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[Continued on next page]

(54) Title: DESIGN PARAMETERS FOR THIN HOLLOW CAVITY BACKLIGHTS OF THE LIGHT-RECYCLING TYPE

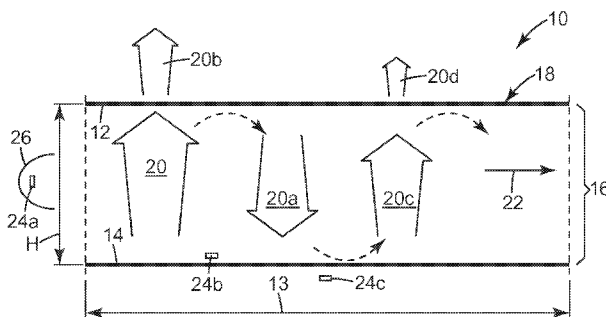


Fig. 1

(57) Abstract: A backlight unit (10) has a hollow cavity (16) instead of employing a light guide. One or more light sources (24a-c), such as LEDs, are arranged to emit light into the cavity, which is formed by a front (12) and a back reflector (14). The backlight is typically of the edge-lit type. The backlight can have a large area, is thin and consists of fewer components than conventional devices. Its design permits light recycling. The unit emits light of a predefined polarisation and can be arranged to have desired horizontal / vertical viewing angle properties. Light is uniformly distributed within the guide and the light output (20b, 20d) is substantially collimated. Such backlights occupy a specific region in a parameter space defined by two parameters: first, the ratio of the output emission area to the total source emission area should lie in the range 0.0001 to 0.1; and second, the ratio of the SEP to the height of the cavity (H) should be in the range 3 to 10, where the SEP is an average plan view source separation, a special measure of the average spacing of light sources in the plane of the unit. There is also a discussion on the required number of light sources N, their arrangement near the periphery of the cavity, as well as the shape and size of the output emission area. A required minimum brightness uniformity (VESA) value to be maintained, when a subset of M adjacent sources is switched off (where M is at least 0.1 N or M > 2 or both), is also disclosed. The backlight can be used for a display or for general lighting purposes.



WO 2008/144636 A3



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. G02F1/13357 G02B6/00
 ADD. F21V8/00

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)
 G02F G02B

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
 EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 210 785 B1 (WEBER MICHAEL F [US] ET AL) 3 April 2001 (2001-04-03)	1-11
X	column 1, line 12 - line 30 column 14, line 18 - line 45 figures 9,10	17,19-21
Y	-----	12
A	JP 2005 173546 A (TORAY INDUSTRIES) 30 June 2005 (2005-06-30) the whole document	1-11
A	US 2005/007758 A1 (LEE CHUN-YU [TW] ET AL) 13 January 2005 (2005-01-13) the whole document	1-11
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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	*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
E earlier document but published on or after the international filing date	*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
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*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.
O document referring to an oral disclosure, use, exhibition or other means	*Z* document member of the same patent family
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 29 January 2009	Date of mailing of the international search report 13/02/2009
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Thomas, Kenneth
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/064096

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003/043567 A1 (HOELEN CHRISTOPH GERARD AUGUST [NL] ET AL) 6 March 2003 (2003-03-06) the whole document	1-11
X	US 2002/060907 A1 (SACCOMANNO ROBERT J [US]) 23 May 2002 (2002-05-23)	12
Y	figures 1,2 paragraphs [0011], [0016] paragraphs [0023] - [0030] paragraphs [0047], [0048]	12-15
Y	US 2006/220040 A1 (SUZUKI TOSHIHIRO [JP]) 5 October 2006 (2006-10-05)	13-15
X	paragraphs [0004], [0027] paragraphs [0034], [0058] figures 1,2	17, 19, 20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/064096

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-11

An improved backlight design by identifying a preferred region in a specific geometrical parameter space

2. claims: 12-16

Achieving a large backlight whose size exceeds a certain value

3. claims: 17-21

Maintaining a minimum brightness uniformity in a backlight when a certain fraction of the light sources is turned off

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/064096

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