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Datasheet for the decision of 4 October 2018

Case Number: T 1854/14 - 3.4.02

Application Number: 08726525.2

Publication Number: 2130092

IPC: G02F1/13357

Language of the proceedings: EN

Title of invention:
BACKLIGHT UNIT WITH VERTICAL INTERIOR REFLECTORS AND METHOD OF FORMING THE SAME

Applicant:
Cree, Inc.

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (no)

Decisions cited:

Catchword:

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Case Number: T 1854/14 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 4 October 2018

Appellant: (Applicant)	Cree, Inc. 4600 Silicon Drive Durham, NC 27703 (US)
Representative:	Boult Wade Tennant LLP Verulam Gardens 70 Gray's Inn Road London WC1X 8BT (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 29 April 2014 refusing European patent application No. 08726525.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Bekkering
Members:	A. Hornung
	B. Müller

Summary of Facts and Submissions

I. The applicant appealed against the decision of the examining division refusing European patent application No. 08726525.2 on the basis of Article 56 EPC.

II. With the statement setting out the grounds of appeal, the applicant filed sets of claims according to a main request, a first auxiliary request and a second auxiliary request. The claims of the main request and of the first auxiliary request are identical to those underlying the appealed decision. The applicant requested that the decision of the examining division be set aside and a patent be granted on the basis of one of these sets of claims.

III. In a communication annexed to a summons to oral proceedings, the board informed the applicant about its provisional and non-binding opinion according to which, *inter alia*, the claimed subject-matter of all requests lacked an inventive step.

IV. In response to the summons to oral proceedings, the applicant informed the board with its letter dated 7 September 2018 that it would not be attending the oral proceedings. The applicant did not file any comments concerning the board's preliminary opinion that the subject-matter of the independent claims of the main request and the first auxiliary request lacked an inventive step. Arguments "intended to address the issues identified by the board of appeal with respect to only the second auxiliary request" were provided with the letter dated 7 September 2018.

V. Following the applicant's letter of 7 September 2018 the oral proceedings scheduled on 9 October 2018 were cancelled.

VI. Independent claim 1 of the **main** request reads as follows:

"A method of forming a solid state backlight unit for providing light to a display, the method comprising:

mounting a plurality of LEDs (106) to a first surface (108) of a backlight unit housing (102), the first surface being a major surface, the backlight unit housing also comprising sidewalls (114) extending generally perpendicularly from one or more edges of the first surface;

attaching a first reflector (140) to the backlight unit housing, wherein the first reflector is configured to extend from the first surface, wherein the first reflector is oriented substantially perpendicular to the first surface, and wherein the first reflector is positioned adjacent a first side of the plurality of LEDs;

engaging the first surface with a planar diffuse reflector (110);

attaching a diffuser (112) to a distal edge of the sidewalls of the backlight unit housing, wherein the diffuser is positioned substantially parallel to the first surface (108), wherein the diffuser transmits light from the plurality of LEDs (106) and the first reflector (140);

characterized in that the diffuse reflector is formed of a coating on the first surface; and in that

the first reflector is a specularly reflective component that comprises an optical film and/or a metallic tape."

Independent claim 1 of the **first** auxiliary request reads as follows:

"A method of forming a solid state backlight unit for providing light to a display, the method comprising:

mounting a plurality of LEDs (106) to a first surface (108) of a backlight unit housing (102), the first surface being a major surface, the backlight unit housing also comprising sidewalls (114) extending generally perpendicularly from one or more edges of the first surface;

attaching a first reflector (140) to the backlight unit housing, wherein the first reflector is configured to extend from the first surface, wherein the first reflector is oriented substantially perpendicular to the first surface, and wherein the first reflector is positioned adjacent a first side of the plurality of LEDs;

engaging the first surface with a planar diffuse reflector (110), formed of a coating on the first surface;

attaching a diffuser (112) to a distal edge of the sidewalls of the backlight unit housing, wherein the diffuser is positioned substantially parallel to the first surface (108), wherein the diffuser transmits light from the plurality of LEDs (106) and the first reflector (140);

characterized in that the first reflector is a specularly reflective component (141) that comprises a multilayer optical film."

Independent claim 1 of the **second** auxiliary request reads as follows:

"A method of forming a solid state backlight unit for providing light to a display, the method comprising:

mounting a plurality of LEDs (106) to a first surface (108) of a backlight unit housing (102), the first surface being a major surface, the backlight unit housing also comprising sidewalls (114) extending generally perpendicularly from one or more edges of the first surface;

attaching a first reflector (140) to the backlight unit housing, wherein the first reflector is configured to extend from the first surface, wherein the first reflector is oriented substantially perpendicular to the first surface, and wherein the first reflector is positioned adjacent a first side of the plurality of LEDs;

attaching a diffuser (112) to a distal edge of the sidewalls of the backlight unit housing, wherein the diffuser is positioned substantially parallel to the first surface (108), wherein the diffuser transmits light from the plurality of LEDs (106) and the first reflector (140); and

characterized by:

engaging the first surface with a planar diffuse reflector (110), formed of a sheet or plate, and in that

the first reflector is a specularly reflective component (141) that comprises a multilayer optical film."

VII. The following documents are referred to in the present decision:
D8: DE 297 07 964 U1,
D9: JP 2006-190847, including a copy of a machine-translated English version of D9 as annexed to the communication sent with the summons to oral proceedings.

Reasons for the Decision

1. Main request - inventive step

1.1 The subject-matter of claim 1 lacks an inventive step in view of the disclosure of D8 in combination with D9 (Article 56 EPC).

1.1.1 It is undisputed by the applicant that D8 represents the closest prior art and that the claimed subject-matter differs from the method of D8 in that "the first reflector is a specularly reflective component that comprises an optical film and/or a metallic tape".

1.1.2 As announced in the board's communication annexed to the summons to oral proceedings, the board agrees with the appealed decision, point 23, that "the specular first reflector provides an "infinite mirror" optical effect which improves the uniformity of the light emitted by the backlight unit in the region of the sidewalls of the housing structure" and that, therefore, the technical problem solved by the distinguishing feature can be seen "as how to eliminate or reduce bright non-uniformities caused by housing structures of a backlight device".

1.1.3 The board also agrees with the reasoning in the appealed decision, point 24, that it is obvious for the skilled person to solve the objective technical problem by replacing the diffusive sidewalls (10) of D8 by a specularly reflective component that comprises an optical film and/or a metallic tape. The reasoning in the appealed decision, point 24, reads as follows:

"When trying to solve this problem, the skilled person would have searched for prior art documents dealing with this problem and would have retrieved document D9 since D9

addressed exactly the same problem (See Fig.3 and description on paragraphs [0004]-[0007]: color non-uniformity and reduction in brightness occurs in the periphery of the diffusion plate 14).

D9 not only addresses the same objective technical problem as the present application, but also provides the same solution to it, namely to replace the diffusively reflecting sidewalls (Fig.3 (13)) by specular reflecting sidewalls obtained by providing a specular reflector ("mirror surface 5") on each of the sidewalls (3).

As illustrated in Figure 2 of D9, this results in the same "infinite mirror" effect as claimed in the present application. The specular reflector 5 of D9 results in color and brightness uniformity in the peripheral parts of the diffuser (14), as stated in paragraph [0010] of D9. According to paragraph [0009] of D9, the mirror surface 5 may be formed of an aluminum or silver vapor deposited film. An aluminum or silver vapor deposited film constitutes an optical film according to claim 1.

In the light of the teaching of D9, the skilled person would therefore have replaced the diffusive sidewall reflectors 10 in the back illumination unit of D8 by specular reflectors in order to reduce brightness non-uniformities occurring at peripheral parts of the diffuser 6 of D8 close to the sidewalls, without involving an inventive step (Article 56 EPC)."

1.2 Counter-arguments from the applicant

1.2.1 The applicant argued essentially that "if the skilled person were to modify the device of D8 based on the teachings of D9, they would remove all of the diffuse reflectors from the device of D8 and replace them with a smooth resin mirror on

the sidewalls of the unit only. (...) Thus, not only would the skilled person arrive at a device that does not have a diffuse reflector on the base of the housing, the device would also have a resin mirror formed on the sidewalls and not a specularly reflective component that comprises an optical film and/or a metallic tape".

1.2.2 The board is not convinced by this argument. D8 deals with the problem of inhomogeneous illumination provided by the backlight (see page 1, third paragraph). It discloses several arrangements for solving the technical problem: the optimization of the distance between the LEDs (8) and the diffusing plate (6), a white diffusing reflector (9) coated on the plate (5) supporting the LEDs, coating the portion of the housing (4) between the supporting plate (5) and the diffusing plate (6) with a diffusing reflector (10) and attaching a total reflector (11) at the outer periphery of the diffusing plate (6). However, despite these arrangements, the illumination transmitted through the diffusing plate (6) is not perfectly homogeneous (see page 2, last paragraph: "weitgehend homogen", i.e. largely homogeneous). Therefore, the skilled person does have a clear incentive to look for further optimization of the inhomogeneous illumination provided by the backlight.

The lack of homogeneity in the device of D8 is at least partially due to the fact that light originating from the vertical portion of the housing has a different intensity than light originating directly from the LEDs and from the diffusive coating on the horizontal supporting plate (5). Being confronted with the problem of lack of homogeneity, the skilled person would consult D9 relating to the same problem and learn that a solution consists in providing a mirror at the vertical portion of the housing which improves the homogeneity at the periphery of the device by providing multiple virtual images of the LEDs, located outside of the

device and virtually cancelling the disruptive optical effect of the vertical portion of the housing. Due to these virtual images of the LEDs, "it is possible to improve light utilization efficiency and prevent color unevenness and luminance lowering" (see D9, [0013]). Applying the solution taught in D9 to the device of D8 leads the skilled person to replace the diffusive material on the vertical portion of the housing of D8 by a mirror, especially in view of the fact that the diffusive coating on the vertical portion (4) of the housing of D8 is optional (see page 3, lines 2 and 3: "kann ... beschichtet sein").

Once the vertical portion of the housing of D8 is replaced with a mirror, there is no reason why the skilled person would further modify the device of D8 by removing the diffusive material from the horizontal supporting plate (5) of D8. In particular, D9 does not teach such a removal of diffusive material. D9 leaves open the question of how to form the upper surface of the printed circuit board. On the contrary, the diffusive material on the supporting plate (5) appears to improve illumination efficiency and homogeneity independently from the imaging effect provided by the mirror on the vertical portion of the housing.

1.2.3 The applicant's argument that the resin mirror disclosed in D9 differed from the "specularly reflective component that comprises an optical film and/or a metallic tape" of claim 1 cannot be followed because D9, [0009], effectively discloses a resin mirror obtained from aluminium vapor deposition or silver evaporation. The deposited aluminium or silver layer is effectively an optical film.

2. First auxiliary request - inventive step

2.1 The subject-matter of claim 1 lacks an inventive step in view of the disclosure of D8 in combination with D9 (Article 56 EPC).

2.2 The subject-matter of claim 1 of the first auxiliary request differs from the subject-matter of claim 1 of the main request only in that the specularly reflective component comprises a multilayer optical film instead of an optical film and/or a metallic tape.

In the technical field of reflective optical films, it is well known that vapor deposited metallic layers and e.g. dielectric multilayer optical films are alternative ways of providing a reflective element. Therefore, no inventive step can be based on the additional feature of the multilayer optical film.

2.3 The applicant argued that none of the cited prior art documents described the use of a specularly reflective component that comprises a multilayer optical film.

Furthermore, the claimed multilayer optical film improved the "infinite mirror" optical effect significantly and that the skilled person would not have appreciated that the use of a multilayer optical film could improve the illumination in this way.

2.4 Reflective multilayer optical films form part of the common general knowledge. Therefore, it is not relevant for the assessment of inventive step of claim 1 that multilayer optical films are not disclosed in D8 or D9.

Furthermore, the board does not see how the "infinite mirror" optical effect would improve significantly when using a general multilayer film instead of an optical film.

In particular, claim 1 does not define any specific or surprising properties of the multilayer optical film.

3. Second auxiliary request - inventive step

3.1 The subject-matter of claim 1 lacks an inventive step in view of the disclosure of D8 in combination with D9 (Article 56 EPC).

3.2 The subject-matter of claim 1 of the second auxiliary request differs from the subject-matter of claim 1 of the first auxiliary request only in that the planar diffuse reflector engaged with the first surface to which the LEDs are mounted is formed of a sheet or plate instead of a coating.

Diffusers formed of a sheet, a plate or a coating represent well known embodiments of an optical element whose primary function is to diffuse light. Each type of diffuser has specific technical characteristics being either advantageous or disadvantageous depending on the actual circumstances of the case. The skilled person would select, without exercising any inventive skills, a specific embodiment of a diffuser depending on the actual circumstances and constraints, such as ease of manufacturing of the diffuser, efficient mounting of the diffuser into the device, weight and volume constraints for the diffuser or desired diffusion property. In particular, replacing the diffusing reflecting coating (9) on the printed board (5) in the backlight of D8 by a diffusing reflecting sheet or plate is, therefore, considered an obvious possibility.

It is to be noted that the application as filed discloses the three types of diffusers only briefly in paragraph [0048], stating "[t]he diffuse reflector may be a sheet, plate and/or coating". No specific technical advantage of

one diffuser over the other is mentioned in the patent application. The board does also not see any surprising technical effect linked to one type of diffusers. Therefore, sheet, plate and coated diffusers are equivalent optical means for diffusing light.

3.3 The applicant argued that "since none of the prior art documents describe engaging the first surface with a planar diffuse reflector, formed of a sheet or plate, the skilled person would not be able to combine any of the documents and arrive at this feature".

The applicant further argued that "the process of implementing a sheet or a plate diffuser improves the ease of manufacturing the backlight unit" and presented two examples of the ease of manufacturing: providing a sheet or a plate diffuser is less reliant on the property of the surface on which the LEDs are mounted and neither requires applying a coating to the LED surface prior to the mounting of the LEDs, nor masking the LEDs to prevent them from being coated.

3.4 The board is not convinced by these arguments.

Diffusers formed as a sheet or a plate are common general knowledge. Therefore, it is not relevant for the assessment of inventive step of claim 1 whether diffusers formed as sheet or plate are disclosed in D8 or D9.

Using a sheet or plate diffuser instead of a coated diffusing layer on the printed circuit board has the disadvantage of mounting an additional optical component in the backlight. Moreover, the sheet or plate diffuser must be equipped with apertures and a careful registration of the apertures in front of the LEDs is required. These aspects might increase cost, weight and volume of the backlight. The

skilled person is aware of such potential advantages and disadvantages of the diffusers and will obviously select the type of diffuser which represents the best compromise in view of the actual constraints and desired performances of the backlight. In particular, depending on the actual circumstances of the case, replacing the diffusive coating on the printed circuit board by a sheet or plate diffuser represents an obvious possibility for the skilled person.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl R. Bekkering

Decision electronically authenticated