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D E C I S I O N
of 4 May 2006

Case Number: T 0021/04 - 3.4.02

Application Number: 95933564.7

Publication Number: 0857309

IPC: G02B 5/02

Language of the proceedings: EN

Title of invention:
Light-diffusing panel and window shade using same

Applicant:
Oyama, Nobuo

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 83, 84, 52(1), 54, 56

Keyword:
"Sufficiency of disclosure (yes)"
"Clarity (yes)"
"Main and first to fifth auxiliary requests: novelty (no)"
"Sixth auxiliary request: novelty and inventive step (yes)"

Decisions cited:
T 1110/03

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0021/04 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 4 May 2006

Appellant: Oyama, Nobuo
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 20 August 2003 refusing European application No. 95933564.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. G. Klein
Members: F. J. Narganes-Quijano
M. Vogel

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 95933564.7, based on the International application No. PCT/IB95/00888 published with the International publication No. WO 97/14982.

In the decision under appeal the examining division found that the application documents according to the request then on file did not comply with the requirements of Articles 83 and 84 EPC. In particular, the examining division referred to the effect specified in the independent claims and relating to the median of the angle of diffusion of light, and held that the claimed effect was not supported by the description (Article 84 EPC) and that the description and the claims failed to specify the features by which the effect could be achieved (Articles 83 and 84 EPC).

During the examination procedure the examining division also expressed its view on the issues of novelty and inventive step of the subject-matter of independent claims then on file (Articles 52(1), 54 and 56 EPC).

II. With the statement of grounds of appeal the appellant submitted sets of application documents amended according to different requests.

III. With a communication annexed to summons to attend oral proceedings, the Board cited the following documents from its own knowledge in support of the examining division's findings during the first-instance proceedings:

D4: JP-A-6033671 and the corresponding abstract published in "Patent Abstracts of Japan",

D5: EP-A-0118951,

D6: EP-A-0051976,

A1: JP-A-07296617 (published on 10 November 1995) and

A2: EP-A-1326101 (published on 9 July 2003),

and gave a preliminary assessment of the case.

IV. In response to the summons to oral proceedings, the appellant submitted further amendments to the application documents according to a main and first to sixth auxiliary requests.

V. During the oral proceedings held on 4 May 2006 the appellant submitted the following document:

D4': computer-generated English translation of the Japanese patent document D4.

The appellant maintained the amendments to the application documents according to the main and the first to fifth auxiliary requests, and replaced the description and the set of claims of the application documents according to the sixth auxiliary request by an amended set of claims 1 to 7 and amended description pages 1 to 8 together with a page containing an insert to the text of page 1 of the description.

The appellant requested setting aside of the decision and the grant of a patent on the basis of one of the main and the first to sixth auxiliary requests.

At the end of the oral proceedings, the Board gave its decision.

VI. Claim 1 of the main request is worded as follows:

"A panel (10; 110; 210; 310; 410; 510; 610) for diffusing light, comprising:

a plurality of transparent elongated members (14; 114a, 114b; 214a, 214b; 314; 414; 514; 614), each member having a longitudinal axis and a cross-sectional shape that is at least partially circular with a substantially smooth outer surface; and

means (12; 112; 212; 312; 412; 612;) for securing the members together such that the longitudinal axes of the members lie in a substantially single plane and are substantially parallel to one another,

characterized in that

the cross-sectional shape and size of the members are such that, for incident chief rays (I_1, I_2) lying in a plane normal to the longitudinal axes and having different angles of incidence, the medians of the corresponding angles of diffusion of light (T11, T12; T21, T22) are substantially perpendicular to the single plane."

The wording of claim 1 of each of the first to fourth auxiliary requests differs from the wording of claim 1 according to the main request only in the replacement of the expression "lie in a substantially single plane" by the expression "lie substantially in a single plane".

Claim 1 of the fifth auxiliary request reads as follows:

"A panel (210) for diffusing light, comprising:

- a first plurality of transparent elongated members (214a), each member of said first plurality having a longitudinal axis and a cross-sectional shape that is at least partially circular with a substantially smooth outer surface;
- a second plurality of transparent elongated members (214b), each member of said second plurality having a longitudinal axis and a cross-sectional shape that is semi-circular;
- securing means (212) for securing the members (214a, 214b) together such that longitudinal axes of the members (214a) of the first plurality and the members (214b) of the second plurality lie each substantially in a single plane and are each substantially parallel to one another;

wherein

- the securing means includes a sheet (212) having a first surface and a second surface and carrying the first plurality of members (214a) on the first surface and the second plurality of members (214b) on the second surface;
- the longitudinal axes of the members (214a) of the first plurality having a different direction than the longitudinal axes of the members (214b) of the second plurality; and
- the cross-sectional shape and size of the members is selected such that light incident to a surface of the panel is transmitted through the members and is diffused thereby along the plane."

The main and the first to fifth auxiliary requests include additional independent claims as well as dependent claims the wording of which is not relevant to the present decision.

Independent claims 1 and 5 of the sixth auxiliary request read as follows, respectively:

"A cover (850; 910) for a window (960), comprising:

- a sheet (12; 112; 212; 312) of light-transmissive material sized to cover the window; and
- a plurality of transparent elongated members (14; 114a, 114b; 214a, 214b; 314; 414; 514; 614) arranged side-by-side on at least one surface of the sheet, the members having longitudinal axes that are substantially parallel to one another and cross-sectional shapes that are at least partially circular with substantially smooth outer surfaces, the cross-sectional shape and size of the members are such that, for incident chief rays (I_1, I_2) lying in a plane normal to the longitudinal axes and having different angles of incidence, the medians of the corresponding angles of diffusion of light (T11, T12; T21, T22) are substantially perpendicular to the single plane

wherein

- the sheet (12; 112; 212; 312) is divided into a plurality of panels;
- the plurality of members (14; 114a, 114b; 214a, 214b; 314; 414; 514; 614) are arranged on at least one of the panels such that the direction of their longitudinal axes defines a first direction;
- the cover includes additional pluralities of members arranged on the other panels such that the

directions of the longitudinal axes of said additional pluralities of members define at least one additional direction; and

- the pluralities of members (14; 114a, 114b; 214a, 214b; 314; 414; 514; 614) are arranged such that the directions of their longitudinal axes define three different directions, morning sunlight being diffused in a plane normal to one of the directions, afternoon sunlight being diffused in a plane normal to another one of the directions."

"A window shade (750), comprising

- a sheet (12; 112; 212; 312) of light-transmissive material sized to cover the window (760) and divided into a plurality of sections (710a-j);
- means for hanging the sheet in front of the window; and
- a plurality of transparent elongated members (14; 114a, 114b; 214a, 214b; 314; 414; 514; 614) for each section of the sheet,

wherein

- the members in each plurality have at least partially circular cross-sections with substantially smooth outer surfaces;
- the members in each plurality are arranged side-by-side on a surface of the sheet and have longitudinal axes parallel to the other members in the same plurality, the cross-sectional shape and size of the members are such that, for incident chief rays (I_1, I_2) lying in a plane normal to the longitudinal axes and having different angles of incidence, the medians of the corresponding angles of diffusion of light (T11, T12; T21, T22) are substantially perpendicular to the single plane and

– at least two pluralities of members are arranged to diffuse light which is incident in the planes normal to the longitudinal axes of the respective members in at least two different planes."

The set of claims according to the sixth auxiliary request includes dependent claims 2 to 4 and dependent claims 6 and 7 referring back to claims 1 and 5, respectively.

VII. The arguments of the appellant in support of his requests are essentially the following:

The independent claims and the description of the application specify how the effect relating to the median of the angle of diffusion of light is achieved, namely by appropriately selecting the cross-sectional shape and size of the members. Therefore the claims are clear and supported by the description, and the application discloses sufficiently the invention.

Document D4 discloses a curtain made of a light-transmitting material for controlling the direction and the degree of diffusion of transmitted sunlight by forming a light-refractive pattern structure at least on one surface of the curtain. The physical phenomena and the light diffusion mechanism underlying the devices of document D4 and those of the invention are, however, different. While document D4 relies on refraction by a lenticular pattern and the angle of refraction changes when the position of the sun changes, the predominant physical effect in the case of the invention is diffraction and interference at the regions between adjacent members, and the resulting

light diffusion mechanism is not very much affected by the position of the sun. Thus, by selecting the interval between the elongated members smaller, the diffusion effect caused by diffraction at the regions between adjacent members is made more predominant than that caused by refraction at the central regions of the members. This mechanism renders the claimed invention novel and also inventive over document D4.

The effect disclosed in document D5 with reference to Figure 7 is similar to that achieved in the invention; however, document D5 requires two arrangements of elongated elements. Document D6 relies on refraction and the lens elements are not elongated but have a convex surface of revolution; in addition, although the arrangement of Figure 6 achieves the claimed effect, it has a different structure than that of the invention, and the panel of the invention should rather be compared with the arrangement of Figure 2 which fails to achieve the claimed effect.

Reasons for the Decision

1. The appeal is admissible.

2. *Sufficiency of disclosure - Clarity of the claims*

The invention according to the claims of the different requests presently on file involves a substantially planar arrangement of parallel transparent elongated members each having a substantially smooth and at least partially circular cross-sectional shape. Each of the independent claims specifies in addition that "the

cross-sectional shape and size of the members are such that, for incident chief rays lying in a plane normal to the longitudinal axes [of the members] and having different angles of incidence, the medians of the corresponding angles of diffusion of light are substantially perpendicular to the single plane" of the arrangement.

In the decision under appeal the examining division held with regard to the application documents then on file that the effect specified in the independent claims and corresponding - up to an improved formulation of its wording - to the effect mentioned above was unclear and not supported by the description (Articles 84 EPC), and was also not sufficiently disclosed in the application (Article 83 EPC). The appellant for its part has submitted that the claimed effect is achieved by appropriately selecting the cross-sectional shape and the size of the members as actually defined in the claims and explained in the description with reference to Figures 2 and 3.

The Board first notes that a transparent arrangement of elongated members as specified above refracts parallel light incident thereon so that the refracted light emerges as divergent light. Therefore, the arrangement disperses the incident light on the plane orthogonal to the elongated members and in this sense, as shown in the present application, the arrangement operates as a light diffuser. In addition, following purely geometrical and optical considerations - and as evidenced by post-published documents A1 (Figures 1, 2, 3 and 5 together with the abstract) and A2 (Figures 1 and 2 together with the corresponding description) both

originating from the same inventor of the present application and cited, not as state of the art, but only as technical evidence (T 1110/03 (OJ EPO 2005, 302), point 2 of the reasons) illustrating inherent optical phenomena in planar arrangements of elongated transparent lens elements - it appears that light incident obliquely on this type of arrangements is diffused in such a way that the median of the effective angle of diffusion of light by each of the members is generally closer to the normal to the planar arrangement than the direction of propagation of the incident light.

It follows that in an arrangement as that considered above parallel light incident on the arrangement is diffused by the arrangement so that the medians of the angular ranges of diffusion are closer to the normal to the planar arrangement than the direction of propagation of the incident light and thus are, at least to a predetermined degree, substantially perpendicular to the panel, the degree to which the medians are substantially perpendicular to the plane of the arrangement generally depending on the shape and size of the members.

In view of the above, the Board agrees with the appellant that the claimed effect is sufficiently clear and supported by the description and also sufficiently disclosed in the application, although only to the extent that the medians of the angles of diffusion are not strictly perpendicular - as appears to have been assumed by the examining division - but only - as actually claimed and consistently specified in the description - *substantially* perpendicular to the plane

of the arrangement to the degree that can be achieved with elongated members having the cross-sectional shape and size exemplified in the application, and in particular with semi-cylindrical members having a smooth, circular cross-sectional shape. Any effect going beyond the latter would not be supported by the description (Article 84 EPC) and would not be sufficiently disclosed in the application within the meaning of Article 83 EPC.

The Board concludes that the definition of the invention in the claims is sufficiently clear and supported by the description (Article 84 EPC) and that the invention is sufficiently disclosed in the description and drawings (Article 83 EPC) to the extent specified above.

3. *Main request - Novelty and inventive step*

3.1 Document D4 discloses a window curtain constituted by a planar panel including a plurality of transparent elongated members arranged side-by-side and secured together so that the longitudinal axes of the members lie parallel to each other in the plane of the panel (English abstract and Figures 2 and 3). The members have a smooth outer surface having an essentially circular cross-sectional shape (Figures 2 and 3; see also paragraph [0013] of the computer-generated translation D4').

In addition, sunlight incident on, and transmitted through the panel disclosed in document D4 is diffused by the members (Figure 2), the cross-sectional shape and the size of the members being such that the optical

diffusivity of the panel in the horizontal direction is enhanced (English abstract, and also paragraphs [0014], [0016] and [0017] of document D4'). Thus, when in use the panel is located with the longitudinal axes of the members in a horizontal direction as represented for example in Figure 3(b), sunlight rays falling within different angles of incidence in a plane normal to the longitudinal axes of the members are diffused by the panel so that the medians of the corresponding angles of diffusion of the light are closer to the normal to the plane of the panel than the respective incident sunlight rays, and consequently are substantially perpendicular to the plane of the panel at least to the degree of achievement supported by the disclosure of the present application (see point 2 above).

3.2 The appellant has submitted that, while in document D4 the diffusion mechanism is purely refractive, in the case of the invention the diffusion mechanism is predominantly diffraction and interference of light. However, there is no support in the application for the appellant's contention that the panels of the invention diffuse light predominantly by diffraction and/or by interference. In particular, the only examples in the description of the application that specify the dimensions of the members involve members having a width of 0.6 mm (page 4, lines 29 to 31) and members constituted by fibres of fishing line having a diameter of 0.14 mm (page 5, lines 21 to 23 and lines 31 to 33, and page 6, lines 10 and 11), i.e. members having a width orders of magnitude greater than the wavelengths of visible sunlight. Thus, although diffusion effects by diffraction and/or interference can certainly not be excluded at the adjoining longitudinal edges of the

members, the predominant diffusion effect would be that resulting from refraction by the members themselves (see point 2 above) as is also the case in the panels of document D4. In any case, according to paragraphs [0013] and [0015] of document D4 (see also the corresponding paragraphs of the computer-generated translation D4' submitted by the appellant during the oral proceedings) the width of the members of the panels is of 0.4 or 0.5 mm, i.e. of the same order of magnitude as in the examples of the invention given in the application. For this reason, any diffusion mechanism distinct from, and any diffusion effect going beyond that intrinsically achieved by the panels of document D4 would not be supported by the disclosure of the application.

3.3 Having regard to the above, the panels of document D4 anticipate all the structural and functional features of the subject-matter of claim 1 according to the main request, at least to the extent that the claimed effect is supported by the disclosure of the application (point 2 above), and consequently the claim cannot be considered to define novel subject-matter over the disclosure of document D4 (Articles 52(1) and 54 EPC).

Notwithstanding, the Board notes that any improvement of the light diffusion directivity of the claimed panel in a direction perpendicular to the panel beyond that intrinsically achieved by the arrangement disclosed in document D4, in addition of not being supported by the disclosure of the application, would in any case not involve an inventive step (Articles 52(1) and 56 EPC) because it belongs to the general knowledge in this field that the cross-sectional shape and the size of

the members can be selected to control the directivity of the emerging divergent light as illustrated in document D5 (page 10, lines 1 to 9 and page 8, lines 26 to 31 together with Figure 7) and document D6 (Figures 5 and 6 together with page 7, lines 16 to 32 and page 8, lines 7 to 20) addressing the corresponding effect in planar arrangements of lenses. The argument of the appellant that document D5 requires two arrangements of members is not persuasive as the subject-matter of claim 1 does not exclude the provision of the members as bi-convex elements or the provision of a second parallel arrangement of plano-convex elements (see Figures 4 to 9 of the application). The further contention of the appellant that document D6 involves spheroid members and that the invention should rather be compared structurally with the arrangement of Figure 2 cannot be followed either; in particular, the fact that in document D6 the members are not elongated, but spheroid is not relevant as in any planar section of the spheroid members the divergence or diffusion effect on the emerging light is the same as that achieved according to the invention, and the representation of Figure 2 of document D6 in which the diffused light does not appear to emerge in a direction closer to the normal to the arrangement than the direction of propagation of the incident light is not conclusive since the representation is only schematic and, in addition, confined to a section of the light beam actually incident on the arrangement.

4. *First to fourth auxiliary requests - Novelty and inventive step*

The wording of claim 1 of each of the first to fourth auxiliary requests differs from that of claim 1 according to the main request only in the replacement of the expression "lie in a substantially single plane" by the expression "lie substantially in a single plane". This amendment does not affect the substance of the considerations and conclusions set forth in point 3 above. Consequently, the subject-matter of claim 1 of these requests is not novel and in any case does not involve an inventive step (Articles 52(1), 54 and 56 EPC) for the same reasons put forward in point 3 above with regard to claim 1 of the main request.

5. *Fifth auxiliary request - Novelty and inventive step*

The panel disclosed in document D4 with reference to Figure 3 and comprising the parallel and planar arrangement of transparent elongated members referred to in point 3.1 above includes a second parallel, planar arrangement of transparent elongated members having the same structural and functional features as the aforementioned arrangement. In addition, the two planar arrangements can be considered - as is the case of the embodiment disclosed in the description of the application with reference to Figure 5 - to be secured to a respective one of the two sides of an intermediate planar sheet of transparent material.

It follows that the subject-matter of claim 1 of the fifth auxiliary request is also anticipated, and in any case rendered obvious by the prior art for reasons

analogous to those put forward in point 3 above with regard to claim 1 of the main request (Articles 52(1), 54 and 56 EPC).

6. *Sixth auxiliary request*

6.1 Amendments

After due consideration of the amendments made to the application documents according to the sixth auxiliary request, the Board is satisfied that the amended application documents comply with the formal requirements of the EPC, and in particular with those set forth in Article 123(2) EPC. More particularly, each of independent claims 1 and 5 is based on claims 15 to 17 and on claim 22 as published, respectively, together with the passages on page 3, lines 10 to 12 and lines 17 and 18 of the description, and Figure 2 and the corresponding description of the application as published; and dependent claims 2 to 4 and 6 to 7 are respectively based on claims 18, 19, 21, 23 and 24 as published. Furthermore, the description has been appropriately amended and brought into conformity with the invention as defined in the claims (Article 84 EPC, second sentence and Rule 27(1)(c) EPC) and document D4 has been appropriately acknowledged in the introductory part of the description (Rule 27(1)(b) EPC).

6.2 Novelty and inventive step

No objection of lack of novelty or lack of inventive step was raised by the examining division during the first-instance proceedings with regard to the window

cover and the window shade respectively defined in claims 1 and 5 according to the sixth auxiliary request. In addition, after consideration of the prior art documents on file, the Board is satisfied that the subject-matter of independent claims 1 and 5, and also that of dependent claims 2 to 4, 6 and 7 is novel and involves an inventive step within the meaning of Articles 52(1), 54 and 56 EPC. In particular, the available prior art fails to disclose or to suggest a planar arrangement of light diffusing panels having different light-diffusion directivity characteristics as claimed, nor the effect achieved therewith, namely the different light-diffusion properties of the individual panels for sunlight incident thereon along a direction varying along the day.

7. In view of the above, the decision under appeal is to be set aside. In addition, being satisfied that the patent application as amended according to the sixth auxiliary request of the appellant and the invention to which it relates meet the requirements of the EPC (Article 97(2) EPC), the Board, in accordance with Article 111(1) EPC, considers it appropriate to exercise favourably the power within the competence of the examining division to order grant of a patent.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first-instance department with the order to grant a patent on the basis of the following documents:

   - claims 1 to 7 pursuant to the sixth auxiliary request as filed during the oral proceedings,

   - description pages 1 to 8 with insert to page 1 of the description as filed during the oral proceedings, and

   - drawings comprising Figures 1 to 13 as published.

The Registrar: The Chairman:

M. Kiehl A. G. Klein