of LEDs.

36. An assembly as recited in claim 35, wherein said at least two different types of LEDs is characterized by at least one of a colour, an angle of light pattern, and intensity.
15

37. An assembly as recited in claim 33 for a streetlight.

38. An assembly of light emitting diodes for a light comprising:
20 at least one board of light emitting diodes (LEDs) defining a light projection plane; at least some LEDs of at least one of said at least one board of LEDs defining an angle with at least one of said at least one board of LEDs.

25 39. An assembly as recited in claim 38 for a streetlight.

40. An assembly of light emitting diodes for a light comprising:

a first board including a first set of light emitting diodes (LEDs) mounted thereon;

5 at least one other board including a second set of LEDs mounted thereon; said at least one other board being mounted to said first board so as to define an angle therewith.

41. An assembly as recited in claim 40, further comprising a
10 casing including boards-receiving means for removably and selectively receiving said first and at least one other boards;
whereby, different assembly configurations can be achieved by inserting said first and said at least one other boards in different said boards-receiving means.

15

42. An assembly as recited in claim 41, wherein said boards-receiving means includes at least one of grooves and channels.

43. An assembly as recited in claim 40, wherein said at least
20 one other board includes a plurality of boards; said plurality of boards and said first board being assembled so as to yield a convex light projection surface.

44. An assembly as recited in claim 40, wherein said at least
25 one other board includes two side boards, a front board and a back board secured to said first board so as to define a convex light projection surface.

45. An assembly as recited in claim 40, wherein said LEDs include at least two different types of LEDs.

5 46. An assembly as recited in claim 45, wherein said at least two different types of LEDs are characterized by at least one of a colour, an angle of light pattern, and intensity.

10 47. An assembly as recited in claim 45, wherein said at least two different types of LEDs are provided on a same one of said at least said first and said at least another boards.

 48. An assembly of light-emitting diodes (LEDs) for a light comprising:
15 a plurality of slats pivotably mounted to a frame so as to define a loover assembly; each said slats including a matrix of LEDs mounted thereto; and
 a mechanism for pivoting each said slats relative to said frame, thereby allowing to define and modify relative angles between said
20 slats and said frame.

 49. An assembly of LEDs as recited in claim 48, wherein said mechanism allows to independently pivot each said slats.

25 50. An assembly of LEDs as recited in claim 48, wherein at least a first one of said LEDs of at least some of said plurality of slats is

both tilted towards said respective slat so as to define a first angle therewith and oriented along a predetermined first direction.

5 51. An assembly as recited in claim 50, wherein at least a second one of said LEDs of at least some of said plurality of slats are both tilted towards said respective slat so as to define a second angle therewith and oriented along a predetermined second direction.

10 52. An assembly as recited in claim 48, wherein said LEDs include at least two different types of LEDs.

15 53. An assembly as recited in claim 52, wherein said at least two different types of LEDs are characterized by at least one of a colour, an angle of light pattern, and intensity.

54. An assembly as recited in claim 52, wherein said at least two different types of LEDs are provided on a same one of said plurality of slats.

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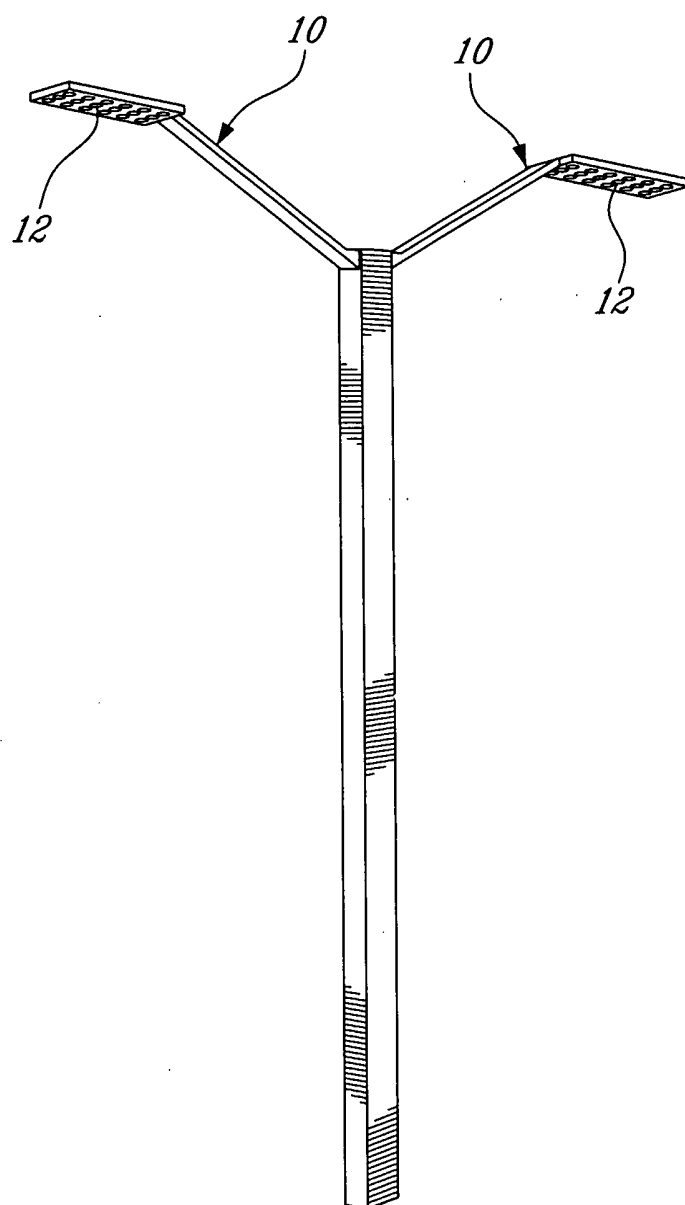
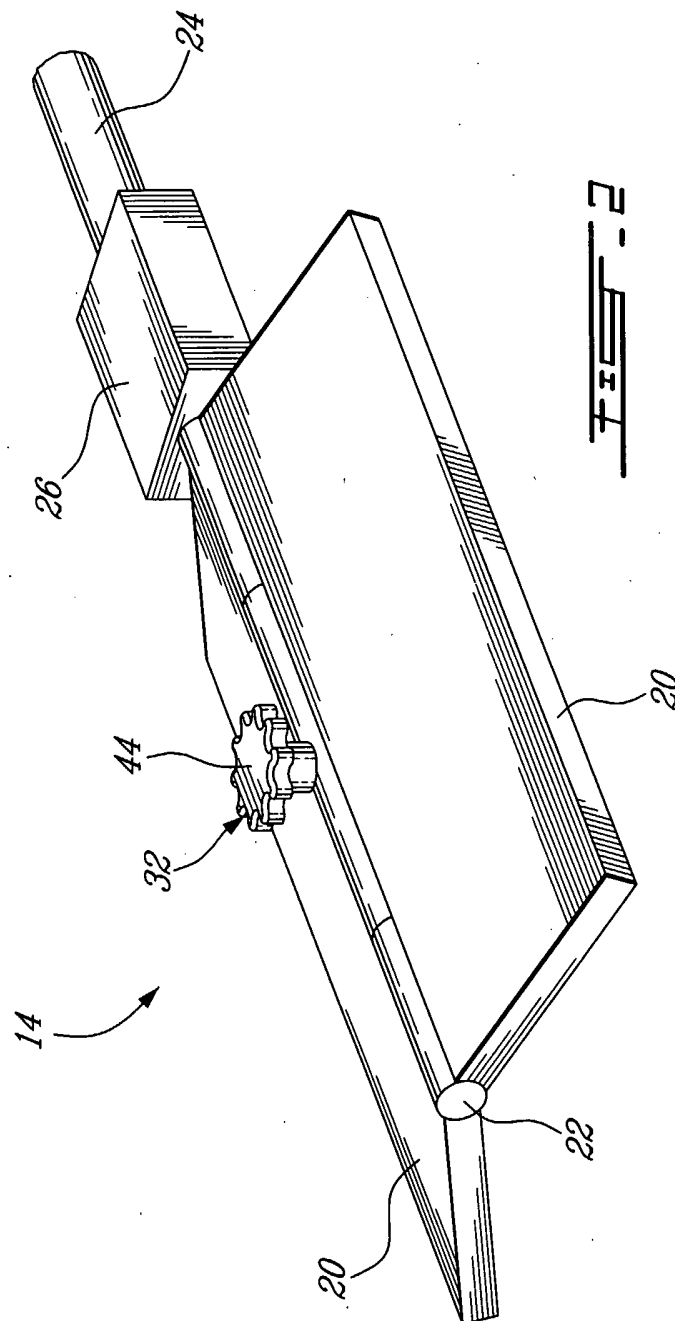
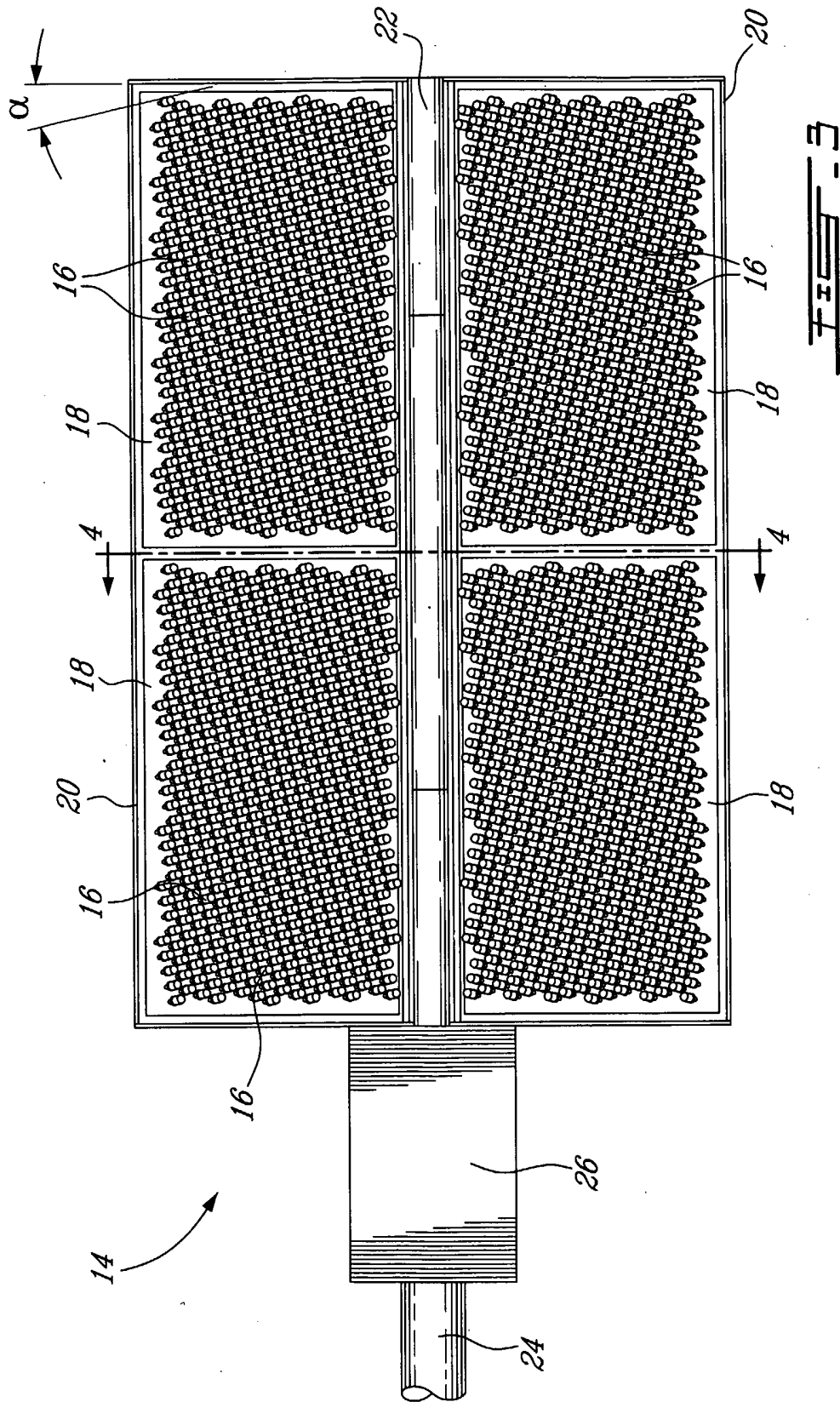


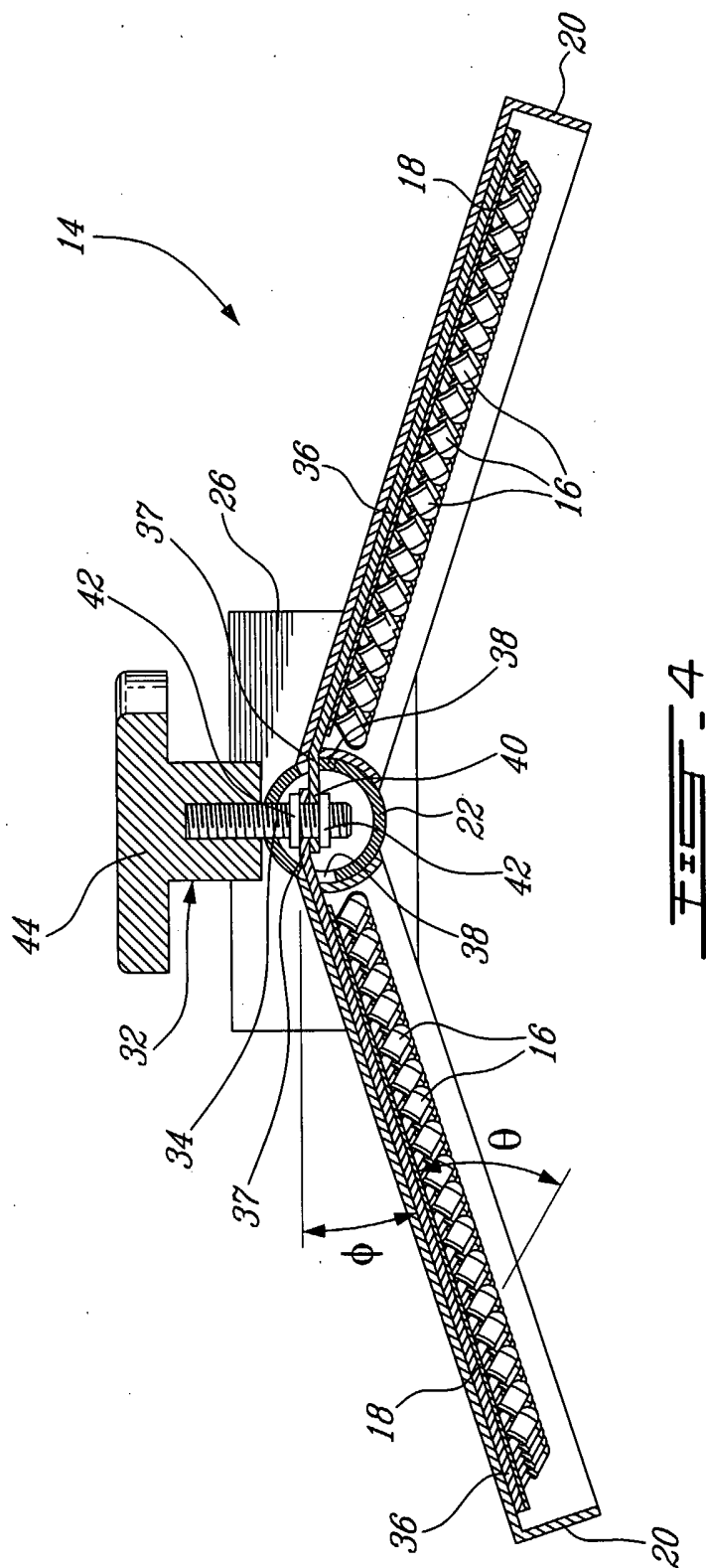
FIG. 1 (PRIOR ART)

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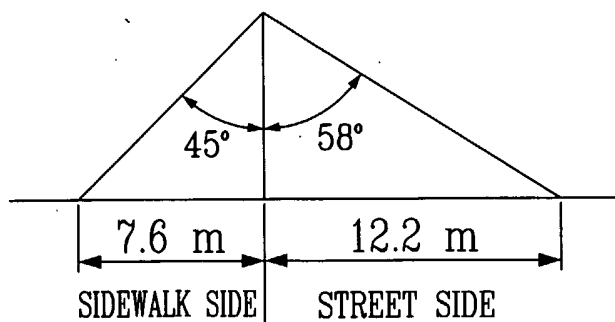
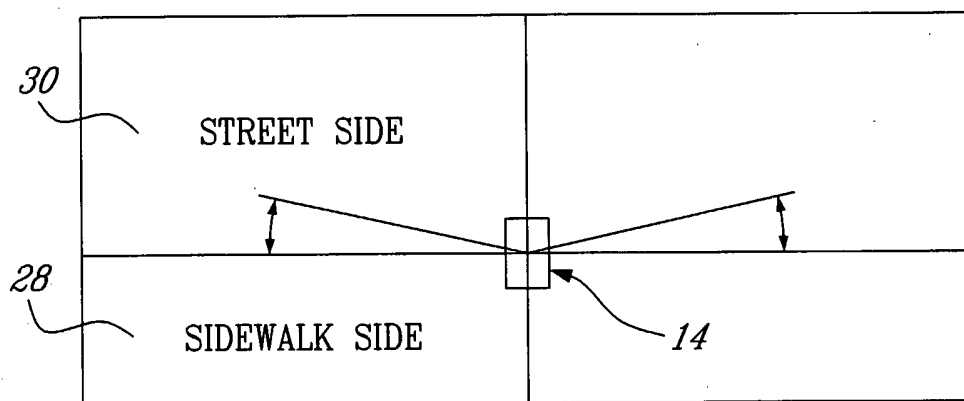
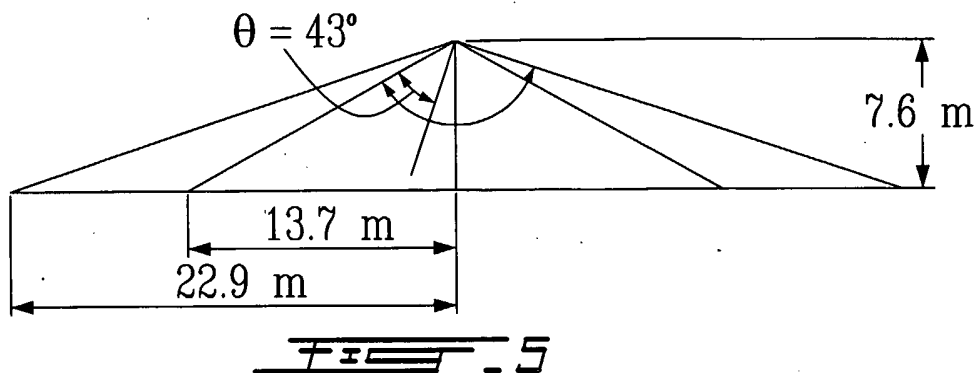


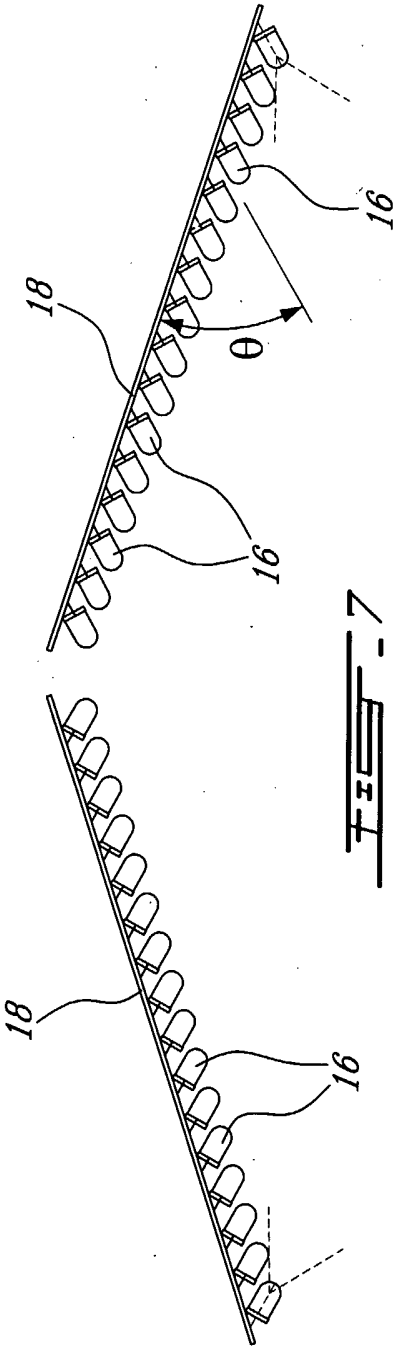


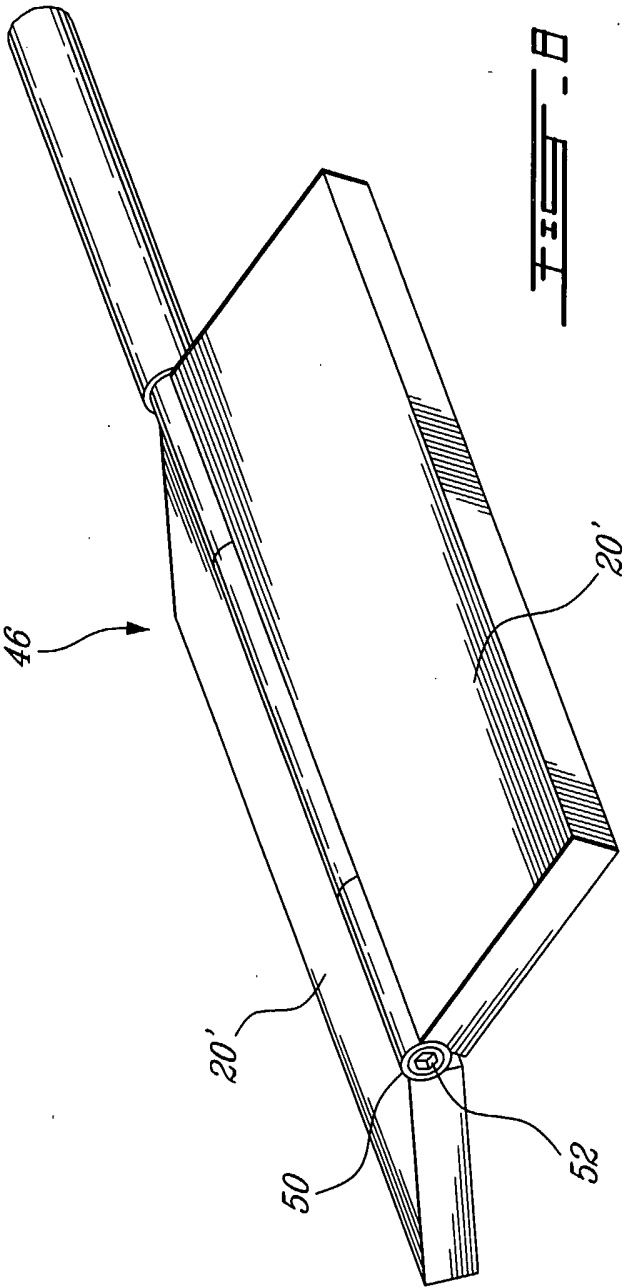
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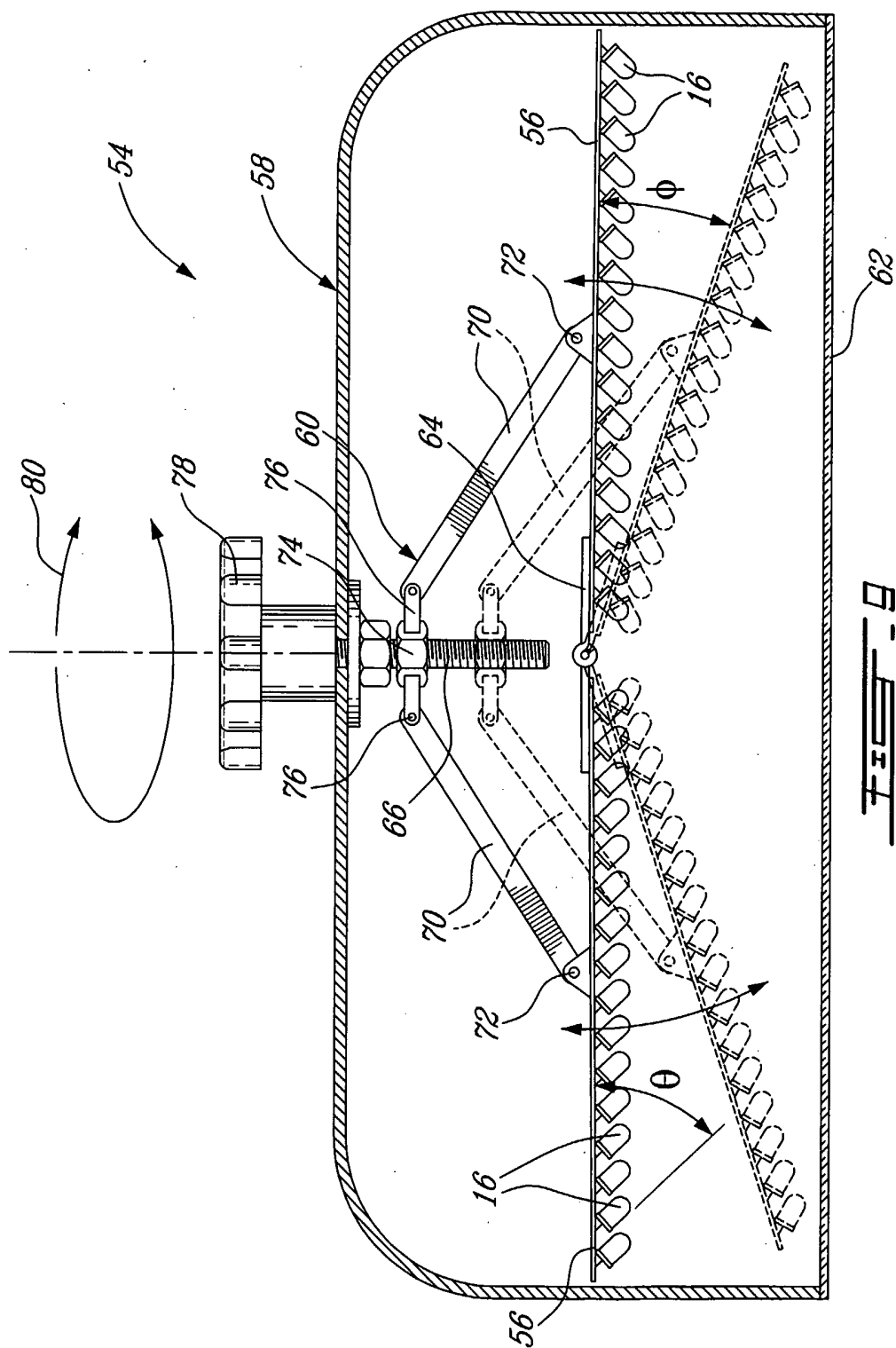
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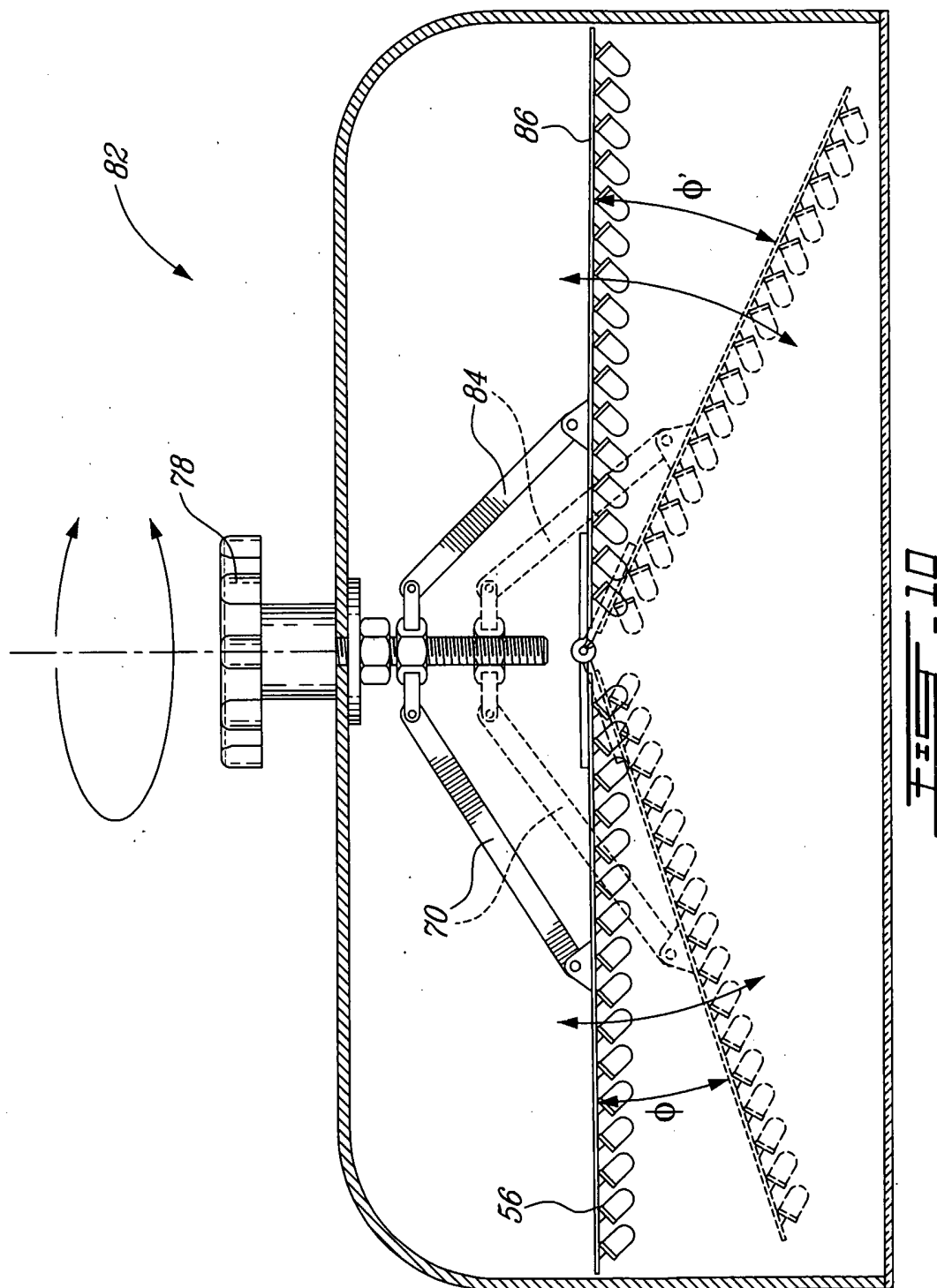


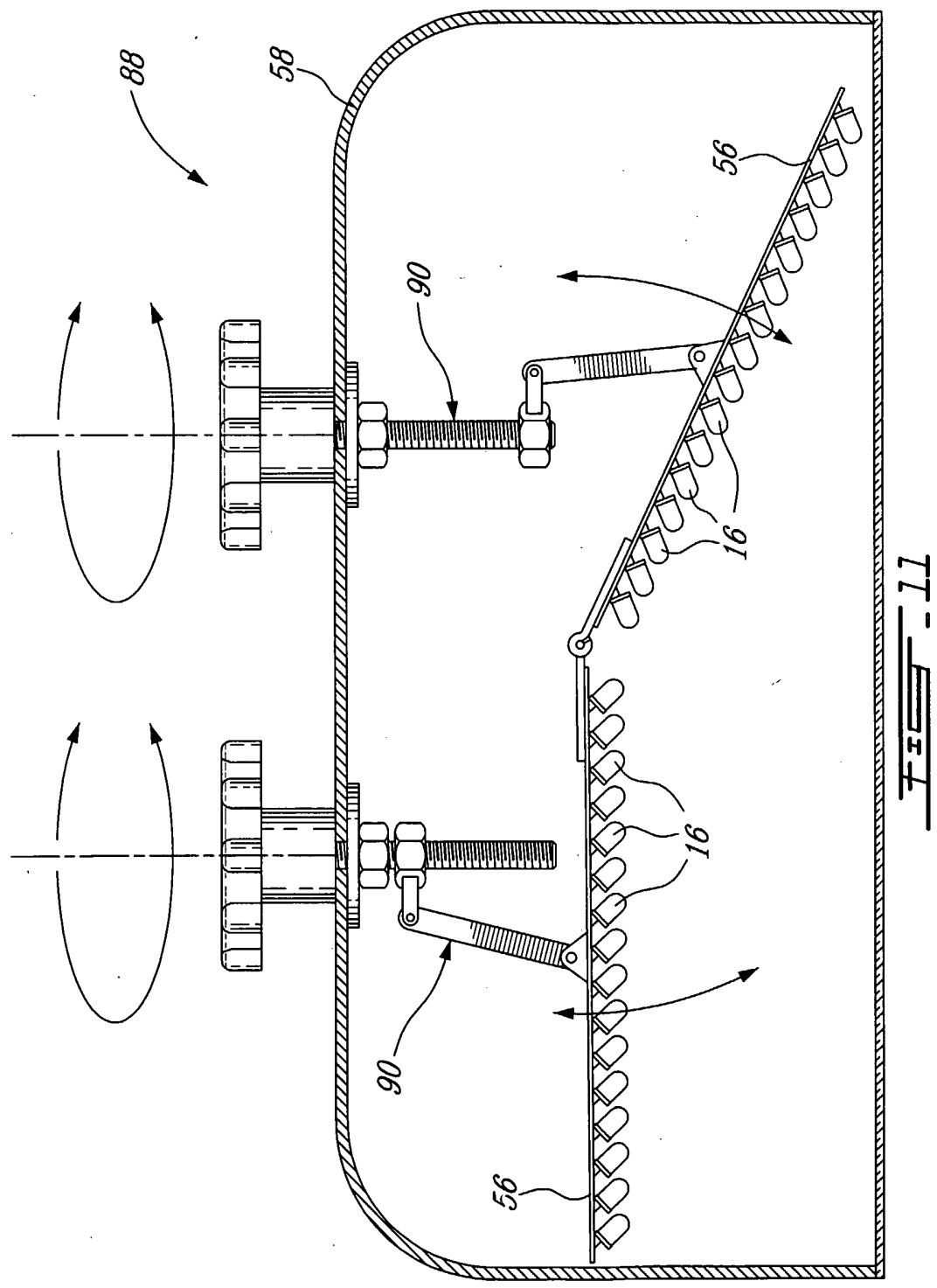


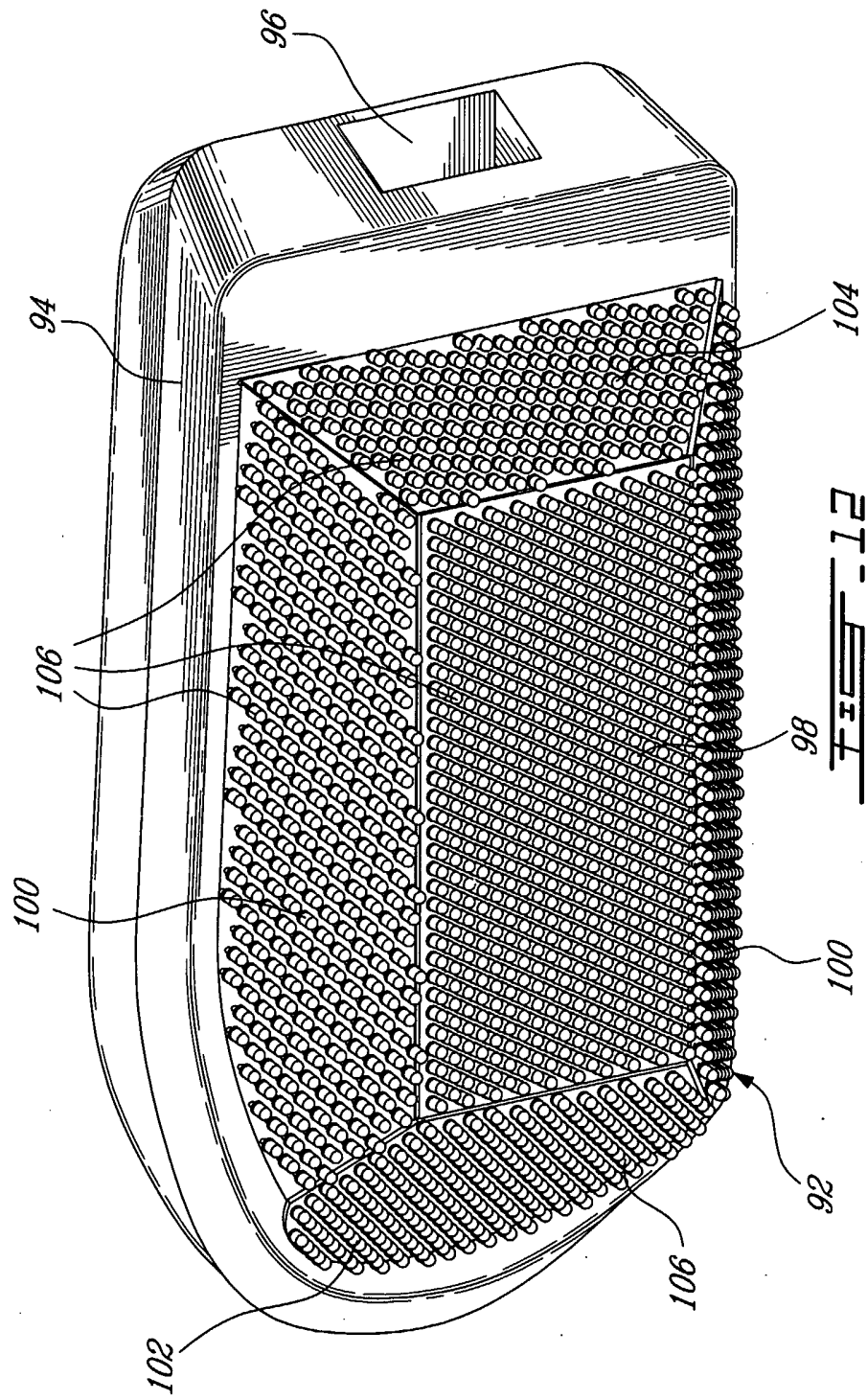
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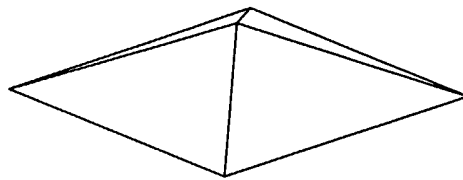


FIG. 13

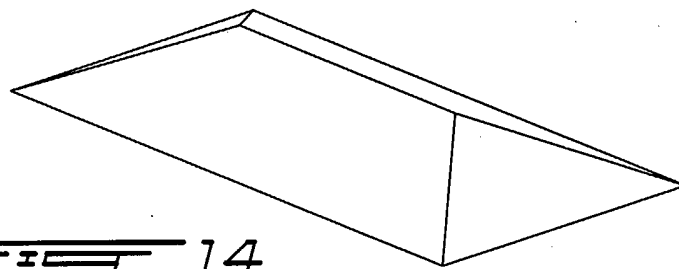


FIG. 14

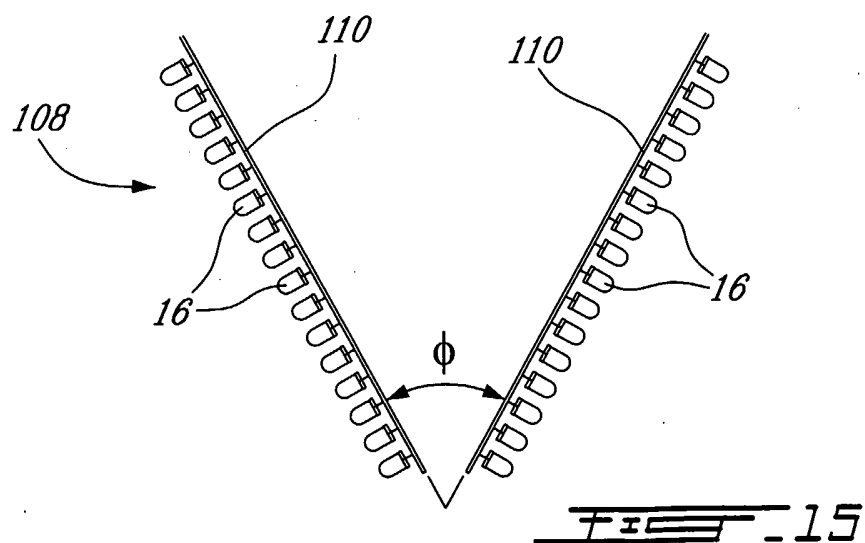
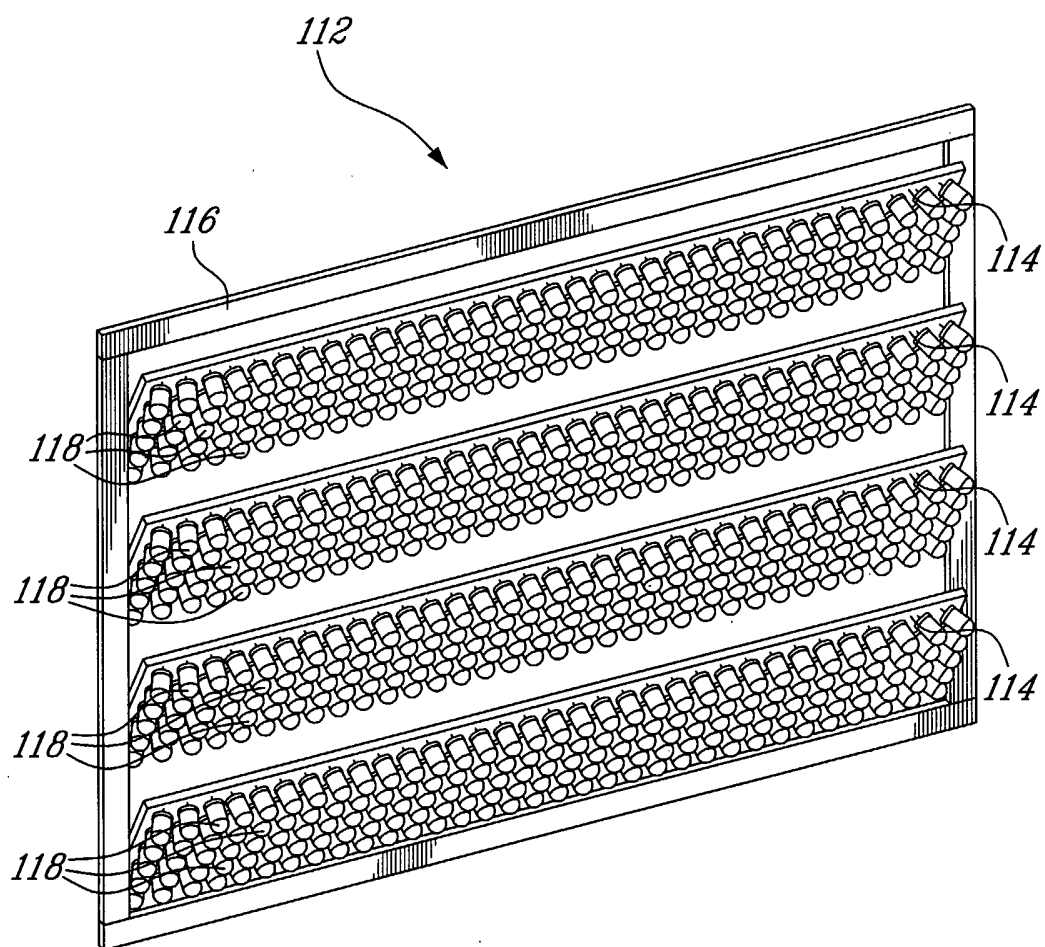
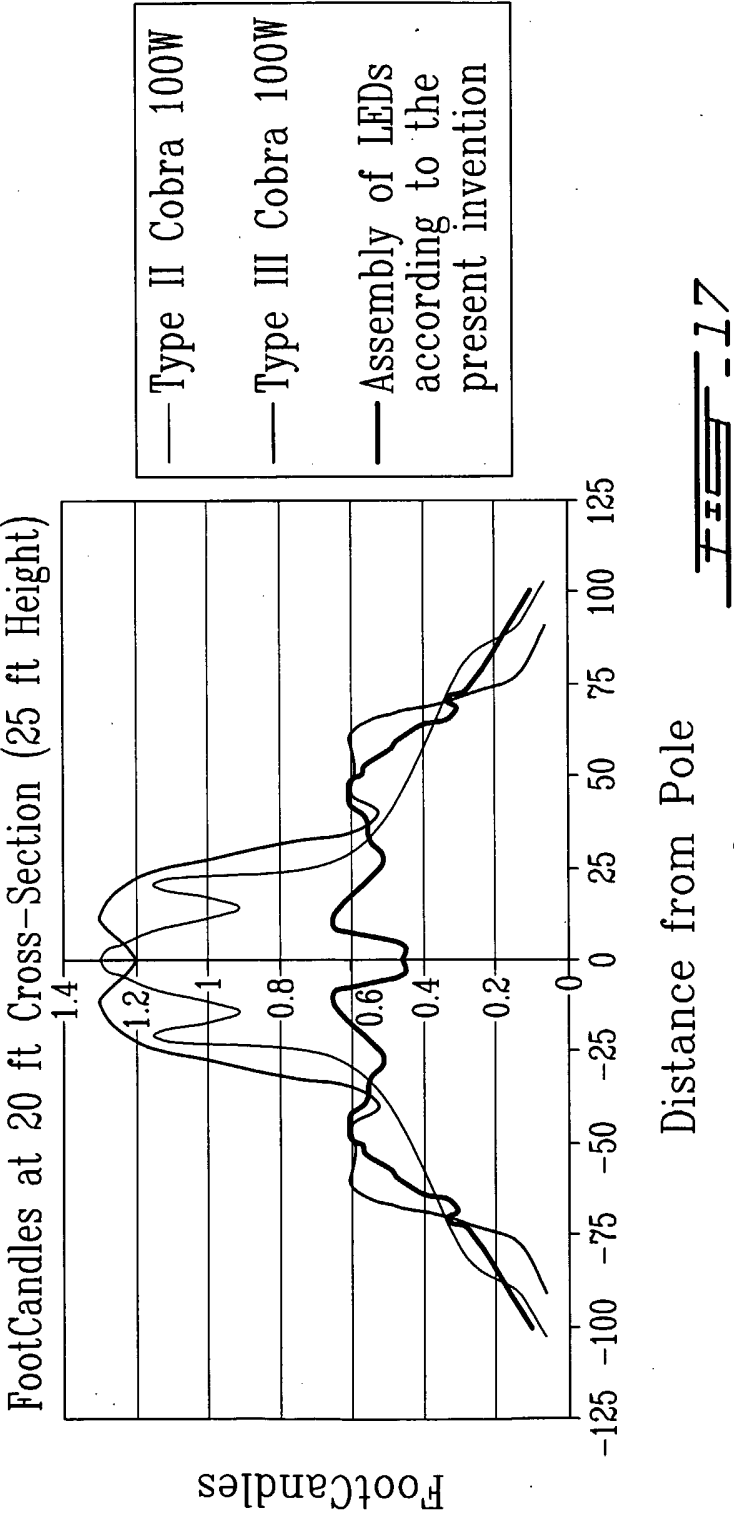


FIG. 15

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FIG. 16



INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2005/001847

A. CLASSIFICATION OF SUBJECT MATTER IPC: H05B 33/12 (2006.01) , F21S 8/08 (2006.01) , F21S 8/04 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC																										
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC: H05B 33/12 (2006.01) , F21S 8/08 (2006.01) , F21S 8/04 (2006.01) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used) West, Canadian Patent Database. angle; cross / intersect / focus; plane / array ; LED / lamp/ light																										
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 2003-0193802 (Luk) 16 October, 2003 (16-10-2003) Abstract; Figures 4, 5, 6; Paragraphs [0006], [0008], [0025]-[0030], [0057]-[0059], [0065], [0103], [0107], [0108]</td> <td>1, 9, 13-15, 17, 19-22, 24, 29, 30, 40, 43-46</td> </tr> <tr> <td>Y</td> <td></td> <td>2-7, 10-12, 32, 35, 36, 52, 53</td> </tr> <tr> <td>X</td> <td>US 2004-0105264 (Spero) 03 June, 2004 (03-06-2004) Abstract; Figures 2c, 3b, 15; Paragraphs [0014], [0016], [0059], [0118], [0120], [0145]</td> <td>33, 34, 37-39, 48-51</td> </tr> <tr> <td>Y</td> <td></td> <td>2-7, 10-12, 32, 35, 36, 52, 53</td> </tr> <tr> <td>A</td> <td>US 2002-0163805 (Hubbell et al.) 07 November, 2002 (07-11-2002) Abstract; Figures 6, 7; Paragraphs [0048]-[0050]</td> <td>33, 34, 37-39, 48-51</td> </tr> <tr> <td>A</td> <td>US 2004-0222947 (Newton et al.) 11 November, 2004 (11-11-2004) Abstract; Figures 5, 8</td> <td>33, 34, 37-39, 48-51</td> </tr> <tr> <td>A</td> <td>US 5580163 (Johnson, II) 03 December, 1996 (03-12-1996) *whole document*</td> <td>1, 9, 13-15, 17, 19-22, 24, 29, 30, 40, 43-46</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 2003-0193802 (Luk) 16 October, 2003 (16-10-2003) Abstract; Figures 4, 5, 6; Paragraphs [0006], [0008], [0025]-[0030], [0057]-[0059], [0065], [0103], [0107], [0108]	1, 9, 13-15, 17, 19-22, 24, 29, 30, 40, 43-46	Y		2-7, 10-12, 32, 35, 36, 52, 53	X	US 2004-0105264 (Spero) 03 June, 2004 (03-06-2004) Abstract; Figures 2c, 3b, 15; Paragraphs [0014], [0016], [0059], [0118], [0120], [0145]	33, 34, 37-39, 48-51	Y		2-7, 10-12, 32, 35, 36, 52, 53	A	US 2002-0163805 (Hubbell et al.) 07 November, 2002 (07-11-2002) Abstract; Figures 6, 7; Paragraphs [0048]-[0050]	33, 34, 37-39, 48-51	A	US 2004-0222947 (Newton et al.) 11 November, 2004 (11-11-2004) Abstract; Figures 5, 8	33, 34, 37-39, 48-51	A	US 5580163 (Johnson, II) 03 December, 1996 (03-12-1996) *whole document*	1, 9, 13-15, 17, 19-22, 24, 29, 30, 40, 43-46
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X	US 2003-0193802 (Luk) 16 October, 2003 (16-10-2003) Abstract; Figures 4, 5, 6; Paragraphs [0006], [0008], [0025]-[0030], [0057]-[0059], [0065], [0103], [0107], [0108]	1, 9, 13-15, 17, 19-22, 24, 29, 30, 40, 43-46																								
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Date of the actual completion of the international search 13 March 2006 (13-03-2006)		Date of mailing of the international search report 28 March 2006 (28-03-2006)																								
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001(819)953-2476		Authorized officer Mark J. Stephens (819) 934-3472																								

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2005/001847

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 6120164 (Libin et al.) 19 September, 2000 (19-09-2000) *whole document*	1, 9, 13-15, 17, 19-22, 24, 29, 30, 40, 43-46
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/CA2005/001847

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