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**Datasheet for the decision
of 11 January 2011**

Case Number: T 2158/08 - 3402

Application Number: 98102813.7

Publication Number: 864905

IPC: G02F1/1335, F21V8/00

Language of the proceeding: EN

Title of invention:
Backlight device and liquid crystal display device

Applicant:
DAI NIPPON PRINTING CO., LTD.

Opponent:

Headword:

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

Keyword:
Inventive step (no)

Decisions cited:

Catchword:



Case Number: T2158/08 - 3402

D E C I S I O N
of the Technical Board of Appeal 3402
of 11 January 2011

Appellant:

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted 20 June 2008
refusing European application No. 98102813.7
pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman:

A.G. Klein

Members:

A. Maaswinkel

D.S. Rogers

Summary of Facts and Submissions:

- I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing the European patent application No. 98102813.7.
- II. In its decision, the examining division held that the subject-matter of the independent claims did not involve an inventive step (Art. 52(1) and 56 EPC), *inter alia* having regard to document D2 (EP-A-0 597 261) which could be regarded as the closest prior art document.
- III. With the statement of grounds of appeal the appellant requested that the decision of the examining division be set aside and that a patent be granted upon the basis of the claims that formed its main request before the examining division and also filed an auxiliary request for oral proceedings. This claim request was subsequently refiled with a letter dated 13 December 2010.
- IV. In a Communication pursuant to Article 15(1) RPBA accompanying the summons to oral proceedings the board expressed its preliminary opinion that the subject-matter of the independent claims did not involve an inventive step.
- V. In the letter received on 13 December 2011 the appellant also filed an auxiliary request containing method claims 1 to 15.
- VI. Oral proceedings took place on 11 January 2011. At the oral proceedings the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of either the main or the

auxiliary request, both filed with the letter dated 13 December 2010. The board gave its decision at the end of the oral proceedings.

VII. The wording of claim 1 of the main request reads as follows:

" A backlight device comprising:

 a light source (1) for emitting light;
a light guide (2) for receiving the light from the light source (1) and for emitting directional light having a maximum intensity in a first direction (5);

 a light diffusing surface (7) provided on at least one side of the light guide (2) for emitting the directional light at the maximum intensity as directionally diffused light;

 a polarization light splitter (3) having a planar, multi-layer structure, wherein each of the multiple layers constituting the polarization light splitter is in planar form over its entirety and the multiple layers of the polarization light splitter are configured for light passing through at an angle of incidence;

 and a beam deflector (4), disposed between the light guide (2) and the polarization light splitter (3), for deflecting the directional light from the light guide (2) towards the polarization light splitter (3) in a second direction (8) substantially coinciding with a direction in which the polarization light splitter (3) has a maximum polarization light splitting effect ".

The wording of claim 15 of the main request reads as follows:

" A liquid crystal display device, comprising:
a backlight device according to one of claims 1 to 15
[sic], and a liquid crystal cell for receiving the
light transmitted through the polarization light
splitter to display at least one image ".

Claims 2 to 14 of this request are dependent claims.

The wording of independent claim 1 of the auxiliary
request reads as follows:

" A method for guiding light in a backlight device,
said method comprising:

emitting light from a light source (1);
receiving the light from the light source (1) in a
light guide (2) and emitting directional light having a
maximum intensity in a first direction (5) from said
light guide, where the directional light at the maximum
intensity is emitted as directionally diffused light
using a light diffusing surface (7) provided on at
least one side of the light guide (2);

deflecting the directional light from the light
guide (2) in a beam deflector (4) in a second direction
(8) towards a polarization light splitter (3) having a
planar, multi-layer structure, wherein each of the
multiple layers constituting the polarization light
splitter is in planar form over its entirety and the
multiple layers of the polarization light splitter are
configured for light passing through at an angle of
incidence, said beam deflector being disposed between
the light guide (2) and the polarization light splitter
(3), said second direction (8) substantially coinciding
with a direction in which the polarization light
splitter (3) has a maximum polarization light splitting
effect ".

Claims 2 to 15 of the auxiliary request are dependent claims.

VIII. The arguments of the appellant may be summarised as follows.

In the decision under appeal it was argued that prior art reference D2 discloses all of the claimed features, except for a light diffusing surface being provided on at least one side of the light guide for emitting the directional light at the maximum intensity as directionally diffused light. However, apart from this feature, claim 1 comprises further features not known from document D2. Namely, D2 does not disclose a light guide that is specifically designed to emit directional light having a maximum intensity in a predetermined direction, i.e. in a defined direction. Furthermore, this document also does not disclose a beam deflector within the meaning of the present application.

Regarding the light guide 3 shown in Figure 2 of D2, the entire document does not in any way describe that it is designed to provide any form of directionality. With respect to the direction of light in this light guide 3, the only considerations given in document D2 refer to whether or not there is total reflection (see e.g. page 9, lines 46 to 52). It is within this context that document D2 describes an array of micro-lenses or prisms on the surface of the light guide. As a consequence, the description of prism array 13 on page 10, lines 8 to 12 must also be read within this overall context. It is thus a device for coupling light out of the light guide, where the light emitted from the film of prisms has a certain directionality which, according to page 10, lines 2 to 12, may be in a range conforming

to a Brewster's angle. However, there is no indication of light being emitted from the light guide in a defined direction, and consequently there is also no disclosure of the prism array 13 being designed to deflect light from such a first direction into a second defined direction. Because of these considerable differences between the disclosure of D2 and the claimed subject-matter, the assessment of inventive step formed in the decision under appeal is wrong. Namely, reference D2 is distinguished from the claimed invention by the features of a light guide being designed for emitting directional light in a defined first direction, where this directional light is diffused light, and having a corresponding beam deflector for deflecting the emitted light into a second direction chosen in view of efficiency of a polarization light splitter. The effect of this technical difference is an increased efficiency, because specifically designing the light guide in view of directionality in a first direction and appropriately selecting the beam deflector increases the amount of light that reaches the polarization light splitter at the direction of maximum polarization light splitting effect. At the same time, the combination of on the one hand providing directionality and on the other hand allowing diffusion within the light guide allows good performance of the overall device without necessarily having to add further separate light diffusion layers. Thus compactness is achieved.

It is not evident how a skilled person could in a straightforward way arrive at these objects when starting from document D2. There is no objective hint towards designing the light guide in order to provide a desired directionality of light emitted from the light guide, and there is certainly no suggestion of

combining a desired directionality in the light guide with diffusion in order to emit directionally diffused light. Namely, in connection with diffusion in the light guide, page 13, lines 12 to 18 of D2 clearly describe that such diffusion destroys directionality, thereby reducing the effect of the polarized light separator. As a consequence, document D2 in fact teaches away from employing diffusion with the light guide and the skilled person would most certainly refrain from employing any form of diffusion within the light guide. Therefore D2 cannot provide the advantage of compactness as the present invention does.

The claims of the auxiliary request are directed to a method of guiding light into a light guide based on the backlight device disclosed in the patent application. With respect to document D2 it is argued that there is clearly no hint in this document at the specific idea of guiding light into a light guide, then having it emitted from the light guide in a first direction into a beam deflector for deflecting it into a second direction that is designed to be suitable for a polarisation light splitter. Therefore it is submitted that the claims of the auxiliary request are in any case novel and inventive over the discussed prior art.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

The present set of claims according to the main request is identical to the one before the examining division and which was the subject of the decision under appeal. These claims were not found objectionable under Art.

123(2) EPC and the board has no such objections of its own.

According to the appellant in its letter of 13 December 2011, the claims of the auxiliary request fully correspond to those of the main request and only differ in that they have been rewritten as method claims relating to the use of a backlight device. Having regard to the original patent application documents this appears to be fairly disclosed, therefore the reformulation does not lead to an objection under Art. 123(2) EPC.

3. *Patentability - main request*

3.1 The board concurs with the position of the examining division in point 1.1.2 of the appealed Decision that document D2 may be considered as the closest prior art. This document discloses in Figure 2 a backlight device (illumination device, see Title of D2) comprising a light source (1) for emitting light; a light guide (3); a polarization beam splitter (6); and a beam deflector (prism array (13)) disposed between the light guide and the polarization beam splitter.

3.2 In point III.1 of the grounds of appeal it was argued that document D2 does not disclose that the light guide (3) is specifically designed to emit directional light having a maximum intensity in a predetermined direction, i.e. in a defined direction. Furthermore, document D2 also did not disclose a beam deflector within the meaning of the present invention (*emphasis by the board*).

3.3 However, the only restrictions in claim 1 to the light guide are that it should be suitable for receiving the light from the light source; and that it should be capable of emitting light having a maximum intensity in a first direction. The claim does not define any further concrete features of the light source or the light guide, nor does it provide any information or restrictions with respect to the angular distribution of the emitted light pattern, apart from that it should apparently not be an isotropic pattern. Therefore for the purpose of patentability (novelty/inventive step) the claim's terminology must be construed in a broad sense, which is why the board concurs with the position on page 5, first paragraph of the Decision of the examining division that since in the arrangement of D2 the light is only emitted from the top surface of the light guide it "is directional to some degree".

3.4 For similar reasons the argument that the beam deflector in D2 is not a deflector "within the meaning of the present invention" is not persuasive, since for the purposes of Article 84 EPC the subject-matter of the claim should be defined in a way that it allows an unambiguous distinction from the prior art, without having to resort to the description. Therefore the board does not concur with the statement in point III.4 of the above letter that there was no disclosure of the prism array 13 "being designed to deflect light from such a first direction into a second defined direction". To the contrary, document D2, page 10, lines 8 to 12, discloses that the maximum of intensity of light emitted from the light guide (*in a first direction, presumably in an angular range of -90° to +90°*) is concentrated in a deviated (*i.e.: second*) direction of light cones having ranges +40° through +80°, respectively -40° through -80°.

- 3.5 Therefore the only difference between the subject-matter of claim 1 and the embodiment of Figure 2 of D2 is the light diffusing surface provided on at least one side of the light guide.
- 3.6 This feature addresses the technical problem of increasing the viewing angle of a LCD device when combined with a backlight device. As pointed out in point 1.1.2.3 of the Decision, this problem was recognised in document D2, see page 10, lines 4 to 9: *"When the directivity of the light transferring through the light guide, is large, as a result, the light direction distribution of the light emitted from the flat illumination device concentrates on the perpendicular direction, and the range of viewing angle which corresponds to a clear display, is too narrow. In this case, it is possible to dispose an optically element such as a light diffusing sheet 8 which deteriorates the directivity, between the liquid crystal display element and the light deflecting means such as the above prism array"*. A further suggestion to increase a diffusing effect in the backlight device is on page 9, lines 44 and 45, where it is proposed that the reflecting pane 5 may be a diffused reflection pane to increase light emitted from the face on the side of the liquid crystal element 12 of the light guide 13. Finally on page 13, lines 5 to 18 discloses that a light diffusing means can be employed as one of the uniform light forming means.
- 3.7 The appellant has argued that this last passage in D2 on page 13, lines 12 to 18 discloses that the provision of a printed mesh might possibly deteriorate the directivity of the light and that this passage teaches away from applying such a mesh layer.

3.8 However, this passage also discloses that the size and the density of the printed mesh can be controlled, i.e. the degree of randomization of the light is selectable. Furthermore, the application of a printed layer corresponds to one of the alternatives disclosed in the patent application (Figure 2) and covered by claim 1.

3.9 Therefore the skilled person finds in document D2 various suggestions of improving the uniformity of the illumination and increasing its viewing angle by including a diffusing layer in the backlight device (additional light diffusing sheet; or selecting the plane 5 as a diffusely reflecting surface; or imprinting a mesh pattern on the light guide and controlling its size or density) and will select one of these alternatives according to the particular requirements of the LCD device.

3.10 Hence the board concurs with the position of the examining division and the subject-matter of claim 1 of the main request does not involve an inventive step. Therefore the main request is not allowable.

4. *Patentability - auxiliary request*

4.1 With respect to the patentability requirements of the claims of the auxiliary requests the appellant has argued that document D2 did not suggest the idea of guiding light into a light guide; subsequently deflecting it from the light guide into a beam deflector in a first direction; and finally deflecting it into a second direction that is designed to be suitable for a polarisation beam splitter.

4.2 In point 3 *supra* it has been found that the backlight device shown in Figure 2 of D2 explicitly shows all the technical features of the claimed device with the exception of a diffusing layer, which is, however, suggested in this document and is, in any case, routinely employed in this kind of devices. Therefore, since the backlight device of the patent application is obvious in view of the prior art in Figure 2 of document D2, clearly, the use of this device cannot be inventive either, since the skilled person will use that device exactly in the same way as defined in claim 1 of the auxiliary request. Thus this claim does not involve an inventive step.

4.3 In conclusion the auxiliary request is not allowable.

5. Since the independent claims of either request do not meet the requirements of Article 52(1) and 56 EPC, the appeal is not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

M. Kiehl

A.G. Klein