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(54) **OPTICAL SHEET AND RELEVANT BACKLIGHT MODULE AND LIQUID CRYSTAL DISPLAY**

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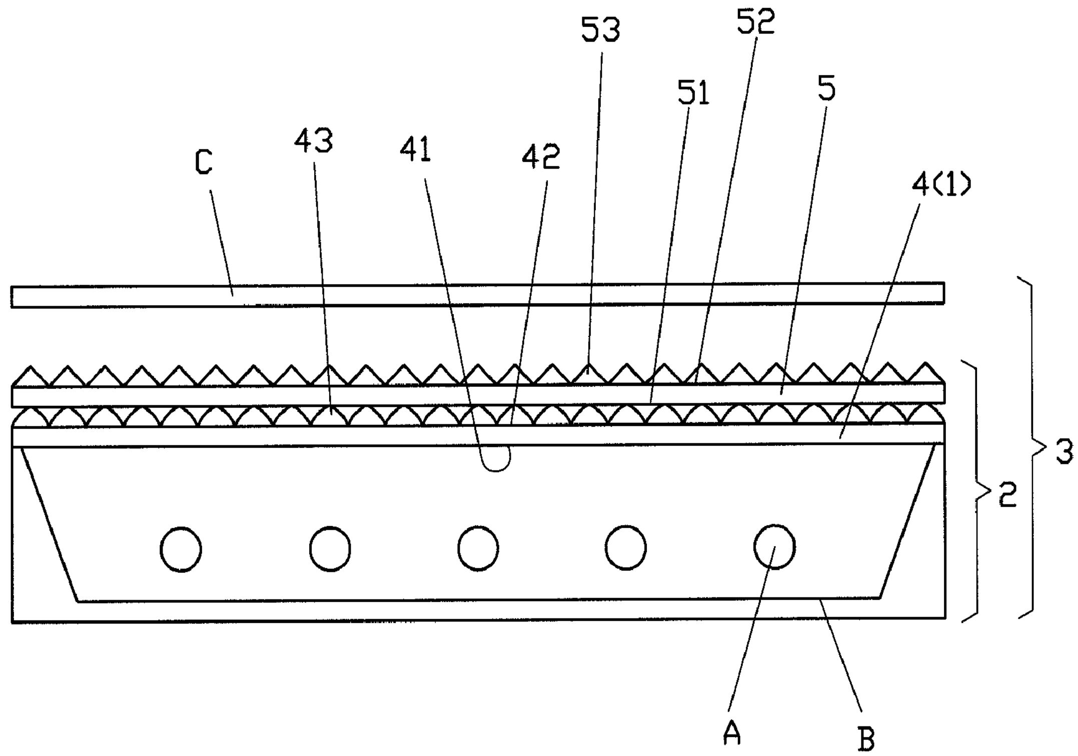
G09G 3/36 (2006.01)

(52) **U.S. Cl.** **345/102**

(57) **ABSTRACT**

An optical sheet adapted to relevant backlight module and LCD includes a light guiding side, a light emitting side, and a plurality of microstructures disposed on the light emitting side. Each of the microstructures is formed in an aspheric contour. At an intersection of an X-line and Y-line of each microstructure cross-sectionally defines a first bottom joint, which extending toward opposing sides of the X-line to define two symmetrical second bottom joints and upwardly extending from the Y-line to construct a top point. A first arc route is formed between the top point and the second bottom joint, and a second straight route is formed between the top point and the second bottom joint. A third route is defined round a cross-sectional outside contour of each microstructure, which is located within an area surrounded by the first and the second routes.



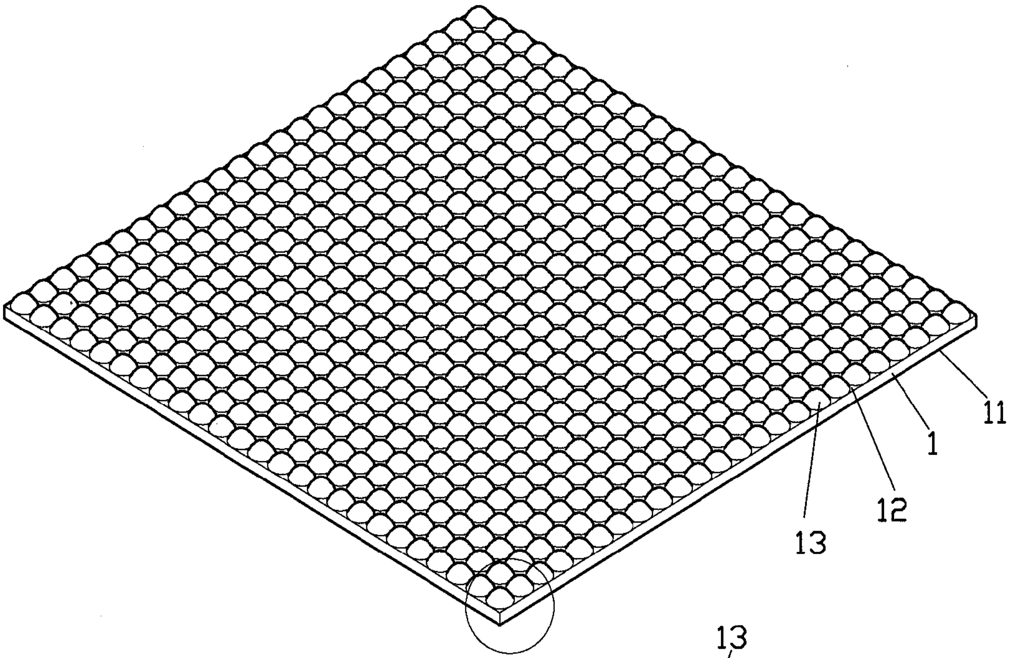


FIG. 1

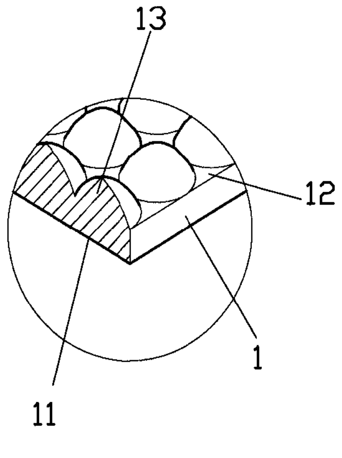
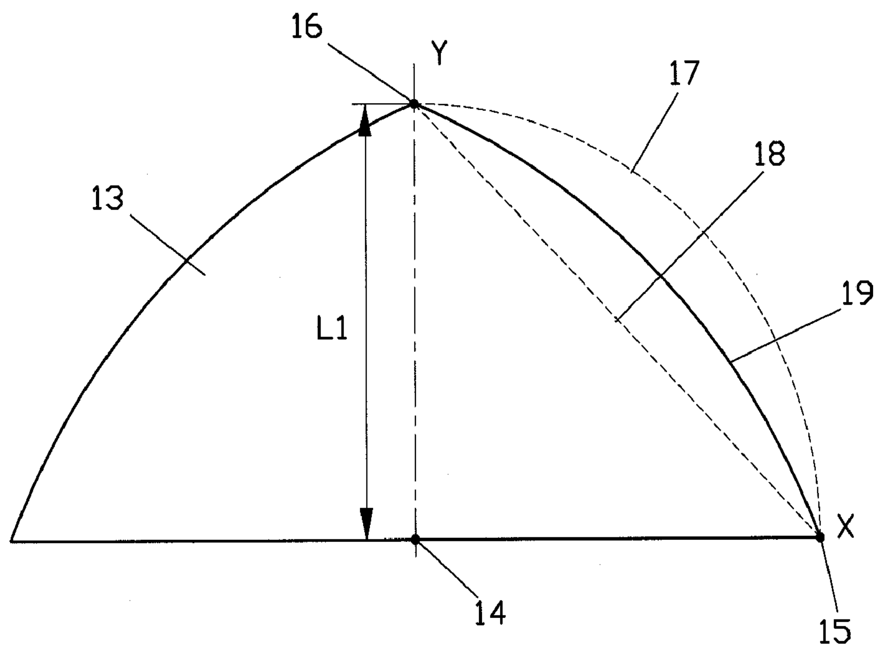
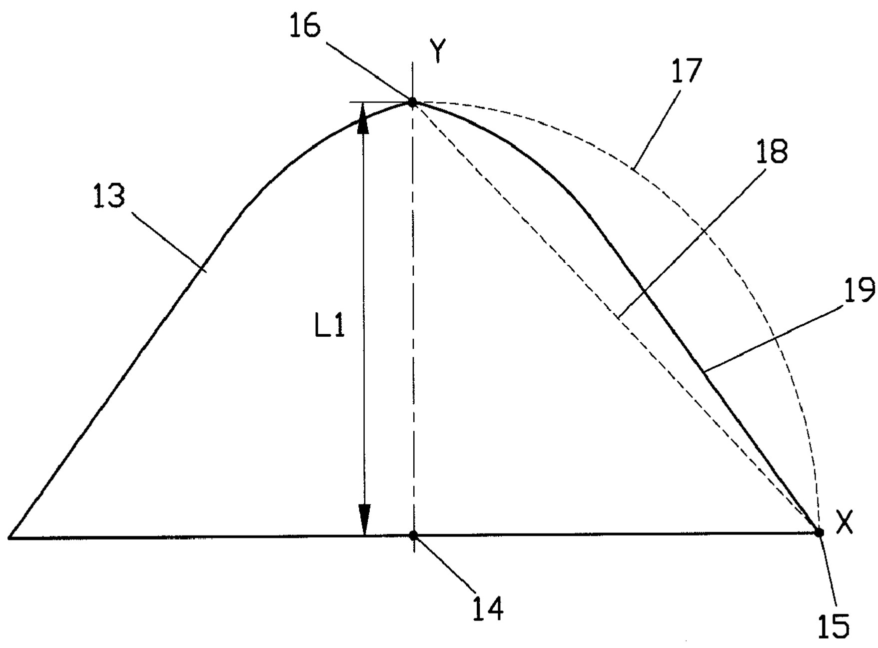


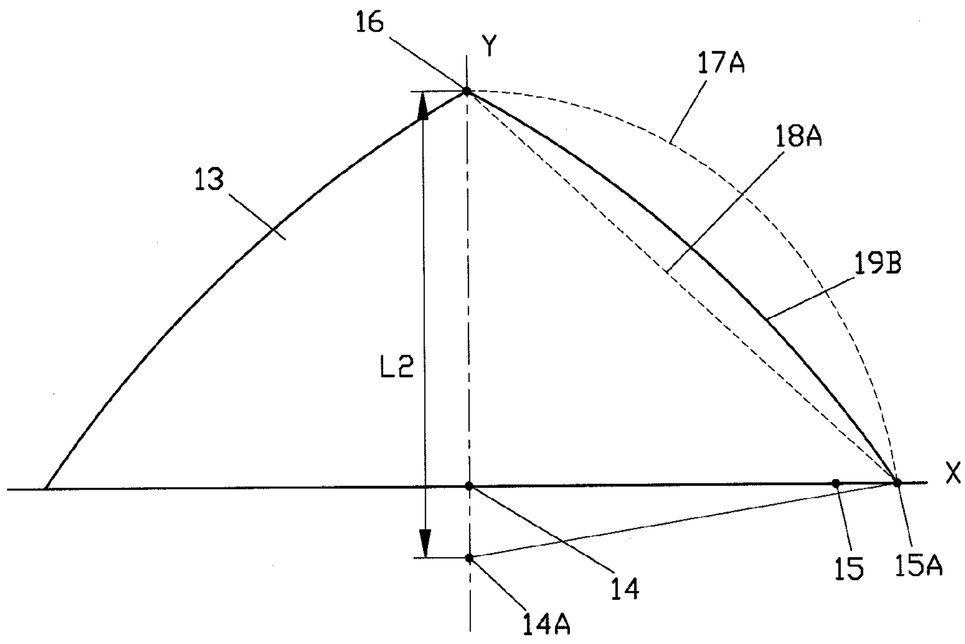
FIG. 1A



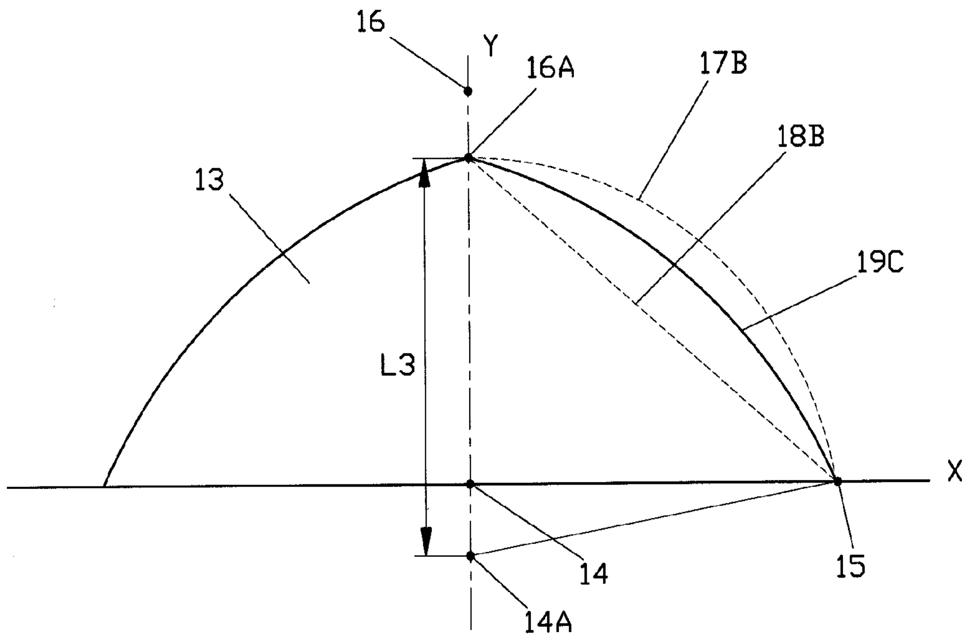
F I G . 2



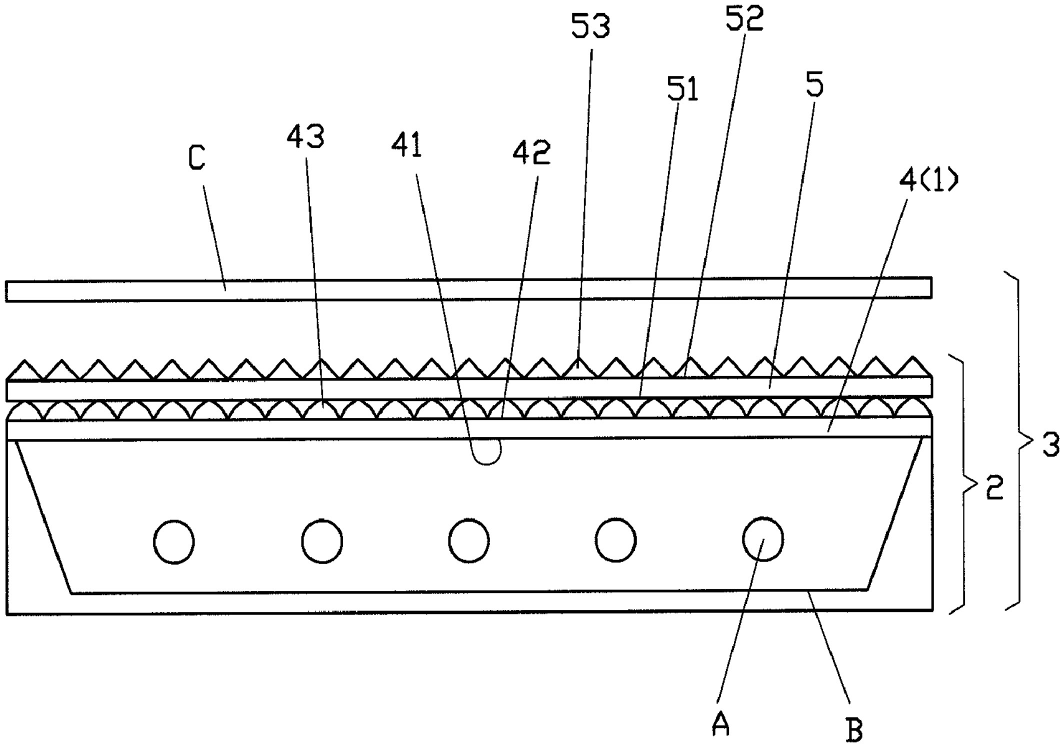
F I G . 3


16
Y
17A
18A
13
19B
L2
X
14
15
15A
14A

F I G . 4A


16
Y
16A
17B
18B
13
19C
L3
X
14
15
14A

F I G . 4B



F I G . 5

(a)Incident angle at 0 degree

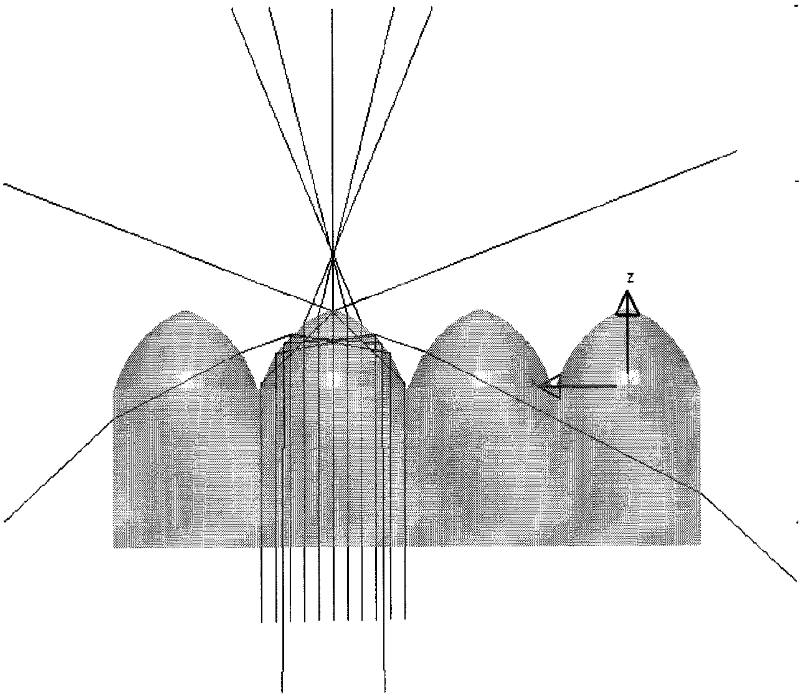


FIG. 6A

(b) Incident angle at 15 degrees

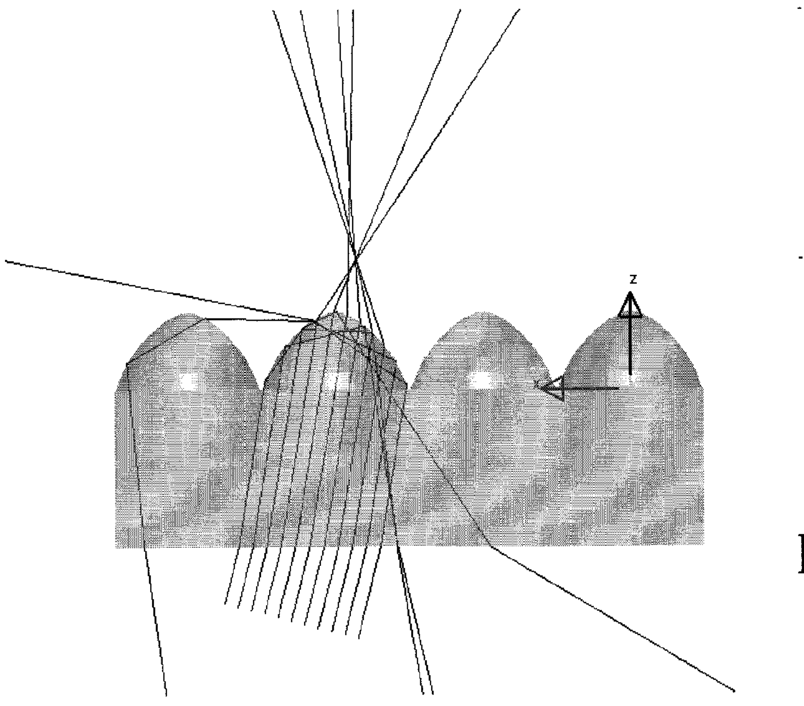


FIG. 6B

(c) Incident angle at 30 degrees

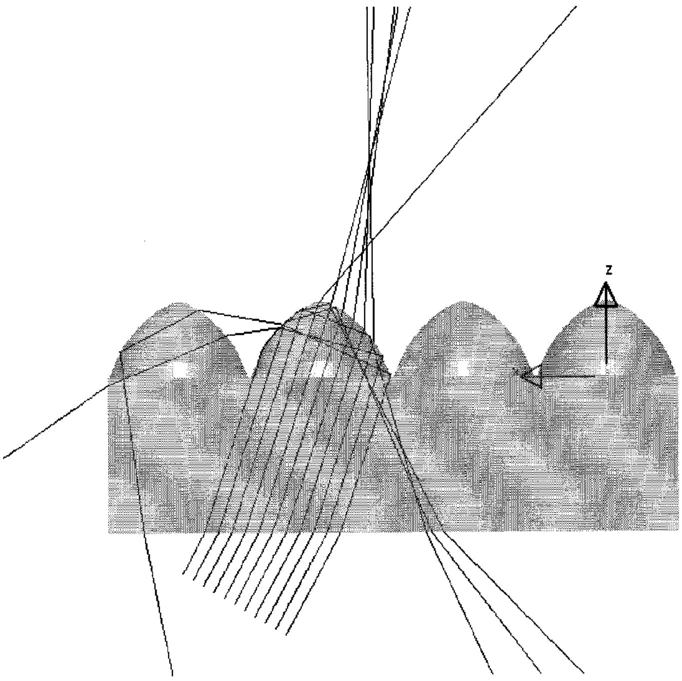


FIG. 6C

(d) Incident angle at 35 degrees

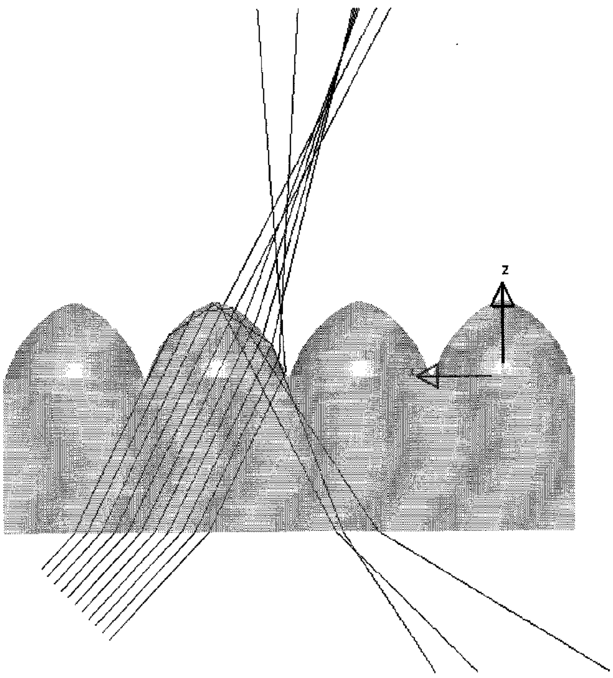


FIG. 6D

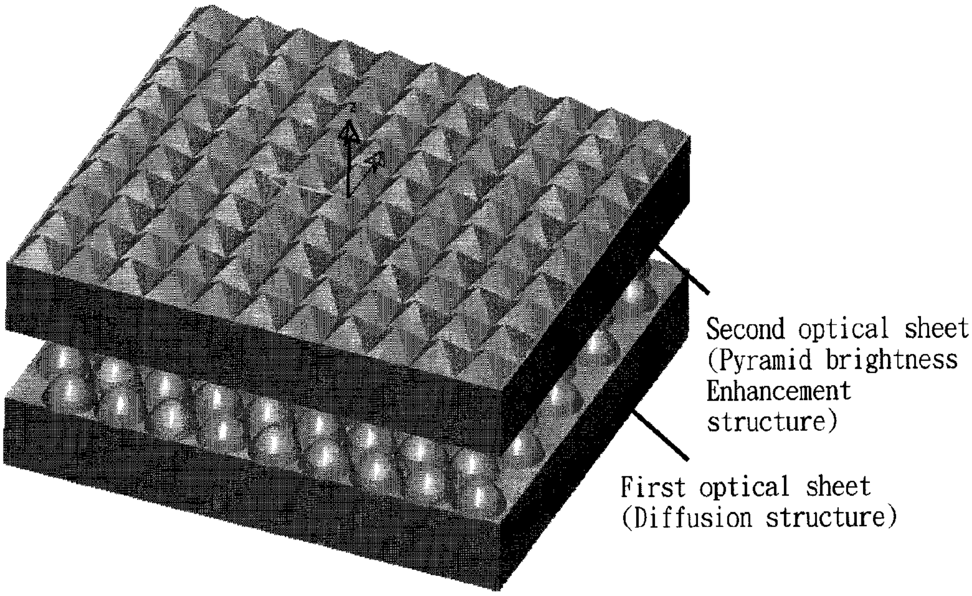

Second optical sheet
(Pyramid brightness
Enhancement
structure)
First optical sheet
(Diffusion structure)

FIG. 7

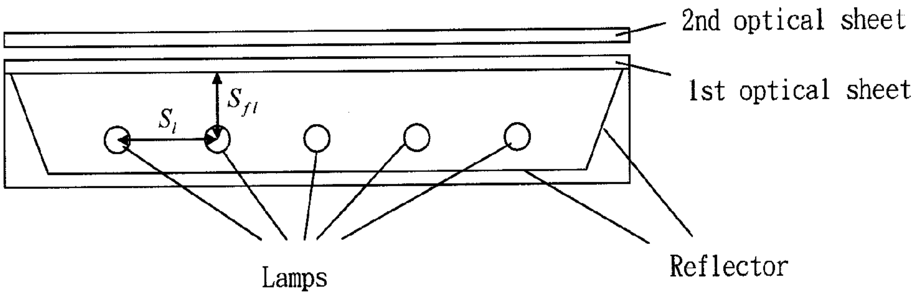

2nd optical sheet
1st optical sheet
S_l
S_{fl}
Lamps
Reflector

FIG. 8

Types of microstructures of the first optical sheet

	Average luminance/ Uniformity	Aspheric	Spherical	Conical
S_{fl}	21mm	159.98 / 96.44%	154.45 / 95.10%	152.76 / 94.80%
	18.9mm	162.63 / 95.73%	155.97 / 93.20%	153.25 / 92.74%
	16.8mm	164.65 / 94.85%	157.75 / 94.31%	154.39 / 91.87%
	14.7mm	166.57 / 95.31%	161.13 / 90.26%	156.13 / 91.44%
	12.6mm	168.80 / 94.23%	161.73 / 86.68%	156.81 / 93.86%
	10.5mm	171.10 / 90.37%		158.17 / 85.44%
	8.4mm	173.57 / 85.33%		

FIG. 9

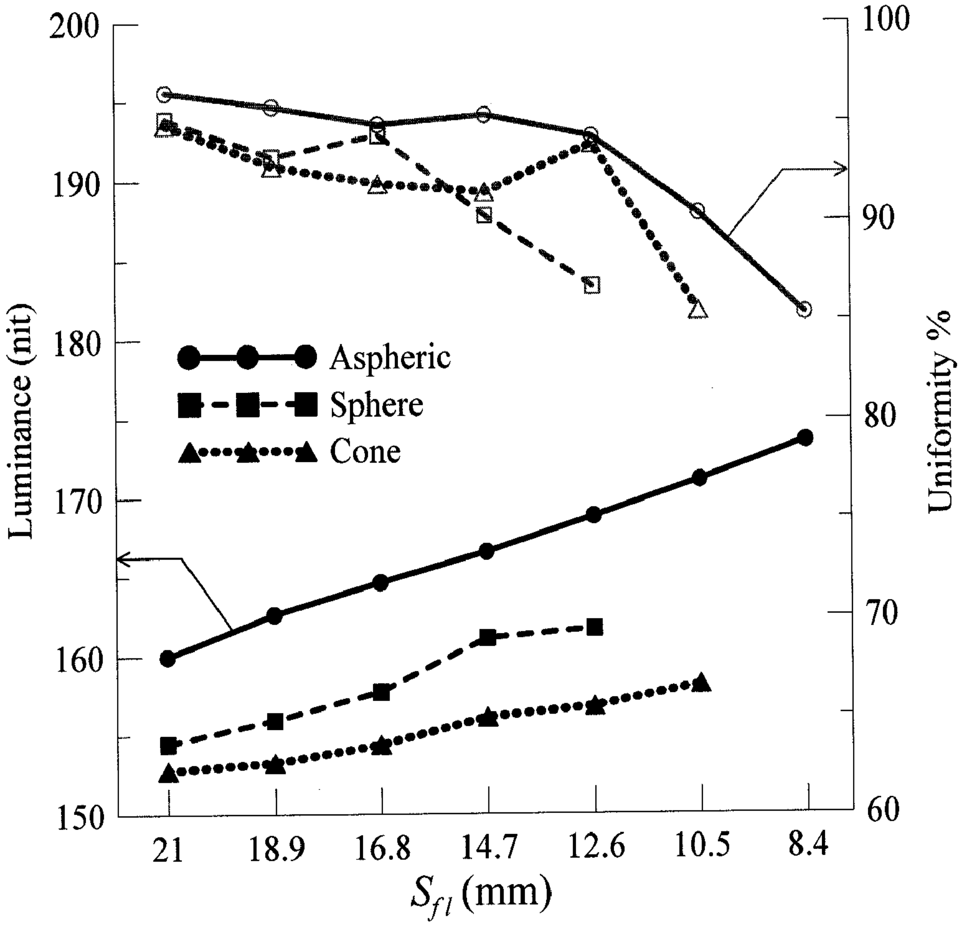
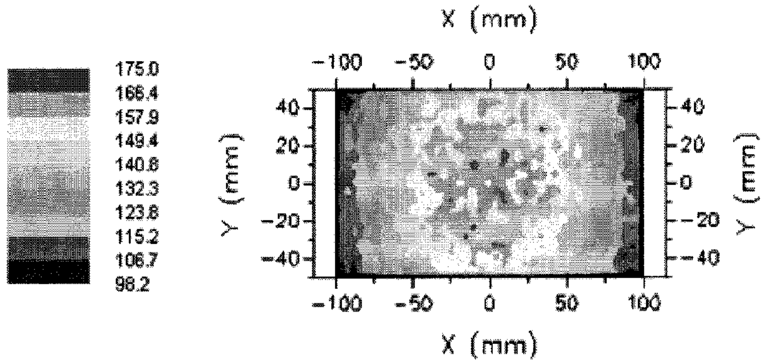


FIG. 10

(a) Overall distribution of luminance while S_{fl} is 21mm

Spatial Luminance Chart

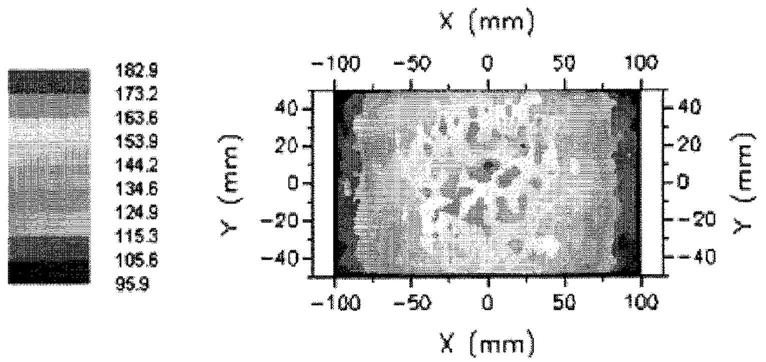


X(mm)=0. 821987, Y(mm)=-0. 987963, Value=153. 686

FIG. 11A

(b) Overall distribution of luminance while S_{fl} is 18.9mm

Spatial Luminance Chart

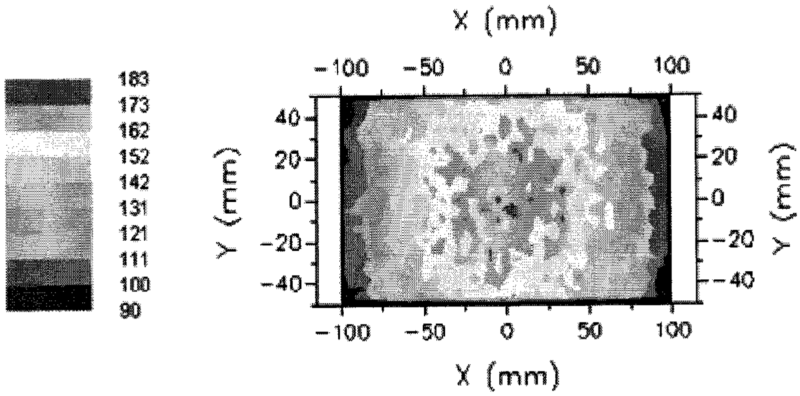


X(mm)=0. 520033, Y(mm)=0, Value=163. 366

FIG. 11B

(c) Overall distribution of luminance while S_{fl} is 16.8mm

Spatial Luminance Chart

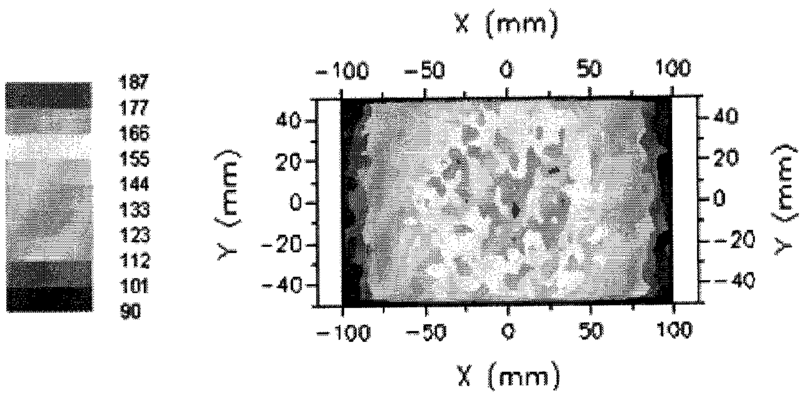


X(mm)=2.03829, Y(mm)=-2.65172, Value=173.153

FIG. 11C

(d) Overall distribution of luminance while S_{fl} is 14.7mm

Spatial Luminance Chart

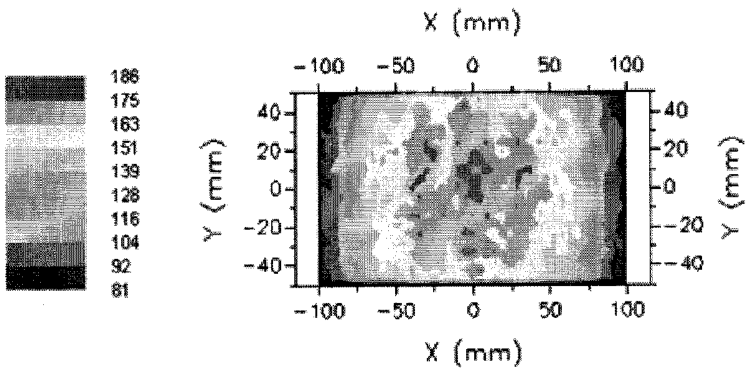


X(mm)=0, Y(mm)=0.883908, Value=172.739

FIG. 11D

(e) Overall distribution of luminance while S_{fl} is 12.6mm

Spatial Luminance Chart

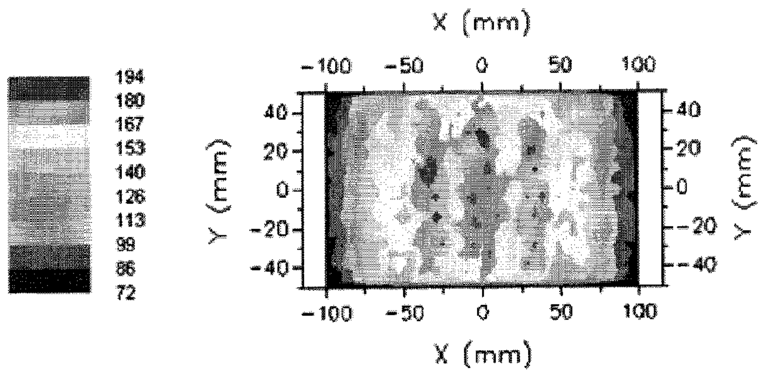


X(mm)=1.01915, Y(mm)=-1.76782, Value=178.957

FIG. 11E

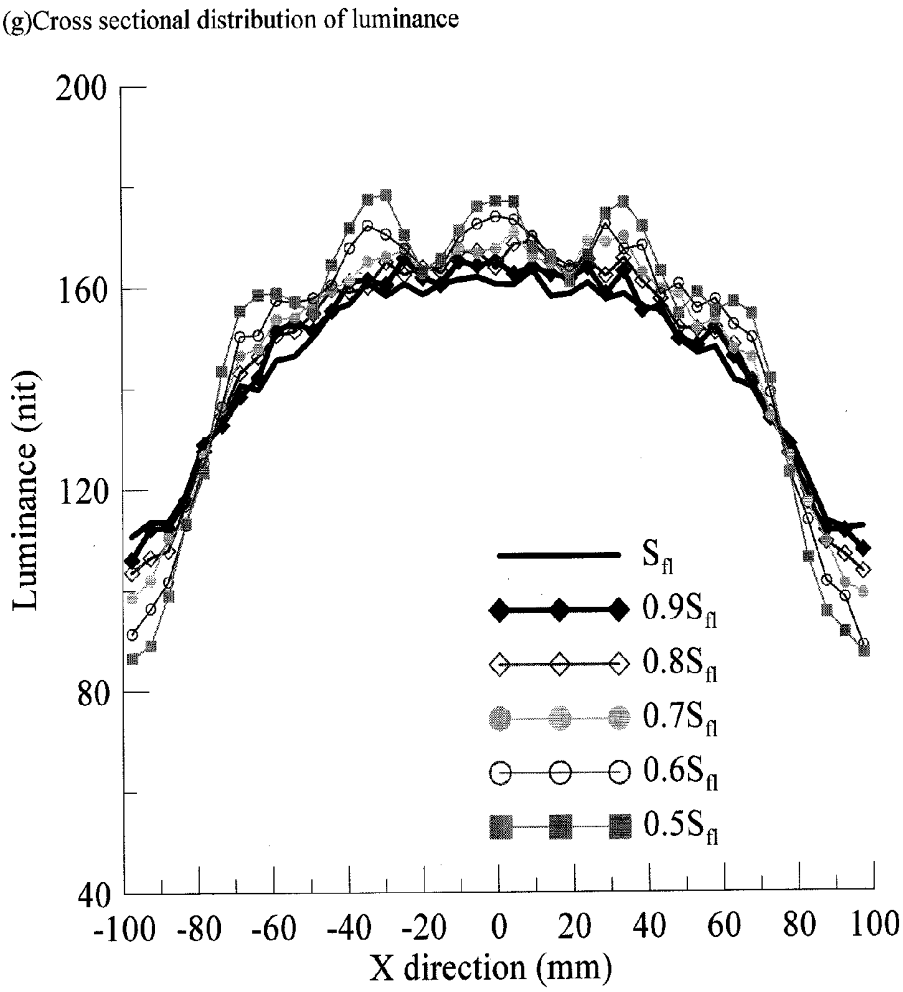
(f) Overall distribution of luminance while S_{fl} is 10.5mm

Spatial Luminance Chart



X(mm)=2.03829, Y(mm)=-1.76782, Value=175.748

FIG. 11F



(g)Cross sectional distribution of luminance
200
160
120
80
40
Luminance (nit)
-100
-80
-60
-40
-20
0
20
40
60
80
100
X direction (mm)
S_{fl}
$0.9S_{fl}$
$0.8S_{fl}$
$0.7S_{fl}$
$0.6S_{fl}$
$0.5S_{fl}$

FIG. 11G

(a) Overall distribution of luminance while S_{fl} is 21mm

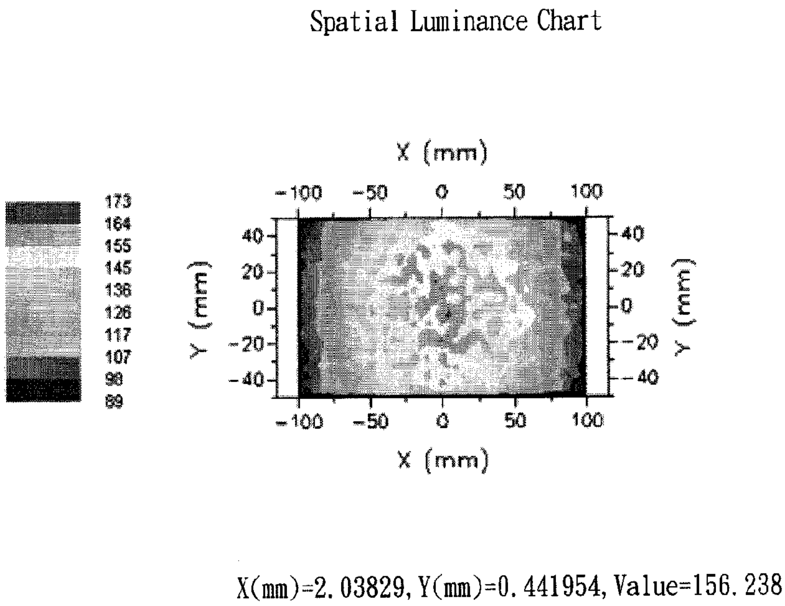


FIG. 12A

(b) Overall distribution of luminance while S_{fl} is 18.9mm

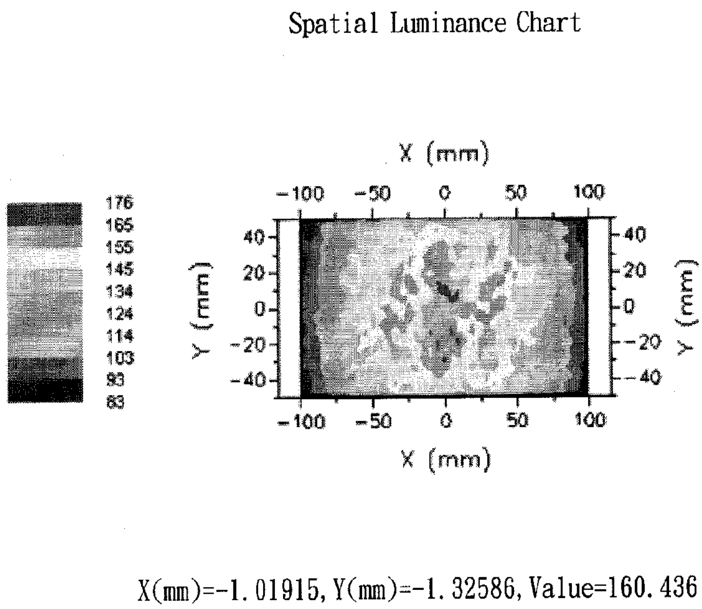
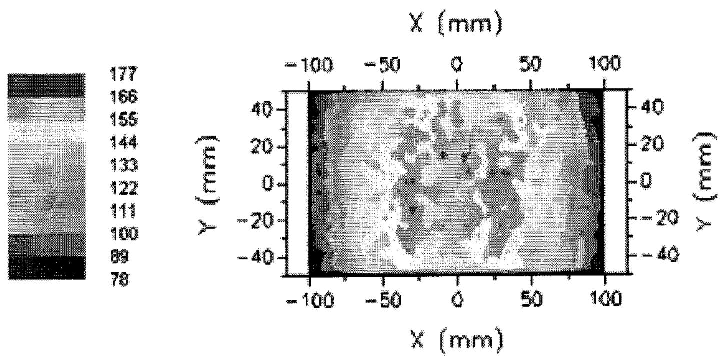


FIG. 12B

(c) Overall distribution of luminance while S_{fl} is 16.8mm

Spatial Luminance Chart

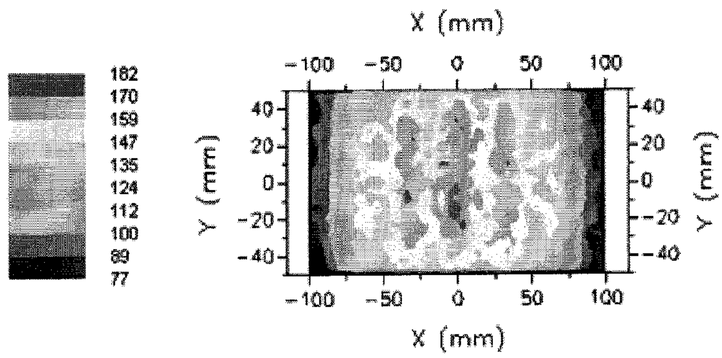


X(mm)=0, Y(mm)=2. 20977, Value=160. 42

FIG. 12C

(d) Overall distribution of luminance while S_{fl} is 14.7mm

Spatial Luminance Chart

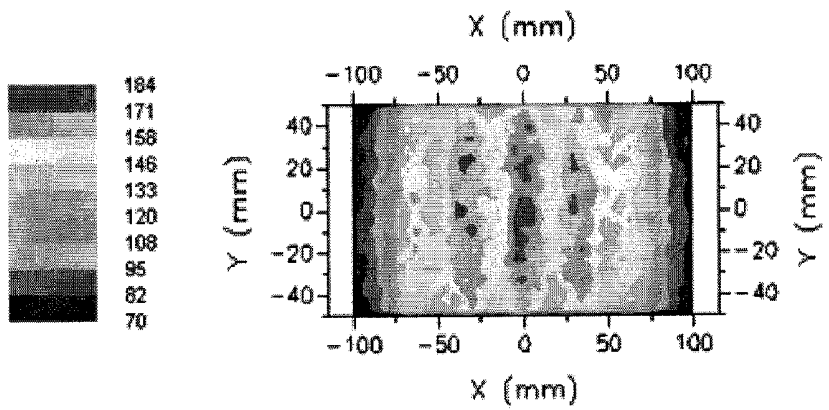


X(mm)=1. 01915, Y(mm)=-2. 20977, Value=170. 626

FIG. 12D

(e) Overall distribution of luminance while S_{fl} is 12.6mm

Spatial Luminance Chart



X(mm)=1. 01915, Y(mm)=-0. 441954, Value=179. 534

FIG. 12E

(f) Cross sectional distribution of luminance

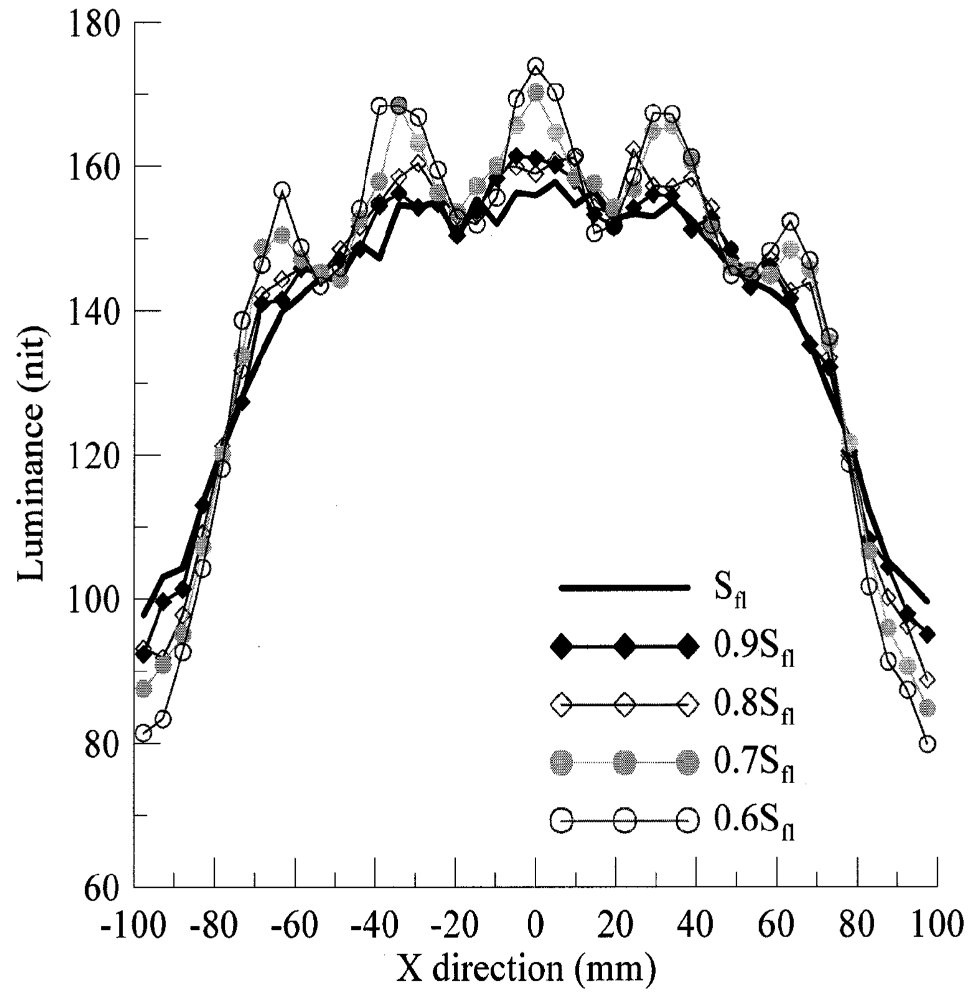
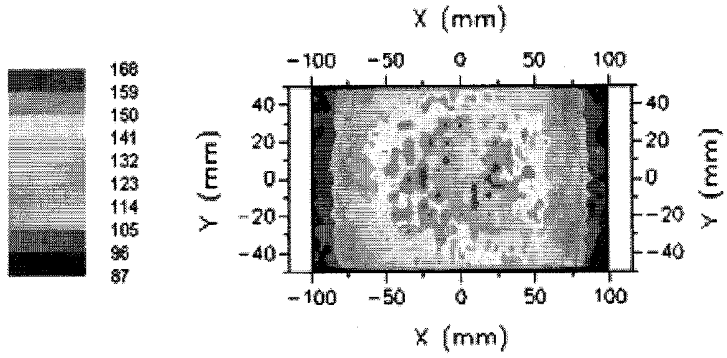


FIG. 12F

(a) Overall distribution of luminance while S_{fl} is 21mm

Spatial Luminance Chart

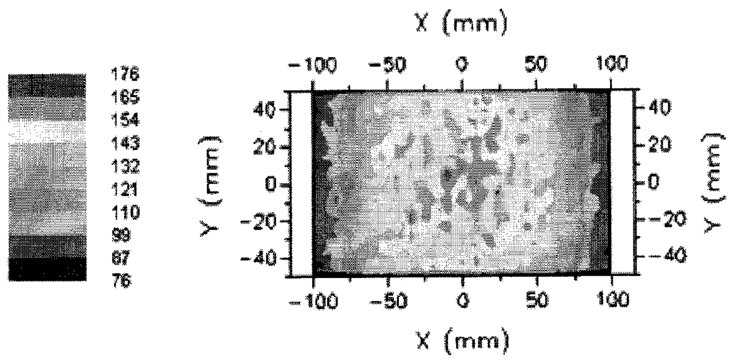


X(mm)=0, Y(mm)=-3.09368, Value=154.221

FIG. 13A

(b) Overall distribution of luminance while S_{fl} is 18.9mm

Spatial Luminance Chart

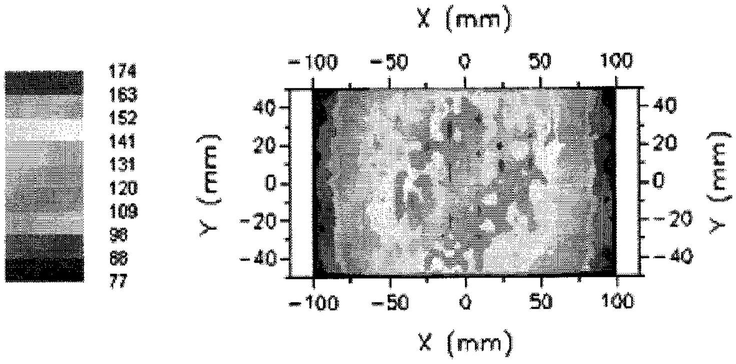


X(mm)=1.01915, Y(mm)=-0.441954, Value=146.989

FIG. 13B

(c) Overall distribution of luminance while S_{fl} is 16.8mm

Spatial Luminance Chart

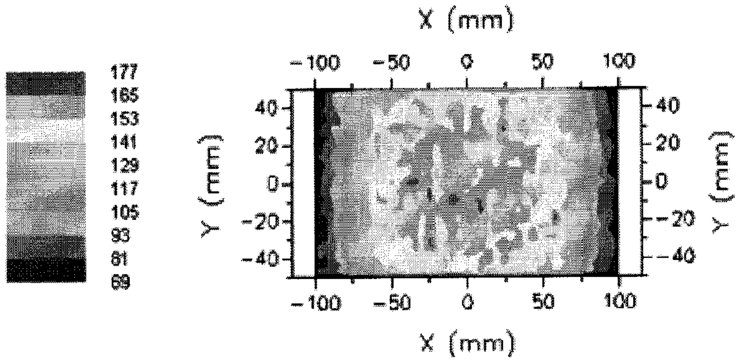


X(mm)=0, Y(mm)=0, Value=0

FIG. 13C

(d) Overall distribution of luminance while S_{fl} is 14.7mm

Spatial Luminance Chart

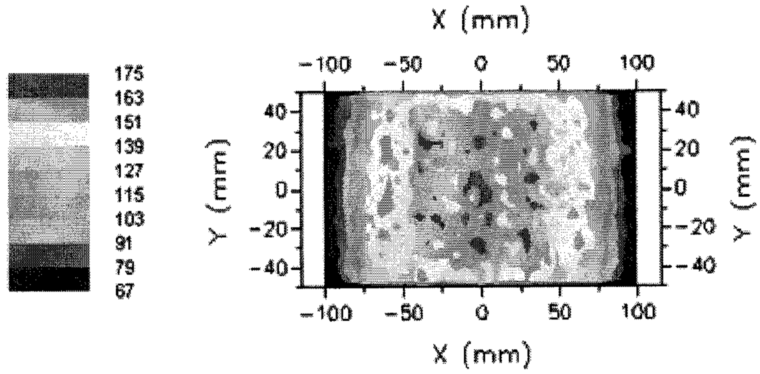


X(mm)=1.01915, Y(mm)=0.441954, Value=157.175

FIG. 13D

(e) Overall distribution of luminance while S_{fl} is 12.6mm

Spatial Luminance Chart

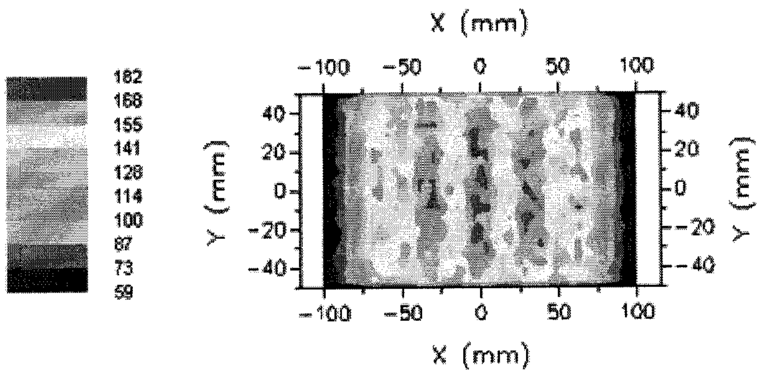


X(mm)=0, Y(mm)=-1.32586, Value=165.827

FIG. 13E

(f) Overall distribution of luminance while S_{fl} is 10.5mm

Spatial Luminance Chart



X(mm)=0, Y(mm)=-0.441954, Value=167.374

FIG. 13F

(g) Cross sectional distribution of luminance

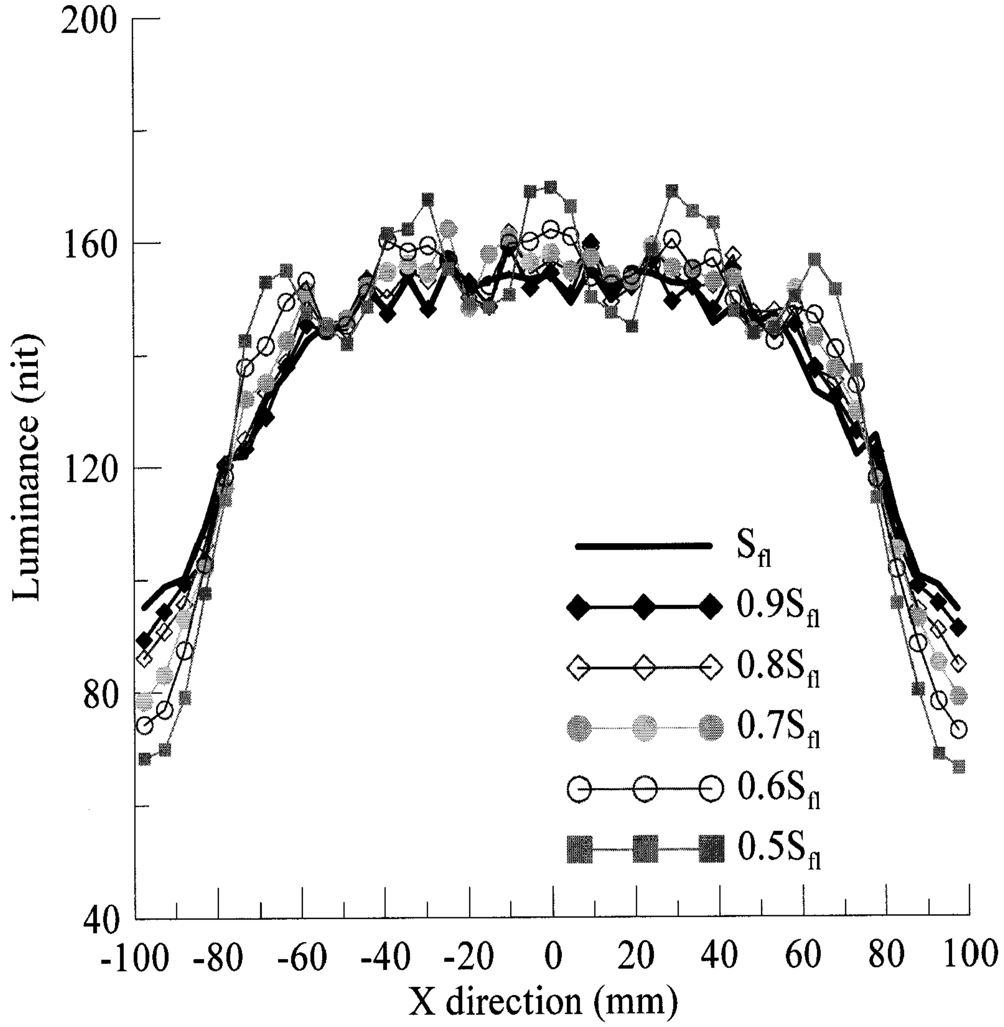
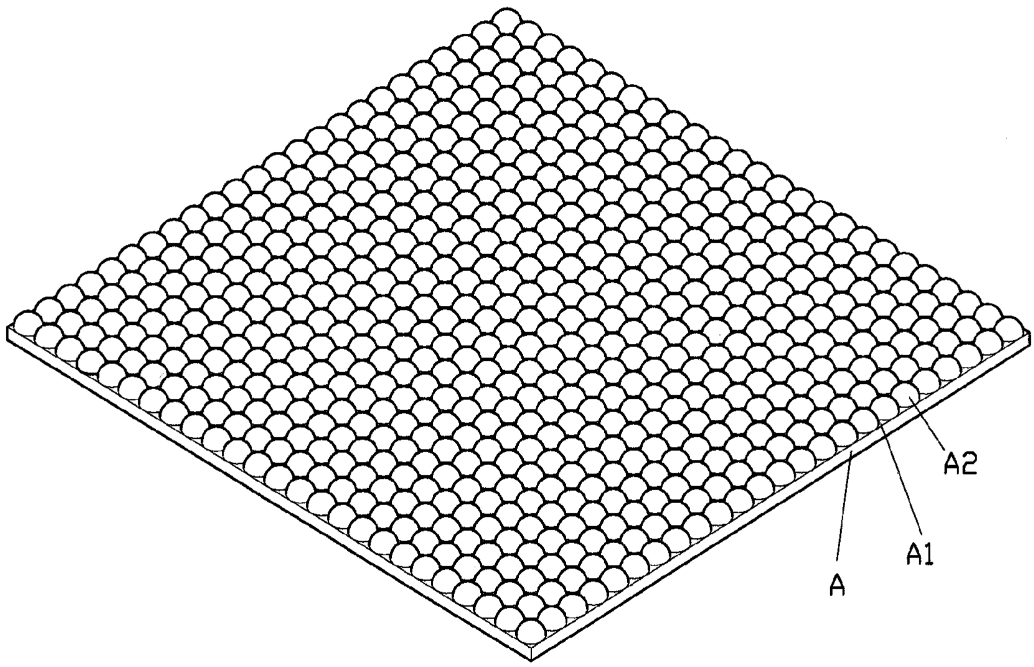
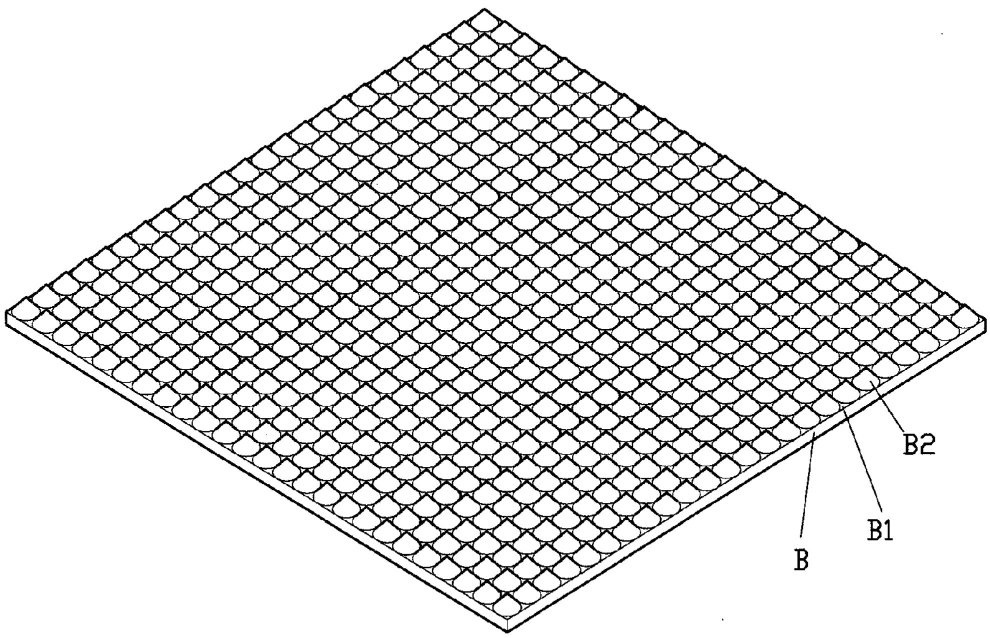


FIG. 13G



F I G . 14
(PRIOR ART)



F I G . 15
(PRIOR ART)

OPTICAL SHEET AND RELEVANT BACKLIGHT MODULE AND LIQUID CRYSTAL DISPLAY

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an optical sheet and relevant backlight module as well as liquid crystal display, in particular to an optical sheet including a light emitting side on which pluralities of aspheric microstructures are disposed and the same cooperating with the backlight module and the liquid crystal display.

[0003] 2. Description of the Related Art

[0004] As a tendency, the liquid crystal display (LCD) has widely developed various electronic products, such as notebooks, LCD TVs, mobile phones, PDAs, etc. Generally, the LCD includes a backlight module and a liquid crystal panel; wherein, the backlight module is placed under the liquid crystal panel and essentially comprised of an optical sheet including a light source, a reflecting piece, a diffusing piece, brightness enhancement film, etc.

[0005] Referring to FIGS. **14** and **15**, two conventional optical sheets A, B have respective light emitting surfaces A**1**, B**1**, on which a plurality of spherical microstructures A**2** and conical microstructures B**2** are disposed thereon, respectively. Besides, the microstructures configured into a uniform shape or formed by an assortment of shaped contours are commonly adopted, for instance formed by the aforementioned shapes, a rectangular shape, or a wave-rectangular shape. Additional description concerning the relevant techniques may also be found in U.S. Pat. No. 5917664 and 6825984, and Republic of China Patent No. M289203, M280484, M305348, M331676, M333584, 1274896, 1278662.

SUMMARY OF THE INVENTION

[0006] The object of the present invention is to solve the conventional optical sheet for lacking of sufficient luminance and uniformity.

[0007] An optical sheet in accordance with the present invention includes a light guiding side and a light emitting side; wherein, a plurality of microstructures are disposed on the light emitting side, and each of the microstructures is formed into an aspheric configuration. Each microstructure cross sectionally intersects with the light emitting side at an X-line, which thence vertically meets at a Y-line. Further, the microstructure in cross section is in a symmetrical arrangement via centering the Y-line. The X-line and the Y-line intersect at a first bottom joint; the first bottom joint extends toward two sides of the X-line to symmetrically define two respective second bottom joints and then extends upwardly from the Y-line to form a top point. Moreover, a first arc route is defined between the top point and the second bottom joint, and a second straight route is formed between the top point and the second bottom joint; a third route is defined round an outside contour of the cross-sectional microstructure, whereby the third route is located within an area surrounded by the first and the second routes.

[0008] A backlight module in accordance with the present invention includes a light source, a reflecting plate, a first optical sheet, and a second optical sheet. Wherein, the light source serves to emit light, and the reflecting plate applies to reflect the light; further, the first optical sheet is disposed on the light source and the reflecting plate, which further includes a first light guiding side and a first light emitting side; wherein, a plurality of microstructures are disposed on the first light emitting side, and each of the microstructures is formed into an aspheric configuration. Each microstructure cross sectionally intersects with the first light emitting side at an X-line, which thence vertically meets at a Y-line. Further, the microstructure in cross section is in a symmetrical arrangement via centering the Y-line. The X-line and the Y-line intersect at a first bottom joint; the first bottom joint extends toward two sides of the X-line to symmetrically defined two respective second bottom joints and then extends upwardly from the Y-line to form a top point. Moreover, a first arc route is defined between the top point and the second bottom joint, and a second straight route is formed between the top point and the second bottom joint; a third route is defined round an outside contour of the cross-sectional microstructure, whereby the third route is located within an area surrounded by the first and the second routes. Additionally, the second optical sheet is disposed on the first optical sheet, which further has a second light guiding side and a second light emitting side; the second light emitting side thence has microstructures each in a pyramid thereon.

[0009] A liquid crystal display in accordance with the present invention includes a light source, a reflecting plate, a first optical sheet, a second optical sheet, and a liquid crystal panel. Wherein, the light source serves to emit light, and the reflecting plate applies to reflect the light; further, the first optical sheet is disposed on the light source and the reflecting plate, which further includes a first light guiding side and a first light emitting side; wherein, a plurality of microstructures are disposed on the first light emitting side, and each of the microstructures is formed into an aspheric configuration. Each microstructure cross sectionally intersects with the first light emitting side at an X-line, which thence vertically meets at a Y-line. Further, the microstructure in cross section is in a symmetrical arrangement via centering the Y-line. The X-line and the Y-line intersect at a first bottom joint; the first bottom joint extends toward two sides of the X-line to symmetrically defined two respective second bottom joints and then extends upwardly from the Y-line to form a top point. Moreover, a first arc route is defined between the top point and the second bottom joint, and a second straight route is formed between the top point and the second bottom joint; a third route is defined round an outside contour of the cross-sectional microstructure, whereby the third route is located within an area surrounded by the first and the second routes. Additionally, the second optical sheet is disposed on the first optical sheet, which further has a second light guiding side and a second light emitting side; the second light emitting side thence has microstructures each in a pyramid shape thereon. The liquid crystal panel is disposed on the second optical sheet for the purpose of displaying images.

[0010] The aforementioned third route defined on the optical sheet, backlight module, and liquid crystal display could be either shaped by an arc or by a connection of an arc and a straight line. Further, a center of the first route claimed in the optical sheet, backlight module, and liquid crystal display could be either located at the first bottom joint intersected by the X-line and Y-line or right below the first bottom joint on the Y-line.

[0011] Accordingly, the present invention has advantages as following described:

1. The present invention is beneficial of reducing the consumption of the optical sheets and increasing the luminance and the uniformity thereof, so as to correspondingly render the backlight module and the liquid crystal display thinner and lighter.
2. The microstructures of the present invention as described above are formed in an aspheric contour. The aspheric microstructures substantially change the light path and impinge on a diffusion of the light while emitting the light from the underside into the microstructures. Further, the second optical sheet, provided with the pyramid brightness enhancement structure, is disposed on the first optical sheet, which leads to a skew ray from the first optical sheet sending toward a positive direction for increasing the luminance of the backlight module.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a schematic view showing the present invention;

[0013] FIG. **1**A is a partially enlarged view of the present invention;

[0014] FIG. **2** is a cross-sectional view showing the third route formed in an arc shape and a center of the first route set at the first bottom joint;

[0015] FIG. **3** is a cross-sectional view showing the third route formed by a connection of an arc and a straight line;

[0016] FIGS. **4**A and **4**B are cross-sectional views showing the center of the first route set right below the first bottom joint;

[0017] FIG. **5** is a schematic view showing the present optical sheet cooperating with a backlight module and a liquid crystal display;

[0018] FIGS. **6**A to **6**D illustrate rays of light entering the first optical sheet at different emitting angles;

[0019] FIG. **7** illustrates the cooperation of the second optical sheet and the first optical sheet possessing aspheric microstructures;

[0020] FIG. **8** is a schematic view showing the backlight module of the present invention in an experimental mode;

[0021] FIG. **9** shows an experiment result of the present invention;

[0022] FIG. **10** shows another experiment result of the present invention;

[0023] FIGS. **11**A to **11**G are charts showing variations of S_{fl} that perform the spatial luminance of aspheric microstructures cooperating with pyramid enhancement structures;

[0024] FIGS. **12**A to **12**F are charts showing variations of S_{fl} that perform the spatial luminance of spherical microstructures cooperating with pyramid enhancement structures;

[0025] FIGS. **13**A to **13**G are charts showing variations of S_{fl} that perform the spatial luminance of conical microstructures cooperating with pyramid enhancement structures;

[0026] FIG. **14** is a schematic view showing a conventional optical sheet provided with complete spherical microstructures; and

[0027] FIG. **15** is a schematic view showing a conventional optical sheet provided with conical microstructures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Referring to FIGS. **1**, **2** and **3**, an optical sheet **1** of the present invention includes a light guiding side **11** and a light emitting side **12**; wherein, a plurality of microstructures **13** are disposed on the light emitting side **12**, and the microstructures **13** are formed into an aspheric configuration. Each microstructure **13** cross sectionally intersects with the light emitting side **12** at an X-line, and the X-line vertically meets at a Y-line. Further, the microstructure **13** in cross section is put in a symmetrical arrangement via centering the Y-line. The X-line and the Y-line intersect at a first bottom joint **14**; the first bottom joint **14** extends toward two sides of the X-line to symmetrically define two respective second bottom joints **15** and then extends upwardly from the Y-line to form a top point **16**. Moreover, a first arc route **17** is defined between the top point **16** and the second bottom joint **15**, and a second straight route **18** is defined from the top point **16** to the second bottom joint **15**; a third route **19** is defined round an outside contour of the cross-sectional microstructure **13**, whereby the third route **19** is located within an area surrounded by the first route **17** and the second route **18**.

[0029] Referring to FIG. **2**, a center of the first route **17** is located at the first bottom joint **14** intersected by the X-line and the Y-line, by which a distance L**1** from the first bottom joint **14** to the top point **16** equals to the distance from the first bottom joint **14** to the second bottom joint **15**, which renders the first route **17** as a quadrant.

[0030] Still referring to FIG. **2**, the third route **19**, located between the area surrounded by the first route **17** and the second route **18**, is formed into an arcuate contour.

[0031] Referring to FIG. **3**, the third route **19**A, located between the area surrounded by the first route **17** and the second route **18**, is shaped by a connection of an arc and a straight line.

[0032] Referring to FIG. **4**A distinguishing from FIG. **2**, a center **14**A of the first route **17**A is placed right below the first bottom joint **14** on the Y-line, so as to define a radius whose length L**2** goes from the center **14**A to the top point **16**. Further, the intersection of the first route **17**A and the X-line is at a second bottom joint **15**A escaping from the second bottom joint **15**. As such, the distance between the center **14**A and the second bottom joint **15**A also equals to L**2**, which renders the first route **17**A formed into an arcuate line. The second route **18**A is formed by connecting the top point **16** and the second bottom joint **15**A. Between the area surrounded by the first route **17**A and the second route **18**A, the third route **19**B passes therethrough via an arc or a combination of an arc and a straight line.

[0033] Referring to FIG. **4**B distinguishing from FIG. **2**, the center **14**A of the first route **17**B is placed right below the first bottom joint **14**, so as to define a radius whose length L**3** goes from the center **14**A to the second bottom joint **15**. Further, the intersection of the first route **17**B and the Y-line is at a top point **16**A that is located inwardly from the top point **16** to the center **14**A. As such, the distance between the center **14**A and the top point **16**A also equals to L**3**, which renders the first route **17**B formed into an arcuate line. The second route **18**B is formed by connecting the top point **16**A and the second bottom joint **15**. Between the area surrounded by the first route **17**B and the second route **18**B, the third route **19**C passes therethrough via an arc or a combination of an arc and a straight line.

[0034] Consequently, while the third route **19**, **19**A in accordance with the present invention has shown and described to be located within the area surrounded by the first route **17** and the second route **18**, it should be clear to those skilled in the art that the third route formed into an arc or configured by a connection of an arc and a straight line should be covered without departing from the scope of the present invention.

[0035] Referring to FIG. **5** shows the present optical sheet **1** cooperating with a backlight module **2** and a liquid crystal display **3**. The backlight module **2** includes a light source A, a reflecting plate B, a first optical sheet **4**, and a second optical sheet **5**. Wherein, the light source A serves to emit light, and the reflecting plate B applies to reflect the light; further, the first optical sheet **4** is disposed on the reflecting plate B and the second optical sheet **5** is thence placed on the first optical sheet **4**. Further, the first optical sheet **4**, same to the configuration shown in FIG. **1**, includes a first light guiding side **41** and a first light emitting side **42**. A number of aspheric microstructures **43** are disposed on the first light emitting side **42**. Additionally, the second optical sheet **5** has a second light guiding side **51** and a second light emitting side **52**; the second light emitting side **52** has microstructures **53** each in a pyramid shape for serving as a brightness enhancement structure.

[0036] Continuing with the aforementioned, a liquid crystal panel C is disposed on the second optical sheet **5** for preferably displaying images, by which the integral liquid crystal display **3** is attained.

[0037] Moreover, FIGS. **6**A to **6**D illustrate rays of light entering the first optical sheet at different emitting angles, which are preferably diffused to a tolerance of ±35 degrees. The second optical sheet applies its pyramid brightness enhancement microstructures to lead the light forward ahead.

[0038] FIG. **7** illustrates the cooperation of the second optical sheet and first optical sheet possessing the aspheric microstructures for increasing the luminance of the backlight module.

[0039] Comparisons between the present spatial luminance affected by the pyramid brightness enhancement structure respectively cooperating with the present aspheric, the typical spherical-contour, and conical microstructures are herein illustrated. The comparisons show the variations of the luminance of the backlight module under a gradual reduction of the distance S_{fl} between the first optical sheet and the light source. A basic experiment structure is shown in FIG. **8**, in which the microstructures of the first optical sheet depend on shapes as variables like an aspheric contour, a spherical contour, and a cone configuration; wherein, the spherical height divided by the spherical width (or diameter) is 0.5, and the cone height divided by the cone width (or diameter) is 0.5. The second optical sheet is a pyramid brightness enhancement structure, and the top angle of which is set by 90 degrees. Based on the structure described above, FIGS. **9** to **13** respectively illustrate the experiment results. In terms of the uniformity, the aspheric microstructures get a great uniformity under the condition of S_{fl} ranged over 12.6 mm, the spherical microstructures maintains its high uniformity under the condition of S_{fl} ranged over 16.8 mm, and the conical microstructures keeps its high uniformity under the condition of S_{fl} ranged over 12.6 mm. Under a tendency toward a thinner backlight module, i.e. reducing the value of S_{fl}, the results above could substantially conclude that the spherical microstructures can not maintain a high uniformity in case of decreasing the S_{fl} value, whereas the aspheric and conical microstructures could still keep the same a high level of uniformity. In terms of the average luminance, the average luminance of the aspheric microstructures is 1.036 times higher than that of the spherical microstructures and is 1.047 times higher than that of the conical microstructures. In the condition of setting S_{fl} at 12.6 mm, the average luminance of the aspheric microstructures is 1.063 times higher than that of the conical microstructures. Consequently, the optical sheet with aspheric microstructures could efficiently increase the luminance. It is also noted that such optical sheet could not only maintain high uniformity but attain the brightness enhancement while reducing the S_{fl} value.

I claim:

1. An optical sheet, comprising a light guiding side and a light emitting side, said light emitting side including a plurality of microstructures disposed thereon, said microstructures each being formed into an aspheric configuration; each of said microstructures in cross section intersecting with said light emitting side at an X-line, and said X-line vertically meeting at a Y-line; said microstructure in cross section being in a symmetrical arrangement via centering said Y-line; said X-line and said Y-line meeting at a first bottom joint; said first bottom joint extending toward two sides of said X-line to symmetrically defined two respective second bottom joints and extending upwardly from said Y-line to form a top point; a first route as an arc contour being defined between said top point and said second bottom joint, and a second route as a straight line being formed between said top point and said second bottom joint; a third route being defined round an outside contour of said microstructure in cross section; said third route being located within an area surrounded by said first and said second routes.

2. The optical sheet as claimed in claim **1**, wherein said third route is shaped by an arc.

3. The optical sheet as claimed in claim **1**, wherein said third route is shaped by a connection of an arc and a straight line.

4. The optical sheet as claimed in claim **1**, wherein said first bottom joint serves as a center of said first route.

5. The optical sheet as claimed in claim **1**, wherein a center of said first route is located right below said first bottom joint.

6. The optical sheet as claimed in claim **5**, wherein a radius of said first route equals to a distance from said center to said top point.

7. The optical sheet as claimed in claim **5**, wherein a radius of said first route equals to a distance from said center to said second bottom joint.

8. A backlight module, comprising:

a light source for emitting light;

a reflecting plate for reflecting light;

a first optical sheet disposed on said light source and said reflecting plate; said first optical sheet comprising a first light guiding side and a first light emitting side; said first light emitting side including a plurality of microstructures disposed thereon, said microstructures each being formed into an aspheric configuration; each of said microstructures in cross section intersecting with said first light emitting side at an X-line, and said X-line vertically meeting at a Y-line; said microstructure in cross section being in a symmetrical arrangement via centering said Y-line; said X-line and said Y-line meeting at a first bottom joint; said first bottom joint extending toward two sides of said X-line to symmetrically defined two respective second bottom joints and extending upwardly from said Y-line to form a top point; a first route as an arc contour being defined between said top point and said second bottom joint, and a second route as a straight line being formed between said top point and said second bottom joint; a third route being defined round an outside contour of said microstructure in cross section; said third route being located within an area surrounded by said first and said second routes; and

a second optical sheet disposed on said first optical sheet, said second optical sheet comprising a second light guiding side and a second light emitting side, said second light emitting side having microstructures each in a pyramid shape thereon.

9. The backlight module as claimed in claim **8**, wherein said third route is shaped by an arc.

10. The backlight module as claimed in claim **8**, wherein said third route is shaped by a connection of an arc and a straight line.

11. The backlight module as claimed in claim **8**, wherein said first bottom joint serves as a center of said first route.

12. The backlight module as claimed in claim **8**, wherein a center of said first route is located right below said first bottom joint.

13. The backlight module as claimed in claim **12**, wherein a radius of said first route equals to a distance from said center to said top point.

14. The backlight module as claimed in claim **12**, wherein a radius of said first route equals to a distance from said center to said second bottom joint.

15. A liquid crystal display, comprising:

a light source for emitting light;

a reflecting plate for reflecting light;

a first optical sheet disposed on said light source and said reflecting plate; said first optical sheet comprising a first light guiding side and a first light emitting side; said first light emitting side including a plurality of microstructures disposed thereon, and said microstructures each being formed into an aspheric configuration; each of said microstructures in cross section intersecting with said first light emitting side at an X-line, and said X-line vertically meeting at a Y-line; said microstructure in cross section being in a symmetrical arrangement via centering said Y-line; said X-line and said Y-line meeting at a first bottom joint; said first bottom joint extending toward two sides of said X-line to symmetrically defined two respective second bottom joints and extending upwardly from said Y-line to form a top point; a first route as an arc contour being defined between said top point and said second bottom joint, and a second route as a straight line being formed between said top point and said second bottom joint; a third route being defined round an outside contour of said microstructure in cross section; said third route being located within an area surrounded by said first and said second routes;

a second optical sheet disposed on said first optical sheet, said second optical sheet comprising a second light guiding side and a second light emitting side; said second light emitting side having microstructures each in a pyramid shape thereon; and

a liquid crystal panel disposed on said second optical sheet for displaying images.

16. The liquid crystal display as claimed in claim **15**, wherein said third route is shaped by an arc.

17. The liquid crystal display as claimed in claim **15**, wherein said third route is shaped by a connection of an arc and a straight line.

18. The liquid crystal display as claimed in claim **15**, wherein said first bottom joint serves as a center of said first route.

19. The liquid crystal display as claimed in claim **15**, wherein a center of said first route is located right below said first bottom joint.

20. The liquid crystal display as claimed in claim **19**, wherein a radius of said first route equals to a distance from said center to said top point.

21. The liquid crystal display as claimed in claim **19**, wherein a radius of said first route equals to a distance from said center to said second bottom joint.

* * * * *

专利名称(译)	光学片及相关的背光模组和液晶显示器		
公开(公告)号	US20110115695A1	公开(公告)日	2011-05-19
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[标]申请(专利权)人(译)	LIN敕封 方瑜BIN 陈一凡		
申请(专利权)人(译)	林志玲冯 方宇彬 陈一凡		
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摘要(译)

适用于相关背光模块和LCD的光学片包括导光侧，发光侧和设置在发光侧的多个微结构。每个微结构形成为非球面轮廓。在每个微结构的X线和Y线的交叉处横截面地限定第一底部接头，该第一底部接头朝向X线的相对侧延伸以限定两个对称的第二底部接头并且从Y线向上延伸到构建一个顶点。在顶点和第二底部接头之间形成第一弧形路线，在顶点和第二底部接头之间形成第二直线路径。围绕每个微结构的横截面外轮廓限定第三路线，其位于由第一和第二路线围绕的区域内。