

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
16 March 2006 (16.03.2006)

PCT

(10) International Publication Number
WO 2006/028334 A1(51) International Patent Classification: **G03B 21/62**(21) International Application Number:
PCT/KR2005/002876

(22) International Filing Date: 31 August 2005 (31.08.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

10-2004-0070627	4 September 2004 (04.09.2004)	KR
10-2004-0070629	4 September 2004 (04.09.2004)	KR
10-2004-0070628	4 September 2004 (04.09.2004)	KR

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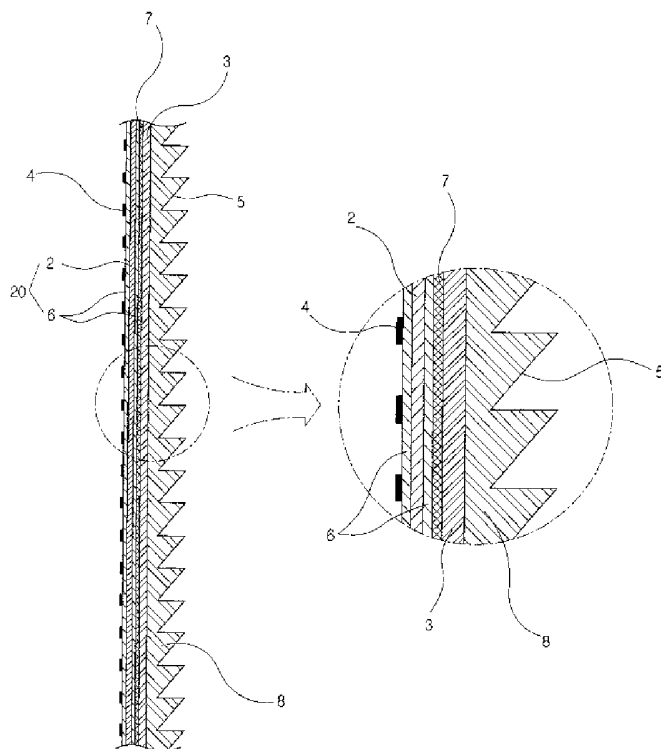
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,

[Continued on next page]

(54) Title: REAR PROJECTION SCREEN



(57) Abstract: The present invention relates to a rear projection screen (1) for allowing an observer to view an image at a front side by receiving light projected at a rear side. The rear projection screen comprises a transparent plate (3); an optical sheet (8; 8') which is hot-pressed on a rear surface of the transparent plate (3) and includes a plurality of fine prisms (5; 5') formed from side to side and parallel to one another to refract the light and guide the refracted light to the front side, each fine prism protruding to the rear side; a diffusion film (20) which is bonded to a front surface of the transparent plate (3) and including a transparent film (2) and diffusion layers (6) formed on front and rear surfaces of the transparent film to omni directionally disperse and diffuse the light refracted through the optical sheet (8; 8'); and light-shielding printed layers (4) which are formed on an upper surface of the diffusion layer (6) to be horizontally parallel to one another and face portions between the fine prisms (5; 5') of the optical sheet (8; 8'). According to the rear projection screen of the present invention so configured, there is no reflected image on a surface on the side of an observer even under a bright environment such as the presence of sunlight, and a extremely precise color image with a high black level can be obtained. Further,

a large-sized screen with less light loss can be manufactured at a low cost by first refracting light emitted from a projector through a fine prism optical sheet and then diffusing the refracted light.



KG, KM, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

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Description

REAR PROJECTION SCREEN

Technical Field

- [1] The present invention relates to a rear projection screen, and more particularly, to a rear projection screen in which an image from a projector is transferred from a rear surface thereof and refracted through an optical sheet with fine prisms formed thereon, and then diffused on a diffusion layer of an optical film formed on a front surface thereof to enable an observer to view the image through the front surface.

[2]

Background Art

- [3] A projection screen is widely used for displaying a projection image from a projector and the like. Such a projection screen includes a transmissive rear projection screen and a reflective projection screen. This projection screen requires the following two significant factors. First, there should be little surface reflection of external light (sunlight or surrounding light) at an observer side such that a surface reflection image is not created. Second, a black level should be secured such that a high contrast ratio can be obtained.
- [4] The present invention is directed to a transmissive projection screen for displaying a projection image from a projector onto an inner surface of a show window or glass window. That is, an image from the projector is projected onto a rear surface of the screen. This type of screen has been put to practical use as a transmissive rear projection screen for displaying a notice, an advertisement, image information, etc. thereon.
- [5] However, there is a problem in the conventional rear projection screen in that an observer cannot view the image against the strength of external light or a reflection image formed on a glass window surface and the projection image seen from the observer side comes to be an unclear image with weak contrast, under bright light such as sunlight.
- [6] The conventional rear projection screen is a multiple sheet screen comprising a light diffusion facing a projector and a fine prism optical sheet for refracting light from the projector toward the front of the rear projection screen. In the rear projection screen, ink with a light-shielding characteristic has been printed on upper surfaces of fine prisms to overcome contrast reduction caused by the external light. However, it is difficult to manufacture the rear projection screen due to difficulty in printing the ink with a light-shielding characteristic on the upper surfaces of the fine prisms. Further, since the light from the projector is first diffused through the diffusion layer and then

refracted through the fine prism optical sheet toward the observer side, the light loss is produced due to a light-shielding printed layer formed on a front surface of the screen, whereby luminance of the screen is lowered.

- [7] Furthermore, a image display device in which the conventional LED lamps are arranged on a displaying area is widely used as a large-sized image display device, but it is very expensive and it takes a great deal of time to install this image display device.

[8]

Disclosure of Invention

Technical Problem

- [9] Accordingly, the present invention is conceived to solve the aforementioned problems. A first object of the present invention is to provide a novel rear projection screen wherein there is no image reflected from a surface of the screen at an observer side and an extremely precise color image with a high black level can be obtained even under a bright environment such as the presence of sunlight light from a projector is first refracted through a fine prism optical sheet toward the front of the screen and then diffused through a light diffusion layer such that light loss can be reduced to thereby enhance the luminance of the screen; and ink with a light-shielding characteristic is printed on the flat light diffusion layer to allow the screen to be easily manufactured such that the large-sized screen can be manufactured at a low cost.

- [10] A second object of the present invention is to provide a rear projection screen capable of preventing the occurrence a ghost phenomenon from occurring with the use of an optical sheet comprising fine prisms with continuously variable angles in a vertical direction.

- [11] A third object of the present invention is to provide a rear projection screen capable of having a wider viewing angle with the use of fine a spherical lens layers.

[12]

Technical Solution

- [13] The first object of the present invention can be achieved by a rear projection screen for allowing an observer to view an image at a front side by receiving light projected at a rear side, comprising a transparent plate; an optical sheet which is hot-pressed on a rear surface of the transparent plate and includes a plurality of fine prisms formed from side to side and parallel to one another to refract the light and guide the refracted light to the front side, each fine prism protruding to the rear side; a diffusion film which is bonded to a front surface of the transparent plate and includes a transparent film and diffusion layers formed on front and rear surfaces of the transparent film to omnidirectionally disperse and diffuse the light refracted through the optical sheet; and light-shielding printed layers which are formed on an upper surface of the diffusion layer to

be horizontally parallel to one another and face portions between the fine prisms of the optical sheet.

[14] The second object of the present invention can be achieved by the aforementioned rear projection screen wherein the fine prisms are different-angle fine prisms of which the angles defined with respect to the rear surface of the transparent plate consecutively vary within a range of 5 to 65 degrees in a vertical direction to form a gradient as a whole.

[15] The third object of the present invention can be achieved by the aforementioned rear projection screen in which the screen has fine a spherical lens layers formed to be elongated between the light-shielding printed layers.

[16]

[17] According to an aspect of the present invention for achieving the objects, there is provided a rear projection screen for allowing an observer to view an image at a front side by receiving light projected at a rear side, comprising a transparent plate; an optical sheet which is hot-pressed on a rear surface of the transparent plate and includes a plurality of fine prisms formed from side to side and parallel to one another to refract the light and guide the refracted light to the front side, each fine prism protruding to the rear side; a diffusion film which is bonded to a front surface of the transparent plate and includes a transparent film and diffusion layers formed on front and rear surfaces of the transparent film to omni directionally disperse and diffuse the light refracted through the optical sheet; and light-shielding printed layers which are formed on an upper surface of the diffusion layer to be horizontally parallel to one another and face portions between the fine prisms of the optical sheet.

[18] Preferably, the screen has fine a spherical lens layers formed to be elongated between the light-shielding printed layers.

[19] Further, the fine prisms may be fixed-angle fine prisms of which angles with respect to the rear surface of the transparent plate are constant.

[20] Further, the fine prisms may be different-angle fine prisms of which the angles defined with respect to the rear surface of the transparent plate consecutively vary within a range of 5 to 65 degrees in a vertical direction to form a gradient as a whole.

[21] Preferably, the diffusion layer of the diffusion film is formed by coating and drying a solution with white powder and an acrylic binder mixed therein.

[22] More preferably, the white powder is selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof.

[23]

Advantageous Effects

[24] In the rear projection screen according to the present invention described above,

there is no reflected image on a surface on the side of an observer even under a bright environment such as the presence of sunlight, and a extremely precise color image with a high black level can be obtained.

[25] Further, light emitted from a projector is first refracted through a fine prism optical sheet and then diffused so that a large-sized screen with less light loss can be manufactured at a low cost.

[26] Moreover, the present invention has advantages in that the occurrence of a ghost phenomenon is prevented with the use of different-angle fine prisms, and a wider viewing angle can be secured with the use of fine a spherical lens layers.

[27]

Brief Description of the Drawings

[28] The above and other objects, features and advantages of the present invention will become apparent from the following descriptions of preferred embodiments given in conjunction with the accompanying drawings, in which:

[29] Fig. 1 is a view illustrating an installation example of a rear projection screen according to the embodiment of the present invention;

[30] Fig. 2 is a vertical sectional view of a rear projection screen according to a first embodiment of the present invention;

[31] Fig. 3 is a vertical sectional view of a rear projection screen according to a second embodiment of the present invention;

[32] Fig. 4 is a vertical sectional view of a rear projection screen according to a third embodiment of the present invention;

[33] Fig. 5 is a vertical sectional view of a rear projection screen according to a fourth embodiment of the present invention;

[34] Fig. 6 is a view showing the configuration and operation of a fine prism optical sheet of the rear projection screen according to the embodiment of the present invention;

[35] Fig. 7 is a view showing the configuration and operation of light-shielding printed layers of the rear projection screen according to the embodiment of the present invention;

[36] Fig. 8 is a vertical sectional view of a different-angle fine prism optical sheet applied to the rear projection screen according to the second and fourth embodiments of the present invention;

[37] Fig. 9 is a view showing a path of light projected onto the rear projection screen according to the third embodiment of the present invention;

[38] Fig. 10 is a perspective view of a fixed-angle fine prism optical sheet applied to the rear projection screen according to the first and third embodiments of the present

invention; and

[39] Fig. 11 is a perspective view of a different-angle fine prism optical sheet applied to the rear projection screen according to the second and fourth embodiments of the present invention.

[40]

Mode for the Invention

[41] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[42] Although the preferred embodiments described herein and illustrated in the accompanying drawings have been provided for the purpose of general understanding of the present invention, it should be understood that the embodiments are merely described for illustrating the present invention and the present invention is not limited there to. In addition, detailed descriptions on known functions and constitutions, which may make the scope of the present invention unnecessarily obscure, will be omitted herein.

[43] Fig. 1 is a view showing an arrangement of a rear projection screen according to the embodiment of the present invention, in which reference numeral 1 designates the rear projection screen according to the preferred embodiment of the present invention and reference numeral P designates a projector for emitting light constituting an image.

[44] As shown in the figure, observers are located outside of a window (a show window) and the rear projection screen 1 according to the embodiment of the present invention is installed indoor near the window. Further, the projector P for emitting the light constituting the image is installed on the ceiling above a position which is spaced apart rearward from the screen 1. Accordingly, the observers can view outdoors the image displayed on the screen 1 through the window.

[45]

[46] [The first embodiment]

[47] Fig. 2 is a longitudinal sectional view of a rear projection screen according to a first embodiment of the present invention. The rear projection screen 1 according to the first embodiment comprises a transparent plate 3 with a thickness of 50 ~ 150 μ m, an optical sheet 8 that has a thickness of 250 ~ 500 μ m, is hot-pressed on a rear surface of the transparent plate 3 and comprises a plurality of fixed-angle fine prisms 5 arranged continuously from side to side and parallel to one another to refract light and guide the refracted light forward and formed to protrude rearward and to have the same shape and size of 50 ~ 500 μ m (the size of the base of a triangular section or a distance between corners of adjacent fine prisms); a diffusion film 20 that has a thickness of 50 ~ 150 μ m, is bonded to a front surface of the transparent plate 3, and comprises a transparent film 2

and diffusion layers 6 formed on front and rear surfaces of the transparent film to omnidirectionally disperse and diffuse the light refracted through the optical sheet 8; and light-shielding printed layers 4 that are formed on an upper surface of the diffusion layer 6 to be horizontally parallel to one another at positions between the fixed-angle fine prisms 5 of the optical sheet 8 and to have a thickness of 10 ~ 15 μ m.

[48] It is preferred that the transparent plate 3 be made of a material with high light transmittance, such as a polymethyl methacrylate (PMMA) sheet. Further, it is preferred that the transparent film 2 and the optical sheet 8 be made of a flexible material so that the entire rear projection screen 1 of the present invention can be rolled upward and then stored.

[49] However, a bonding layer 7 between the transparent plate 3 and the diffusion film 20 may be an adhesive layer formed of an adhesive. In this case, the diffusion film 20 and the optical sheet 8 can be detachably attached with respect to the transparent plate 3. Thus, a pane of a window may be used directly as the transparent plate 3, the diffusion film 20 formed with the diffusion layer 6 and the light-shielding printed film 20 may be adhered to an outer side of the window, and the optical sheet 8 with the fine prisms 5 formed thereon may be adhered or bonded to an inner side of the window using an additional adhesive or bonding agent. This resultant combination can serve as the rear projection screen 1.

[50] Moreover, the diffusion layer 6 provided on the diffusion film 20 is formed by coating and drying a solution with white powder and an acrylic binder mixed therein, which is a conventional method. A material such as polyethylene terephthalate (PET) or polycarbonate (PC) can be used as the transparent plate 3.

[51] A material selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof can be used as the white powder.

[52] Fig. 6 is a view showing the fine prism optical sheet of the rear projection screen according to the embodiment of the present invention and the operation thereof, and Fig. 10 is a perspective view of a fixed-angle fine prism optical sheet applied to the rear projection screen according to first and third embodiments of the present invention. It can be seen from Figs. 6 and 10 that light emitted from the projector P is refracted by the fine prisms 5 of the optical sheet 8 and travels toward the transparent plate 3, and that the prisms 5 with the same shape and size (the size of the base of the triangular section or a distance between corners of adjacent fine prisms is 50 ~ 500 μ m) are arranged continuously on the optical prism 8.

[53] Further, Fig. 7 is a view showing the light-shielding printed layers of the rear projection screen according to the embodiment of the present invention and the operation thereof. Sunlight (external light) is not reflected on a front surface of the rear

projection screen 1 according to the embodiment of the present invention but is absorbed mostly by the light-shielding printed layers 4, thereby preventing a phenomenon in which an observer cannot properly view an image due to reflected light.

[54] As described above, since the light-shielding printed layers 4 are arranged not to face the fine prisms 5 but to face portions between the fine prisms, they do not intercept the light refracted by the fine prisms 5. Accordingly, the light refracted by the fine prisms 5 diffuses through the diffusion layer 6 with the light-shielding layers 4 formed on the upper surface thereof. Thus, when an image is formed, a combination of dense linear image components implements one image.

[55] That is, the light emitted from the projector P is first refracted by the fine prisms 5 of the optical sheet 8 and then passes through the transparent plate 3. The light passing through the transparent plate 3 makes an image on the white diffusion layer 6 of the diffusion film 20. Thus, light loss is reduced and luminance is improved. Since the diffusion layer 6 is arranged in front of the fine prisms 5, an image projected from the projector P optically diffuses widely so that an observer can be provided with an image with a wide viewing angle.

[56]

[57] [The second embodiment]

[58] Fig. 3 is a vertical sectional view of a rear projection screen according to a second embodiment of the present invention. The structure of this embodiment is identical with that of the first embodiment except that the angles α , and of fine prisms 5' of an optical plate 8' with respect to a rear surface of the transparent plate 3 consecutively vary within a range of 5 to 65 degrees in a vertical direction to form a gradient as a whole so that the light emitted from the projector P is precisely (uniformly) refracted to be directed forward, thereby preventing a ghost phenomenon.

[59] Fig. 8 is a view of a different-angle fine prism optical sheet applied to rear projection screens according to second and fourth embodiments of the present invention, and Fig. 11 is a perspective view of the different-angle fine prism optical sheet. It can be seen that the light emitted from the projector P is refracted by the different-angle fine prisms 5' of the optical sheet 8', the prisms 5' are arranged at regular intervals on the optical sheet 8, and the angles α , and of the fine prisms 5' defined with respect to a rear surface of the transparent plate 3 vary consecutively to form a gradient as a whole. In this embodiment, the relationship $\alpha > \beta > \gamma$ is established so that lower ones of the fine prisms 5' further protrude and thus a lower portion of the optical sheet 8 becomes thicker, resulting in an inclined screen 1 with a gradient as a whole.

[60] With the use of the different-angle fine prisms 5', the light emitted from the

projector P, which is a point light source, can be refracted to be more precisely directed forward. The reason is that the incident angle of the light emitted from the point light source onto the screen 1 consecutively varies according to the position of the point light source and a position on the screen 1, and thus, the angle of each of the fine prisms 5' should vary according to the varying incident angle of the light in order to ensure that the light can be refracted at different-angles at all positions and then directed forward. This makes an image on the screen 1 brighter, resulting in improved luminance, and also prevents the occurrence of the ghost phenomenon that may be generated upon use of the fixed-angle fine prism 5.

[61]

[62] [The third embodiment]

[63] Fig. 4 is a vertical sectional view of a rear projection screen according to a third embodiment of the present invention. The structure of this embodiment is identical with that of the first embodiment except that fine a spherical lens layers 9 are formed to be elongated laterally between the light-shielding printed layers 4.

[64] Fig. 9 is a view showing a path of light projected on the rear projection screen according to the third embodiment of the present invention. The light emitted from the projector P is refracted by the fine prisms 5 of the optical sheet 8 and then passes through the transparent plate 3. The light passing through the transparent plate 3 makes an image on the white diffusion layer 6 of the diffusion film 20. The image formed on the diffusion layer 6 is refracted in the vertical direction and directed to the fine a spherical lens layers 9, so that a final image with a wider viewing angle can be provided to an observer.

[65]

[66] [The fourth embodiment]

[67] Fig. 5 is a vertical sectional view of a rear projection screen according to a fourth embodiment of the present invention. The structure of this embodiment is identical with that of the third embodiment except that as applied to the second embodiment, the angles θ , and of the fine prisms 5' of the optical plate 8' with respect to the rear surface of the transparent plate 3 consecutively vary within a range of 5 to 65 degrees in the vertical direction to form a gradient as a whole so that the light emitted from the projector P is precisely (uniformly) refracted to be directed forward, thereby ensuring a wide viewing angle and preventing the ghost phenomenon.

[68]

Industrial Applicability

[69] In the rear projection screen according to the present invention described above, there is no reflected image on a surface on the side of an observer even under a bright

environment such as the presence of sunlight, and a extremely precise color image with a high black level can be obtained.

[70] Further, light emitted from a projector is first refracted through a fine prism optical sheet and then diffused so that a large-sized screen with less light loss can be manufactured at a low cost.

[71] Moreover, the present invention has advantages in that the occurrence of a ghost phenomenon is prevented with the use of different-angle fine prisms, and a wider viewing angle can be secured with the use of fine a spherical lens layers.

[72]

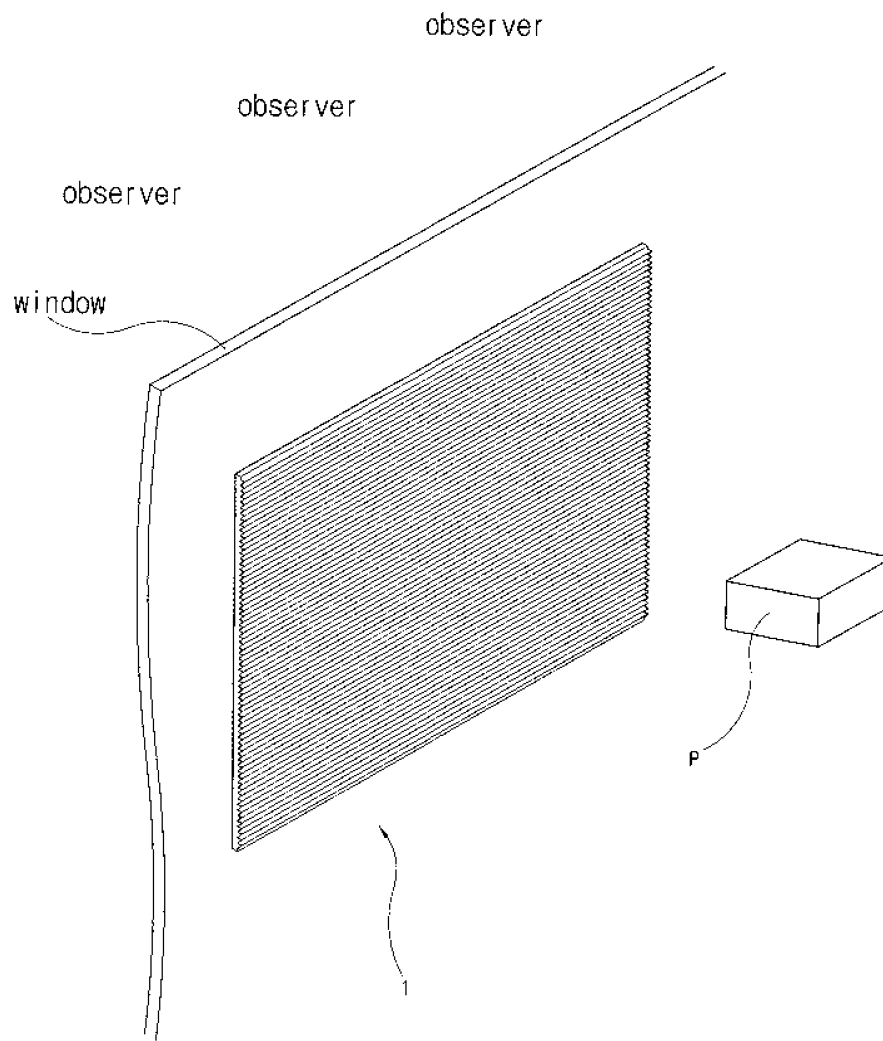
Claims

- [1] A rear projection screen for allowing an observer to view an image at a front side by receiving light projected at a rear side, comprising:
a transparent plate;
an optical sheet hot-pressed on a rear surface of the transparent plate, the optical sheet comprising a plurality of fine prisms formed from side to side and parallel to one another to refract the light and guide the refracted light to the front side, each of the fine prisms protruding to the rear side;
a diffusion film bonded to a front surface of the transparent plate, the diffusion film comprising a transparent film and diffusion layers formed on front and rear surfaces of the transparent film to omni directionally disperse and diffuse the light refracted through the optical sheet; and
light-shielding printed layers formed on an upper surface of the diffusion layer to be horizontally parallel to one another, the light-shielding printed layers facing portions between the fine prisms of the optical sheet.
- [2] The rear projection screen as claimed in claim 1, wherein the screen has fine a spherical lens layers formed to be elongated between the light-shielding printed layers.
- [3] The rear projection screen as claimed in claim 1, wherein the fine prisms have a fixed angle with respect to the rear surface of the transparent plate.
- [4] The rear projection screen as claimed in claim 2, wherein the fine prisms have a fixed angle with respect to the rear surface of the transparent plate.
- [5] The rear projection screen as claimed in claim 1, wherein the fine prisms are different-angle fine prisms of which the angles defined with respect to the rear surface of the transparent plate consecutively vary within a range of 5 to 65 degrees in a vertical direction to form a gradient as a whole.
- [6] The rear projection screen as claimed in claim 2, wherein the fine prisms are different-angle fine prisms of which the angles defined with respect to the rear surface of the transparent plate consecutively vary within a range of 5 to 65 degrees in a vertical direction to form a gradient as a whole.
- [7] The rear projection screen as claimed in claim 1, wherein the diffusion layer of the diffusion film is formed by coating and drying a solution with white powder and an acrylic binder mixed therein.
- [8] The rear projection screen as claimed in claim 2, wherein the diffusion layer of the diffusion film is formed by coating and drying a solution with white powder and an acrylic binder mixed therein.
- [9] The rear projection screen as claimed in claim 3, wherein the diffusion layer of

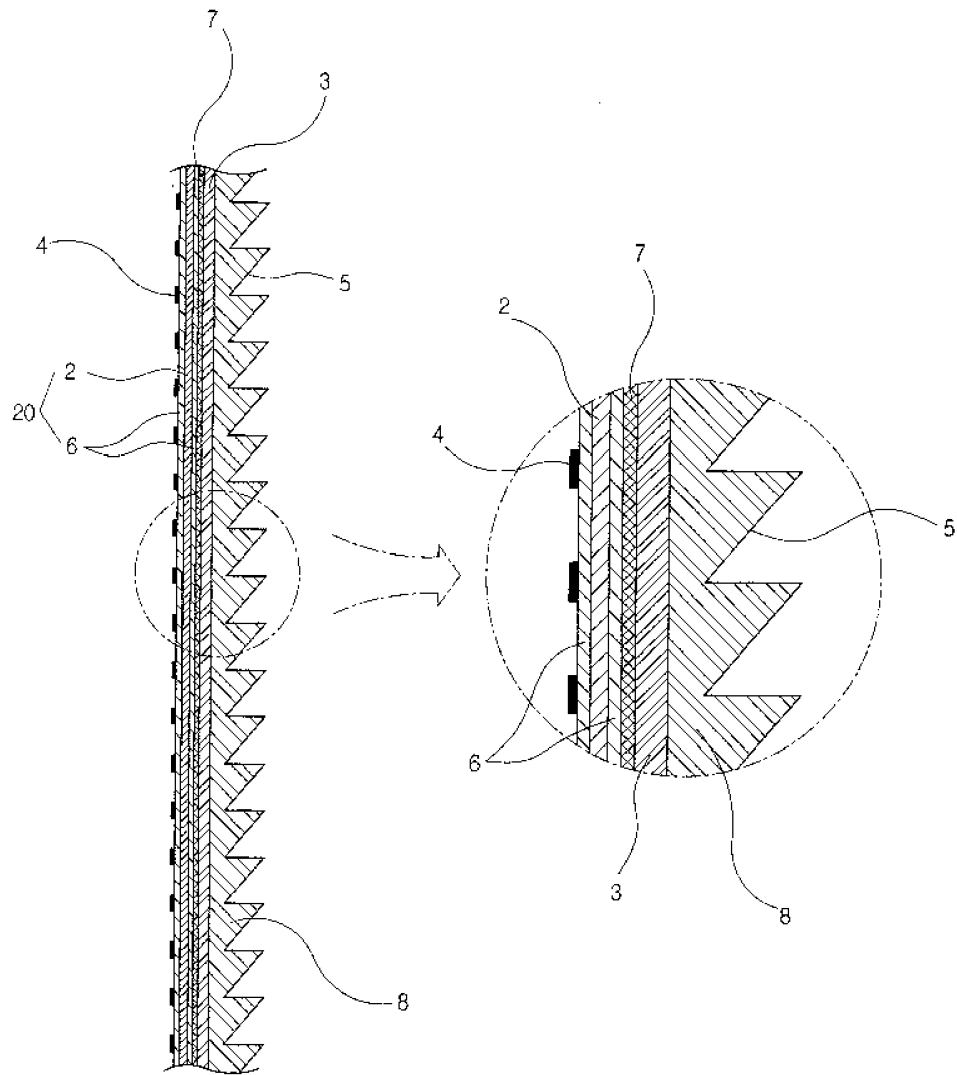
the diffusion film is formed by coating and drying a solution with white powder and an acrylic binder mixed therein.

- [10] The rear projection screen as claimed in claim 4, wherein the diffusion layer of the diffusion film is formed by coating and drying a solution with white powder and an acrylic binder mixed therein.
- [11] The rear projection screen as claimed in claim 5, wherein the diffusion layer of the diffusion film is formed by coating and drying a solution with white powder and an acrylic binder mixed therein.
- [12] The rear projection screen as claimed in claim 6, wherein the diffusion layer of the diffusion film is formed by coating and drying a solution with white powder and an acrylic binder mixed therein.
- [13] The rear projection screen as claimed in claim 7, wherein the white powder is selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof.
- [14] The rear projection screen as claimed in claim 8, wherein the white powder is selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof.
- [15] The rear projection screen as claimed in claim 9, wherein the white powder is selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof.
- [16] The rear projection screen as claimed in claim 10, wherein the white powder is selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof.
- [17] The rear projection screen as claimed in claim 11, wherein the white powder is selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof.
- [18] The rear projection screen as claimed in claim 12, wherein the white powder is selected from the group consisting of titanium dioxide, silica, calcium carbonate, aluminum hydroxide, or a combination thereof.

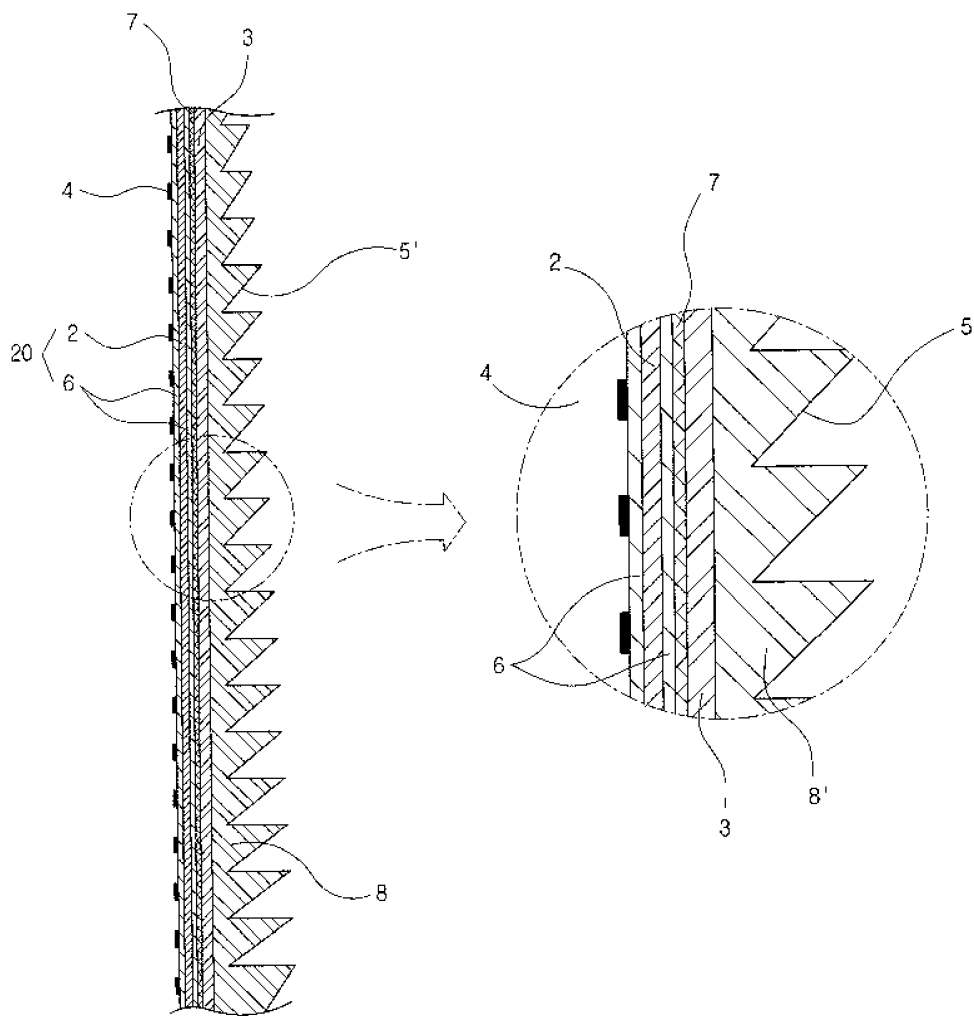
[Fig. 1]



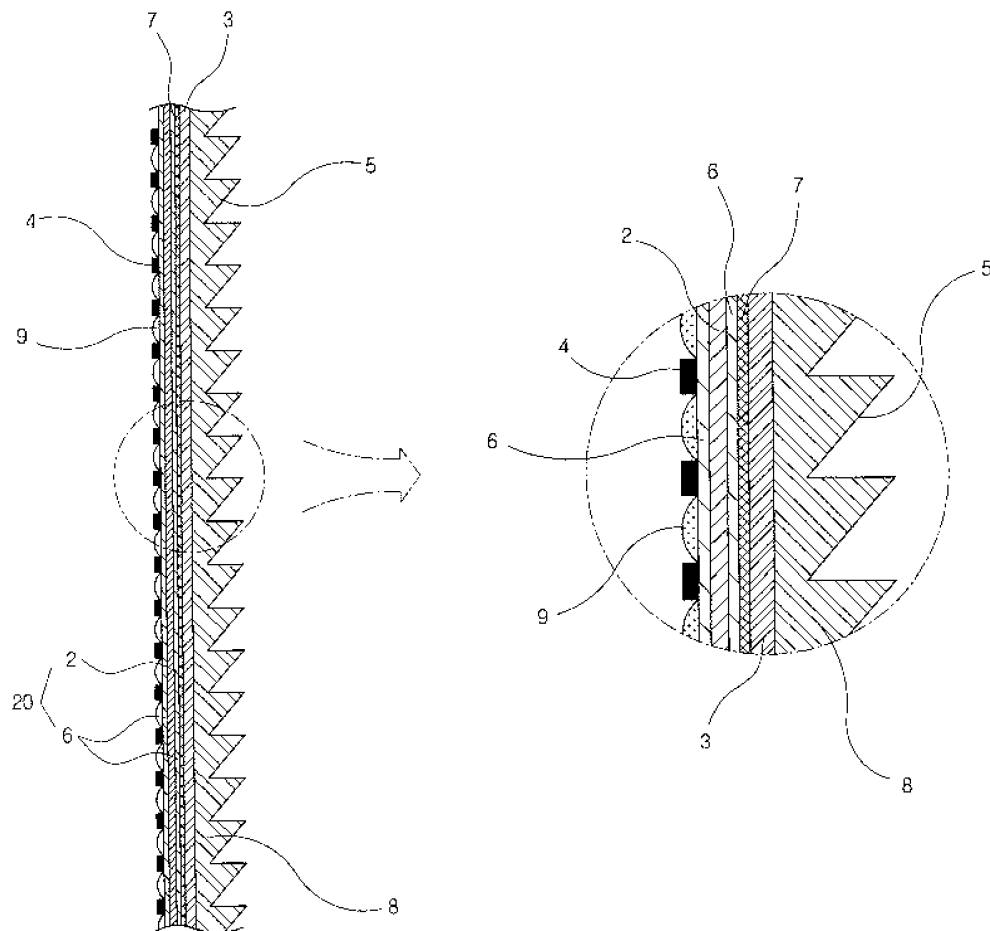
[Fig. 2]



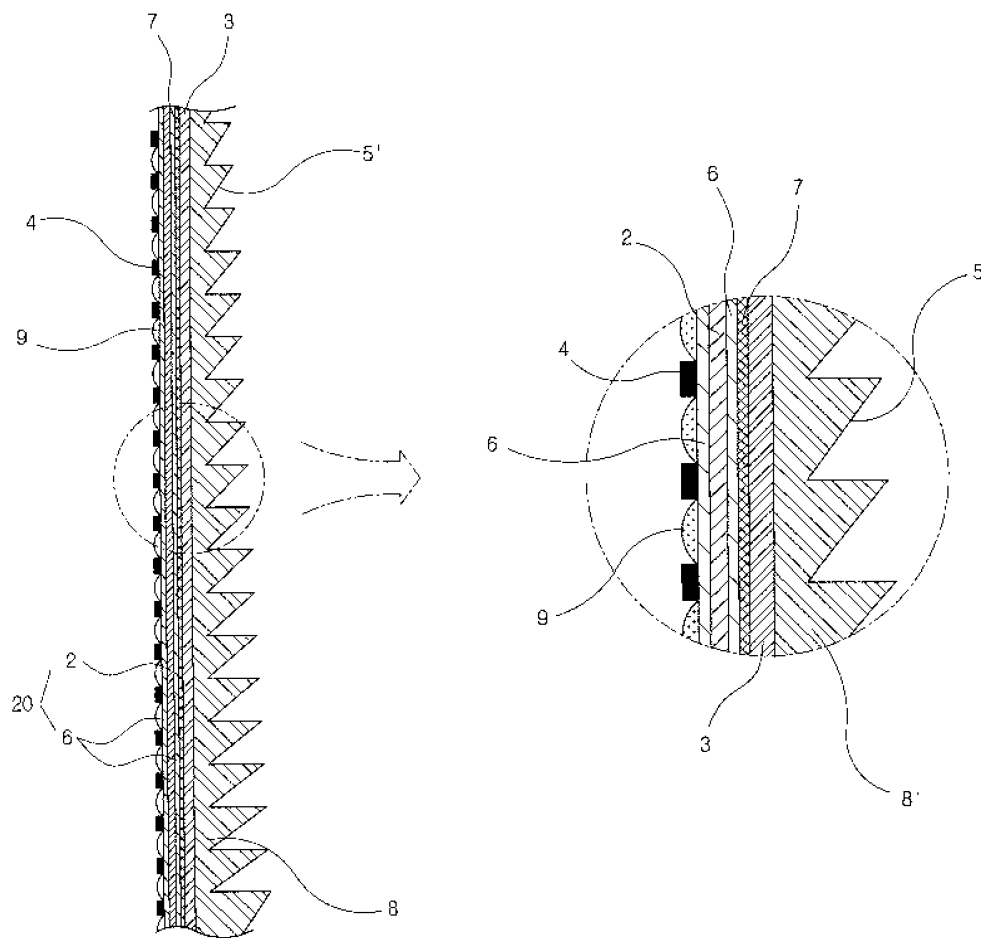
[Fig. 3]



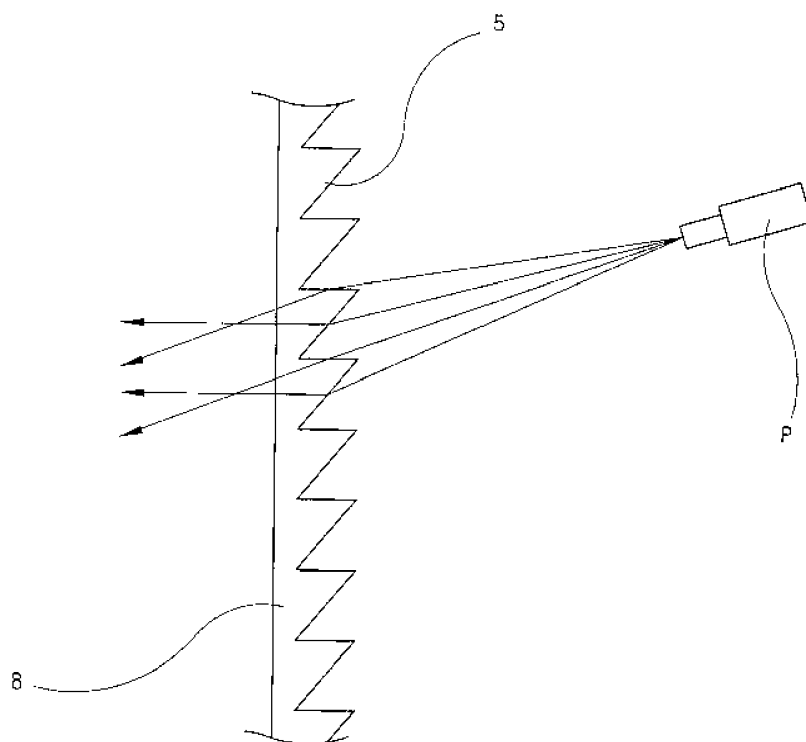
[Fig. 4]



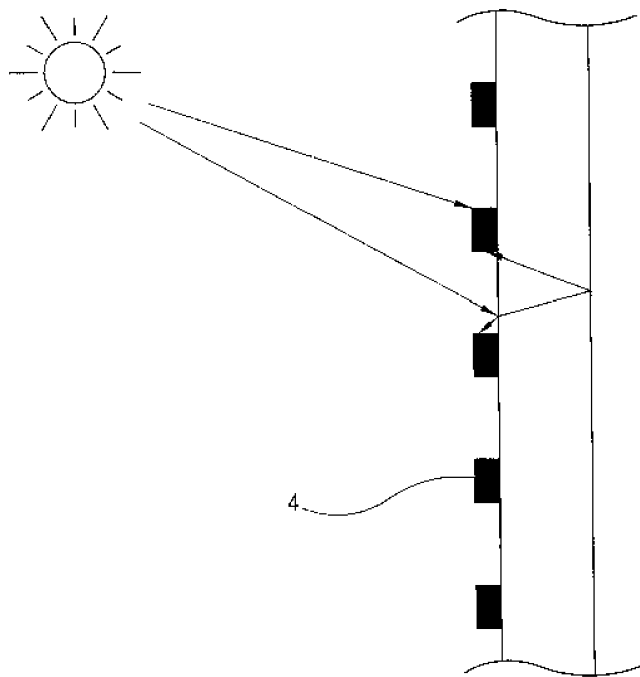
[Fig. 5]



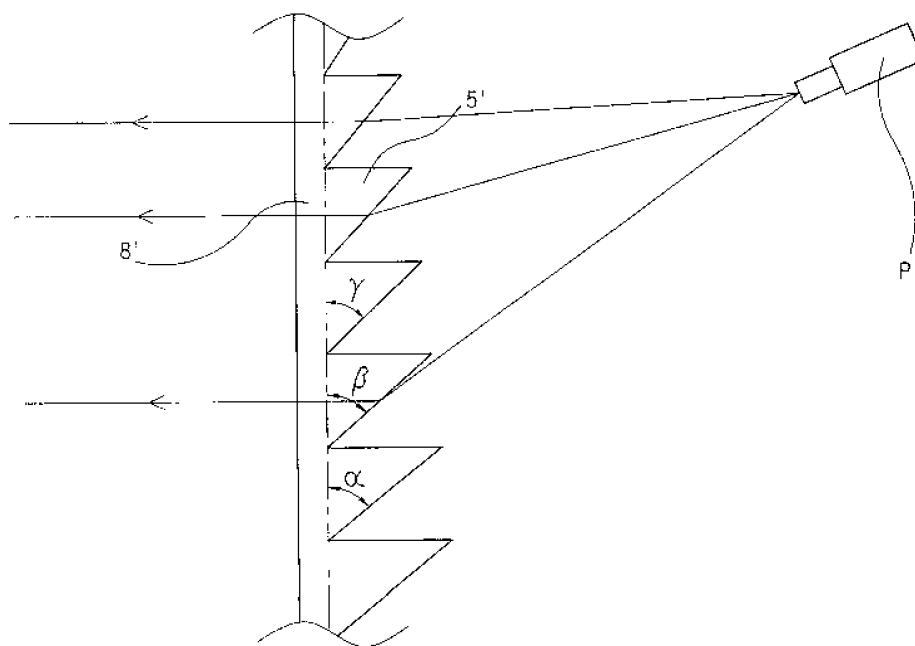
[Fig. 6]



[Fig. 7]

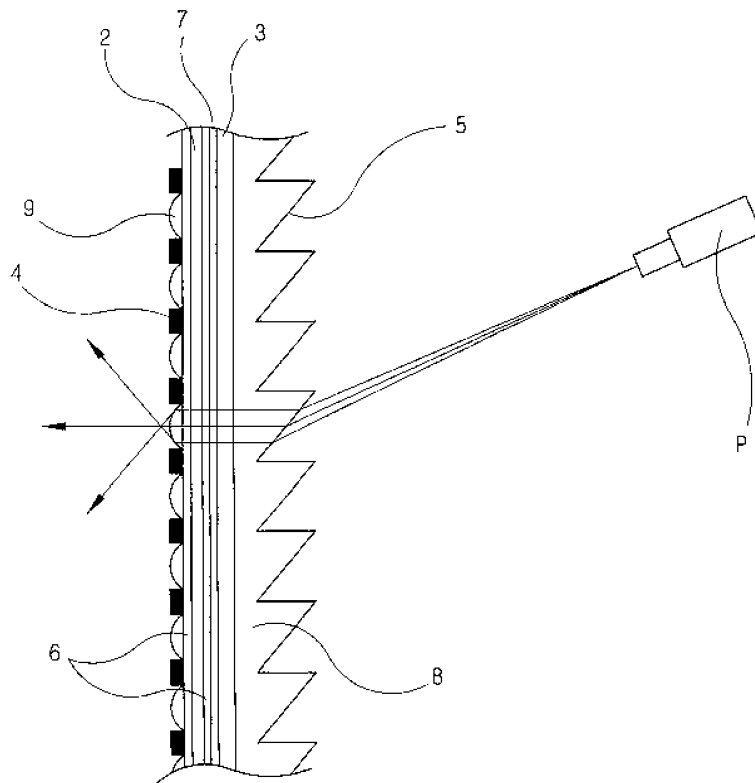


[Fig. 8]

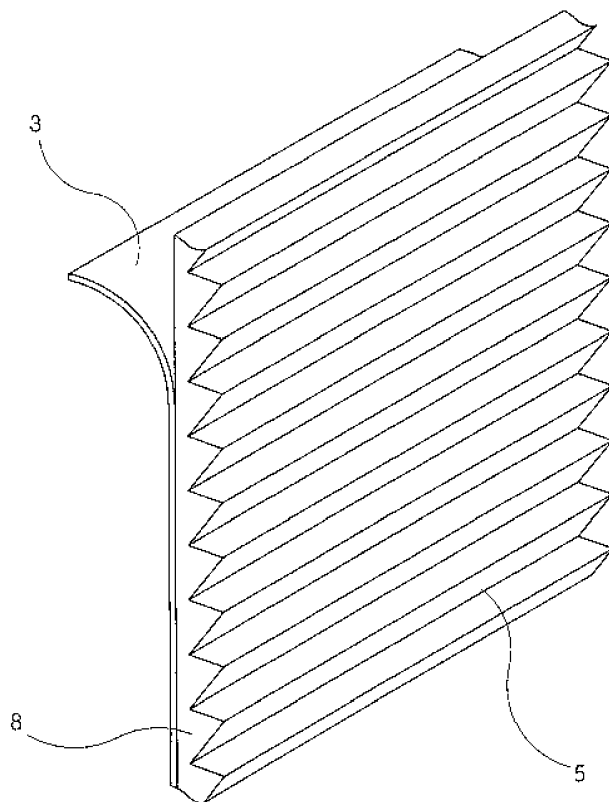


$$\alpha \neq \beta \neq \gamma$$

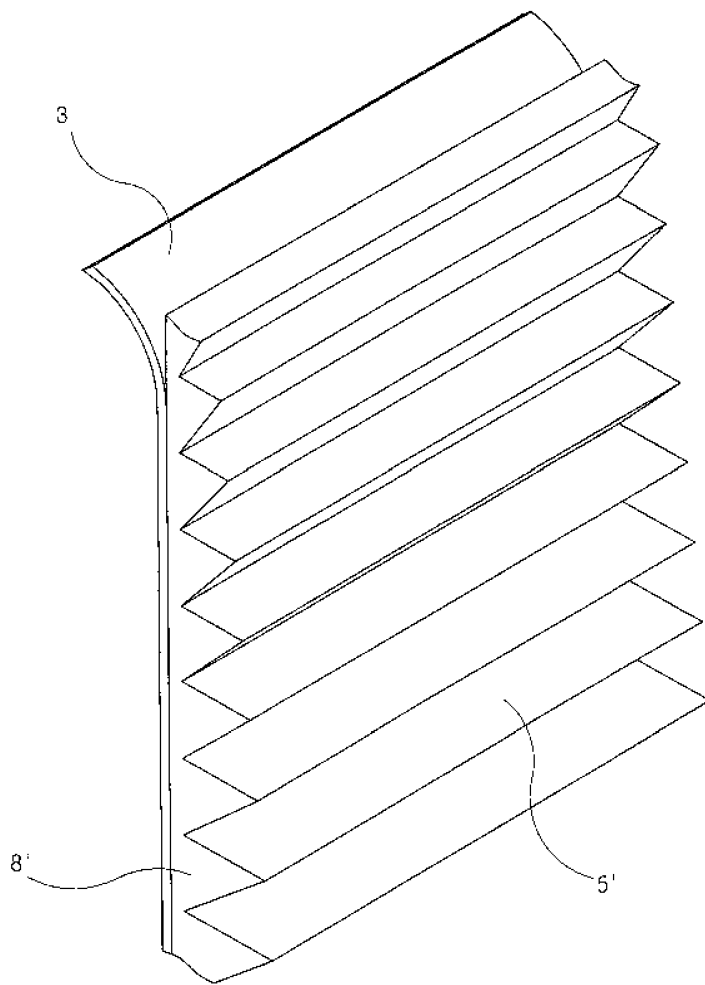
[Fig. 9]



[Fig. 10]



[Fig. 11]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2005/002876

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 G03B 21/62**

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)

IPC7 G03B 21/62

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975

Korean Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 05072634 A (SEIKO EPSON CORP.) 26 Mar. 1993 see the abstract	1, 3, 7, 9, 13, 15 2, 4 - 6, 8, 10 - 12, 14, 16 - 18
Y	JP 2001004808 A (DAINIPPON PRINTING CO., LTD.) 12 Jan. 2001 see paragraph [0003] and Fig. 6	2, 4, 6, 8, 10, 12, 14, 16, 18
Y	JP 62010637 A (MITSUBISHI RAYON CO., LTD.) 19 Jan. 1987 see the abstract and Figs. 1 and 4	5, 6, 11, 12, 17, 18
A	US 4,512,631 A (BERTRAM VANBREEMEN) 23 Apr. 1985 see line 15, column 4 to line 31, column 6 and Figs. 4 and 6	5, 6
A	US 4,432,608 A (GRUP, HOWARD W.) 21 Feb. 1984 see the whole document	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

26 DECEMBER 2005 (26.12.2005)

Date of mailing of the international search report

27 DECEMBER 2005 (27.12.2005)

Name and mailing address of the ISA/KR



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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2005/002876

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 05072634 A	26 Mar . 1993	NONE	
JP 2001004808 A	12 Jan . 2001	NONE	
JP 62010637 A	19 Jan . 1987	NONE	
US 4,512,631 A	23 Apr . 1985	JP4006315B4 JP59205887A2 US4512631A	05.02.1992 21.11.1984 23.04.1985
US 4,432,608 A	21 Feb . 1984	NONE	