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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
10/298,367	6886956	2872	9200



**Correspondence Address/Fee Address Change**

The following fields have been set to Customer Number 93969 on 03/23/2010

- Correspondence Address
- Power of Attorney Address

The address of record for Customer Number 93969 is:

**93969**  
Donald L. Otto (Rambus)  
Renner, Otto, Boisselle & Sklar, LLP  
1621 Euclid Avenue  
19th Floor  
Cleveland, OH 44115



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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
10/298,367	6886956	2872	9200



**Correspondence Address/Fee Address Change**

The following fields have been set to Customer Number 93969 on 03/09/2010

- Correspondence Address
- Power of Attorney Address

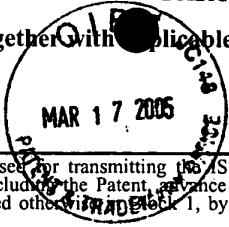
The address of record for Customer Number 93969 is:

**93969**  
Rambus International Ltd  
c/o Rambus Inc.  
4440 El Camino Real  
Los Altos, CA 94022

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail

Mail Stop ISSUE FEE  
 Commissioner for Patents  
 P.O. Box 1450  
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address indicated unless corrected below or directed otherwise. Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7590 01/05/2005

Donald L. Otto  
 Renner, Otto, Boisselle & Sklar, LLP  
 19th Floor  
 1621 Euclid Avenue  
 Cleveland, OH 44115-2191

Note: A certificate of mailing can only be used for domestic mailings of Fee(s) Transmittal. This certificate cannot be used for any other accompany papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (703) 746-4000, on the date indicated below.

Donald L. Otto	(Depositor's name)
<i>Donald L. Otto</i>	(Signature)
March 14, 2005	(Date)

03/18/2005 RMEBRAH1 00000141 10298367

01 FC:1501 1400.00 OP  
 02 FC:1501 300.00 OP  
 03 FC:1800 15.00 OP

REGISTRATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/298,367	11/18/2002	Jeffery R. Parker	GLOLP0106USD	3656

TITLE OF INVENTION: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1400	\$300	\$1700	04/05/2005

EXAMINER	ART UNIT	CLASS-SUBCLASS
ASSAF, FAYEZ G	2872	362-029000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

"Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

Renner, Otto, Boisselle & Sklar, LLP

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Solid State Opto Limited

(B) RESIDENCE: (CITY and STATE OR COUNTRY): British Virgin Islands

Please check the appropriate assignee category or categories (will not be printed on the patent):  Individual  Corporation or other private group entity  Government

4a. The following fee(s) are enclosed:

Issue Fee \$1400

Publication Fee (No small entity discount permitted) \$300

Advance Order - # of Copies 4 \$15

4b. Payment of Fee(s):

A check in the amount of the fee(s) is enclosed. \$1715

Payment by credit card. Form PTO-2038 is attached. Charge deficiencies only.

The Director is hereby authorized to charge the required fee(s), or credit any overpayment Deposit Account Number 18-0988 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.  b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above. NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other part interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature: *Donald L. Otto* Date: March 14, 2005

Typed or printed name: Donald L. Otto Registration No.: 22,125

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
10/298,367		2872	7530

**Change of Address/Power of Attorney**

The following fields have been set to Customer Number 23908 on 02/28/2005

- Correspondence Address
- Power of Attorney

**The address of record for Customer Number 23908 is:**

RENNER OTTO BOISSELLE & SKLAR, LLP  
1621 EUCLID AVENUE  
NINETEENTH FLOOR  
CLEVELAND, OH 44115

**The Practitioners of record for Customer Number 23908 are:**

**PTO INSTRUCTIONS:**

**Please take the following action when the correspondence address has been changed to a customer number:**

- 1) Add 'ADDRESS CHANGE TO CUSTOMER NUMBER' on the next available content line of the File Jacket.**
- 2) Put a line through the old address on the File Jacket and enter the Customer Number as the new address.**
- 3) File this Notice in the File Jacket.**

**Please take the following action when the correspondence address has NOT been changed:**

- 1) File this Notice in the File Jacket**





SJ

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NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 01/05/2005
Donald L. Otto
Renner, Otto, Boisselle & Sklar, LLP
19th Floor
1621 Euclid Avenue
Cleveland, OH 44115-2191

EXAMINER

ASSAF, FAYEZ G

ART UNIT PAPER NUMBER

2872

DATE MAILED: 01/05/2005

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
Values: 10/298,367, 11/18/2002, Jeffery R. Parker, GLOLP0106USD, 3656

TITLE OF INVENTION: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Table with 6 columns: APPLN. TYPE, SMALL ENTITY, ISSUE FEE, PUBLICATION FEE, TOTAL FEE(S) DUE, DATE DUE
Values: nonprovisional, NO, \$1400, \$300, \$1700, 04/05/2005

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATEN PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHT THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPO PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM TH MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. TH STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (O AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WIL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is n claiming SMALL ENTITY status, check box 5a on Part B - Fee Transmittal and pay the PUBLICATION FEE (if required) and 1 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) w your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

**PART B - FEE(S) TRANSMITTAL**

Complete and send this form, together with applicable fee(s), to: Mail

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
(703) 746-4000**

or Fax

**INSTRUCTIONS:** This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7590 01/05/2005

Donald L. Otto  
Renner, Otto, Boisselle & Sklar, LLP  
19th Floor  
1621 Euclid Avenue  
Cleveland, OH 44115-2191

Note: A certificate of mailing can only be used for domestic mailings of Fee(s) Transmittal. This certificate cannot be used for any other accompany papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

**Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (703) 746-4000, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/298,367	11/18/2002	Jeffery R. Parker	GL0LP0106USD	3656

TITLE OF INVENTION: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1400	\$300	\$1700	04/05/2005

EXAMINER	ART UNIT	CLASS-SUBCLASS
ASSAF, FAYEZ G	2872	362-029000

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.</p>	<p>2. For printing on the patent front page, list</p> <p>(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, _____ 1</p> <p>(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. _____ 2</p> <p>_____ 3</p>
--	---

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE \_\_\_\_\_ (B) RESIDENCE: (CITY and STATE OR COUNTRY) \_\_\_\_\_

Please check the appropriate assignee category or categories (will not be printed on the patent) :  Individual  Corporation or other private group entity  Government

<p>4a. The following fee(s) are enclosed:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s):</p> <p><input type="checkbox"/> A check in the amount of the fee(s) is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input type="checkbox"/> The Director is hereby authorized to charge the required fee(s), or credit any overpayment Deposit Account Number _____ (enclose an extra copy of this form).</p>
--	---

5. Change in Entity Status (from status indicated above)

a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.  b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above. NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other part interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_ Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_ Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 14 Alexandria, Virginia 22313-1450.

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www.uspto.gov

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO. Includes details for application 10/298,367, inventor Jeffery R. Parker, and attorney Donald L. Otto.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after t mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a ha months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date th determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retriev (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office Patent Legal Administration at (571) 272-7702. Questions relating to issue and publication fee payments should directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/298,367	PARKER ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Fayez G. Assaf	2872	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1.  This communication is responsive to the Amendment filed 10/25/2004.
2.  The allowed claim(s) is/are 1-8, 10-23, 26-33 and 53-55.
3.  The drawings filed on 12 February 2004 are accepted by the Examiner.
4.  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a)  All    b)  Some\*    c)  None    of the:
    1.  Certified copies of the priority documents have been received.
    2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3.  Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5.  A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6.  CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a)  including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1)  hereto or 2)  to Paper No./Mail Date \_\_\_\_\_.
  - (b)  including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7.  DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. <input type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br/>Paper No./Mail Date <u>10/01/2004</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br/>of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____.</li> <li>7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____.</li> </ol> |
|--|---|

Art Unit: 2872

**DETAILED ACTION*****Election/Restrictions***

Claim 1 is generic and allowable. Accordingly, the restriction requirement as to the encompassed species is hereby withdrawn and claims 26-33, directed to the second species are no longer withdrawn from consideration since all of the claims to this species depend from or otherwise include each of the limitations of an allowed generic claim. In view of the above noted withdrawal of the restriction requirement as to the linked species, applicant(s) are advised that if any claim(s) depending from or including all the limitations of the allowable generic linking claim(s) be presented in a continuation or divisional application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

***Examiner's Amendment***

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an

Art Unit: 2872

amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

In the Specification:

Page 1, line 5, after "10/005,090, filed December 5, 221", the following phrase has been inserted, --now U.S. Patent No. 6,508,563 B2--.

#### ***Reasons for Allowance***

Claims 1-8, 10-23, 26-33 and 53-55 are allowable in view of the Amendment to claims filed 10/25/2004 and further in view of Applicant remarks.

#### ***Conclusion***

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fayez G.

Art Unit: 2872

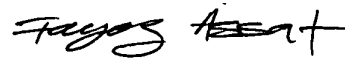
Assaf whose telephone number is (571) 272-2307. The examiner can normally be reached on 8-5 M-F.

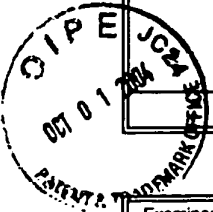
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FA

12/29/04

  
**FAYEZ G. ASSAF**  
**PRIMARY EXAMINER**



Form PTO-1449 (Modified)  <b>LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT</b>  (Use several sheets if necessary)	Atty Docket No. <b>GLOLP0106USD</b>	Serial No. <b>10/298,367</b>
	Applicant: <b>Jeffery R. Parker et al</b>	
	Filing Date <b>November 18, 2002</b>	Group <b>2872</b>

**U.S. PATENT DOCUMENTS**

Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
<i>JD</i>	2,945,313	7/1960	Hardesty			
<i>JA</i>	4,638,131	1/1987	Kidd et al			
<i>JD</i>	4,989,956	2/1991	Wu et al			
<i>JD</i>	5,128,842	7/1992	Kenmochi			

**FOREIGN PATENT DOCUMENTS**

Examiner Initial	Document Number	Date (MM/YYYY)	Country	Class	Sub-class	Translation	
						Yes	No
<i>JD</i>	AU-A-78486/91 (enclosed)	pub. 12/1991	AU				
<i>JA</i>	523,706 (enclosed)	3/1939	GB				
<i>JD</i>	2285518A (enclosed)	7/1995	GB				
<i>JA</i>	WO 92/05535 (enclosed)	4/1992	PCT				

**OTHER ART**

Examiner Initial	Author, Title, Date, Pertinent Pages, etc.


EXAMINER <b>FAYEZ ASSAF</b>	DATE CONSIDERED <b>12/28/04</b>
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EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

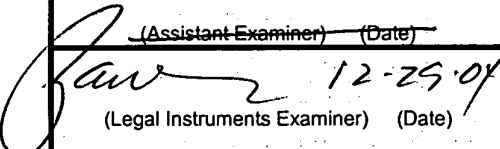
**Information Disclosure Statement PTO-1449 (Modified)**

The identification of any reference is not intended to be, and should not be understood as being, an admission that such publication, in fact, constitutes "prior art" within the meaning of applicable law since, for example, a given reference may have a later effective date than first seems apparent or the reference may have an effective date which can be antedated. The "prior art" status of any reference is a matter to be resolved during prosecution.



<b>Issue Classification</b> 	<b>Application No.</b> 10/298,367	<b>Applicant(s)</b> PARKER ET AL.	
	<b>Examiner</b> Fayez G. Assaf	<b>Art Unit</b> 2872	

ORIGINAL				CROSS REFERENCE(S)									
CLASS	SUBCLASS			CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)								
362	29			362	85	26	30	487	543				
INTERNATIONAL CLASSIFICATION													
G01D	11/28												
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 (Assistant Examiner) (Date) 12-29-04 (Legal Instruments Examiner) (Date)	<b>FAYEZ G. ASSAF</b> <b>PRIMARY EXAMINER</b> (Primary Examiner)	12/29/04 (Date)	<b>Total Claims Allowed: 33</b>	
			O.G. Print Claim(s) 1	O.G. Print Fig. 3:4

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant		<input type="checkbox"/> CPA		<input checked="" type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47							
Final	Original	Final	Original	Final	Original	Final	Original						
1	1	28	31		61		91		121		151		181
2	2	29	32		62		92		122		152		182
3	3	30	33		63		93		123		153		183
4	4		34		64		94		124		154		184
5	5		35		65		95		125		155		185
6	6		36		66		96		126		156		186
7	7		37		67		97		127		157		187
8	8		38		68		98		128		158		188
	<del>9</del>		39		69		99		129		159		189
9	10		40		70		100		130		160		190
10	11		41		71		101		131		161		191
11	12		42		72		102		132		162		192
12	13		43		73		103		133		163		193
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21	22		52		82		112		142		172		202
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	25	33	55		85		115		145		175		205
23	26		56		86		116		146		176		206
24	27		57		87		117		147		177		207
25	28		58		88		118		148		178		208
26	29		59		89		119		149		179		209
27	30		60		90		120		150		180		210

**Index of Claims**



Application No.

10/298,367

Examiner

Fayez G. Assaf

Applicant(s)

PARKER ET AL.

Art Unit

2872

√	Rejected
=	Allowed

-	(Through numeral) Cancelled
÷	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim		Date	
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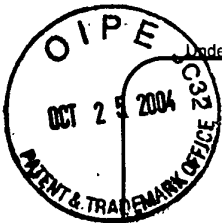
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD					Application or Docket Number <b>10/298367</b>				
CLAIMS AS FILED - PART I					SMALL ENTITY		OTHER THAN SMALL ENTITY		
(Column 1)		(Column 2)							
FOR	NUMBER FILED	NUMBER EXTRA			RATE	FEE	RATE	FEE	
BASIC FEE (37 CFR 1.16(a))						\$ _____		\$ _____	
TOTAL CLAIMS (37 CFR 1.16(c))		minus 20 = *			X \$ _____ =		X \$ _____ =		
INDEPENDENT CLAIMS (37 CFR 1.16(b))		minus 3 = *			X \$ _____ =		X \$ _____ =		
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(d))					+ \$ _____ =		+ \$ _____ =		
					TOTAL		TOTAL		
* If the difference in column 1 is less than zero, enter "0" in column 2.									
CLAIMS AS AMENDED - PART II					SMALL ENTITY		OTHER THAN SMALL ENTITY		
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE
Total (37 CFR 1.16(c))	<b>33</b>	Minus	<b>52</b>	= <b>1</b>		X \$ <b>9</b> =	/	X \$ <b>18</b> =	/
Independent (37 CFR 1.16(b))	<b>1</b>	Minus	<b>6</b>	= <b>1</b>		X \$ <b>44</b> =	/	X \$ <b>88</b> =	/
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(d))					+ \$ <b>150</b> =		+ \$ <b>300</b> =		
					TOTAL ADD'L FEE		TOTAL ADD'L FEE		
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE
Total (37 CFR 1.16(c))	*	Minus	**	=		X \$ _____ =		X \$ _____ =	
Independent (37 CFR 1.16(b))	*	Minus	***	=		X \$ _____ =		X \$ _____ =	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(d))					+ \$ _____ =		+ \$ _____ =		
					TOTAL ADD'L FEE		TOTAL ADD'L FEE		
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE
Total (37 CFR 1.16(c))	*	Minus	**	=		X \$ _____ =		X \$ _____ =	
Independent (37 CFR 1.16(b))	*	Minus	***	=		X \$ _____ =		X \$ _____ =	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(d))					+ \$ _____ =		+ \$ _____ =		
					TOTAL ADD'L FEE		TOTAL ADD'L FEE		

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.  
 \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".  
 \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".  
 The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>	Application Number	10/298,367
	Filing Date	November 18, 2002
	First Named Inventor	Jeffery R. Parker
	Art Unit	2872
	Examiner Name	Fayez G. Assaf
(to be used for all correspondence after initial filing)		
Total Number of Pages in This Submission	9	Attorney Docket Number GLOLP0106USD

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance Communication to TC
<input type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
<input checked="" type="checkbox"/> Amendment/Reply	<input type="checkbox"/> Petition	<input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
<input type="checkbox"/> After Final	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Power of Attorney, Revocation	<input type="checkbox"/> Status Letter
<input type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Change of Correspondence Address	<input type="checkbox"/> Other Enclosure(s) (please identify below):
<input type="checkbox"/> Express Abandonment Request	<input type="checkbox"/> Terminal Disclaimer	
<input type="checkbox"/> Information Disclosure Statement	<input type="checkbox"/> Request for Refund	
<input type="checkbox"/> Certified Copy of Priority Document(s)	<input type="checkbox"/> CD, Number of CD(s) _____	
<input type="checkbox"/> Reply to Missing Parts/ Incomplete Application	<input type="checkbox"/> Landscape Table on CD	
<input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	Remarks	

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Renner, Otto, Boisselle & Sklar LLP		
Signature			
Printed name	Donald L. Otto		
Date	October 20, 2004	Reg. No.	22,125

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name	Donald L. Otto	Date	October 20, 2004

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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6P2872  
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CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Date: October 20, 2004

Donald L. Otto

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Attorney Docket GLOLP0106USD

In re PATENT application of

Jeffery R. Parker et al

Serial No. 10/298,367

Filed November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Art Unit 2872  
Confirmation No. 3656  
Fayez G. Assaf, Examiner

**REPLY TO NOTICE OF NON-COMPLIANT AMENDMENT MAILED OCTOBER 12, 2004**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

In reply to the Notice of Non-Compliant Amendment mailed October 12, 2004, resubmitted herewith is the entire "Amendments to the Claims" section of applicants' amendment filed October 1, 2004 in which markings have been added to amended claim 13 to show any changes in compliance with 37 CFR 1.121.

In view of the foregoing, further and favorable consideration of this application is respectfully requested.

In the event that an extension of time is necessary, this should be considered a petition for such an extension. If required, fees are enclosed for the extension of time and/or for the presentation of new and/or amended claims. In the event any additional fees are due in connection with the filing of this amendment, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 (Docket No. GLOLP0106USD).

Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

By   
Donald L. Otto, Registration No. 22,125

1621 Euclid Avenue  
Nineteenth Floor  
Cleveland, Ohio 44115-2191  
Phone: 216-621-1113  
Fax: 216-621-6165

Z:\SEC177\GLOLP106D\REPLY TO NOTICE OF NON-COMPLIANT AMENDMENT.doc

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

Claim 1 (currently amended): A light emitting assembly for vehicle illumination comprising a light guide having opposite sides and at least one light input surface along at least one edge of said light guide, one or more light emitting diodes along said light input surface for ~~supplying light to said light guide~~ receiving light from said light emitting diodes and conducting the light from said edge for emission of the light from at least one of said sides, a plurality of light extracting deformities on at least one ~~surface of said light guide~~ of said sides, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one ~~surface of said light guide~~ of said sides, said substrate providing an exterior portion of a vehicle for vehicle illumination at said exterior portion.

Claim 2 (original): The assembly of claim 1 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 3 (original): The assembly of claim 1 wherein said substrate is attached to said light guide.



Claim 4 (original): The assembly of claim 1 wherein said substrate is positioned against said light guide.

Claim 5 (currently amended): The assembly of claim 1 wherein said substrate covers said at least one ~~surface of said light guide~~ of said sides.

Claim 6 (currently amended): The assembly of claim 1 wherein said deformities are at least one of depressions and raised surfaces on ~~said one surface of said light guide~~ at least one of said sides.

Claim 7 (currently amended): The assembly of claim 1 wherein said deformities vary on ~~said one surface of said light guide~~ at least one of said sides.

Claim 8 (original): The assembly of claim 1 wherein at least one of said deformities is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 9 (canceled)

Claim 10 (previously presented): The assembly of claim 1 wherein said light emitting diodes are attached to a circuit.

Claim 11 (previously presented): The assembly of claim 1 wherein said light emitting diodes are embedded, potted, bonded or molded into said light guide.

Claim 12 (currently amended): The assembly of claim 1 wherein said deformities are on more than one ~~surface of said light guide~~ of said sides.

Claim 13 (currently amended): The assembly of claim 1 wherein said deformities are on ~~two~~ both sides of said light guide.

Claim 14 (original): The assembly of claim 1 wherein at least some deformities are on said substrate.

Claim 15 (original): The assembly of claim 1 wherein said substrate has at least one of a prismatic lens, lenticular lens, and other device that changes the output ray angle distribution.

Claim 16 (original): The assembly of claim 1 wherein more than one said substrate overlies said light guide.

Claim 17 (currently amended): The assembly of claim 1 wherein said substrate has deformities on at least one surface of said substrate, said deformities on said substrate having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, at least some of the deformities on at least

one of said light guide and said substrate varying relative to one another in at least one of the following characteristics: size, shape, placement, index of refraction, density, angle, depth, height and type.

Claim 18 (original): The assembly of claim 17 wherein the variations in the deformities are random.

Claim 19 (original): The assembly of claim 17 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 20 (original): The assembly of claim 17 wherein said substrate has reflective and refractive surfaces.

Claim 21 (original): The assembly of claim 17 wherein said substrate has a coating.

Claim 22 (original): The assembly of claim 17 wherein more than one said substrate overlies said light guide.

Claim 23 (currently amended): The assembly of claim 17 wherein at least one ~~surface~~ side of at least one of said substrate and said light guide is prismatic or lenticular.

Claims 24 and 25 (canceled)

Claim 26 (previously presented): The assembly of claim 1 wherein at least one of said light guide and said substrate has at least one of a coating and surface treatment that changes, wherein the changes in said at least one of the coating and surface treatment are at least one of the following: density, color, index of refraction, reflection, opaqueness, translucence, area, depth, shape, size and type.

Claim 27 (original): The assembly of claim 26 wherein said at least one of the coating and surface treatment are at least one of the following: paint, ink, coating and epoxy.

Claim 28 (original): The assembly of claim 26 wherein the coating is selected to improve at least one of the following: color correction, opaqueness, diffusion, reflection, translucence and transmission of light.

Claim 29 (currently amended): The assembly of claim 26 wherein at least one surface side of at least one of said light guide and said substrate is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 30 (original): The assembly of claim 26 wherein the coating on at least one of said light guide and said substrate randomly changes.

Claim 31 (original): The assembly of claim 26 wherein the surface treatment of at least one of said light guide and said substrate randomly changes.

Claim 32 (currently amended): The assembly of claim 26 wherein at least one surface side of at least one of said light guide and said substrate varies in shape or geometry.

Claim 33 (currently amended): The assembly of claim 32 wherein the shape or geometry of said one ~~surface~~ side randomly varies.

Claims 34-52 (canceled)

Claim 53 (previously presented): The assembly of claim 1 wherein said substrate provides protection for the light guide.

Claim 54 (previously presented): The assembly of claim 1 wherein there are a plurality of said light emitting diodes along said light input surface.

Claim 55 (previously presented): The assembly of claim 1 wherein at least some of said deformities include prismatic surfaces having angles that vary.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/298,367	11/18/2002	Jeffery R. Parker	GLOLP0106USD	3656

7590 10/12/2004  
Donald L. Otto  
Renner, Otto, Boisselle & Sklar, LLP  
19th Floor  
1621 Euclid Avenue  
Cleveland, OH 44115-2191

EXAMINER

ASSAF, FAYEZ G

ART UNIT PAPER NUMBER

2872

DATE MAILED: 10/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.



UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. Box 1450
ALEXANDRIA, VA 22313-1450
www.uspto.gov

10-298367

Notice of Non-Compliant Amendment (37 CFR 1.121)

The amendment document filed on 10-1-04 is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121. In order for the amendment document to be compliant, correction of the following item(s) is required. Only the corrected section of the non-compliant amendment document must be resubmitted (in its entirety), e.g., the entire "Amendments to the claims" section of applicant's amendment document must be re-submitted. 37 CFR 1.121(h).

THE FOLLOWING CHECKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- 1. Amendments to the specification:
A. Amended paragraph(s) do not include markings.
B. New paragraph(s) should not be underlined.
C. Other
2. Abstract:
A. Not presented on a separate sheet. 37 CFR 1.72.
B. Other
3. Amendments to the drawings:

- 4. Amendments to the claims:
A. A complete listing of all of the claims is not present.
B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following 7 status identifiers: (Original), (Currently amended), (Canceled), (Withdrawn), (Previously presented), (New) and (Not entered).
D. The claims of this amendment paper have not been presented in ascending numerical order.
E. Other: claim 13 status identifier is currently amended, but there are no markings to show any changes.

For further explanation of the amendment format required by 37 CFR 1.121, see MPEP Sec. 714 and the USPTO website at http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/officeflyer.pdf.

If the non-compliant amendment is a PRELIMINARY AMENDMENT, applicant is given ONE MONTH from the mail date of this letter to supply the corrected section which complies with 37 CFR 1.121. Failure to comply with 37 CFR 1.121 will result in non-entry of the preliminary amendment and examination on the merits will commence without consideration of the proposed changes in the preliminary amendment(s). This notice is not an action under 35 U.S.C. 132, and this ONE MONTH time limit is not extendable.

If the non-compliant amendment is a reply to a NON-FINAL OFFICE ACTION (including a submission for an RCE), and since the amendment appears to be a bona fide attempt to be a reply (37 CFR 1.135(c)), applicant is given a TIME PERIOD of ONE MONTH from the mailing of this notice within which to re-submit the corrected section which complies with 37 CFR 1.121 in order to avoid abandonment. EXTENSIONS OF THIS TIME PERIOD ARE AVAILABLE UNDER 37 CFR 1.136(a).

If the amendment is a reply to a FINAL REJECTION, this form may be an attachment to an Advisory Action. The period for response to a final rejection continues to run from the date set in the final rejection, and is not affected by the non-compliant status of the amendment.

Amenda Jirel
Legal Instruments Examiner (LIE)

571-272-1573
Telephone No.

PATENT APPLICATION FEE DETERMINATION RECORD  
Effective October 1, 2001

Application or Docket Number

10 298367

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	**
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY TYPE <input type="checkbox"/>		OR	OTHER THAN SMALL ENTITY	
BASE	ADDITIONAL FEE		BASE	ADDITIONAL FEE
X19		OR	X119	
X42		OR	X04	
+140		OR	+200	
TOTAL ADDITIONAL FEE		OR	TOTAL ADDITIONAL FEE	

*PCE*

CLAIMS AS AMENDED - PART II

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	* 33	Minus	** 52
Independent	* 1	Minus	** 6
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY OR		OTHER THAN SMALL ENTITY	
BASE	ADDITIONAL FEE	BASE	ADDITIONAL FEE
X19		X119	
X42		X04	
+140		+200	
TOTAL ADDITIONAL FEE		TOTAL ADDITIONAL FEE	

101-04

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	* 33	Minus	** 52
Independent	* 1	Minus	** 6
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY OR		OTHER THAN SMALL ENTITY	
BASE	ADDITIONAL FEE	BASE	ADDITIONAL FEE
X19		X119	
X42		X04	
+150		+200	
TOTAL ADDITIONAL FEE		TOTAL ADDITIONAL FEE	

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	**
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

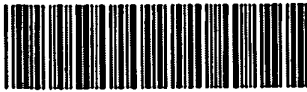
SMALL ENTITY OR		OTHER THAN SMALL ENTITY	
BASE	ADDITIONAL FEE	BASE	ADDITIONAL FEE
X19		X119	
X42		X04	
+140		+200	
TOTAL ADDITIONAL FEE		TOTAL ADDITIONAL FEE	

\* If the entry in column 1 is less than the entry in column 2, enter "0" in column 3.  
 \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 30, enter "20".  
 \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".  
 The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

**BEST AVAILABLE COPY**



**Index of Claims**



Application No.

10/298,367

Examiner

Fayez G. Assaf

Applicant(s)

PARKER ET AL.

Art Unit

2872

✓	Rejected
=	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

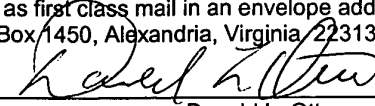
A	Appeal
O	Objected

Claim		Date	Claim		Date	Claim		Date
Final	Original		Final	Original		Final	Original	
	1			98			101	
	2			99			102	
	3			53			103	
	4			54			104	
	5			55			105	
	6			56			106	
	7			57			107	
	8			58			108	
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	45			95			145	
	46			96			146	
	47			97			147	
	48			98			148	
	49			99			149	
	50			100			150	

CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Date: September 29, 2004

  
\_\_\_\_\_  
Donald L. Otto

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Attorney Docket GLOLP0106USD

In re PATENT application of

Jeffery R. Parker et al

Serial No. 10/298,367

Filed November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Art Unit 2872

Confirmation No. 3656

Fayez G. Assaf, Examiner

**REPLY TO OFFICE ACTION OF JUNE 29, 2004**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

In reply to the Office Action of June 29, 2004, please amend the above-identified application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 8 of this paper.



**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

Claim 1 (currently amended): A light emitting assembly for vehicle illumination comprising a light guide having opposite sides and at least one light input surface along at least one edge of said light guide, one or more light emitting diodes along said light input surface for ~~supplying light to said light guide~~ receiving light from said light emitting diodes and conducting the light from said edge for emission of the light from at least one of said sides, a plurality of light extracting deformities on at least one ~~surface of said light guide~~ of said sides, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one ~~surface of said light guide~~ of said sides, said substrate providing an exterior portion of a vehicle for vehicle illumination at said exterior portion.

Claim 2 (original): The assembly of claim 1 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 3 (original): The assembly of claim 1 wherein said substrate is attached to said light guide.

Claim 4 (original): The assembly of claim 1 wherein said substrate is positioned against said light guide.

Claim 5 (currently amended): The assembly of claim 1 wherein said substrate covers said at least one ~~surface of said light guide~~ of said sides.

Claim 6 (currently amended): The assembly of claim 1 wherein said deformities are at least one of depressions and raised surfaces on ~~said one surface of said light guide~~ at least one of said sides.

Claim 7 (currently amended): The assembly of claim 1 wherein said deformities vary on ~~said one surface of said light guide~~ at least one of said sides.

Claim 8 (original): The assembly of claim 1 wherein at least one of said deformities is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 9 (canceled)

Claim 10 (previously presented): The assembly of claim 1 wherein said light emitting diodes are attached to a circuit.

Claim 11 (previously presented): The assembly of claim 1 wherein said light emitting diodes are embedded, potted, bonded or molded into said light guide.

Claim 12 (currently amended): The assembly of claim 1 wherein said deformities are on more than one ~~surface of said light guide~~ of said sides.

Claim 13 (currently amended): The assembly of claim 1 wherein said deformities are on ~~two~~ both sides of said light guide.

Claim 14 (original): The assembly of claim 1 wherein at least some deformities are on said substrate.

Claim 15 (original): The assembly of claim 1 wherein said substrate has at least one of a prismatic lens, lenticular lens, and other device that changes the output ray angle distribution.

Claim 16 (original): The assembly of claim 1 wherein more than one said substrate overlies said light guide.

Claim 17 (currently amended): The assembly of claim 1 wherein said substrate has deformities on at least one surface of said substrate, said deformities on said substrate having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, at least some of the deformities on at least

one of said light guide and said substrate varying relative to one another in at least one of the following characteristics: size, shape, placement, index of refraction, density, angle, depth, height and type.

Claim 18 (original): The assembly of claim 17 wherein the variations in the deformities are random.

Claim 19 (original): The assembly of claim 17 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 20 (original): The assembly of claim 17 wherein said substrate has reflective and refractive surfaces.

Claim 21 (original): The assembly of claim 17 wherein said substrate has a coating.

Claim 22 (original): The assembly of claim 17 wherein more than one said substrate overlies said light guide.

Claim 23 (currently amended): The assembly of claim 17 wherein at least one surface side of at least one of said substrate and said light guide is prismatic or lenticular.

Claims 24 and 25 (canceled)

Claim 26 (previously presented): The assembly of claim 1 wherein at least one of said light guide and said substrate has at least one of a coating and surface treatment that changes, wherein the changes in said at least one of the coating and surface treatment are at least one of the following: density, color, index of refraction, reflection, opaqueness, translucence, area, depth, shape, size and type.

Claim 27 (original): The assembly of claim 26 wherein said at least one of the coating and surface treatment are at least one of the following: paint, ink, coating and epoxy.

Claim 28 (original): The assembly of claim 26 wherein the coating is selected to improve at least one of the following: color correction, opaqueness, diffusion, reflection, translucence and transmission of light.

Claim 29 (currently amended): The assembly of claim 26 wherein at least one surface side of at least one of said light guide and said substrate is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 30 (original): The assembly of claim 26 wherein the coating on at least one of said light guide and said substrate randomly changes.

Claim 31 (original): The assembly of claim 26 wherein the surface treatment of at least one of said light guide and said substrate randomly changes.

Claim 32 (currently amended): The assembly of claim 26 wherein at least one surface side of at least one of said light guide and said substrate varies in shape or geometry.

Claim 33 (currently amended): The assembly of claim 32 wherein the shape or geometry of said one ~~surface~~ side randomly varies.

Claims 34-52 (canceled)

Claim 53 (previously presented): The assembly of claim 1 wherein said substrate provides protection for the light guide.

Claim 54 (previously presented): The assembly of claim 1 wherein there are a plurality of said light emitting diodes along said light input surface.

Claim 55 (previously presented): The assembly of claim 1 wherein at least some of said deformities include prismatic surfaces having angles that vary.



## REMARKS/ARGUMENTS

Claims 1-8, 10-23, 26-33 and 53-55 remain in the application. Claims 9, 24, 25 and 34-52 are canceled. Claims 1-8, 10-23 and 53-55 read on the elected species 1. Claims 26-33 are withdrawn from consideration.

Claims 1-6, 8, 10, 11, 14-17, 19-23, 53 and 54 are rejected under 35 U.S.C. § 102(b) as being anticipated by Serizawa et al (U.S. 4,733,335). In support, the Examiner contends that Serizawa discloses a light emitting assembly illumination comprising a light guide (125 of Fig. 2) having at least one light input surface (Figs. 2 and 4), one or more light emitting diodes (111 of Fig. 2) along said light input surface for supplying light to said light guide, a plurality of light extracting deformities (lenses onto light guide) on at least one surface of said light guide, said deformities having shapes (Fig. 4) for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate (218 of Fig. 4) overlying at least one surface of the light guide, the substrate providing an exterior portion of a vehicle for vehicle illumination at said exterior portion (line 8 to line 15 of column 10).

However, the light emitting assembly of Serizawa is a high mount stop lamp that is either mounted on the exterior or interior of a vehicle. Thus the so-called substrate 218 of Serizawa (which is actually a light shielding film on the front surface of the front lens 205) does not provide an exterior portion of a vehicle for vehicle illumination at the exterior portion as recited in claim 1. Moreover, the light emitting diodes of Serizawa are positioned adjacent one side of the lens assembly 104 for shining light through the lens assembly from one

side to the other. In contrast, claim 1 has been amended more particularly to recite that the light guide has opposite sides and at least one light input surface along at least one edge of the light guide, and that one or more light emitting diodes are along the light input surface for receiving light from the light emitting diodes and conducting the light from the edge of the light guide for emission of the light from at least one of the sides, in a manner clearly nowhere taught by Serizawa. Accordingly, claim 1 is submitted as clearly allowable.

Claims 2-6, 8, 10, 11, 14-17, 19-23, 53 and 54 depend from claim 1 and are submitted as allowable for substantially the same reasons. Moreover, at least claim 17 further patentably distinguishes over Serizawa by reciting that at least some of the deformities on at least one of the light guide and the substrate vary relative to one another in at least one of the specified characteristics. In Serizawa, all of the deformities are the same.

Claims 7, 12, 13, 18 and 55 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Serizawa et al. The Examiner acknowledges that Serizawa does not disclose that the deformities vary on at least one of the sides of the light guide (claim 7), that the variations in the deformities are random (claim 18), that the deformities are on more than one of the sides of the light guide (claims 12 and 13), and that at least some of the deformities include prismatic surfaces having angles that vary (claim 55). With respect to these claim features, the Examiner contends that they are well known in illumination devices utilized in vehicles, and that it would have been obvious to use such optical deformities in order to provide the proper light illumination which suits a

particular application in a vehicle (*i.e.*, illuminating plate, turn signals, etc.).

However, with this contention applicants' attorney cannot agree. The facts in the record must support the legal conclusion of obviousness under 35 U.S.C. § 103.

Merely stating that a particular feature is obvious, without adequate factual support, is not sufficient. Moreover, claims 7, 12-13, 18 and 55 depend from claim 1 and are submitted as allowable for substantially the same reasons in addition to reciting the above noted additional novel features in the claimed combination.

Claims 26-33 are withdrawn. However, withdrawn claims 26-33 depend from claim 1 and are also submitted as allowable.

For the foregoing reasons, this application is now believed to be in condition for final allowance of all of the pending claims 1-8, 10-23, 26-33 and 53-55, and early action to that end is earnestly solicited. Should the Examiner disagree with applicants' attorney in any respect, it is respectfully requested that the Examiner telephone applicants' attorney in an effort to resolve such differences.

In the event that an extension of time is necessary, this should be considered a petition for such an extension. If required, fees are enclosed for the extension of time and/or for the presentation of new and/or amended claims. In the event any additional fees are due in connection with the filing of this amendment, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 (Docket No. GLOLP0106USD).

Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

By   
Donald L. Otto, Registration No. 22,125

1621 Euclid Avenue  
Nineteenth Floor  
Cleveland, Ohio 44115-2191  
Phone: 216-621-1113  
Fax: 216-621-6165

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**



In re patent application of

Applicant: Jeffery R. Parker et al

Serial No.: 10/298,367

Filed: November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Art Unit: 2872

Examiner: Fayez G. Assaf

**SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

1. Pursuant to 37 C.F.R. 1.97 and 1.98, and in compliance with 37 C.F.R. 1.56, the Office's attention is directed to the patents, pending applications, publications and other information listed on the attached PTO-1449. A copy of each listed document is enclosed, except for (a) those previously cited or submitted to the Office in the following application(s) upon which this application relies for an earlier filing date under 35 U.S.C. 120, and (b) any U.S. patent or U.S. patent application publication if the present application was filed after June 30, 2003 or entered the national stage under 35 USC § 371 after June 30, 2003:

Serial No.:	<u>10/005,090</u>	<u>09/703,088</u>	<u>09/167,949</u>	<u>08/585,062</u>
Filing Date:	<u>12/5/01</u>	<u>10/31/00</u>	<u>10/7/98</u>	<u>1/16/96</u>
Pat. No.:	<u>6,508,563</u>	<u>6,367,940</u>	<u>6,158,867</u>	<u>5,895,115</u>
Issue Date:	<u>1/21/03</u>	<u>4/9/02</u>	<u>12/12/00</u>	<u>4/20/99</u>

Regarding any document, publication or other information for which a date is not given on the attached PTO-1449, Applicant(s) believe(s) the same may qualify as "prior" art to this application and should be treated accordingly, although Applicant(s) reserve(s) the right to contest the prior art status of any document, publication or information, should issue arise.

2. Regarding each listed document that is not in the English language, an English-language translation accompanies this Statement as indicated on the attached PTO-1449 or a concise explanation of the relevance of the document is set forth in the following document(s):

- (a) \_\_\_ A copy of each English language version of a search report (or EPO Search Report) indicating the degree of relevance found by the foreign office of each document being submitted from the search report, is being submitted herewith or has previously been submitted.
- (b) \_\_\_ Attached is a "Concise Explanation of Relevance of Non-English Language Documents".

3. Pursuant to 37 C.F.R. 1.97(b) this Statement is being filed (one must be checked):

- (a) \_\_\_ Within 3 months of the filing date, date of entry into the National Stage, or filing date of a CPA.
- (b) \_\_\_ Before the mailing date of a first Office Action on the merits. If this Statement is not filed before the mailing date of a first Office Action on the merits, the required certification is given below or, in the absence thereof, the Office is authorized to charge the required fee set forth in 37 C.F.R. 1.17(p) to

Deposit Account No. 18-0988 for consideration of this Statement.

(c) \_\_\_ Before the mailing date of a first Office Action on the merits after a first or second submission after final rejection under 37 C.F.R. 1.129(a).

(d) \_\_\_ After the period set forth in 37 C.F.R. 1.97(b) but before the mailing date of either a final action or a notice of allowance.

(1) \_\_\_ The required certification is given below, or

(2) \_ Enclosed is a check in the amount of \$180.00 covering the fee set forth in 37 C.F.R. 1.17(p) for consideration of this Statement, or

(3) \_\_\_ Charge the fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988

(e) X After the mailing date of either a final action or a notice of allowance, but before payment of the issue fee. Petition hereby is made for consideration of this Statement and the required certification is indicated below.

(1) X Enclosed is a check covering the fee set forth in 37 C.F.R. 1.17(p), or

(2) \_\_\_ Charge the fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988.

4. Certification (if applicable)


(a) \_\_\_ The undersigned hereby certifies that each item of information contained in this Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than 3 months prior to the filing of this Statement.

(b) \_\_\_ The undersigned hereby certifies that no item of information contained in this Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the undersigned's knowledge after making reasonable inquiry, no item of information contained in this statement was known to any individual designated in 37 C.F.R. 1.56(c) more than 3 months prior to the filing of this Statement.

5. The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No. 18-0988.

Respectfully Submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

By 

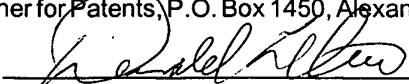
Donald L. Otto  
Reg. No. 22,125

1621 Euclid Avenue, 19th Floor  
Cleveland, Ohio 44115  
(216) 621-1113

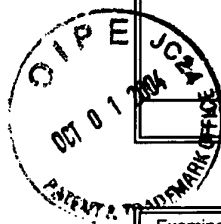
**CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8**

I hereby certify that this correspondence (along with any paper referenced as being attached or enclosed) is being deposited on the below date with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: September 29, 2004

  
Donald L. Otto

Form PTO-1449 (Modified)  <b>LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT</b>  (Use several sheets if necessary)	Atty Docket No.	Serial No.
	GLOLP0106USD	10/298,367
	Applicant: Jeffery R. Parker et al	
	Filing Date	Group
	November 18, 2002	2872



**U.S. PATENT DOCUMENTS**

Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
	2,945,313	7/1960	Hardesty			
	4,638,131	1/1987	Kidd et al			
	4,989,956	2/1991	Wu et al			
	5,128,842	7/1992	Kenmochi			

**FOREIGN PATENT DOCUMENTS**

Examiner Initial	Document Number	Date (MM/YYYY)	Country	Class	Sub-class	Translation	
						Yes	No
	AU-A-78486/91 (enclosed)	pub. 12/1991	AU				
	523,706 (enclosed)	3/1939	GB				
	2285518A (enclosed)	7/1995	GB				
	WO 92/05535 (enclosed)	4/1992	PCT				

**OTHER ART**

Examiner Initial	Author, Title, Date, Pertinent Pages, etc.

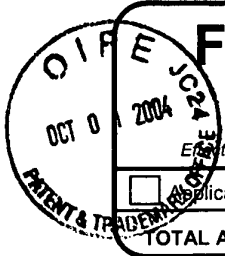
EXAMINER	DATE CONSIDERED
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EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

**Information Disclosure Statement PTO-1449 (Modified)**

The identification of any reference is not intended to be, and should not be understood as being, an admission that such publication, in fact, constitutes "prior art" within the meaning of applicable law since, for example, a given reference may have a later effective date than first seems apparent or the reference may have an effective date which can be antedated. The "prior art" status of any reference is a matter to be resolved during prosecution.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



# FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

Applicant claims small entity status. See 37 CFR 1.27

**TOTAL AMOUNT OF PAYMENT** (\$) 180.00

**Complete if Known**

Application Number	10/298,367
Filing Date	November 18, 2002
First Named Inventor	Jeffery R. Parker
Examiner Name	Fayez G. Assaf
Art Unit	2872
Attorney Docket No.	GLOLP0114USG

**METHOD OF PAYMENT** (check all that apply)

Check  Credit card  Money Order  Other  None

Deposit Account:

Deposit Account Number: 18-0988

Deposit Account Name: Renner, Otto, Boisselle & Sklar, LLP

The Director is authorized to: (check all that apply)

Charge fee(s) indicated below  Credit any overpayments

Charge any additional fee(s) or any underpayment of fee(s)

Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

**FEE CALCULATION** (continued)

**3. ADDITIONAL FEES**

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for <i>ex parte</i> reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	180
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) \_\_\_\_\_

\*Reduced by Basic Filing Fee Paid

**SUBTOTAL (3)** (\$) 180.00

**FEE CALCULATION**

**1. BASIC FILING FEE**

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

**SUBTOTAL (1)** (\$) \_\_\_\_\_

**2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE**

	Extra Claims	Fee from below	Fee Paid
Total Claims	_____ -20** = _____	X _____	= _____
Independent Claims	_____ -3** = _____	X _____	= _____
Multiple Dependent	_____		= _____

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1202	18	2202	9	Claims in excess of 20	
1201	86	2201	43	Independent claims in excess of 3	
1203	290	2203	145	Multiple dependent claim, if not paid	
1204	86	2204	43	** Reissue independent claims over original patent	
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent	

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Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22,125	Telephone	216-621-1113
Signature		Date	9-29-04		

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(12) **UK Patent Application** (19) **GB** (11) **2 285 518** (13) **A**

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(71) Applicant(s)

**Nokia Mobile Phones Limited**

**(Incorporated in Finland)**

**P.O. Box 86, SF-24101 Salo, Finland**

(72) Inventor(s)

**Seppo Pienimaa**

(74) Agent and/or Address for Service

**Julian M Potter**

**Nokia Mobile Phones, St Georges Court,  
St Georges Road, CAMBERLEY, Surrey, GU15 3QZ,  
United Kingdom**

(51) INT CL<sup>6</sup>

**G02B 6/00**

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**G2J JGX**

**U1S S2028 S2125 S2215**

(56) Documents Cited

**GB 2260840 A GB 2235295 A GB 2065373 A**

**GB 2027551 A US 5050946 A US 3774021 A**

(58) Field of Search

**UK CL (Edition N ) G2J JGX , H1N NPW**

**INT CL<sup>6</sup> G02B , H01H**

(54) **Sheet-like light guide for illuminating keypad**

(57) A sheet like light guide 5 covering essentially the area of keypad 1 and made of light-conducting material, such as polycarbonate, and provided with an uneven light-transmitting and light-diffusing surface, such as roughened surface 19, against each key 7 to illuminate the key, while the surface of the light guide between the keys is essentially unilluminated. The non-illumination is provided by making the surface of light guide 5 smooth. The roughening can be made on conical surfaces 19 of apertures 13 in light guide 5, through which keys 7 are connected to the electronic parts of circuit board 20 underneath. The illumination of keys 7 and display 2 can be by the same light sources 4 and light guide 5. The keypad 1 may be part of a control panel 3 for electronic devices e.g. a mobile phone.

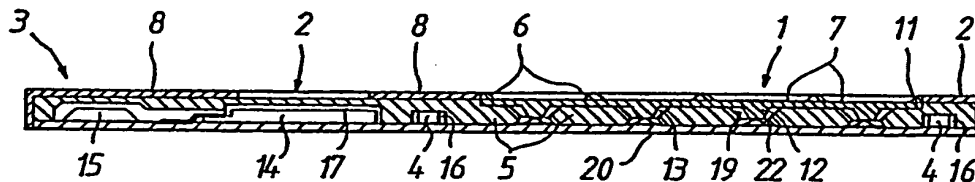


Fig. 2

GB 2 285 518 A

Fig.1

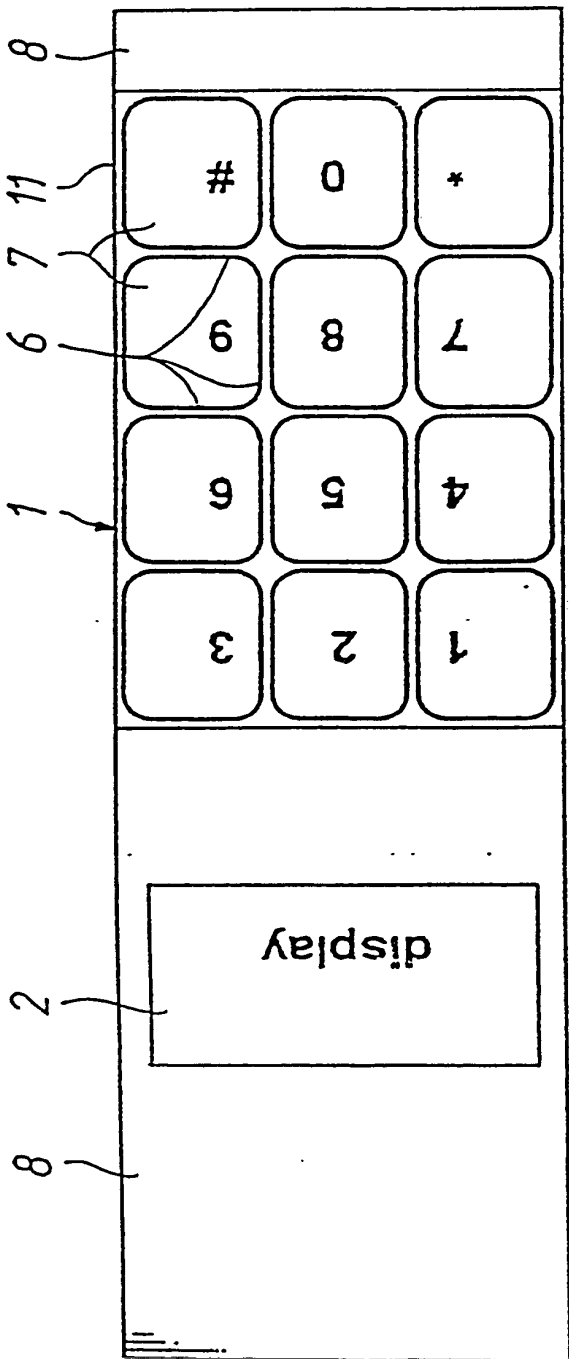
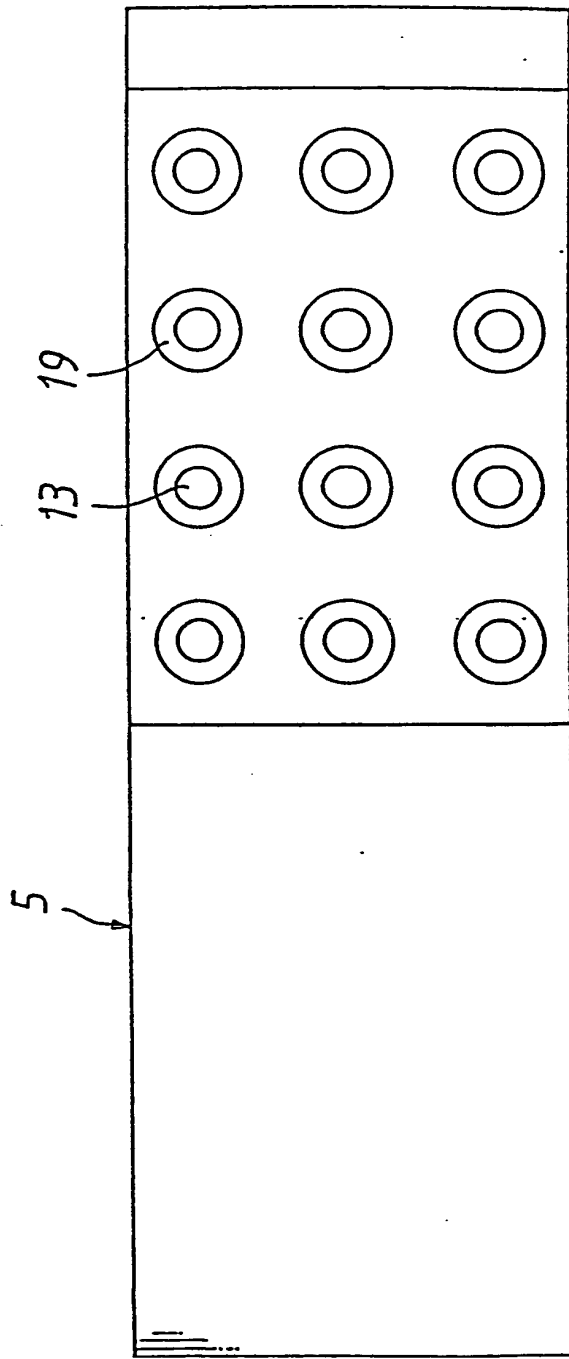
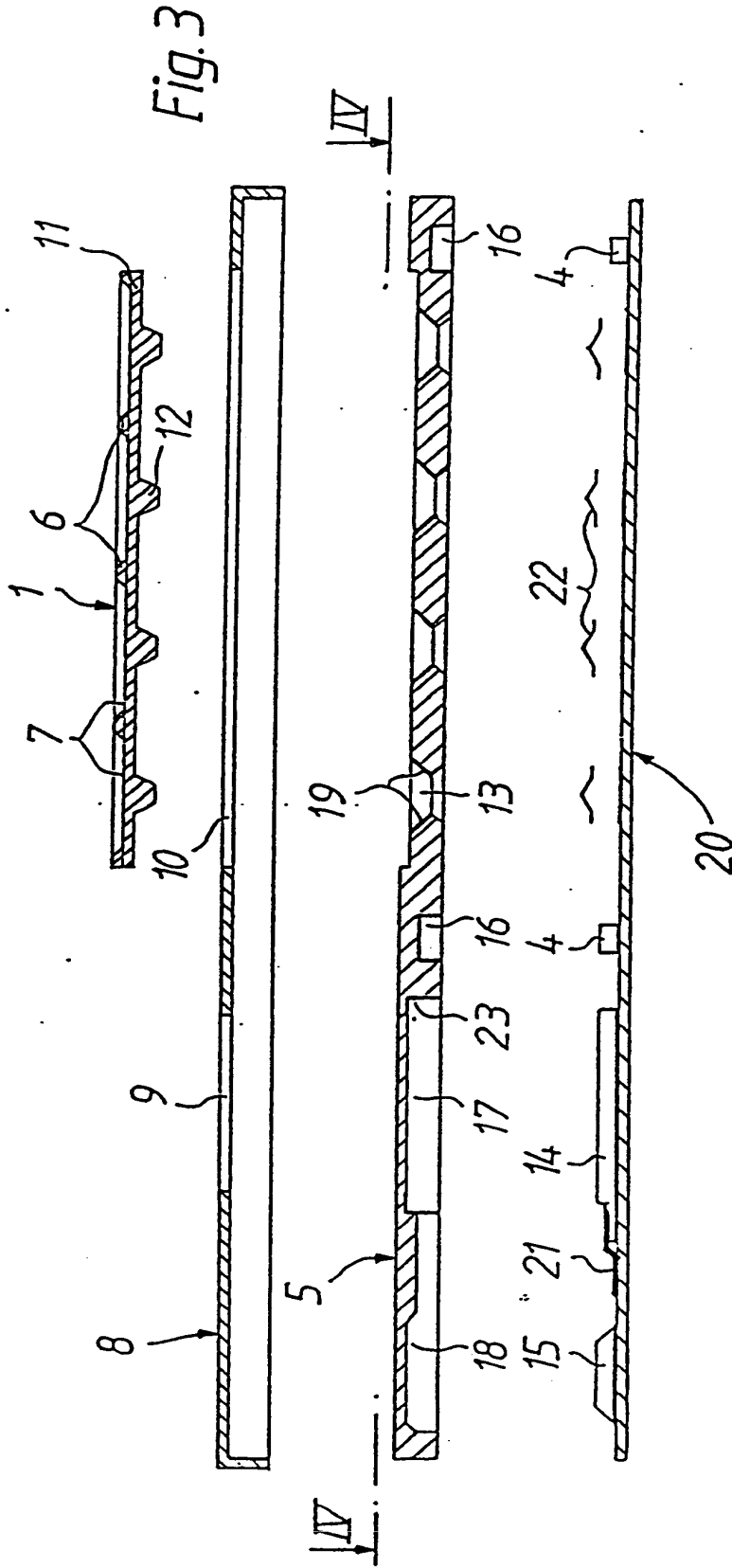
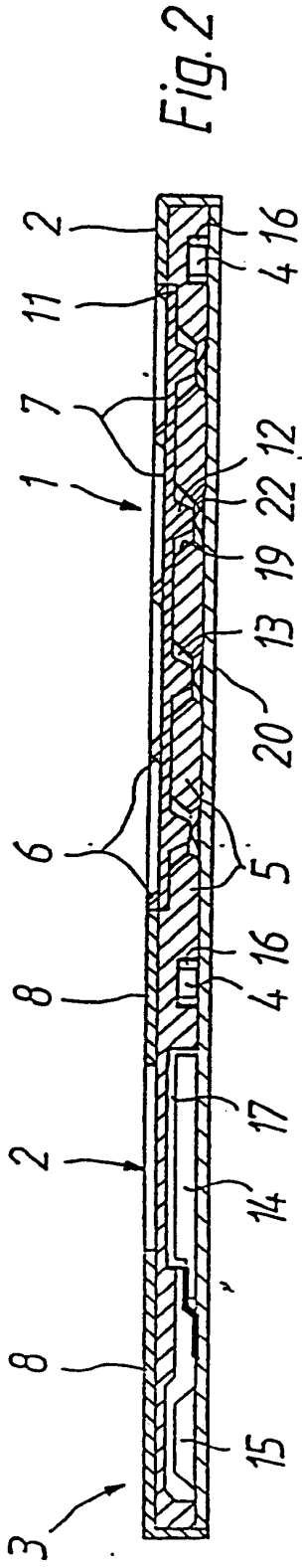


Fig.4





LIGHT GUIDE

This invention relates to a control panel for use in portable electronic devices, comprising one or more light sources for illuminating the keys and the display typically found on such devices. Suitable applications of the invention include portable telephones and calculators.

Some previously known solutions for illuminating keypads are disclosed in US patent publications; 4,124,879; 4,365,120; 4,636,593; 4,812,831 and 4,916,262. Publication 4,365,120 describes a solution where each key, which is made of light-transmitting material, comprises its own light source, situated in a recess formed in the back of the key. In the solution according to publication 4,124,879, light is distributed around the keypad from a light source on the side of the keypad through light-conducting channels situated between the rows of keys. The channels are provided with matt and reflecting painted surfaces for directing the light. In publication 4,636,593 the keys are part of an element made of translucent elastomeric material, and the light sources are placed between the keys in recesses formed in the element. Publication 4,916,262 discloses a structure formed of numerous superimposed, light-transmitting layers in which the keypad is illuminated by light conducting through the lowest layer of the structure and distributing over the whole area of the keypad. In the solution according to publication 4,812,831 the keypad is illuminated by electroluminescence provided by phosphorizing powder or ink contained in a layer under the keypad.

Excluding US patent publication 4,124,879, all the solutions above have light sources placed within the keypad, or arranged to be effective from under the keypad. A drawback with these solutions is that the position of the light source results in the control panel being relatively thick. In publication 4,124,879 the light source is to the side of the keypad, thus overcoming the thickness problem. This

solution, however, requires a complex channel structure to direct the light to the keys, usually with numerous surfaces painted with matt or reflecting paint.

According to the present invention there is provided a light guide for a key pad, comprising a sheet-like light-transmitting member having matted or greyed light-transmitting and light-diffusing surfaces disposed in regions corresponding to keys of a key pad for illuminating the keys of the key pad and having smooth surfaces between the regions corresponding to the keys to inhibit illumination of the surfaces between said regions.

An advantage of the invention is that it provides a simple solution for distributing light to illuminate a control panel for an electronic device and distributing light to the keypad in the lateral direction from one or more light sources situated at the edges of the keypad.

The operation of a sheet-like light guide in accordance with the invention is based on the total internal reflection of light in the sheet material in a similar manner as in light cables containing optic fibres. A beam of light which comes to the surface of the light guide in an inclined manner does not escape the light guide but is reflected back instead, and diffusion of light outside the light guide only occurs in the areas of the light guide which are made uneven for the purpose of diffusing the light. Using the solution, the illumination can be directed to each key of the keypad, while the external areas of the keys remain unilluminated. A single source of light is sufficient to illuminate the keypad, but the control panel is preferably provided with several light sources which can provide different colour light and which can be used to vary the illumination of the keypad. Suitable materials for the light guide include plastic materials, such as polycarbonate, polystyrene or polymethylmethacrylate, which are easy to cast and which transmit light well, though other materials are viable with which the above-mentioned total reflection effect is possible.

In accordance with an advantageous embodiment of the invention each aperture of the light guide corresponding to each key is provided with a roughened surface, while the surface of the light guide between the apertures is smooth. If the light guide is manufactured by casting of plastics such as polycarbonate, both the roughened surfaces on the apertures and the smooth surfaces between them can be provided by the actual casting process. A sufficiently smooth surface keeps a major part of the light beams inside the light guide so that no separate, non-transparent coating is required to keep the surface unilluminated.

The sheet-like light guide preferably comprises an opening under each key through which the key communicates with the circuit board under the light guide, the side surfaces of the openings being roughened to diffuse light. In addition, the openings expand in a concave, conical or pyramid-like manner in the direction of the surface of the control panel, whereby the inclined surfaces of the openings direct light diagonally to the keys on the surface of the control panel.

In accordance with an advantageous embodiment of the invention keys are included in a uniform, sheet-like element located on top of the sheet-like light guide, the element being generally of light-transmitting or translucent material. The said element protects the smooth surfaces of the light guide against scratching which would cause light to diffuse in spots intended to be unilluminated. The element may be a light-transmitting rubber material such as silicone.

The front surface of the element containing said keypad can be even or flat, except for ridges which are of non-transparent silicone, for example, and which form a net or similar figure on the surface of the element, separating the keys from each other. The ridges make it easier to use the keypad and they form a guard against the accidental pushing of the keys while the device is in a pocket, for instance.

In accordance with an especially advantageous embodiment the sheet-like light guide extends, in addition to the keypad, to the display included in the control panel of the device and comprises one or more roughened surfaces to illuminate the

display. This means that the keypad and the display can be illuminated using the same light source(s). In previously known solutions both the keypad and the display required separate light sources. Further, by a single casting a light guide for both the keys and the display can be fabricated.

Embodiments of the invention will now be described, by way of example only and with reference to the accompanying drawings, in which:

Figure 1 illustrates a control panel for a mobile phone which is provided with an illuminated keypad and display in accordance with the invention;

Figure 2 is an axial cross section of the control panel shown in Figure 1;

Figure 3 is an exploded view of Figure 2 showing the components which constitute the control panel; and

Figure 4 illustrates the light guide included in the control panel, as viewed in direction IV-IV, of Figure 3, i.e. from above.

Referring to Figures 1 and 2, there is shown a control panel 3 comprising a keypad 1, a display 2, light sources 4 and a substantially planar light guide 5, used to illuminate the display 2 and keys 7.

Referring also to Figure 3, there is shown on the uppermost part of control panel 3 a sheet-like cover 8 made from non-transparent material. The cover 8 includes openings 9, 10 for the display 2 and the keypad 1 respectively.

The keypad 1 comprises a planar element 11 with mutually perpendicular ridges 6 defining the edge of the keys 7. The lower surface of the planar element 11 includes projections 12 below each key 7. The planar element 11 is preferably made of translucent silicone, except for the ridges 6 and any numbers and other symbols painted on keys 7, which are non-translucent.

Referring to Figure 3 and Figure 4, there is shown a planar light guide 5 in cross-section and from above respectively. The light guide 5 is preferably made of polycarbonate or a corresponding light-transmitting material to permit illumination of the display 2 and the keypad 1 with light from light sources 4. The light guide 5 is provided with concave apertures 13 situated below each key 7 of keypad 1 and from the lower surface with recesses 16-18 for accommodating the light sources 4, a display element 14 and a display control circuit 15. The light guide 5 is preferably fabricated by casting and comprises roughened cast surfaces against the concave apertures 13 and recesses 16, 17, while the remaining surfaces are cast smooth. Light is guided throughout the light guide 5 using the method of total internal reflection, in which light is reflected back from smooth surfaces of the light guide without the light transmitting outside the light guide. Light transmission is only effective on the roughened surfaces of the light guide where the light is diffused and consequently the light only illuminates the keys 7, and the display element 14. The concave apertures 13 in the light guide below the keys 7 have a conical shape such that they increase in radius towards the keys 7 the purpose of which is to direct light diagonally from the roughened conical surfaces 19 to the keys 7 on the surface of the control panel 3.

Preferably the light guide 5 extends over the area of the keypad as a plate-like element which except for the openings for the keys is of a unitary configuration. The keys 7 and the concave apertures 13 are arranged in longitudinal and transversal rows corresponding to the usual arrangement of the keys, thus defining a rectangular area for the keypad. The light guide 5 acts as a means for distributing the light through the channels between the rows of the concave apertures 13 to the entire area of the keypad. For effective light distribution the channels should be wide enough in comparison with the size of the concave apertures 13. This applies in particular to channels extending in a direction perpendicular to the direction from which the light is sourced. Preferably the cross-sectional area of a channel between a pair of adjacent concave apertures is at least equal to the cross-sectional area of one of the concave apertures. Referring now to the areas of the concave apertures and the keypad as seen in Figures 1 and 2,



the sum of all the areas corresponding to the concave apertures is preferably no more than about 25% of the total area of the keypad, thus leaving at least 75% of the keypad's area for the light channels extending between and around the concave apertures. The percentage area of the keypad taken up by the keys, however, is significantly larger which leads to less area on the keypad being unused.

The base of the control panel 3 comprises a printed circuit board 20 provided with electronic components. Referring to Figures 2 and 3, light sources 4 are provided on circuit board 20 on either side of the keypad 1 such that one of the light sources is situated between the keypad 1 and the display 2. Light source 4 may be a light bulb, a fluorescent tube or a light emitting diode. The light may be white or monochromatic, and in accordance with the invention the device can be provided with several light sources of different wavelength, which can be used simultaneously or separately to alter the lighting of keypad 1. If desired, a fluorescent coating may be applied to the roughened surfaces of apertures 13 of the light guide 5 or each key 7 may be dyed with a different colour. Display element 14 situated below the display 2 on circuit board 20 can be in the form of a liquid crystal display which is connected to display control circuit 15 via a lead 21. Metal domes 22 are situated between projections 12 and circuit board 20, the dome being compressed when a key is pushed, either connecting or disconnecting an electrical contact provided on the circuit board.

The components 1, 8, 5 and 20 of the control panel shown in Figure 3 are attached to each other by gluing to form the assembly shown in Figure 2. Keypad 1 is fitted into opening 10 in the cover 8 such that the cover 8 and the keypad 1 together cover the light guide 5 beneath them. The keys 7 communicate with the electrical contacts of the circuit board 20 through the concave apertures 13 of the light guide 5. The light sources 4 are situated within the recesses 16 in the light guide 5 and the display element 14 is situated in recess 17 below display 2 in such a manner that the light guide functions as a light-transmitting window protecting the display element 14. The light from light sources 4 is transmitted through the

roughened surfaces of recesses 16 and into the light guide 5. The illumination of the keys 7 is then achieved by light transmitting out of the light guide via the roughened conical surfaces 19 of the concave apertures 13. Similarly the display element 14 in display 2 is illuminated via roughened edge surfaces 23 of recess 17.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. For example the specific embodiment refers to using rough surfaces, alternatively the illuminating parts of light guide 5 can be provided with relatively coarser roughness, such as different regular-shaped ridges cast on the light guide's surface. Furthermore, it may be advantageous to mould the light guide 5 so that it can be situated under display element 14.

The scope of the present disclosure includes any novel feature or combination of features disclosed therein either explicitly or implicitly irrespective of whether or not it relates to the claimed invention or mitigates any or all of the problems addressed by the present invention.

**CLAIMS**

1. A light guide for a key pad, comprising a sheet-like light-transmitting member having matted or greyed light-transmitting and light-diffusing surfaces disposed in regions corresponding to keys of a key pad for illuminating the keys of the key pad and having smooth surfaces between the regions corresponding to the keys to inhibit illumination of the surfaces between said regions.
2. A light guide according to Claim 1, wherein the sheet-like light guide further comprises an aperture in said regions adapted to enable a corresponding key to communicate with a circuit board disposed the light guide, and a side surface of said apertures are matted or roughened to diffuse light incident thereon.
3. A light guide according to Claim 2, wherein the apertures are generally concave and expand conically in a direction towards a major surface of the sheet-like light guide such that the side surface of the apertures direct light diagonally to the keys.
4. A control panel comprising a light guide according to any of the preceding Claims, wherein there are provided keys formed in a uniform, sheet-like element disposed on a top surface of the sheet-like light guide, the element being generally of light-transmitting or translucent material, and the front surface of the element which is otherwise even or flat, comprising non-translucent ridges which form a net or similar figure on the surface of the element, separating the keys.
5. A control panel according to Claim 4, wherein each key comprises a projection disposed in a corresponding aperture of the light guide and projecting from the sheet-like element, a movement of the projection causing an electric contact to be created or disconnected in a circuit board disposed under the light guide.

6. A control panel according to Claim 4 or Claim 5, further comprising at least two light sources disposed at opposing edges of the sheet-like element and from which the light guide distributes light to the keys.

7. A control panel according to any of Claims 4 to 6, wherein the sheet-like light guide extends, in addition to the keys, also to a display disposed in the control panel, and comprises one or more light-transmitting and light-diffusing surfaces to illuminate the display.

8. A control panel according to Claim 7, wherein the light guide extends over the top of the display element in the display such that the light guide forms a light-transmitting window for the display.

9. A control panel according to Claim 8, wherein the display element is situated in a recess formed in a back surface of the light guide, the side surfaces of the recess being matted or roughened to illuminate the display.

<b>Relevant Technical Fields</b>	Search Examiner MR C ROSS
(i) UK Cl (Ed.N)      G2J (JGX); H1N (NPW)	Date of completion of Search 8 MARCH 1995
(ii) Int Cl (Ed.6)      G02B, H01H	
<b>Databases (see below)</b>	Documents considered relevant following a search in respect of Claims :- 1-9
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Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2260840 A (EUROTHERM) see especially parts 5, 20	1 at least
X	GB 2235295 A (TECHNOPHONE) see especially page 5 line 4 and page 10 line 16 on	1 at least
X	GB 2065373 A (SHIN-ETSU) see especially page 2 line 90 on	1 at least
X	GB 2027551 A (DECCA	1 at least
X	US 5050946 (GOMPAQ) see especially roughened facets 116, column 8 lines 36-37	1 at least
X	US 3774021 (BELL TELEPHONE) see especially Figure 4	1 at least

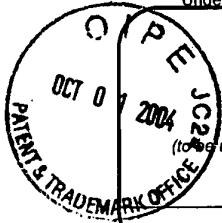
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**(12) PATENT ABSTRACT      (11) Document No. AU-A-78486/91**  
**(19) AUSTRALIAN PATENT OFFICE**

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(54) Title  
**EDGE ILLUMINATED DISPLAY**

International Patent Classification(s)  
(51)<sup>E</sup> **G09F 013/18**

(21) Application No. : **78486/91**

(22) Application Date : **18.06.91**

(30) Priority Data

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<b>PK1763</b>	<b>15.08.90</b>	<b>AU AUSTRALIA</b>
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(71) Applicant(s)  
**MINITRONICS PTY. LIMITED**

(72) Inventor(s)  
**JOHN BLAZINA**

(74) Attorney or Agent  
**F B RICE & CO , 28A Montague Street, BALMAIN NSW 2041**

(57)           The present invention relates to edge illuminated displays, in particular to the type of edge lit signs which are used for displaying directional information, for example, in emergency evacuation lighting.

Emergency evacuation signs must comply with strict standards as regards their illumination properties. Edge lit signs are known but difficulties arise in engineering them to give the correct illumination properties.

The present invention provides a novel edge lit sign, which utilises a panel having thereon a diffraction grating consisting of a plurality of adjacent vertical linear prisms. The prisms run substantially perpendicularly with respect to the edge from which illumination is provided, and act to scatter the light to cause illumination of a display panel placed opposite the diffraction surface.

Use of "V" shaped prisms with walls running at an angle of 45°, and being of varying depth and width, results in good control of illumination properties of the sign.

Claim: Indefinite





### ABSTRACT

The present invention relates to edge illuminated displays, in particular to the type of edge lit signs which are used for displaying directional information, for example, in emergency evacuation lighting.

Emergency evacuation signs must comply with strict standards as regards their illumination properties. Edge lit signs are known but difficulties arise in engineering them to give the correct illumination properties.

The present invention provides a novel edge lit sign, which utilises a panel having thereon a diffraction grating consisting of a plurality of adjacent vertical linear prisms. The prisms run substantially perpendicularly with respect to the edge from which illumination is provided, and act to scatter the light to cause illumination of a display panel placed opposite the diffraction surface.

Use of "V" shaped prisms with walls running at an angle of  $45^{\circ}$ , and being of varying depth and width, results in good control of illumination properties of the sign.

The present invention relates to an edge illuminated display and, particularly but not exclusively, to an edge lit sign for displaying information.

In many buildings, such as, for example, hotels and office blocks, it is required that they be provided with clearly illuminated signs marking exits and directions towards exits, for example, in case of the need for emergency evacuation of the building. Strict standards are provided for such signs.

For example, in Australia, the Australian Standard AS2293 entitled "Emergency Evacuation Lighting in Buildings", provides the following conditions for emergency lighting.

Under the most unfavourable conditions, the sign must operate with the least possible variation in luminance not more than a 5:1 ratio, within the legend and also within its background while maintaining a minimum luminance ratio of 4:1 between the legend and its background. In addition the luminance of the background within 25mm of the legend is to be no less than  $8\text{cd/m}^2$  (candela/metre<sup>2</sup>).

A highly technical approach is required to meet these standards. Edge-lit signs have been known for many years. For example edge lit signs are known where the legend consists of letters engraved in a substrate and a source of illumination is shone down onto the substrate edgewise to illuminate the engraving. A problem here is that it is difficult to attain even illumination of the display because upper parts of the engraving tend to have a shading effect on lower parts. It is very difficult to design such a structure so that it falls within the necessary standards. Other types of edge-lit signs also exist, and they also have problems in complying with the standards.

The present invention provides a display, comprising a display member having a first surface carrying display

matter and a second surface, the second surface being provided with a diffraction pattern arranged to direct light from an edge of the display member proximate the second surface so as to cause illumination of the display.

5       The second surface is preferably opposite said first surface.

      The diffraction pattern preferably comprises a series of parallel grooves machined or hand grooved into the second surface. They are preferably centred so as to  
10 provide the required illumination of the display.

      The grooves are preferably engineered as a series of parallel linear light diffusing refractors or "linear prisms". The grooves are preferably "V" shaped in cross-section. The side walls of the grooves preferably  
15 slope downwards at an angle of  $45^{\circ}$  to the surface. We have found that this angle for the groove side walls advantageously gives optimum illumination properties.

      This angle can be somewhat varied, e.g.,  $40-50^{\circ}$ , and still provide good illumination properties. The angle  
20 may vary from these limits.

      The linear light diffusing refractors may be arranged so that they run in a direction substantially perpendicular to the direction of the edge of the display member from which illumination is provided (i.e.  
25 vertically). The refractors could slope somewhat from the perpendicular.

      The grooves preferably run directly parallel to each other.

      The "V" shaped grooves act as prisms to catch and  
30 refract light from the light source and project it towards the display to cause substantially even illumination over the whole surface of the display.

      A problem can still arise in the even spread of the illumination over the display by virtue of the fact that  
35 the parts of the linear prisms adjacent and close to the

light source can receive and scatter more light than the parts of the linear prisms further away from the light source. Where the light source is at the top of the edge lit display, one can therefore have a situation where the top part of a display is better illuminated than the bottom part.

In a preferred embodiment the linear prisms are arranged such that they become gradually deeper the further away from the light source they are. For example, in the case where the prisms run in a direction away from the light source the depth of each prism adjacent the light source may be in the order of 0.3mm, whereas at the opposite end of the prism away from the light source the depth may be in the region of 0.6mm, with a gradation in depth from the part of the prism adjacent the light source to the part furthest away from the light source. Alternative dimensions are 0.1mm at the edge adjacent the light source to 0.3mm at the part furthest away from the light source. These dimensions are not limiting, and can be varied.

This advantageously results in more even illumination, because the deeper part of the prism naturally catches, refracts and reflects more light than the shallower part of the prism. Situating the deep part of the prism away from the light source, thus makes up for the extra light that the part of the prism adjacent the light source receives.

As well as getting deeper away from the light source, it is preferred that the prisms are arranged to gradually increase in width away from the light source. This also helps in the ability of the prism to catch more light as distance from the light source increases. Again, a gradual increase in width is preferred, as is a gradual increase in depth.

As adjacent prisms increase in width away from the

light source respective walls of the respective prisms may actually come to overlap each other. This is not a problem and does not cause any disadvantages as regards even spread of illumination.

5           In preferred embodiments, the light source is a strip light which extends along one edge of the display member. However, it is usual that the strip light does not extend the full extent of the display member. There are usually gaps at either end of the display member which do not have  
10 a strip light adjacent to them. We have found that in order to provide completely even illumination at these end parts it is preferable to provide prisms which do not vary in depth or width, just in the end areas.

          Two such display members as defined above are  
15 preferably combined in a display unit, so that first surfaces carrying display matter are provided on opposed faces of the display. A light source is positioned proximate one edge of said unit to provide the required illumination.

20           The preferred embodiment comprises a composite display unit, comprising a central member having diffraction patterns on opposite faces thereof, and two outer panel members carrying display matter and sandwiched either side of the central member. The diffraction  
25 patterns on either face of the central or intermediate member therefore comprise respective second surfaces of two display members as previously defined, the respective first surface for each display member being comprised by the surface of each of the outer panel members. The outer  
30 panel members, in the preferred embodiments, are configured to provide diffusion of the light directed from the central member. They may be of opal plastics, for example.

          It is possible to dispense with the outer panel  
35 members and merely have a single member with a diffraction

pattern on opposing faces and display information on the same faces as the diffraction pattern. In such a case the first and second surfaces as previously defined would actually be the same surface.

5           With the display member in accordance with the present invention a light source is preferably positioned as close as possible to the edge of the second surface. An advantage of positioning the light source this close is that the final photometric results are improved. The light  
10 source may even be touching the edge of the second surface.

The provision of linear light diffusing refractors has the advantage that it is possible to provide illumination to the display, eg, "EXIT" legend, which is in compliance with the guidelines provided for emergency  
15 lighting signs. We have found that the illumination properties of this type of linear prism arrangement are extremely satisfactory, particularly with the  $45^{\circ}$  angle arrangement for the walls of the prisms and the increasing width and depth-type structure the further away from the  
20 light source of prisms arranged in a direction perpendicular to the edge adjacent to the light source.

The display unit may not only comprise the three-component composite unit as discussed above, but could also comprise a four-component unit. The  
25 four-component unit comprises two display members, each comprising two components. The first component being a central member having one surface provided with a diffraction pattern, and the second component being an outer panel member provided with display information on a  
30 surface thereof. Both display members could be placed back to back to provide a four-component arrangement display unit. The preferred display unit, however, is the three-component display unit as discussed above.

The present invention further provides a display unit  
35 comprising two display members, each display member

comprising a first surface carrying a display for illumination and a second surface, said second surface having a diffraction pattern for directing light from an edge of said display member proximate said second surface to cause illumination of the display, said two display members being placed back to back.

The second surface is preferably substantially opposite said first surface.

The display members comprising the display unit may have any or all of the preferred features discussed above in relation to the display member of the invention.

In the preferred embodiment display unit of the three-component type unit, the second surfaces of both constituent display members are provided on opposing faces of a single central member.

Where the display unit consists of a four component-type unit, so that each display member consists of two parts, a part carrying the diffraction pattern and a part carrying the display information or legend, each central member may have both its surfaces provided with a diffraction pattern, so that light will be directed therefrom to illuminate the displays on both second plate members.

The present invention yet further provides a display, comprising a display member having a first surface carrying display matter, and a second surface, the second surface being provided with a diffraction pattern arranged to direct light from an edge of the display member proximate the second surface so as to cause illumination of the display, the diffraction pattern comprising a plurality of adjacent linear prisms of varying depth and/or width whereby to provide desired illumination properties.

The prisms run in a direction substantially perpendicular to the edge of said second surface adjacent to the light source.

This aspect of the invention may also have any or all of the preferred features of the invention discussed above in relation to the other aspects.

5 The present invention yet further provides a method of controlling illumination of a display surface, comprising the steps of providing a second surface arranged to illuminate said display surface, said second surface having a diffraction pattern thereon and being arranged to receive light from a light source and direct  
10 the light to illuminate the display, and providing varying depth and/or width linear prisms as the diffraction pattern in order to control the illumination.

Features and advantages of the present invention will become apparent from the following description of an  
15 embodiment thereof, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 shows a front on partially cut-away view of an edge lit EXIT sign in accordance with an embodiment of the present invention;

20 Fig. 2 shows a side on cross-sectional view along line XX of the embodiment of Fig. 1;

Fig. 3 shows a front-on view of an inner panel arranged to carry a diffraction pattern in accordance with an embodiment of the present invention;

25 Fig. 3A shows a side-view of the panel of Fig. 3, and

Figs 4A and 4B show details on A and B of the panel of Fig. 3. A being a detail looking down from the top edge of the panel and B being a detail looking up from the bottom edge of the panel.

30 With reference to the Figures, an edge lit EXIT luminaire 1 is illustrated, which comprises two display members 2A, 2B. Each display member comprises a first surface 3A, 3B mounting display information for illumination, and a second surface 4A, 4B mounting a  
35 diffraction grating comprising a series of parallel



vertical grooves or vertical "prisms" machined or hand grooved into the surface 4A, 4B. The source of illumination, strip light 5, is provided adjacent one edge of the display members 2A, 2B, which are mounted back to back with respect to each other to provide illumination for the display information on the first surfaces 3A, 3B. The vertical diffraction grating, the grooves of which run in a direction perpendicular to the direction of the edge 6 adjacent the strip light, cause the light provided by illumination source 5 to be diffracted in an outward direction to provide the required illumination of the display information.

The prisms on the surfaces 4A and 4B of the display members 2A, 2B, cause the illumination from light source 5 to be spread in an even manner over the display surfaces 3A, 3B, by a mechanism of refraction, reflection and diffraction due to the angles formed by the walls of the prisms. As will be discussed later in the description, the linear prisms actually vary in depth and width along their length so as to provide the optimum illumination properties.

In more detail, the illustrated display unit comprises a housing 7, which may be mounted to the surface of a ceiling or may be located and fixed in a recess in the ceiling. A longitudinal light source 5 is mounted within the housing 7 on the underside of a reflector plate 8. The light source 5 is also enclosed lengthwise by two lateral reflectors 9 into which the display member assembly 2A, 2B is protruding with its edge reaching as near as possible to the surface of the light source 5. The closer the light source 5 is to the edge of the display unit 2A, 2B, even to the point of touching, we have found the better the final photometric results are. The face plate 10 is provided to complete the housing structure and enclose the light source 5. The enclosures,

ie housing 7, lateral sections 9 and face plate 10, may be constructed in steel, aluminium or plastic, with the condition that the required reflecting surfaces are adequately provided.

5           The display members 2A, 2B of the display unit comprise three plastic panels 20, 21 and 22. The inner panel 20 is of clear perspex and of adequate thickness to convey the light emitted from the light source 5 placed at the upper edge of the assembly. To  
10 assist an even as possible distribution of light, the surfaces 4A, 4B of the panel 20 are, as described above, machined to provide vertical linear light diffusing refractors, or prisms (not shown) in close proximity to each other. In this particular embodiment, the vertical  
15 grooves are adjacent to each other, their centres being 0.5mm apart. The depth of the prisms ranges from in the order of 0.1mm at the edge of the panel 20 proximate to the light source 5, increasing in depth gradually to in the region of 0.5mm at the extreme end of the prisms away  
20 from the light source 5.

The width of each prism also increases as the distance from the edge proximate the light source 5 increases.

The two outer panels 21, 22 are opal and are of sufficient thickness to provide rigidity. The legend  
25 "EXIT" is silkscreened in reverse in green on the outside of the opal outer plastic panels 21, 22 (ie, on the first surface 3A, 3B). A white legend on a green background is thus provided.

Please note that an alternative method would be to  
30 eliminate outer panels 21, 22 and have first surfaces 3A, 3B on the outer faces of panel 20, i.e., the faces having the diffraction pattern. The problem here is that it would require several silkscreening steps as opposed to the one above, ie, it would be necessary to  
35 silkscreen in white the whole outside of the perspex panel

21, 22 and again reversing the green colour allowing the legend to remain in white.

Fig. 3 shows a front-on view of inner panel 20. The diffraction grooves C are shown in one area only on this drawing, but it will be appreciated that they extend across the panel. However, areas X, Y and Z, which have different types of diffraction prisms, are indicated in the drawing. Area Y comprises a plurality of parallel prisms which increase in depth and width as distance from top edge 100 increases, as described above. The width of the prisms may be such that at a certain point from top edge 100 they start to overlap. This is not a problem, and optimum light illumination properties are still obtained. It is believed that the increase in depth and width from the top edge 100 means the further one travels away from the top edge the more light the prisms are capable of refracting and reflecting to provide illumination. The increase in depth and width therefore compensates for the fact that there is more light at the top of the panel because of the proximity of the light source 5.

Areas X and Z of the panel 20 indicate areas which lie outside the limits of the strip light source 5. It is usual in edge lit signs to have such outlying areas. We have found that if grooves of increased depth and width are provided in these areas, illumination properties are not good because of the fact that the light source 5 does not extend to these areas. However, by making the prisms in these areas X and Z to be of constant depth and width all the way down from top edge 100, constant illumination properties are obtained. The prisms in these areas are thus of constant depth and constant width.

Figs. 4A and 4B show details on A and B of the diffraction pattern of panel 20, illustrating how the parallel prisms increase in depth and width from the top

to the bottom of the panel 20. The top grooves, in detail 4A, are in the order of 1mm in depth and the bottom grooves, in detail 4B, are in the order of 0.5mm in depth. The bottom of the grooves (the apex of the "V")  
5 are evenly spaced from each other all the way down the length of the panel by a distance of 0.5mm.

It is not quite clear from these drawings, but the top grooves in detail 4A will have their edges spaced apart from each other, whereas the edges of the tops of  
10 the bottom grooves in detail 4B will be close to each other, by virtue of the grooves widening towards the bottom of the panel 20. The slope of the walls of the prisms is at all times  $45^{\circ}$  from the surface of the panel 20.

15 The prisms may be manufactured by a number of means. One grooving (Linear Prism) cutting machine consists of a steel base plate with 4 pillars (one on each corner) of adjustable height. These pillars accommodate two guide shafts in parallel to each other upon which a cradle  
20 mounted on brass bushes is allowed to travel forward and backward by sliding movements. To this cradle a tool steel cutting comb assembly is fixed in such a manner that it locks when the cradle is pulled towards the operator, thus allowing the cutting of grooves in the plastic panel  
25 and it unlocks when it is pushed away from the operator.

A rubber pad is fixed on the upper surface of the steel base plate for the purpose of protecting the surface of the plastic panel when it is placed upon it and also to impede any sliding movement of the panel which is also  
30 held in position by means of adjustable bars. Because the height of the runners can be adjusted independently on each pillar it is possible to control the variation in depth and width of the grooves from the top to the bottom of the panel. The cutting comb comprises a series of  
35 inverted "V" shaped "teeth", akin to the shape of the saw

teeth made from tool steel. In order to produce the diffraction grating on the area Y of panel 20, the panel 20 is placed in the appropriate position on the base of the scribe and the height of the runners (guide shafts) is adjusted such that they slope downwards towards the bottom of the panel. When the scribe is drawn from the top of the panel to the bottom of the panel the combs cuts into the panel 20 following the slope of the runners causing increase in width and depth of the grooves as the teeth of the scribe go deeper into the panel 20. To scribe the areas X and Z of the panel 20, which are constant width and depth prisms, the height of the runners on the pillars is adjusted to make them level before scribing.

Note that there is an area U at the top of the panel which is a polished surface. This area U is mounted in the display housing. Note that all the dimensions discussed in this description are examples only, and should not be taken as limiting.

The grooves are preferably "V" shaped in cross-section, as shown in the drawings. The depth of the groove is preferably 0.1mm or over, increasing as distance from edge 100 increases.

The vertical linear  $45^{\circ}$  prismatic indentations and the thereby derived semi-matt surfaces of the centre perspex (or similar) panel combined with the abutting outer opal panels results in the refraction, reflection and diffusion of light in all directions thereby obtaining an even distribution of light over the surface area of the outer opal panels and hence evenly illuminating any legend and its background screen printed on, or otherwise affixed to, the outer opal panels.

The present invention can be used for the display of any type of information, not just directional indicia, as described. For example, pictorial matter could also be

displayed.

It will be recognised by persons skilled in the art that numerous variations and modifications may be made to the invention as described above without departing from  
5 the spirit or scope of the invention as broadly described.

The claims defining the invention are as follows:-

1. a display, comprising a display member having a first surface carrying display matter and a second surface, the second surface being provided with a diffraction pattern  
5 arranged to direct light from an edge of the display member proximate the second surface so as to cause illumination of the display.
2. A display in accordance with claim 1, wherein the diffraction pattern comprises a series of parallel grooves  
10 in the second surface.
3. A display in accordance with claim 2, wherein the grooves have side walls which slope at an angle in the range of  $40^{\circ}$  -  $50^{\circ}$  to a plane running through the tops of the grooves.
- 15 4. A display in accordance with claim 3, wherein the angle of slope of the groove walls is  $45^{\circ}$ .
5. A display in accordance with any of claims 2 to 4, wherein the grooves are "V" shaped in cross-section, the base of each groove being the apex of the "V".
- 20 6. A display in accordance with any of claims 2 to 5, wherein the grooves run in a direction substantially perpendicular to the edge of the display member from which light is provided.
7. A display in accordance with any of claims 2 to 6,  
25 wherein the depth of the grooves increases the further the grooves are away from the edge of the display member from which light is provided.
8. A display in accordance with any of claims 2 to 7, wherein the width of the grooves increases the further the  
30 grooves are away from the edge of the display member from which light is provided.
9. A display in accordance with claim 7 or 8, wherein grooves in areas proximate each end of the second surface do not increase in depth or width the further they are  
35 away from the edge of the display member from which light

is provided.

10. A display in accordance with claims 7, 8 or 9, wherein the grooves run in a direction substantially perpendicular to the edge of the display member from which  
5 light is provided, and the increase in width or depth is a gradual increase.
11. A display in accordance with any preceding claim, wherein the display member is a composite unit comprising first and second panel members, the first panel carrying  
10 the first surface having the display material, and the second panel carrying the second surface having the diffraction pattern.
12. A display in accordance with claim 11, wherein the first panel is an optical diffuser.
- 15 13. A display unit comprising two display members, each display member being in accordance with any of claims 1 to 12, said two display members being positioned back to back.
14. A display unit in accordance with claim 13, wherein the display unit is a composite unit comprising three  
20 panel members, a central member and two outer members, the two outer members having respective first surfaces carrying the display material and the central member having two respective opposing second surfaces carrying the diffraction patterns.
- 25 15. A display unit in accordance with claim 13, wherein the display unit is a composite unit comprising four panel members, two inner members and two outer members, the two outer members having respective first surfaces carrying the display material and the two inner members having  
30 respective second surfaces carrying the diffraction patterns.
16. A display unit in accordance with any of claims 13 to 15, further comprising a light source mounted adjacent one edge of the display unit.
- 35 17. A display, comprising a display member having first



surface carrying display matter, and a second surface, the second surface being provided with a diffraction pattern arranged to direct light from an edge of the display member proximate the second surface so as to cause  
5 illumination of the display, the diffraction pattern comprising a plurality of adjacent linear prisms of varying depth whereby to provide desired illumination properties.

18. A display in accordance with claim 17, wherein the  
10 linear prisms also vary in width in order to provide desired illumination properties.

19. A display in accordance with any of claims 17 or 18, wherein the linear prisms run in a direction substantially perpendicular to the edge of the display member from which  
15 light is provided.

20. A display in accordance with any of claims 17 through 19, wherein the linear prisms are grooves having the features of shape of any of claims 3 to 5.

21. A method of controlling illumination of a display  
20 surface, comprising the steps of providing a second surface arranged to illuminate said display surface, said second surface having a diffraction pattern thereon and being arranged to receive light from a light source and direct the light to illuminate the display, and providing  
25 varying depth and/or width linear prisms as the diffraction pattern in order to control the illumination.

22. A display substantially as described herein with reference to the accompanying drawings.

23. A display unit substantially as described herein with  
30 reference to the accompanying drawings.

DATED this                      day of

MINITRONICS PTY. LIMITED  
Patent Attorneys for the  
Applicant:

F.B. RICE & CO.

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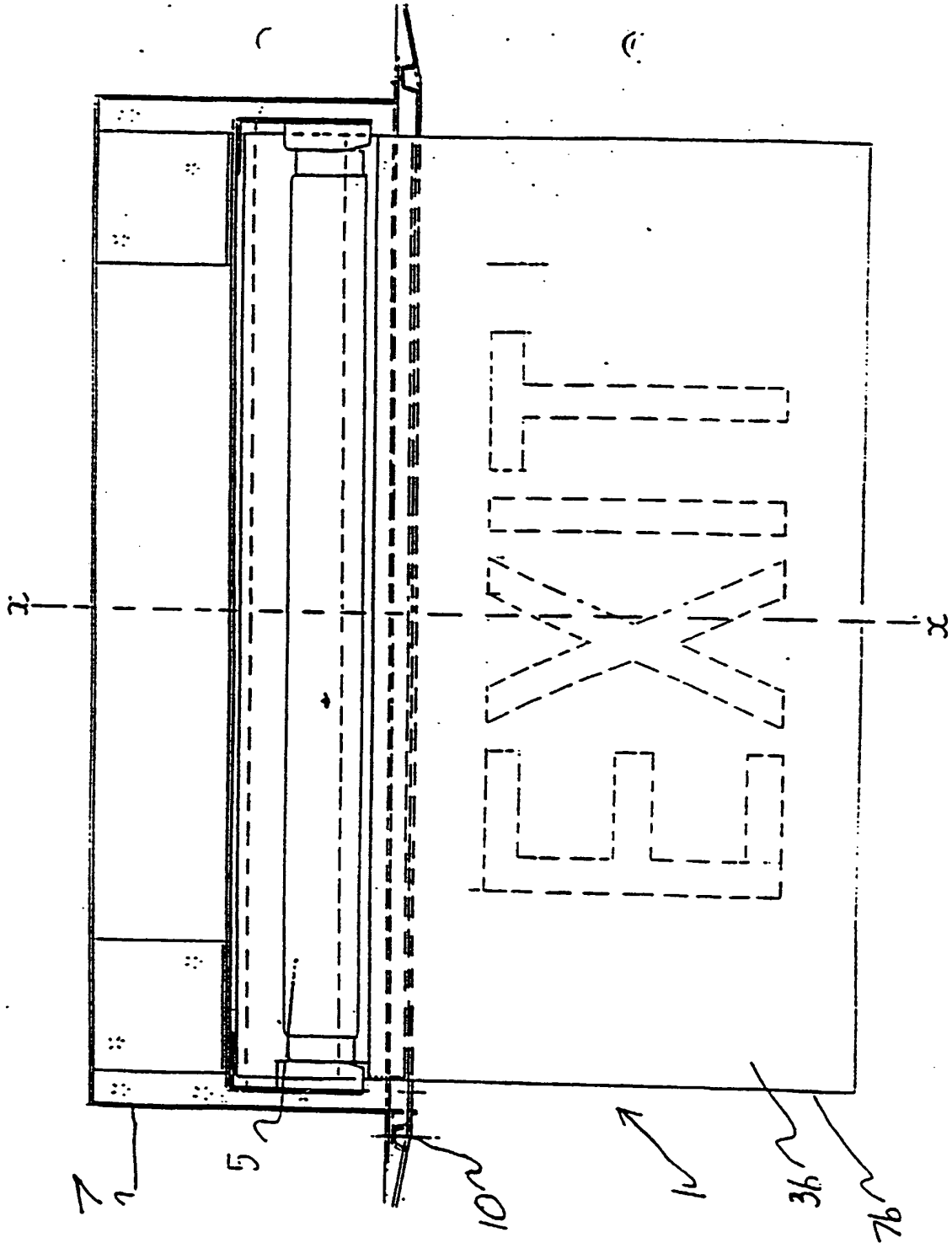


FIGURE 1

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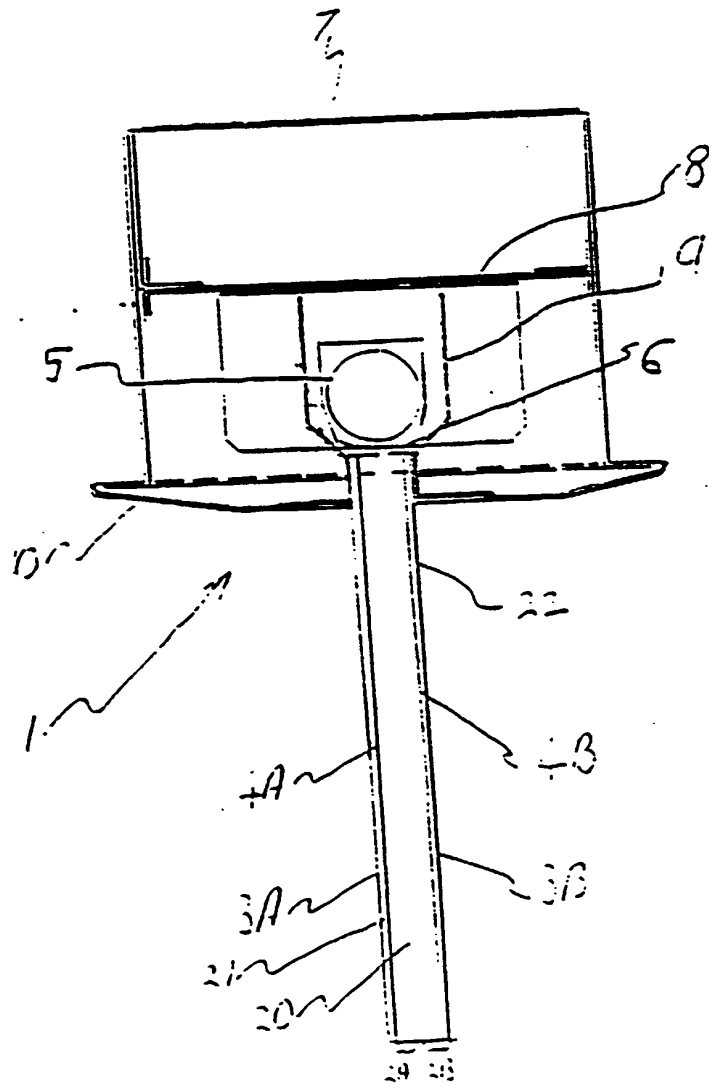


FIGURE 2.

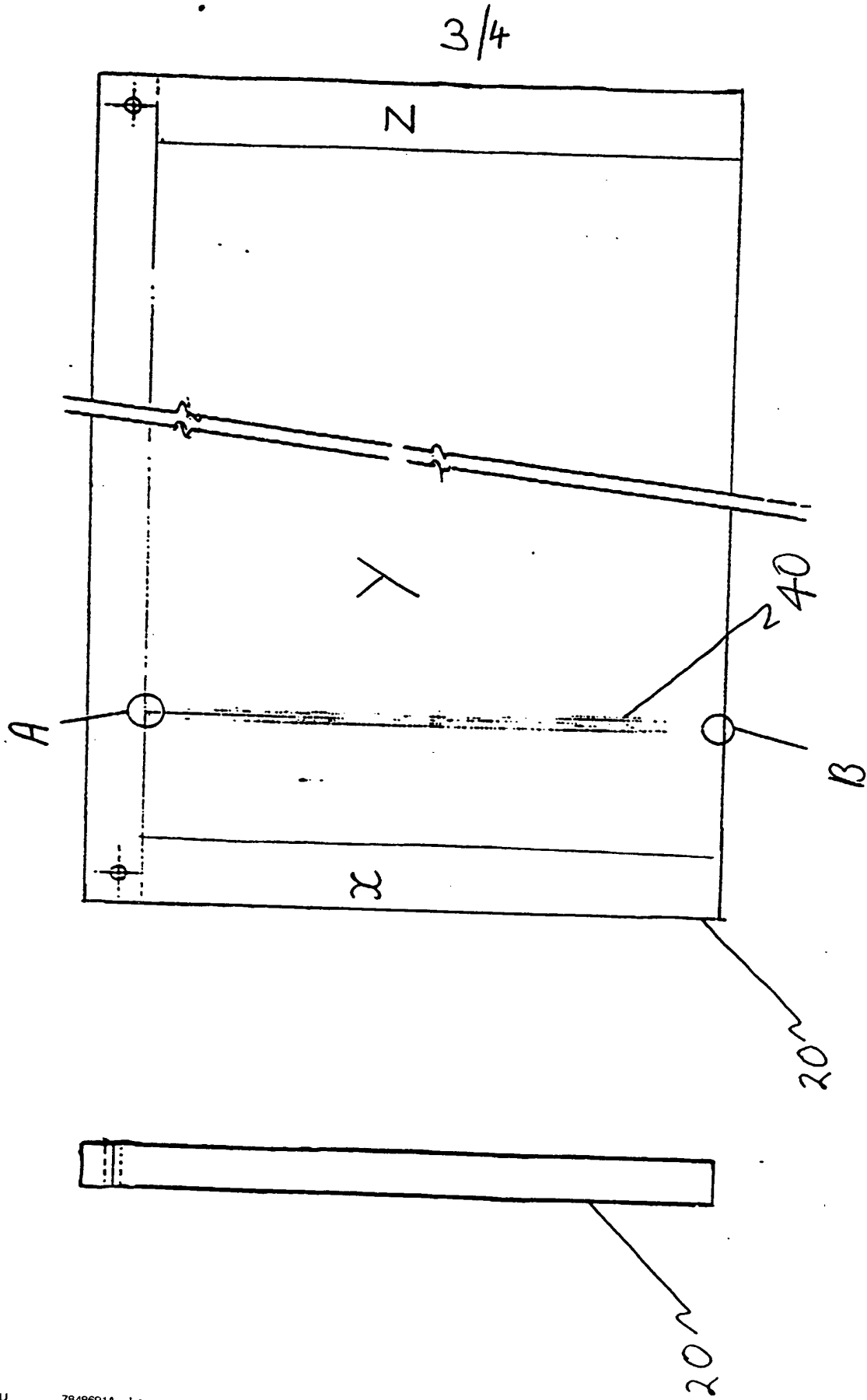


FIGURE 3A.

FIGURE 3B

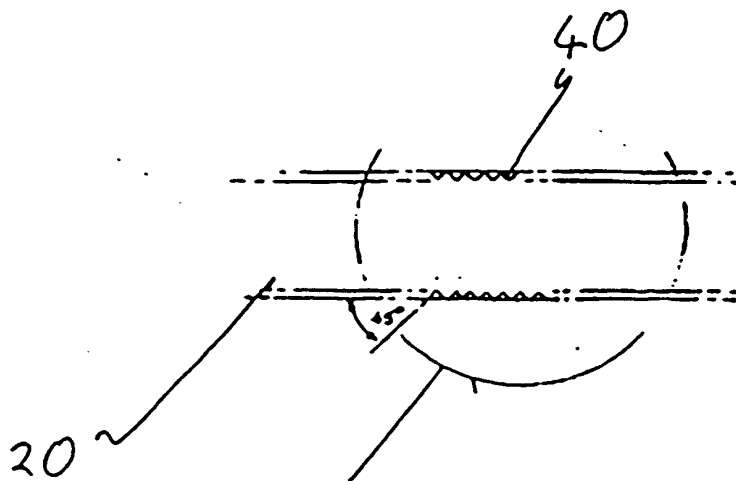


FIGURE 4A

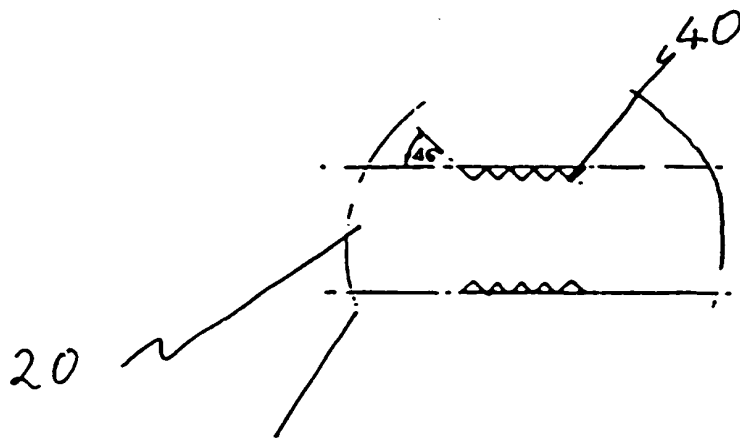


FIGURE 4B

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## PATENT SPECIFICATION



Application Date: March 20, 1939. No. 8849/39.

523,706

Complete Specification Left: March 1, 1940.

Complete Specification Accepted: July 19, 1940.

### PROVISIONAL SPECIFICATION

#### Improvements in or relating to Display and Advertising Devices

I, HORACE ARTHUR MOORE, a British Subject, of 479, Green Lane, Goodmayes, Essex, do hereby declare the nature of this invention to be as follows:—

5 This invention relates to display and advertising devices of the type (hereinafter referred to as the type described) having a body portion comprising a sheet of transparent material provided with ornamentation, patterns, letters, legends or the like. This device may be used with or without artificial illumination which, when employed, is preferably arranged to direct light rays edgewise into the body portion.

10 The invention has for its main object to provide an improved construction of device of the type described having ornamentation, letters or the like applied in a novel manner.

15 According to the invention there is provided a display or advertising device of the type described, whereof the body portion is provided in its rear face with a plurality of holes or recesses arranged in spaced relation to form the ornamentation, pattern, design, figure, one or more letters, legends or the like.

20 Preferably, the recesses are circular, and they may be wholly or partly of tapered or conical formation.

25 The recesses may be of various depth which preferably increases progressively in a direction from one edge of the body portion towards its opposite edge.

30 The sides of the holes or recesses are preferably of a light-diffusing nature, e.g. roughened or frosted.

35 A simple form of display device according to the invention consists of a rectangular strip of glass-clear transparent material, e.g. regenerated cellulose, or a non-inflammable cellulose derivative, such as cellulose acetate, or any of the similar materials, such as synthetic resins, which are available at the present day, having polished edges and a row of conically tapered circular recesses made centrally in one side of the strip. The sides of the recesses are rough so as to be light-diffusing, and the recesses gradually increase in depth from one end of the row to the other. When the strip

is illuminated edgewise at its end having the shallowest recess, and it is viewed by an observer facing the non-recessed side, the recesses have the appearance of luminous projections formed on the non-recessed side of the strip.

When a rectangular sheet of transparent material has a circular row of recesses surrounding a design, e.g. representing a butterfly, also formed by recesses, the recesses of the circular row nearest the edge to be illuminated will be shallower than those more remote from that edge, the depth of which more remote recesses preferably increases successively until it attains a maximum at those recesses nearest the opposite edge. Similarly, some of the recesses forming the design are preferably deeper than others.

A device as set forth above may have a light filter at one or more edges of the body portion, for ensuring that only rays of a predetermined colour or colours shall pass into the body through its edge.

A marginal portion of the body may be of channel section for receiving a light filter.

In some cases, that side face of the body portion which is recessed, may be provided wholly or partly with a dark opaque sheet of material or a darkened background for enhancing the appearance of the device in daylight.

If desired, the said side face may be covered wholly or partly with a reflector or a reflecting background for the same purpose.

One or more marginal portions of the sheet of transparent material may be bent so as to lie out of the general plane of the sheet. It is found that when the unbent flat portion of the sheet is illuminated edgewise, the bent portion is also illuminated. This bent portion may also be provided with holes or recesses.

The invention also provides the combination with a neon lamp, preferably of extended form, of a device as set forth above, arranged with its body portion placed edgewise in relation thereto.

In some cases two devices may be

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situated at opposite sides of the neon lamp of elongated form.

Alternatively, a described device may be suspended from or otherwise mounted in relation to an electric incandescent lamp so as to be illuminated edgewise by the same.

A shop window pelmet may also be constituted by a device as set forth above.

In some cases, two or more sheets, each made as described above, may be placed one in front of another, and one or more of them may be movable, e.g. rotatable in relation to another.

The invention is not restricted to the precise constructional details described above, as the improved display device has wide application. A few examples of its use are the dials of instruments on aero-

planes, motor cars, and elsewhere, direction indicators and displayed matter on transport services, and ornaments for personal wear. Several sheets on dials may be illuminated by one source of light common to them all. Also, in some cases, the recesses may be made in a face of a sheet which slants in relation to the opposite face, in which case the sheet is of tapered cross-section, and the recesses may all be of the same depth.

Moreover, in some cases, glass sheets may be employed.

Dated this 20th day of March, 1939.

BOULT, WADE & TENNANT,  
111/112, Hatton Garden, London, E.C.1,  
Chartered Patent Agents.

### COMPLETE SPECIFICATION

#### Improvements in or relating to Display and Advertising Devices

I, HORACE ARTHUR MOORE, a British Subject, of 479, Green Lane, Goodmayes, Essex, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to display and advertising devices of the type (hereinafter referred to as the type described) having a body portion comprising a sheet of transparent or translucent material provided with ornamentation, patterns, letters, legends or the like, for use with artificial or daylight illumination arranged to direct light rays edgewise into the body portion.

It has heretofore been proposed to provide an illuminated sign of the type described comprising one or more glass plates bearing an etched design whereof portions were incised to varying depths to refract the light rays with different degrees of intensity.

The invention has for its main object to provide an improved construction of device of the type described having ornamentation, letters or the like applied in a novel manner in order to enhance the appearance of the device when it is illuminated by artificial light.

According to the invention there is provided a display or advertising device of the type described, whereof the sheet forming the body portion is provided in its rear face with a plurality of recesses arranged in spaced relation to form the ornamentation, pattern, design, figure, one or more letters, legends or the like, which device is characterised in that the

recesses are circular and their sides are of a light-diffusing nature, such as roughened or frosted.

The recessed sheet is preferably composed of non-vitreous material, and one or more of its recesses may be wholly or partly of tapered or conical formation. Also, the recesses may be of various depth which increases progressively in a direction from one sheet-edge that is to be illuminated towards an opposite edge.

In other words, the distance between the front face of the recessed sheet and the bottom of its recesses may decrease progressively in a direction from one edge of the sheet towards the opposite edge, and when the recessed sheet is of tapered cross-section the recesses may be of equal depth.

Several embodiments of the invention are diagrammatically illustrated by way of example in the accompanying drawings, wherein:—

Figure 1 is a rear elevation, and

Figure 2 is a vertical section taken on the line 2—2 in Figure 1 showing one form of display device, partly broken away, according to the invention;

Figures 3 and 4 are perspective views showing two modified forms;

Figures 5, 6 and 7 are vertical sections showing other forms;

Figure 8 is a rear elevation, and

Figure 9 is a vertical section taken on the line 9—9 in Figure 8 showing another form;

Figure 10 is a rear elevation, and

Figure 11 is a vertical section taken on the line 11—11 in Figure 10 showing another form;



Figure 12 is a front elevation, and Figure 13 is a perspective view showing two other forms;

Figure 14 is a vertical section showing a rotary device according to the invention and

Figure 15 is a front elevation showing part of another rotary device according to the invention, and

Figure 16 is a vertical section taken on the line 16—16 in Figure 15.

Like reference characters designate like parts throughout the several views.

Referring first to Figures 1 and 2, a sheet 20 of glass-clear, preferably non-vitreous, transparent material, e.g. regenerated cellulose, or a non-inflammable cellulose derivative such as cellulose acetate, or any of the similar materials, such as synthetic resins, which are available at the present day, with polished edges, constitutes the body portion of a display device, and has a vertical row of circular recesses 22 formed in its rear face. These may be cylindrical, or conical, or, as shown, partly cylindrical and partly tapered or conical. The sides of these recesses are rough so as to be light-diffusing, and the recesses gradually increase in depth from one end of the row to the other. The shallower recesses are situated adjacent to the upper polished edge 24 of the sheet through which light rays, indicated by an arrow 26, enter the sheet from daylight illumination or from a source of artificial light, e.g. an electric lamp, not shown. When the sheet is illuminated edgewise in the dark, and it is viewed by an observer facing the front non-recessed side face 28, the device has a striking appearance and the recesses appear as luminous projections formed on the face 28. In some cases the sheet 20 may consist of coloured translucent material.

Figure 3 shows an ornamental display device comprising a sheet 20 having a circular row 30 of recesses surrounding a design 32 representing a butterfly also formed by recesses. The recesses of the circular row nearest the top edge 24 are shallower than those more remote from that edge, and the depth of all the recesses of the row progressively increases until it attains a maximum at those recesses nearest the lower opposite edge. Similarly, some of the recesses forming the design 32 are preferably deeper than others. The sheet 20 is carried by a metal mount 36, and has at the rear a dark opaque sheet of material 38. Alternatively, the rear face of the sheet may be darkened by a coat of paint or may be provided with a reflecting background,

for enhancing the appearance of the device in daylight.

Figure 4 shows a display device similar to that shown in Figure 3 but having a sheet of coloured translucent material 40 arranged in front of the body portion 20 of the device.

As shown in Figure 5, when the body portion 20 is of tapered cross-section the recesses 42 in its rear face may be of equal depth and so arranged that the distance between the front face 28 and the bottom of the recesses decreases progressively in a direction from the upper edge 24 towards the lower opposite edge.

The marginal portion of the sheet through which the light rays 26 enter may be of channel section, as shown at 44 in Figure 6, for receiving a light filter 46. When such a light filter is provided at one or more edges, it ensures that only rays of a predetermined colour or colours shall pass into the sheet.

One or more marginal portions of the sheet 20 may be bent, as shown at 48 and 50 in Figure 7, so as to lie out of the general plane of the sheet. It is found that light rays 26 entering a bent portion, which if desired may be provided with recesses, serve for illuminating the entire device.

Figures 8 and 9 show a sheet 20 having at 52 the letter L, whereof the down stroke 54 is a vertical recess of elongated form being in the direction of the light rays 26 and deeper at its lower end than at its upper end, the cross stroke 56 of the letter being formed by a horizontal recess equal in depth throughout its length to the depth of the lower end of the recess 54. The recesses 58 provided are small and circular, and are formed in the bottom of the elongated recesses 54 and 56.

Figures 10 and 11 show a letter T formed by two recesses 60 and 62 similar in shape respectively to the recesses 54 and 56 with a row of small circular recesses 64 surrounding the elongated recesses.

As shown in Figure 12, a shop window peltet comprising a translucent sheet 20 provided with a row of recesses 22 may be made in a similar manner.

Figure 13 shows a neon or other electric lamp 66 of elongated form having a recessed sheet 20 arranged edgewise in parallel relation thereto and spaced a short distance from it. If desired, more than one sheet 20 may be illuminated artificially by the same lamp, e.g. at opposite sides thereof. In this way the illuminated display effect of a single lamp is greatly increased.

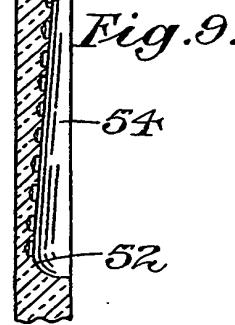
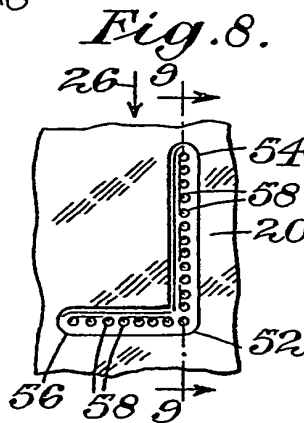
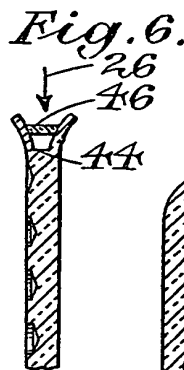
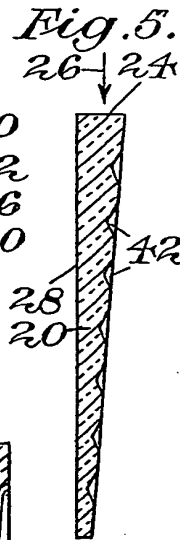
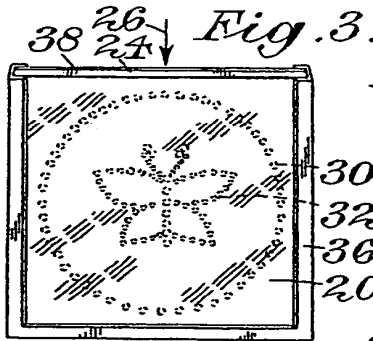
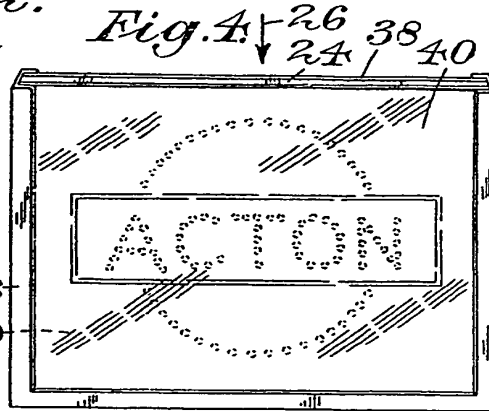
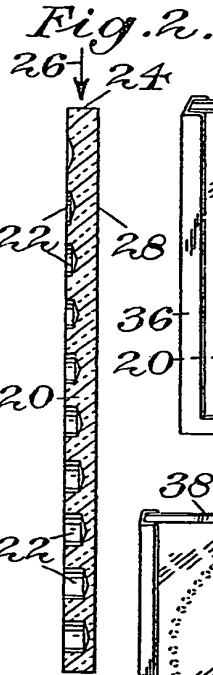
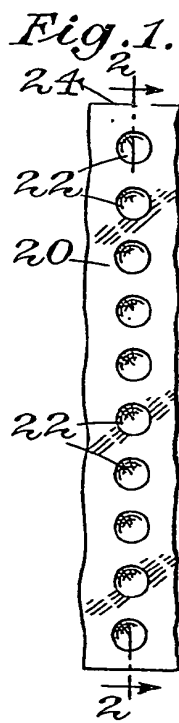
In some cases two or more sheets, each

- made as described above, may be arranged to be movable, e.g. rotatable, one in relation to another. As shown in Figure 14, two circular sheets 68 and 70 are arranged side by side and are provided each with recesses 22 that are deeper as they approach a centre shaft 72, on which the sheet 68 is fixed, and about which the sheet 70 is rotatable.
- 10 Referring to Figures 15 and 16, a sheet 20 forms part of the body portion of an instrument board such as is used on a motor-car or aircraft, and has marked on it a plurality of dials 74 each having a circular aperture in which is rotatable a disc 76 provided with an index 78 formed by a row of recesses. Each disc 76 is carried by a spindle 80 of an instrument 81 and is rotatable within the sheet 20 which may be illuminated edgewise at any convenient situation, e.g. by an electric incandescent lamp 82 arranged at the centre and protected by a cover plate 84.
- 25 It will be appreciated from the above that the invention is applicable to the manufacture of many kinds of display and advertising devices, including direction indicators, ornaments for personal wear, and also for the decoration of furniture, household utilities, stands for various purposes and trade effects. When the display device has a suitable construction, e.g. as shown in Figure 4, it may be suspended from an electric incandescent lamp or its holder so as to be illuminated edgewise by the lamp.
- 30 Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—
1. A display or advertising device of the type described, whereof the sheet forming the body portion is provided in its rear face with a plurality of recesses arranged in spaced relation to form the ornamentation, pattern, design, figure, one or more letters, legends or the like, characterised in that the recesses are circular and their sides are of a light-diffusing nature, such as roughened or frosted.
2. A device according to claim 1, wherein one or more of the recesses are wholly or partly of tapered or conical formation.
3. A device according to claim 1 or claim 2, wherein the recesses are of various depth which increases progressively in a direction from one sheet-edge that is to be illuminated towards an opposite edge.
4. A device according to claim 1 or claim 2 wherein the distance between the front face of the recessed sheet and the bottom of the recesses decreases progressively in a direction from one edge of the sheet towards its opposite edge.
5. A device according to claim 4, wherein the recessed sheet is of tapered cross-section, and the recesses are of equal depth.
6. A device according to claim 1, wherein one or more recesses of elongated form lie in the direction of the light rays, and are deeper at one end than at the other end which is nearer the source of artificial illumination, and circular recesses of equal or various depth are formed in the bottom of a said elongated recess.
7. A device according to any of the preceding claims having a light filter at that edge of the recessed sheet through which the light rays enter it, characterised in that the light filter is accommodated in a marginal portion of the sheet of channel section.
8. A device according to any of the preceding claims, wherein the recessed sheet is composed of non-vitreous material.
9. A device according to any of the preceding claims, wherein the rear face of the recessed sheet is provided with an opaque background, characterised in that the background is reflecting, for enhancing the appearance of the device in daylight.
10. A device according to any of the preceding claims, wherein a marginal portion of the recessed sheet, through the edge of which the artificial light enters, is bent so as to lie out of the general plane of the body portion of the device.
11. A device according to any of the preceding claims 1 to 8 in the form of a shop-window pelmet.
12. The combination of a plurality of devices according to any of the preceding claims 1 to 8 arranged one rotatable in relation to another.
13. A combination of devices according to claim 12 wherein the devices are arranged side by side, or one within another.
14. A display device as shown in Figures 1 and 2 or as modified according to any of the additional Figures of the drawings.

Dated this 1st day of March, 1940.  
BOULT, WADE & TENNANT,  
111/112, Hatton Garden, London, E.C.1,  
Chartered Patent Agents.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1940.

[This Drawing is a reproduction of the Original on a reduced scale.]





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Fig. 10.

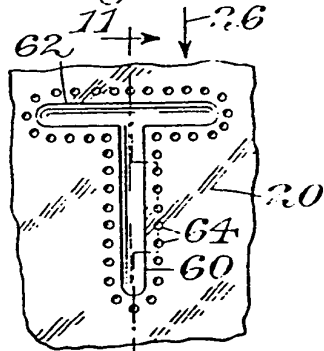


Fig. 12.

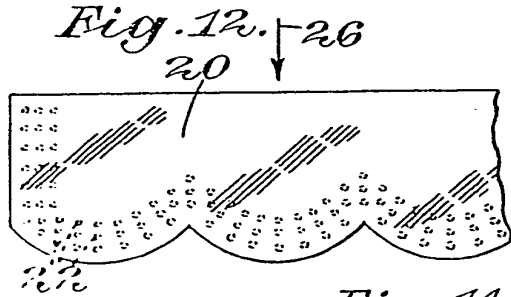


Fig. 11.

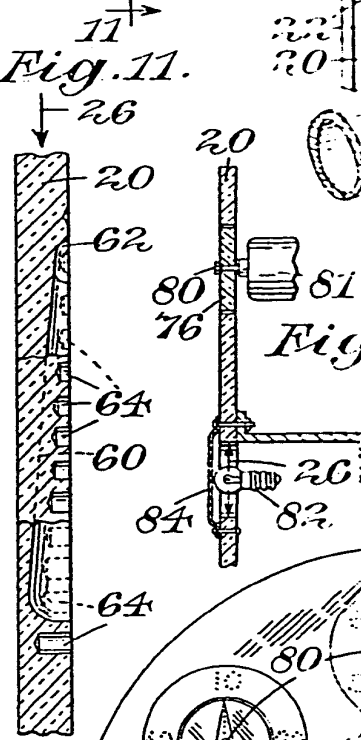


Fig. 14.

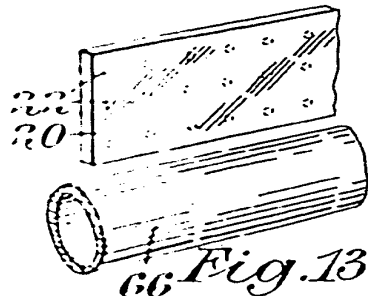
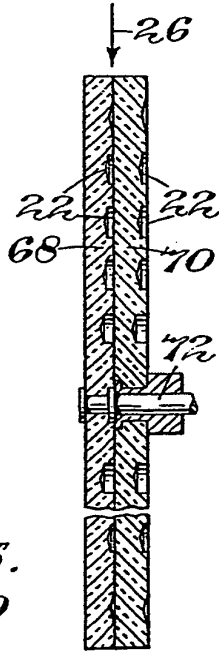
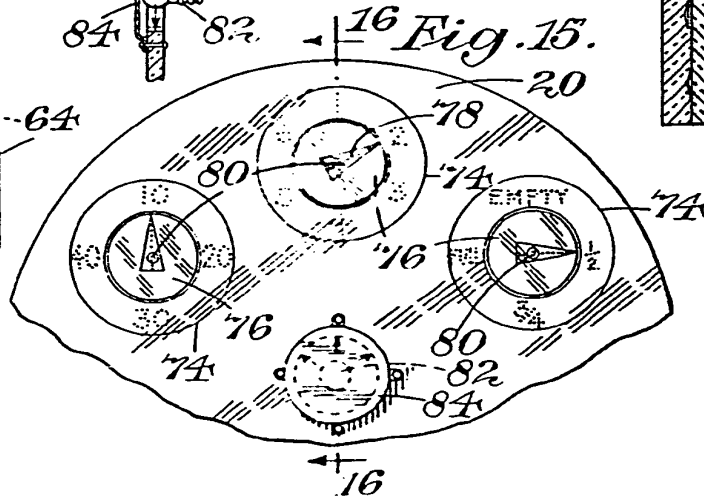
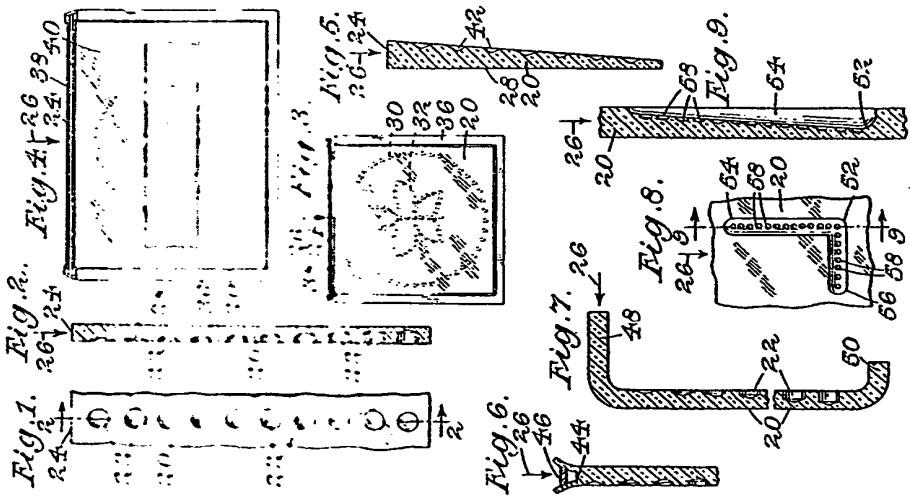
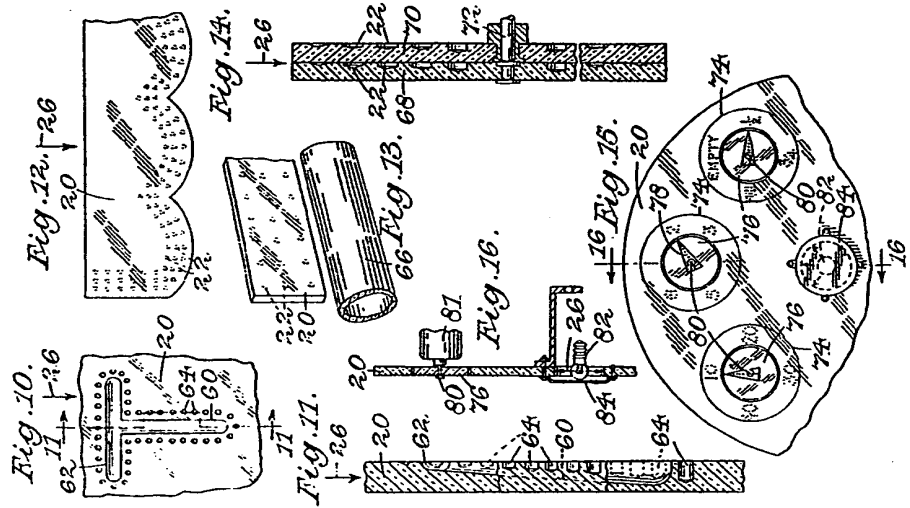


Fig. 13.

Fig. 16.





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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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**(71) Applicant (for all designated States except US):** ASHLAR SCREENPRINTS PTY. LTD. [AU/AU]; 1 Boundary Road, Mordialloc, VIC 3195 (AU).

**(72) Inventor; and**  
**(75) Inventor/Applicant (for US only):** ASHALL, John [AU/AU]; 123 Wooralia Drive, Mount Eliza, VIC 3195 (AU).

**(74) Agent:** WATERMARK; 2nd Floor, The Atrium, 290 Burwood Road, Hawthorn, VIC 3122 (AU).

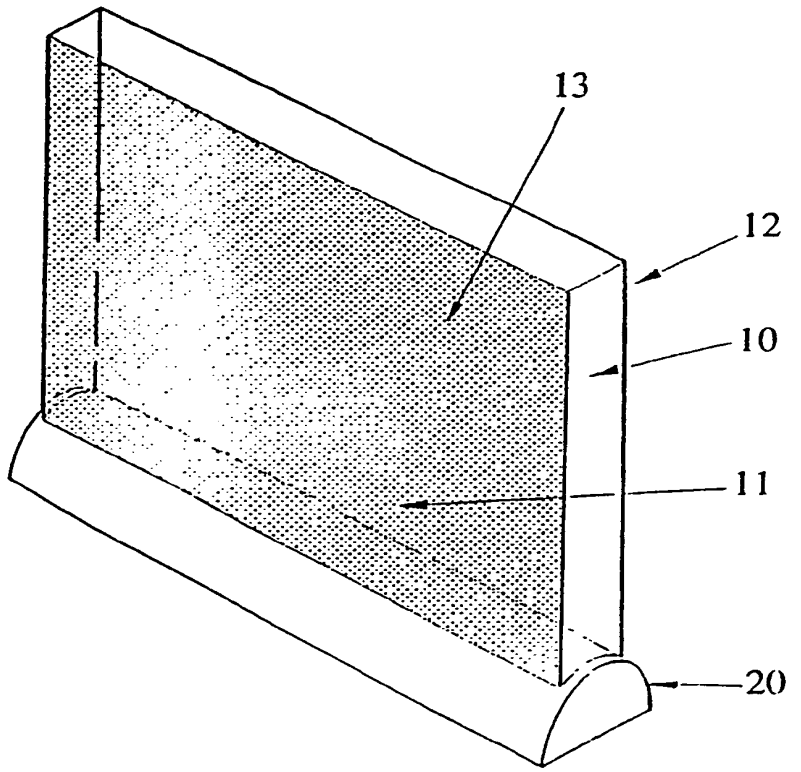
**(81) Designated States:** AT (European patent), AU, BE (European patent), BR, CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent), US.

**Published**  
*With international search report.*

**(54) Title:** A DISPLAY SYSTEM

**(57) Abstract**

The invention provides a novel illuminated display system wherein the system has at least one transparent sheet (10) having two opposing surfaces (11 and 12), wherein at least one of these surfaces has a matrix of dots (13) applied to its surface. It is preferred that both surfaces have the matrix of dots applied thereto. The display system is illuminated by a light source on the edge of the sign. The display system can be one-sided or double-sided.



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A DISPLAY SYSTEM

The invention relates to a novel display system, and to in particular illuminated display boards.

Originally, illuminated display boards were essentially display boards with an external light source. For example, a billboard with lights. Smaller displays were generally even less sophisticated and were not even illuminated.

As the market grew and the need for advertising increased so has the need for more sophisticated but just as simple display systems.

With the advent of translucent plastics, back-illuminated signs and displays have become very popular. This type of system essentially comprises a bank of lights, generally the fluorescent variety with a translucent sheet with the sign applied thereto; either by the way of painting or etching and the like. Large banks of lights are often required to illuminate the entire surface of the signs. A disadvantage of such back-illuminated signs is that a large number of lights are required, increasing running costs and maintenance costs since they are continually needing to be replaced. Furthermore, when one light needs to be replaced generally the entire sign needs to be dismantled, which is a great inconvenience when a large sign is involved.

Clear sheet materials with the sign directly applied to the surface have recently been used. However, the problem with these types of signs/displays, as with the back-illuminated signs, a number of lights are required to fully illuminate the sign. In this case the display requires a light source along each edge of the sheet in order for the sign to be illuminated and even then the middle portion of the display is not illuminated to the same degree as the edges.

The prior art has attempted to increase the degree of illumination of translucent and transparent mediums and generally these attempts have not been particularly successful when applied to larger areas which is often the case with signs. Illumination of a small area is generally easier and an attempt at increasing the illumination of a small area is discussed in U.S. Patent No. 3,241,256. This patent dealt with providing uniform brightness on instrument dials, scales and indicator tapes, generally small in nature. A dot pattern was applied to the rear side of the light transmitting block only wherein the block is supported by a plate. As with previous systems, when larger areas are required to be illuminated, a number of light sources are required to fully illuminate the entire area of the sign.

The present invention provides a novel illuminated display system which reduces the number of lights required to illuminate the same size display and also alleviate some of the other problems of the prior art.

5 The invention provides an illuminated display system comprising at least one transparent sheet having two opposing surfaces, wherein at least one of said surfaces has a matrix of dots substantially covering said surface. Most preferably, each of said surfaces has a matrix of dots substantially covering said surface.

10 The invention also provides an article for use in an illuminated display system comprising a transparent sheet having two opposing surfaces, wherein at least one of said surfaces has a matrix of dots substantially covering said surface. Most preferably, each of said surfaces has a matrix of dots substantially covering said surface.

The invention further provides an article for fixing on to a transparent sheet used in an illuminated display system comprising a transparent film with a matrix of dots applied thereto.

15 Surprisingly and advantageously, the illuminated display system of the present invention with a dot matrix applied to both sides of the transparent sheet, provides greater and more even illumination of the sign. This is also true for large signs. The prior art does not discuss this important finding and the theory does not predict that by applying a dot matrix to both sides would enhance illumination significantly. Also by  
20 using the system, maintenance is reduced as well as the power requirements.

The light source is generally fixed to only one edge of the transparent sheet. Only in very large signs may another light source be required on another edge.

Furthermore, the density of dots preferably increases along the transparent sheet in the direction from the edge where the light source is to be fixed.

25 To increase the density of dots the dots can either increase in number and the gaps between the dots decreases in size or alternatively, the gaps between the dots stay the same and the size of the dots increases.

30 "Dots" used in the specification and in the claims can be of any shape, for example square, round, rectangular, triangular and in fact can be of irregular shape. The dots are translucent or opaque and more preferably light-coloured for example, white.

The dots can be applied to the transparent sheet by etching, painting, screen printing or any other means of applying a medium to a transparent sheet. Alternatively, the matrix of dots may be applied to a transparent film which then may be adhered to the transparent sheet.

35 The transparent sheet may be glass or plastic but is preferably acrylic.

Generally to form the sign, in the case of a one-sided sign, a backing plate is provided which is generally opaque and light in colour, preferably white.

In the case of a two-sided sign, another sheet with a light coloured face, preferably white, facing the dot matrix of the transparent sheet, is attached. This other sheet may be plain or have the sign applied to the other side. This other sheet should be sufficiently translucent to allow some light to pass through and illuminate the sign. The other sheet may be made of any material including plastics and paper.

The light source can be retained in a carrier which can also act as a support for the transparent sheet. Preferably the light source is a fluorescent tube or depending on the size of the display, a number of tubes.

Figure 1 illustrates a preferred embodiment of an illuminated display system of the present invention.

Figure 2a illustrates a preferred embodiment of a one-sided sign.

Figure 2b illustrates a preferred embodiment of a two-sided sign.

Item 10 illustrates a transparent sheet 10 with the matrix of dots 13 applied to the surface 11. A matrix of dots 13 is also applied to the other side 12.

The transparent sheet 10 can be accommodated in a carrier 20 which also houses a light source (not shown). It should be noted that the light source can be affixed in alternate ways, providing the light source is substantially on the edge of the transparent sheet 10.

Figure 2a illustrates an arrangement for a one-sided sign in accordance with the invention. Transparent sheet 10 with dot matrix 13 applied to both sides 11 and 12. A backing sheet 14 which is opaque and preferably white in colour is fixed to the transparent medium 10. The figure illustrates that there is a gap between each of the layers for clarity only, in practice the layers would be in substantial contact with each other. Sheet 15 has the sign printed on its front side. The side in substantial contact with transparent sheet 10 is light in colour and generally white. Sheet 15 is sufficiently translucent to allow some light to pass through the sheet and illuminate the sign. Materials found to be sufficiently translucent include paper (for example posters) and plastic materials.

Figure 2b illustrates an arrangement for a two-sided sign in accordance with the invention. In the case of a two-sided sign, sufficiently translucent sheets 16 are fixed to the transparent sheet 10 with dot matrix thereon. These sheets 16 may be plain or have the sign applied to the outer face of the sheet. The face contacting the transparent sheet 10, at least, is light coloured and preferably white. Similarly if the sheet 16 is plain, the sheet is preferably light coloured and more preferably white. In the case where sheets 16 are plain, further sheets 17 may be incorporated into the sign system, wherein the sheets 17 have the sign applied thereto. Once again sheets 17 are sufficiently translucent to allow some of the light to pass through and illuminate the sign. Similarly for the one-sided sign sheet 15 may be plain and an additional translucent sheet (not shown) can be fixed in front of the plain sheet 15.

Framework (not shown) or the like, can be used to secure all of the layers together. Similarly the carrier and light source housing 20 can also retain the translucent sign sheet.

To more clearly illustrate the present invention tests were conducted on different sized signs wherein the dot matrix in the first instance is only applied to one side of the transparent medium. The dot matrix in this preferred embodiment is applied by screen printing white dots directly on to the transparent material, in this case perspex. The density of the dot matrix, as indicated previously, increases away from the light source.

Secondly, the dot matrix is applied to both sides of the transparent medium in the same way as for the one-sided application.

In both cases only one edge of the sign had a lighting means attached thereto and fluorescent lighting was used. Furthermore, only one-sided signs were formed, and thus an opaque white backing sheet was used in the trials.

Light meter readings were taken at two positions on each of the signs, midway from the light source and at the opposite end of the light source.

The results of the tests are shown below:

Table 1

Size of Sign (cm x cm)		Light Meter Reading (Lux)		(cm) Distance from light source light travelled
		Midway from light source	At Opposite end of light source	
30 x 16	one-sided	3400	2400	16
	two-sided	2600	2400	
30 x 30	one-sided	1500	1250	30
	two-sided	1950	1450	
60 x 45	one-sided	475	435	45
	two-sided	810	685	
60 x 60	one-sided	440	300	60
	two-sided	720	440	

5 The test results clearly indicate a marked improvement of the illumination of the sign when the dot matrix is applied to both sides of the transparent medium. This is especially true in the middle of the sign wherein most of the message to be illuminated is placed. Furthermore the effectiveness of the dot matrix is still good even for larger sizes.

10 The display system in accordance with the invention can be used in small and very large displays and advantageously providing good illumination without the large number of lights previously required. Manufacturing and maintenance of the signs is less time consuming and simpler.

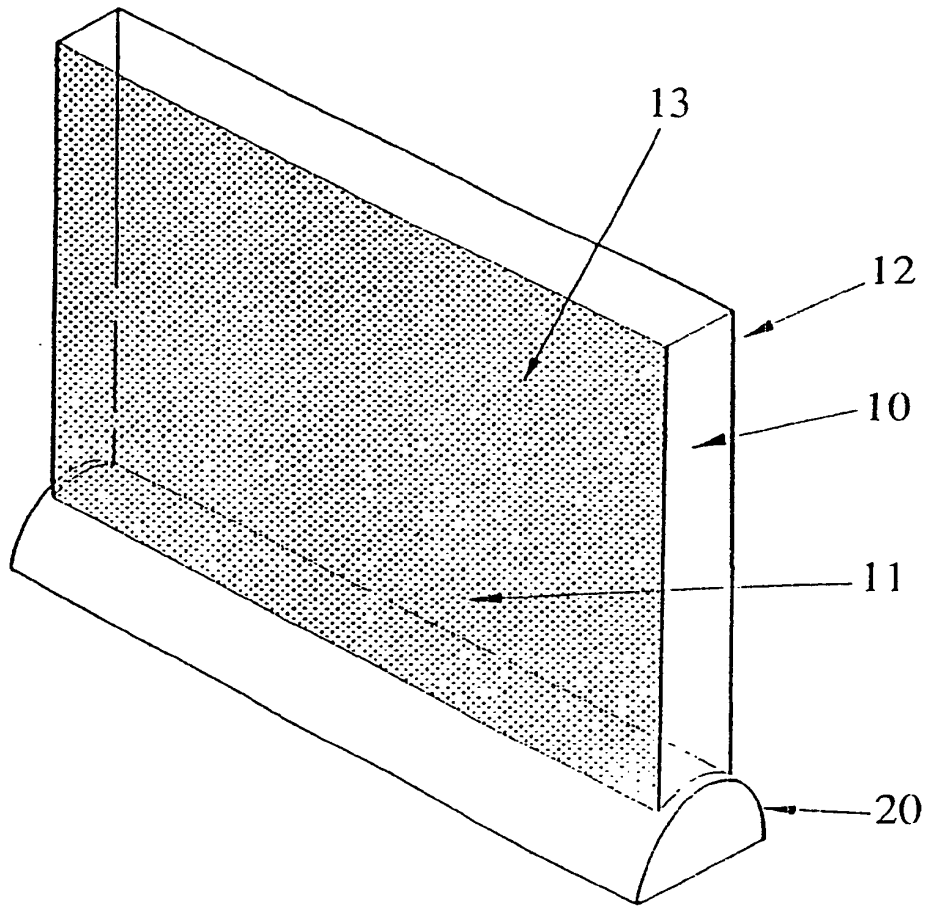
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An illuminated display system comprising at least one transparent sheet having two opposing surfaces, wherein at least one of said surfaces has a matrix of dots substantially covering said surface.
2. The illuminated display system of claim 1 wherein each of said surfaces has a matrix of dots substantially covering said surface.
3. The illuminated display system of claims 1 or 2 wherein the dots are translucent or opaque.
4. The illuminated display system of any one of claims 1-3, further comprising at least one sufficiently translucent sheet with at least one light-coloured surface.
5. The illuminated display system of claim 4 wherein the at least one sufficiently translucent sheet has one light coloured surface and this surface contacts one of the surfaces of the at least one transparent sheet with the matrix of dots thereon.
6. The illuminated display system of claim 5 wherein there is one sufficiently translucent sheet and a light-coloured opaque sheet which contacts the other surface of the at least one transparent sheet with the matrix of dots thereon.
7. The illuminated display system of any one of claims 1-6 wherein the matrix of dots is configured such that the density of dots in number and/or size increases away from a light source.
8. An article for use in an illuminated display system comprising a transparent sheet having two opposing surfaces, wherein at least one of said surfaces has a matrix of dots substantially covering said surface.
9. The article of claim 8 wherein the matrix of dots are applied to the transparent sheet by etching, painting, screen-printing or as a transparent film with the matrix of dots applied thereto and the film then adhered to the transparent sheet.

10. An article for fixing on to a transparent sheet used in an illuminated display system comprising a transparent film with a matrix of dots applied thereto.

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Fig 1.





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Fig 2b

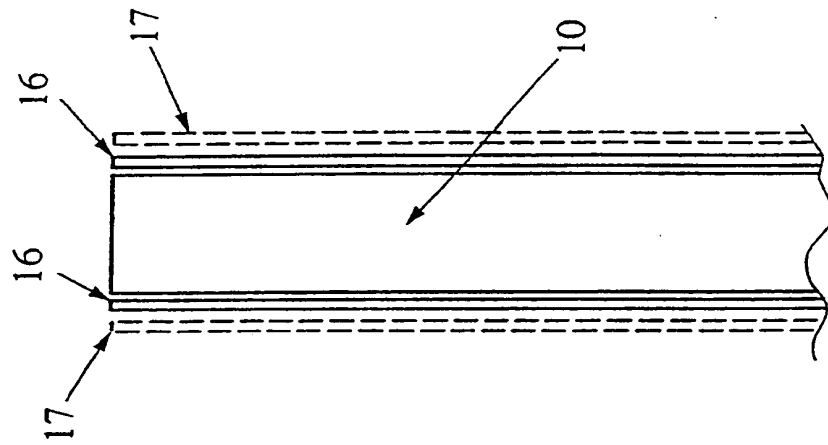
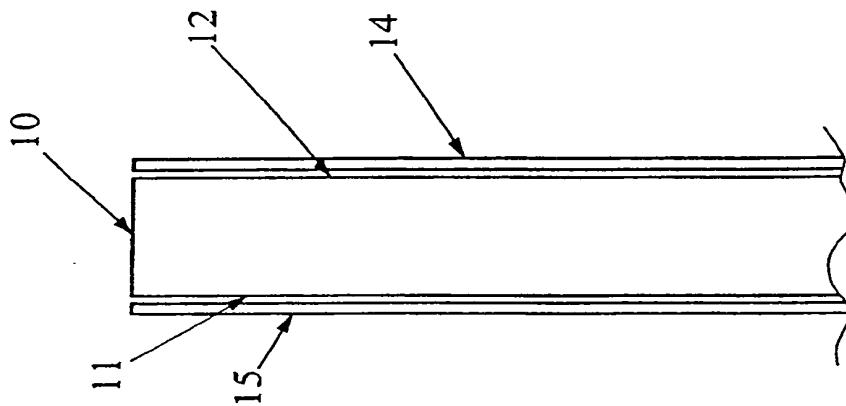



Fig 2a



## INTERNATIONAL SEARCH REPORT

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>				
According to International Patent classification (IPC) or to both National Classification and IPC Int. Cl. <sup>5</sup> G09F 13/18				
<b>II. FIELDS SEARCHED</b>				
Minimum Documentation Searched <sup>7</sup>				
Classification System	Classification Symbols			
IPC	G09F 13/18			
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched <sup>8</sup>				
AU IPC as above.				
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>				
Category <sup>*</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate of the relevant passages <sup>12</sup>	Relevant to Claim No <sup>13</sup>		
X	Patent Abstracts of Japan, P1156, page 157, JP,A, 2-269382 (MEITAKU SYST KK) 2 November 1990 (02.11.90).			
X	Patent Abstracts of Japan, P1101, page 11, JP,A, 2-157791 (FUJITSU LTD) 18 June 1990 (18.06.90).			
A,P	US,A, 4975809 (KU) 4 December 1990 (04.12.90) see whole document			
A,P	US,A, 4974354 (HEMBROOK, JR) 4 December 1990 (04.12.90) see whole document.			
A	US,A, 4715137 (SCHEVE) 29 December 1987 (29.12.87) see whole document. (continued)			
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<b>IV. CERTIFICATION</b>				
Date of the Actual Completion of the International Search 18 December 1991 (18.12.91)		Date of Mailing of this International Search Report 24 December 91		
International Searching Authority <b>AUSTRALIAN PATENT OFFICE</b>		Signature of Authorized Officer A. EVANS 		

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

A

AU,A, 49428/85 (MARK NINE ENGINEERING (PROPRIETARY) LIMITED)  
15 May 1986 (15.05.86) see whole document.

V.  OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>1</sup>

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

1.  Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:
2.  Claim numbers ..., 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.  Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4a

VI.  OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>2</sup>

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

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3.  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 claim numbers:
4.  As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.

**ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 91/00436**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member
JP 2269382	
JP 2157791	
US 4975809	
US 4974354	
US 4715137	
AU 49428/85	ZA 8508575

END OF ANNEX



UNITED STATES PATENT AND TRADEMARK OFFICE

*br*

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/298,367	11/18/2002	Jeffery R. Parker	GLOLP0106USD	3656

7590                      06/29/2004  
 Donald L. Otto  
 Renner, Otto, Boisselle & Sklar, LLP  
 19th Floor  
 1621 Euclid Avenue  
 Cleveland, OH 44115-2191

EXAMINER

ASSAF, FAYEZ G

ART UNIT	PAPER NUMBER
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2872

DATE MAILED: 06/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/298,367	<b>Applicant(s)</b> PARKER ET AL.	
	<b>Examiner</b> Fayez G. Assaf	<b>Art Unit</b> 2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1)  Responsive to communication(s) filed on 14 June 2004.
- 2a)  This action is **FINAL**.
- 2b)  This action is non-final.
- 3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4)  Claim(s) 1-8,10-23,26-33 and 53-55 is/are pending in the application.
  - 4a) Of the above claim(s) 26-33 is/are withdrawn from consideration.
- 5)  Claim(s) \_\_\_\_\_ is/are allowed.
- 6)  Claim(s) 1-8,10-23 and 53-55 is/are rejected.
- 7)  Claim(s) \_\_\_\_\_ is/are objected to.
- 8)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9)  The specification is objected to by the Examiner.
- 10)  The drawing(s) filed on 18 November 2002 is/are: a)  accepted or b)  objected to by the Examiner. Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11)  The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    - a)  All    b)  Some \*    c)  None of:
      - 1.  Certified copies of the priority documents have been received.
      - 2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
      - 3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1)  Notice of References Cited (PTO-892)
- 2)  Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3)  Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4)  Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5)  Notice of Informal Patent Application (PTO-152)
- 6)  Other: \_\_\_\_\_.

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**DETAILED ACTION**

***Election/Restrictions***

The status of claims is as follows:

Claims 1-8, 10-23, 26-33, and 53-55 remain in the application. Claims 53-55 are newly added. Claims 26-33 are withdrawn from consideration.

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/14/2004 has been entered.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 8, 10, 11, 14-17, 19-23, 53 and 54 are rejected under 35 U.S.C. 102(b) as being anticipated by Serizawa et al. (US 4,733,335).

Regarding claims 1-6, 8 and 10, Serizawa discloses a light emitting assembly illumination comprising a light guide (125 of Fig. 2) having at least one light input surface (see Fig. 2, and Fig. 4), one or more light emitting diodes (111's of Fig. 2) along said light input surface for supplying light to said light guide, a plurality of light extracting deformities (lenses onto light guide) on at least one surface of said light guide, said deformities having shapes (see Fig. 4) for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate (218 of Fig. 4) overlying at least one surface of said light guide, the substrate providing an exterior portion of a vehicle for vehicle illumination at said exterior portion (line 8 to line 15 of Col. 10).

Regarding claim 6, Serizawa discloses the deformities being at least one of depressions and raised surfaces on the one surface of the light guide (see Fig. 2.)



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Regarding claims 8 and 15, Serizawa discloses the deformities being a device that changes the output ray angle distribution (lenses 223 of Fig. 2).

Regarding claims 14 and 23, Serizawa discloses at least one surface of at least one of said substrate and said light guide being lenticular (see Fig. 7).

Regarding claims 16 and 22, Serizawa discloses more than one said substrate overlies said light guide (see Fig. 6).

Regarding claims 17, 19 and 20, Serizawa discloses the deformities on the substrate varying in at least shape (see 407, 406, 324 and 400 of Fig. 11) having reflective and refractive surfaces.

Regarding claim 21, Serizawa discloses the substrate having a coating (205 of Fig. 4).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 7, 12-13, 18 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Serizawa et al.

Serizawa discloses the claimed invention except for:

- the deformities varying on the surface of said light guide.
- the variations in the deformities being random, on more than one side of the light guide, or including surfaces (prismatic) having angles that vary.

However, such features are well known in illumination devices utilized in vehicles.

It would have been obvious, at the time the invention was made, to a person having ordinary skill in the art to use such optical deformities in order to provide the proper light illumination which suits particular application in a vehicle (i.e. illuminating plate, turn signals...etc.)

#### **Conclusion**

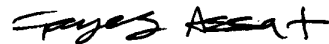
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fayez G. Assaf whose telephone number is (571) 272-2307. The examiner can normally be reached on 8-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be

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reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Faye G. Assaf  
Examiner  
Art Unit 2872

FA  
6/25/2004

<b>Notic of Referenc s Cited</b>	Application/Control No. 10/298,367	Applicant(s)/Patent Under Reexamination PARKER ET AL.	
	Examiner Fayez G. Assaf	Art Unit 2872	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
A	US-4,733,335	03-1988	Serizawa et al.	362/503
B	US-			
C	US-			
D	US-			
E	US-			
F	US-			
G	US-			
H	US-			
I	US-			
J	US-			
K	US-			
L	US-			
M	US-			

**FOREIGN PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
N					
O					
P					
Q					
R					
S					
T					

**NON-PATENT DOCUMENTS**

*	Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
U	
V	
W	
X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

**Index of Claims**



Application No.

10/298,367

Examiner

Fayez G. Assaf

Applicant(s)

PARKER ET AL.

Art Unit

2872

✓	Rejected
=	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim		Date	
Final	Original		
	1	9/19/16	
	2	✓	
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Claim		Date	
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	52	✓	
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PATENT APPLICATION FEE DETERMINATION RECORD  
Effective October 1, 2001

Application or Docket Number

10 298367

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	**
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY TYPE <input type="checkbox"/>		OTHER THAN SMALL ENTITY	
BASE FEE	ADDITIONAL FEE	BASE FEE	ADDITIONAL FEE
X39		X418=	
X42=		X84=	
+140=		+200=	
TOTAL ADDITIONAL FEE		TOTAL ADDITIONAL FEE	

*PCE*

CLAIMS AS AMENDED - PART II

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	* 33	Minus	** 52
Independent	* 1	Minus	** 6
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY OR		OTHER THAN SMALL ENTITY	
BASE FEE	ADDITIONAL FEE	BASE FEE	ADDITIONAL FEE
X39		X418=	
X42=		X84=	
+140=		+200=	
TOTAL ADDITIONAL FEE		TOTAL ADDITIONAL FEE	

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	**
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY OR		OTHER THAN SMALL ENTITY	
BASE FEE	ADDITIONAL FEE	BASE FEE	ADDITIONAL FEE
X39		X418=	
X42=		X84=	
+140=		+200=	
TOTAL ADDITIONAL FEE		TOTAL ADDITIONAL FEE	

AMENDMENT	(Column 1)	(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	**
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY OR		OTHER THAN SMALL ENTITY	
BASE FEE	ADDITIONAL FEE	BASE FEE	ADDITIONAL FEE
X39		X418=	
X42=		X84=	
+140=		+200=	
TOTAL ADDITIONAL FEE		TOTAL ADDITIONAL FEE	

\* If the entry in column 1 is less than the entry in column 2, enter "0" in column 3.  
 \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."  
 \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."  
 The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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\$ RCE 2872

PTO/SB/30 (09-03) Approved for use through 07/31/2006. OMB 0651-0031 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Request for Continued Examination (RCE) Transmittal</b>  Address to: Mail Stop RCE Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	<b>Application Number</b>	10/298,367
	<b>Filing Date</b>	November 18, 2002
	<b>First Named Inventor</b>	Jeffery R. Parker
	<b>Art Unit</b>	2872
	<b>Examiner Name</b>	Fayez G. Assaf
	<b>Attorney Docket Number</b>	GLOLP0106USD

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. **Submission required under 37 CFR 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

a.  Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

i.  Consider the arguments in the Appeal Brief or Rely Brief previously filed on \_\_\_\_\_

ii.  Other \_\_\_\_\_

b.  Enclosed

i.  Amendment/Reply

ii.  Affidavit(s) Declaration(s)

iii.  Information Disclosure Statement (IDS)

iv.  Other Petition for Extension of Time Under 37 CFR 1.136(a)

2. **Miscellaneous**

a.  Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of \_\_\_\_\_ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

b.  Other \_\_\_\_\_

3. **Fees** The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed. The Director is hereby authorized to charge the following fees, or credit any overpayments, to

a.  Deposit Account No. 18-0988 ~~xxxxxx~~ any additional

i.  RCE fee required under 37 CFR 1.17(e)

ii.  Extension of time fee (37 CFR 1.136 and 1.17)

iii.  Other \_\_\_\_\_

b.  Check in the amount of \$ 880.00 enclosed \$770-RCE filing fee  
\$110-one month ext. fee

c.  Payment by credit card (Form PTO-2038 enclosed)

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED**

Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22.125
Signature		Date	June 11, 2004

**CERTIFICATE OF MAILING OR TRANSMISSION**

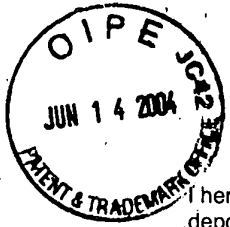
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Name (Print/Type)	Donald L. Otto	Date	June 11, 2004
Signature		Date	June 11, 2004

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450. If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

06/15/2004 WABDELRI 00000097 10298367 770.00 0P 01 FC:1801

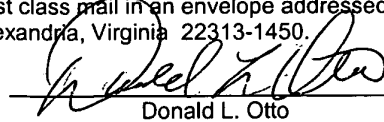




CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Date: June 11, 2004

  
Donald L. Otto

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Attorney Docket GLOLP0106USD

In re PATENT application of

Jeffery R. Parker et al

Serial No. 10/298,367

Filed November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Art Unit 2872

Confirmation No. 3656

Fayez G. Assaf, Examiner

**REPLY TO OFFICE ACTION OF FEBRUARY 12, 2004**

Mail Stop RCE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

In reply to the Office Action of February 12, 2004, please amend the above-identified application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 8 of this paper.

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

Claim 1 (currently amended): A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, one or more light emitting diodes ~~a plurality of closely spaced light sources~~ along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one surface of said light guide, said substrate providing an exterior portion of a vehicle for vehicle illumination at said exterior portion.

Claim 2 (original): The assembly of claim 1 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 3 (original): The assembly of claim 1 wherein said substrate is attached to said light guide.

Claim 4 (original): The assembly of claim 1 wherein said substrate is positioned against said light guide.

Claim 5 (original): The assembly of claim 1 wherein said substrate covers said at least one surface of said light guide.

Claim 6 (original): The assembly of claim 1 wherein said deformities are at least one of depressions and raised surfaces on said one surface of said light guide.

Claim 7 (original): The assembly of claim 1 wherein said deformities vary on said one surface of said light guide.

Claim 8 (original): The assembly of claim 1 wherein at least one of said deformities is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 9 (canceled)

Claim 10 (currently amended): The assembly of claim 1 wherein said light emitting diodes sources are attached to a circuit.

Claim 11 (currently amended): The assembly of claim 1 wherein said light emitting diodes sources are embedded, potted, bonded or molded into said light guide.

Claim 12 (original): The assembly of claim 1 wherein said deformities are on more than one surface of said light guide.

Claim 13 (original): The assembly of claim 1 wherein said deformities are on two sides of said light guide.

Claim 14 (original): The assembly of claim 1 wherein at least some deformities are on said substrate.

Claim 15 (original): The assembly of claim 1 wherein said substrate has at least one of a prismatic lens, lenticular lens, and other device that changes the output ray angle distribution.

Claim 16 (original): The assembly of claim 1 wherein more than one said substrate overlies said light guide.

Claim 17 (currently amended): ~~A light emitting assembly for vehicle illumination comprising a light guide having at least one transparent substrate overlying a surface of said light guide, both said light guide and said substrate having deformities on at least one surface of each of said light guide and said substrate,~~  
The assembly of claim 1 wherein said substrate has deformities on at least one surface of said substrate, said deformities on said substrate having shapes for controlling an output ray angle distribution of emitted light to suit a particular

application, the deformities on at least one of said light guide and said substrate varying in at least one of the following characteristics: size, shape, placement, index of refraction, density, angle, depth, height and type.

Claim 18 (original): The assembly of claim 17 wherein the variations in the deformities are random.

Claim 19 (original): The assembly of claim 17 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 20 (original): The assembly of claim 17 wherein said substrate has reflective and refractive surfaces.

Claim 21 (original): The assembly of claim 17 wherein said substrate has a coating.

Claim 22 (original): The assembly of claim 17 wherein more than one said substrate overlies said light guide.

Claim 23 (original): The assembly of claim 17 wherein at least one surface of at least one of said substrate and said light guide is prismatic or lenticular.

Claims 24 and 25 (canceled)

Claim 26 (currently amended): The assembly of claim 25 1 wherein at least one of said light guide and said substrate has at least one of a coating and surface treatment that changes, wherein the changes in said at least one of the coating and surface treatment are at least one of the following: density, color, index of refraction, reflection, opaqueness, translucence, area, depth, shape, size and type.

Claim 27 (original): The assembly of claim 26 wherein said at least one of the coating and surface treatment are at least one of the following: paint, ink, coating and epoxy.

Claim 28 (original): The assembly of claim 26 wherein the coating is selected to improve at least one of the following: color correction, opaqueness, diffusion, reflection, translucence and transmission of light.

Claim 29 (original): The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 30 (original): The assembly of claim 26 wherein the coating on at least one of said light guide and said substrate randomly changes.

Claim 31 (original): The assembly of claim 26 wherein the surface treatment of at least one of said light guide and said substrate randomly changes.

Claim 32 (original): The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate varies in shape or geometry.

Claim 33 (original): The assembly of claim 32 wherein the shape or geometry of said one surface randomly varies.

Claims 34-52 (canceled)

Claim 53 (new): The assembly of claim 1 wherein said substrate provides protection for the light guide.

Claim 54 (new): The assembly of claim 1 wherein there are a plurality of said light emitting diodes along said light input surface.

Claim 55 (new): The assembly of claim 1 wherein at least some of said deformities include prismatic surfaces having angles that vary.

## REMARKS/ARGUMENTS

Claims 1-8, 10-23, 26-33 and 53-55 remain in the application. Claims 9, 24, 25 and 34-52 are canceled. Claims 1-8, 10-23 and 53-55 read on the elected species 1. Claims 26-33 are withdrawn from consideration.

Claims 1-6, 8, 10, 14-17, 19, 20, 22 and 23 are rejected under 35 U.S.C. § 102(a) as being anticipated by Nakamura (U.S. 5,467,417). However, Nakamura relates to a prism plate which emits light to an indicator such as a liquid crystal indicator incorporating such a prism plate that is used for information indication in information processors such as personal computers, word processors and the like (see column 1, lines 11-19), not a light emitting assembly for vehicle illumination. According to the Examiner, the recitation with respect to the assembly being for vehicle illumination has not been given patentable weight because the manner in which the claimed apparatus is intended to be used does not differentiate the claimed apparatus from the cited prior art apparatus satisfying the claimed structural limitations. However, claim 1 has been amended to differentiate the claimed apparatus from Nakamura satisfying the claimed structural limitations by reciting that the substrate of the claimed light emitting assembly provides an exterior portion of a vehicle for vehicle illumination at said exterior portion, in a manner clearly nowhere disclosed or suggested in Nakamura. Accordingly, claim 1 is submitted as clearly allowable.

Claims 2-6, 8, 10, 14-17, 19, 20, 22 and 23 depend from claim 1 and are also submitted as clearly allowable.



Claims 7, 11-13, 18 and 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura. However, these claims depend from claim 1 and are submitted as allowable for substantially the same reasons. Moreover, at least claims 7, 12, 13, 18 and 21 further patentably distinguish over Nakamura by reciting other novel features in the claimed combination. Claim 7 recites that the deformities vary on said one surface of said light guide; claims 12 and 13 recite that said deformities are on more than one surface/two sides of said light guide; claim 18 recites that the variations in the deformities are random; and claim 21 recites that the substrate has a coating. The Examiner acknowledges that Nakamura does not disclose these claim features, but contends that it would have been obvious to utilize any of these features for the purposes of providing the diffused light with the appropriate intensity profile which suits the particular liquid crystal display. However, applicants' claimed invention is for a light emitting assembly for vehicle illumination wherein the substrate provides an exterior portion of a vehicle for vehicle illumination at the exterior portion; not to provide illumination of a liquid crystal display. Accordingly, it is respectfully submitted that the Examiner has modified Nakamura in light of applicants' present teachings and certainly not from any teachings or suggestions found in the prior art, which is clearly improper.

Claims 53-55 also depend from claim 1 and are submitted as allowable for substantially the same reasons in addition to reciting other novel features in the claimed combination. Claim 53 recites that the substrate provides protection for the light guide; claim 54 recites that there are a plurality of light emitting diodes

along the light input surface for supplying light to the light guide; and claim 55 recites that at least some of the deformities include prismatic surfaces having angles that vary.

Claims 26-33 are withdrawn. However, withdrawn claims 26-33 depend from claim 1 and are also submitted as allowable.

For the foregoing reasons, this application is now believed to be in condition for allowance of all of the pending claims 1-8, 10-23, 26-33 and 53-55, and early action to that end is earnestly solicited. Should the Examiner disagree with applicants' attorney in any respect, it is respectfully requested that the Examiner telephone applicants' attorney in an effort to resolve such differences.

In the event that an extension of time is necessary, this should be considered a petition for such an extension. If required, fees are enclosed for the extension of time and/or for the presentation of new and/or amended claims. In the event any additional fees are due in connection with the filing of this amendment, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 (Charge No. GLOLP0106USD).

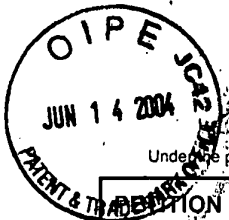
Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

By   
Donald L. Otto, Registration No. 22,125

1621 Euclid Avenue  
Nineteenth Floor  
Cleveland, Ohio 44115-2191  
Phone: 216-621-1113  
Fax: 216-621-6165

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<b>APPLICATION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b>	Docket Number (Optional) <b>GLOLP0106USD</b>
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In re Application of <b>Jeffery R. Parker et al</b>	
Application Number <b>10/298,367</b>	Filed <b>11/18/02</b>
For <b>LIGHT EMITTING PANEL ASSEMBLIES ...</b>	
Art Unit <b>2872</b>	Examiner <b>Fayez G. Assaf</b>

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and appropriate non-small-entity fee are as follows (check time period desired):

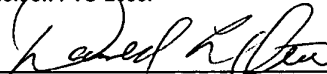
- One month (37 CFR 1.17(a)(1)) \$ 110.00
- Two months (37 CFR 1.17(a)(2)) \$ 420.00
- Three months (37 CFR 1.17(a)(3)) \$ 950.00
- Four months (37 CFR 1.17(a)(4)) \$ 1,480.00
- Five months (37 CFR 1.17(a)(5)) \$ 2,010.00

- Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee amount shown above is reduced by one-half, and the resulting fee is: \$ \_\_\_\_\_.
- A check in the amount of the fee is enclosed.
- Payment by credit card. Form PTO-2038 is attached.
- The Director has already been authorized to charge fees in this application to a Deposit Account.
- The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 18-0988.

I have enclosed a duplicate copy of this sheet.

- I am the  applicant/inventor.
- assignee of record of the entire interest. See 37 CFR 3.71.  
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).
- attorney or agent of record. Registration Number 22,125
- attorney or agent under 37 CFR 1.34(a).  
Registration number if acting under 37 CFR 1.34(a) \_\_\_\_\_.

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

June 11, 2004   
Date Signature

216-621-1113 Donald L. Otto  
Telephone Number Typed or printed name

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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### SEARCH

Class	Sub.	Date	Exmr.
362	85	9/2/03	FA
	511	↓	↓
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	545		
	487		
	459		
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update search		2/2/04	JA

### SEARCH NOTES

(List databases searched. Attach search strategy inside.)

	Date	Exmr.
consulted Eonbase in parent case regarding search	9/2/03	FA
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INTERFERENCE SEARCHED			
Class	Sub.	Date	Exmr.

**Index f Claims**



Application No.

10/298,367

Examiner

Fayez G. Assaf

Applicant(s)

PARKER ET AL.

Art Unit

2872

✓	Rejected
=	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim		Date
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/298,367	11/18/2002	Jeffery R. Parker	GLOLP0106USD	3656
	7590	02/12/2004	EXAMINER	
Donald L. Otto Renner, Otto, Boisselle & Sklar, LLP 19th Floor 1621 Euclid Avenue Cleveland, OH 44115-2191			ASSAF, FAYEZ G	
			ART UNIT	PAPER NUMBER
			2872	

DATE MAILED: 02/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.



Art Unit: 2872

**DETAILED ACTION**

***Election/Restrictions***

The status of the claims is as follows:

Claims 34-52 have been canceled.

Claims 1-33 remain in the application: claims 1-25 are pending and claims 26-33 have been withdrawn from consideration.

***Terminal Disclaimer***

The terminal disclaimer filed on 11/14/2003 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Patent 5,613,751 has been reviewed and is accepted. The terminal disclaimer has been recorded.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-6, 8, 10, 14-17, 19, 20, 22, 23 and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Nakamura (US 5,467,417.)



Art Unit: 2872

Regarding claims 1 and 10, Nakamura discloses a light emitting assembly illumination comprising a light guide (3 of Fig. 1) having at least one light input surface (upper surface of light guide), a plurality of closely spaced light sources (1's of Fig. 1) along said light input surface for supplying light to said light guide, a plurality of light extracting deformities (5 of Fig. 1) on at least one surface of said light guide, said deformities having shapes (line 30 to line 32 of Col. 3) for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate (6 of Fig. 1) overlying at least one surface of said light guide.

Regarding claim 17, Nakamura discloses both the light guide and the substrate having deformities on at least one surface of each of said light guide and said substrate, the deformities vary in at least size and or shape (see Fig. 1 and Fig. 2.)

Regarding claim 25, Nakamura discloses the substrate providing the device that changes the output ray angle distribution, and improved uniformity of the light output distribution (line 24 to line 36 of Col. 2.)

It is noted that the recitation with respect to the assembly being for vehicle illumination has not been given patentable weight, because the manner in which the claimed apparatus is intended to be used does not differentiate the claimed apparatus from the cited prior art apparatus satisfying the claimed structural limitations.

Art Unit: 2872

Regarding claims 2-5, 19 and 22, Nakamura discloses the substrate comprising a plate attached to the light guide which covers said light guide (see Fig. 1, line 30 to line 32 of Col. 3.)

Regarding claim 6, Nakamura discloses the deformities being at least one of depressions and raised surfaces on the one surface of the light guide (see Fig. 2.)

Regarding claims 8 and 15, Nakamura discloses the deformities being a device that changes the output ray angle distribution (line 48 to line 51 of Col. 4.)

Regarding claims 14 and 23, Nakamura discloses at least one surface of at least one of said substrate and said light guide being prismatic (see Fig. 8.)

Regarding claim 16, Nakamura discloses more than one said substrate overlies said light guide (6 and 7 of Fig. 1.)

Regarding claim 20, Nakamura discloses the substrate having reflective and refractive surfaces (see Fig. 2, line 17 to line 27 of Col. 4.)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2872

Claims 7, 9, 11-13, 18, 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura.

Nakamura discloses the claimed invention except for:

- the deformities vary on the surface of said light guide.
- the light sources being light emitting diodes.
- the light sources being embedded, potted, bonded or molded into said light guide.
- the substrate having a coating.
- the variations in the deformities being random, on more than one side of the light guide, or including surfaces having angles that vary.

However, such features are well known in display devices and utility of one or more thereof is generally specific to suit particular application.

It would have been obvious, at the time the invention was made, to a person having ordinary skill in the art to utilize any of such features for the purpose of providing the diffused light with the appropriate intensity profile which suits the particular liquid crystal display.

#### **Conclusion**

Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 11/14/2003 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609(B)(2)(i).

Art Unit: 2872

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fayez G. Assaf whose telephone number is (571) 272-2307. The examiner can normally be reached on 8-5 M-F.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2872

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

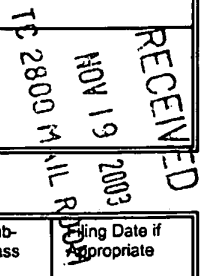
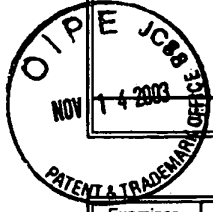


Faye Assaf  
2/2/04



**DREWA. DUNN**  
**SUPERVISORY PATENT EXAMINER**

Form PTO-1449 (Modified)	Atty Docket No. GLOLP0106USD	Serial No. 10/298,367
<b>LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT</b>  (Use several sheets if necessary)	Applicant: Jeffery R. Parker et al	
	Filing Date November 18, 2002	Group 2872



U.S. PATENT DOCUMENTS

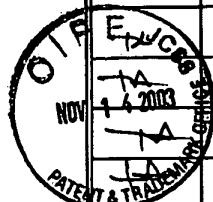
Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
FA	3,043,947	7/1962	Albinger, Jr. (enclosed)			
DA	3,070,913	1/1963	Miller (enclosed)			
DA	3,328,570	6/1967	Balchunas			
DA	3,543,014	11/1970	Bustad (enclosed)			
DA	3,571,585	3/1971	Schermerhorn (enclosed)			
DA	3,752,974	8/1973	Baker et al (enclosed)			
DA	3,761,703	9/1973	Mund et al (enclosed)			
DA	3,892,959	7/1975	Pulles			
DA	3,958,113	5/1976	Termohlen (enclosed)			
DA	4,043,636	8/1997	Eberhardt et al (enclosed)			
DA	4,118,111	10/1978	Laesser (enclosed)			
DA	4,177,501	12/1979	Karlin (enclosed)			
DA	4,183,628	1/1980	Laesser (enclosed)			
DA	4,257,084	3/1981	Reynolds			
DA	4,282,560	8/1981	Kringel et al (enclosed)			
DA	4,290,093	9/1981	Thompson et al (enclosed)			
DA	4,446,508	5/1984	Kinzie			
DA	4,542,449	9/1985	Whitehead (enclosed)			
DA	4,573,766	3/1986	Bournay, Jr. et al			
DA	4,630,895	12/1986	Abdala, Jr. et al			
DA	4,714,983	12/1987	Lang			
DA	4,729,185	3/1988	Baba			
DA	4,751,615	6/1988	Abrams			

Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
TA	4,763,984	8/1988	Awai et al (enclosed)			
TA	4,765,701	8/1988	Cheslak (enclosed)			
TA	4,906,070	3/1990	Cobb, Jr. (enclosed)			
TA	4,974,122	11/1990	Shaw			
TA	4,975,808	12/1990	Bond et al			
TA	4,978,952	12/1990	Irwin			
TA	5,005,108	4/1991	Pristash et al			
TA	5,027,258	6/1991	Schoniger et al (enclosed)			
TA	5,056,892	10/1991	Cobb, Jr. (enclosed)			
TA	5,070,431	12/1991	Kitazawa et al			
TA	5,093,765	3/1992	Kashima et al (enclosed)			
TA	5,134,549	7/1992	Yokoyama (enclosed)			
TA	5,136,483	8/1992	Schoniger et al			
TA	5,207,493	5/1993	Murase et al (enclosed)			
TA	5,262,928	11/1993	Kashima et al (enclosed)			
TA	5,283,673	2/1994	Murase et al (enclosed)			
TA	5,303,322	4/1994	Winston et al (enclosed)			
TA	5,307,244	4/1994	Gaudette (enclosed)			
TA	5,339,179	8/1994	Rudisill et al (enclosed)			
TA	5,349,503	9/1994	Blonder et al (enclosed)			
TA	5,375,043	12/1994	Tokunaga (enclosed)			
TA	5,377,084	12/1994	Kojima et al (enclosed)			
TA	5,390,085	2/1995	Mari-Roca et al (enclosed)			
TA	5,394,308	2/1995	Watanabe et al (enclosed)			
TA	5,396,350	3/1995	Beeson et al (enclosed)			
TA	5,442,523	8/1995	Kashima et al (enclosed)			
TA	5,467,208	11/1995	Kokawa et al ( nclosed)			
TA	5,467,417	11/1995	Nakamura et al ( nclosed)			

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Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
<i>TA</i>	5,485,291	1/1996	Qiao et al ( nclos d)			
<i>TA</i>	5,506,929	4/1996	Tai et al (enclosed)			
<i>TA</i>	5,521,342	5/1996	Barley et al (enclosed)			
<i>TA</i>	5,576,078	11/1996	Schatz (enclosed)			
<i>TA</i>	5,579,134	11/1996	Lengyel (enclosed)			
<i>TA</i>	5,598,280	1/1997	Nishio et al (enclosed)			
<i>TA</i>	5,598,281	1/1997	Zimmerman et al (enclosed)			
<i>TA</i>	5,600,462	2/1997	Suzuki et al (enclosed)			
<i>TA</i>	5,618,095	4/1997	Kashima et al (enclosed)			
<i>TA</i>	5,664,862	9/1997	Redmond et al (enclosed)			
<i>TA</i>	5,671,994	9/1997	Tai et al (enclosed)			
<i>TA</i>	5,711,592	1/1998	Hotta			
<i>TA</i>	5,719,649	2/1998	Shono et al (enclosed)			
<i>TA</i>	5,771,328	6/1998	Wortman et al (enclosed)			
<i>TA</i>	5,775,791	7/1998	Yoshikawa et al (enclosed)			
<i>TA</i>	5,779,338	7/1998	Ishikawa et al (enclosed)			
<i>TA</i>	5,808,784	9/1998	Ando et al (enclosed)			
<i>TA</i>	5,851,062	12/1998	Shinohara et al (enclosed)			
<i>TA</i>	5,961,198	10/1999	Hira et al (enclosed)			
<i>TA</i>	5,971,559	10/1999	Ishikawa et al (enclosed)			
<i>TA</i>	6,091,547	7/2000	Gardiner et al (enclosed)			



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FOREIGN PATENT DOCUMENTS

Examiner Initial	Document Number	Date (MM/YYYY)	Country	Class	Sub-class	Translation	
						Yes	No
<i>TA</i>	0 453 092 A1 (enclosed)	23/10/91	EP				
<i>TA</i>	WO 96/17207 (enclos d)	06/06/96	PCT				



Examiner Initial	Document Number	Date (MM/YYYY)	Country	Class	Sub-class	Translation	
						Yes	No
FA	WO 96/27757 (enclosed)	9/1996	PCT				

OTHER ART

Examiner Initial	Author, Title, Date, Pertinent Pages, etc.

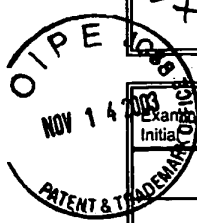
EXAMINER <b>FAYEZ ASSAF</b>	DATE CONSIDERED <b>2/2/04</b>
-----------------------------	-------------------------------

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

**Information Disclosure Statement PTO-1449 (Modified)**

The identification of any reference is not intended to be, and should not be understood as being, an admission that such publication, in fact, constitutes "prior art" within the meaning of applicable law since, for example, a given reference may have a later effective date than first seems apparent or the reference may have an effective date which can be antedated. The "prior art" status of any reference is a matter to be resolved during prosecution.

Z:\SEC17\GLOLIP106\IDS-1449.wpd (IDS1449.FRM) (2/97)



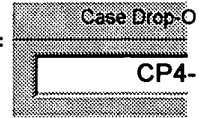
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T.D. INFORMAL MEMO: DO NOT MAIL THIS MEMO TO APPLICANT

DATE: 26-Nov-03  
TO: EXAMINER Assaf, Fayez  
FROM: Preston, Renee  
PARALEGAL SPECIALIST

APPL. S.N.: 10/298,367  
ART UNIT: 2872

RETURN THIS MEMO TO:



SUBJECT: Decision on Terminal Disclaimer (T.D.) filed: 14-Nov-03


INSTRUCTIONS: I have reviewed the submitted T.D. with the results as set forth below. If you agree, please use the appropriate form paragraphs identified by this informal memo in your next Office action to notify applicant of the T.D. If you disagree or have any questions, please see me or the Special Program Examiner. THIS IS AN INFORMAL, INTERNAL MEMO ONLY. IT MUST NOT BE (1) MAILED TO APPLICANT OR (2) PLACED OF RECORD IN THE APPLICATION FILE. When your action is complete, please initial, date and return this memo to me. THANK YOU.

- The T.D. is PROPER and has been recorded (see ¶14.23).
- The T.D. is NOT PROPER and has not been accepted for the reason(s) checked below (see ¶ 14.24):
  - The TD fee of  has not been submitted nor is there any authorization in the application file for the use of a deposit account (see ¶ 14.26.07).
  - The T.D. does not satisfy Rule 321 in that the person who has signed the T.D. has not stated the extent of his/her interest (and/or the extent of the interest of the business entity represented by the signature) in the application/patent (see ¶¶ 14.26 & 14.26.01).
  - The T.D. lacks the enforceable only during common ownership clause – needed to overcome a non-statutory double patenting rejection, Rule 321(b) (see ¶ 14.27.01).
  - The T.D. is directed to a particular claim(s), which is not acceptable since “the disclaimer must be for a terminal portion of the term of the entire patent to be granted” (MPEP 1490) (see ¶¶ 14.26 & 14.26.02).
  - The person who signed the T.D.:
    - is not an attorney “of record” (see ¶¶ 14.29 and 14.29.01).
    - has failed to state his/her capacity to sign for the business entity (see ¶ 14.28).
    - is not recognized as an officer of the assignee (see ¶¶ 14.29 & possible 14.29.02).
  - No documentary evidence of a chain of title from the original inventor(s) to assignee has been submitted, nor is the reel and frame number specified as to where such evidence is recorded in the Office (see 37 CFR 3.73(b) and 1140 O.G. 72). NOTE: This documentary evidence or the specifying of the reel and frame number may be found in the T.D. or in a separate paper of record in the application (see ¶ 14.30).
  - The T.D. is not signed (see ¶¶ 14.26 & 14.26.03).
  - The serial number of the application (or the number of the patent) which forms the basis for the double patenting rejection is missing or incorrect (see ¶ 14.32).
  - The serial number of this application (or the number of the patent in reexam or reissue cases being disclaimed is missing or incorrect (see ¶¶ 14.26, 14.27.02 or 14.26.05).
  - The period disclaimed is incorrect or not specified (see ¶¶ 14.26, 14.27.02 or 14.26.03).
  - Other:
  - Suggestion to request refund (see ¶ 14.36). NOTE: If already authorized, credit refund to deposit account and do not check this item.

I have appropriately notified applicant(s) of the status of the Terminal Disclaimer filed in this case.

Ex. Initials: RF Date: 11/26/03

Log Date:

<b>Serial Number</b> 	<b>Application No.</b> 10/98,367	<b>Applicant(s)</b> PARKER, JEFFERY R. et al.

<b>TERMINAL DISCLAIMER</b>		<input checked="" type="checkbox"/> <b>APPROVED</b>	<input type="checkbox"/> <b>DISAPPROVED</b>
The term of this patent shall not extend beyond the expiration date of U.S. Patent No.	5,613,751		
The term of this patent subsequent to the adjacent date has been disclaimed.			
<b>INTERNAL DOCUMENT - DO NOT MAIL</b>		<b>Document Code - DISQ</b>	

U.S. Patent and Trademark Office

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PTO/SB/26 (08-03)

Approved for use through 07/31/2006. OMB 0651-0047  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE  
**TERMINAL DISCLAIMER APPROVED**

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT**

Docket Number (Optional)

GLOLP06USD

NOV 26 2003

In re Application of: Jeffery R. Parker et al

Application No.: 10/298,367

Filed: November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

The owner\*, Solid State Opto Limited, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 and 173, as presently shortened by any terminal disclaimer, of prior Patent No. 5,613,751. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.


In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1.  For submissions on behalf of an organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2.  The undersigned is an attorney or agent of record.

  
Signature  
11/19/03  
Date

RENEE PRESTON   
PARALEGAL SPECIALIST  
TECHNOLOGY CENTER 2800

Donald L. Otto  
Typed or printed name  
216-621-1113  
Telephone Number

Terminal disclaimer fee under 37 CFR 1.20(d) included.

**WARNING: information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

\*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).  
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

11/17/2003 JBALINAM 00000120 10298367

01 FC:1814

-110.00 0P



Patent Docket No. GLOLP0106USD

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re patent application of

Applicant: Jeffery R. Parker et al  
Serial No.: 10/298,367  
Filed: November 18, 2002  
For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE  
Art Unit: 2872  
Examiner: Fayez G. Assaf

**INFORMATION DISCLOSURE STATEMENT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

11/17/2003-JBALINAN 00000120 10298367  
01 FC:1814 110.00-00

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Sir:

1. Pursuant to 37 C.F.R. 1.97 and 1.98, and in compliance with 37 C.F.R. 1.56, the Office's attention is directed to the patents, pending applications, publications and other information listed on the attached PTO-1449. A copy of each listed document is enclosed, except for (a) those previously cited or submitted to the Office in the following application(s) upon which this application relies for an earlier filing date under 35 U.S.C. 120, and (b) any U.S. patent or U.S. patent application publication if the present application was filed after June 30, 2003 or entered the national stage under 35 USC § 371 after June 30, 2003:

Serial No.:	<u>10/005,090</u>	<u>09/703,088</u>	<u>09/167,949</u>	<u>08/585,062</u>
Filing Date:	<u>12/5/01</u>	<u>10/31/00</u>	<u>10/7/98</u>	<u>1/16/96</u>
Pat. No.:	<u>6,508,563</u>	<u>6,367,940</u>	<u>6,158,867</u>	<u>5,895,115</u>
Issue Date:	<u>1/21/03</u>	<u>4/9/02</u>	<u>12/12/00</u>	<u>4/20/99</u>

Regarding any document, publication or other information for which a date is not given on the attached PTO-1449, Applicant(s) believe(s) the same may qualify as "prior" art to this application and should be treated accordingly, although Applicant(s) reserve(s) the right to contest the prior art status of any document, publication or information, should issue arise.

2. Regarding each listed document that is not in the English language, an English-language translation accompanies this Statement as indicated on the attached PTO-1449 or a concise explanation of the relevance of the document is set forth in the following document(s):

- (a)  A copy of each English language version of a search report (or EPO Search Report) indicating the degree of relevance found by the foreign office of each document being submitted from the search report, is being submitted herewith or has previously been submitted.
- (b)  Attached is a "Concise Explanation of Relevance of Non-English Language Documents".

3. Pursuant to 37 C.F.R. 1.97(b) this Statement is being filed (one must be checked):

- (a)  Within 3 months of the filing date, date of entry into the National Stage, or filing date of a CPA.
- (b)  Before the mailing date of a first Office Action on the merits. If this Statement is not filed before the mailing date of a first Office Action on the merits, the required certification is given below or, in the absence thereof, the Office is authorized to charge the required fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988 for consideration of this Statement.

11/17/2003 JBALINAN 00000120 10298367  
02 FC:1814 180.00 00

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02 FC:1814 180.00 00

- (c) \_\_\_ Before the mailing date of a first Office Action on the merits after a first or second submission after final rejection under 37 C.F.R. 1.129(a).
- (d) X After the period set forth in 37 C.F.R. 1.97(b) but before the mailing date of either a final action or a notice of allowance.
- (1) \_\_\_ The required certification is given below, or
- (2) X Enclosed is a check in the amount of \$180.00 covering the fee set forth in 37 C.F.R. 1.17(p) for consideration of this Statement, or
- (3) \_\_\_ Charge the fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988
- (e) \_\_\_ After the mailing date of either a final action or a notice of allowance, but before payment of the issue fee. Petition hereby is made for consideration of this Statement and the required certification is indicated below.
- (1) \_\_\_ Enclosed is a check covering the fee set forth in 37 C.F.R. 1.17(p), or
- (2) \_\_\_ Charge the fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988.


4. Certification (if applicable)

- (a) \_\_\_ The undersigned hereby certifies that each item of information contained in this Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than 3 months prior to the filing of this Statement.
- (b) \_\_\_ The undersigned hereby certifies that no item of information contained in this Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the undersigned's knowledge after making reasonable inquiry, no item of information contained in this statement was known to any individual designated in 37 C.F.R. 1.56(c) more than 3 months prior to the filing of this Statement.

5. The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No. 18-0988.

Respectfully Submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

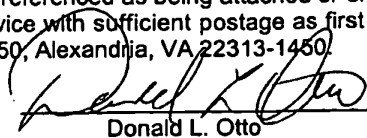
By   
 Donald L. Otto  
 Reg. No. 22,125

1621 Euclid Avenue, 19th Floor  
 Cleveland, Ohio 44115  
 (216) 621-1113

**CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8**

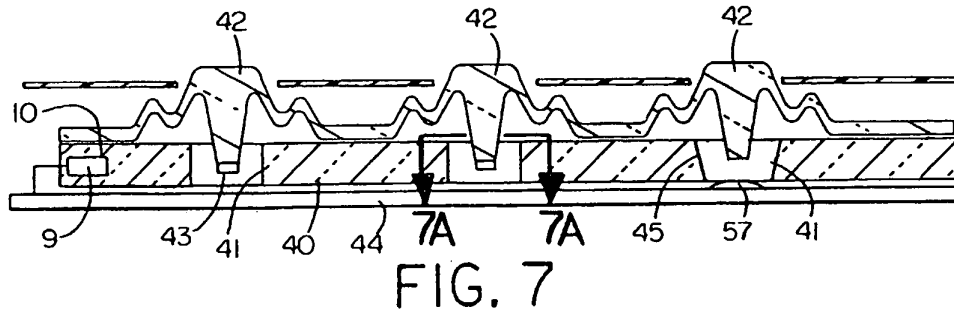
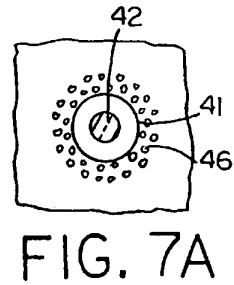
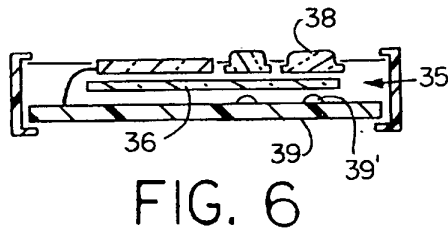
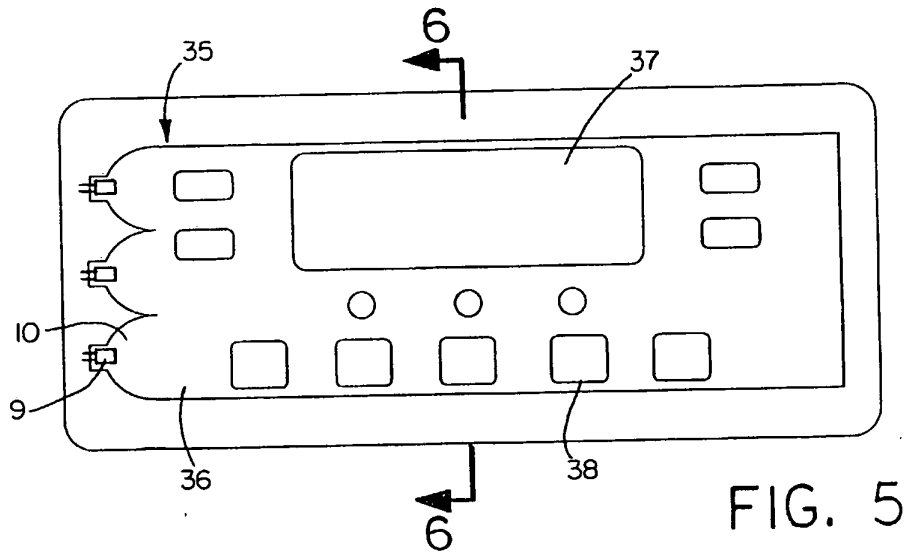
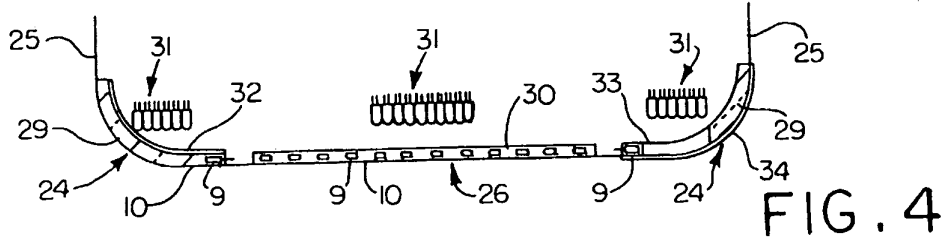
I hereby certify that this correspondence (along with any paper referenced as being attached or enclosed) is being deposited on the below date with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date : November 11, 2003

  
 Donald L. Otto

Z:\SEC177\GLOLP106D\IDS-1449.wpd IDS-1.FRM (2/98)







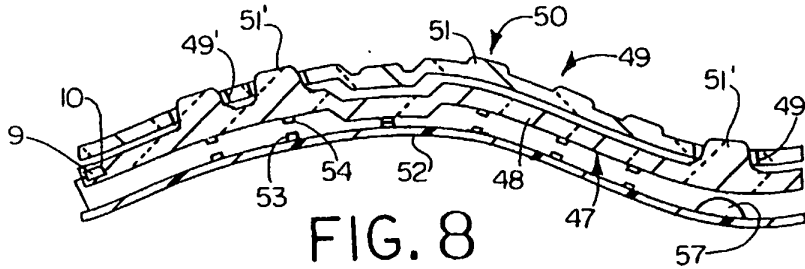


FIG. 8

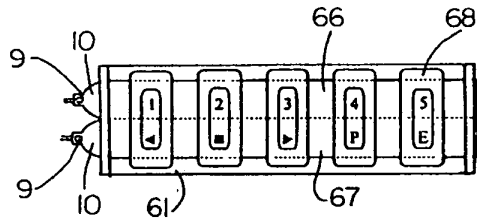


FIG. 9

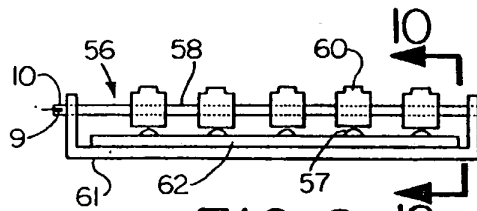


FIG. 10

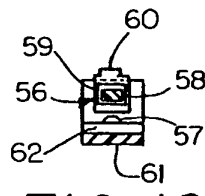


FIG. 11

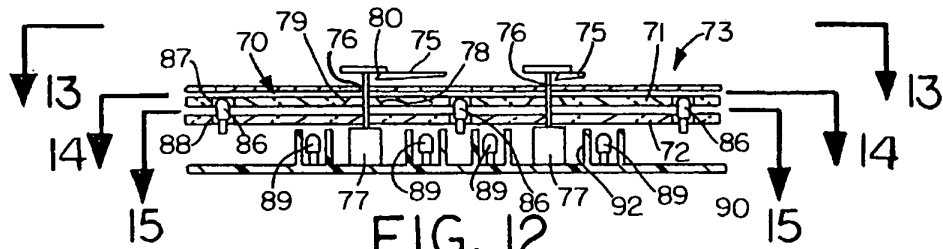


FIG. 12

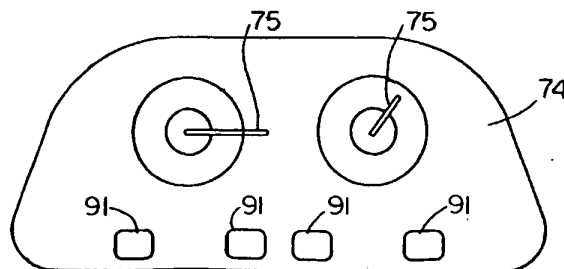


FIG. 13

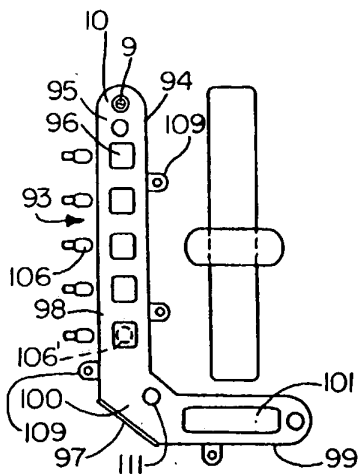


FIG. 16

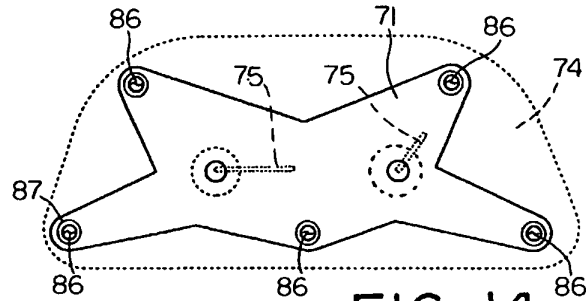


FIG. 14

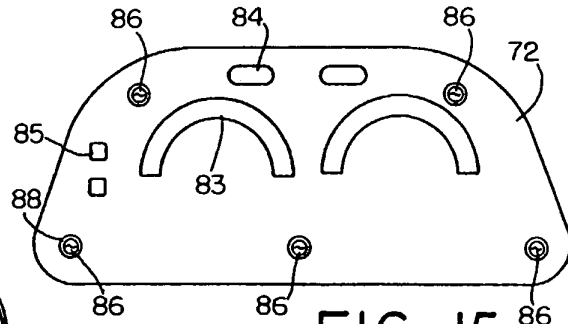


FIG. 15

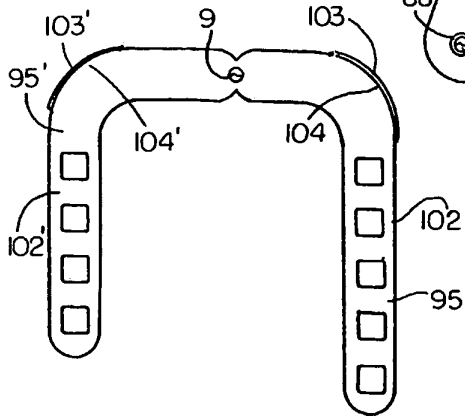


FIG. 17

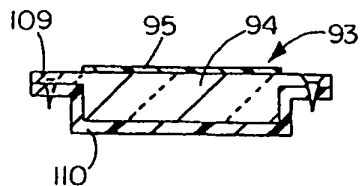


FIG. 19

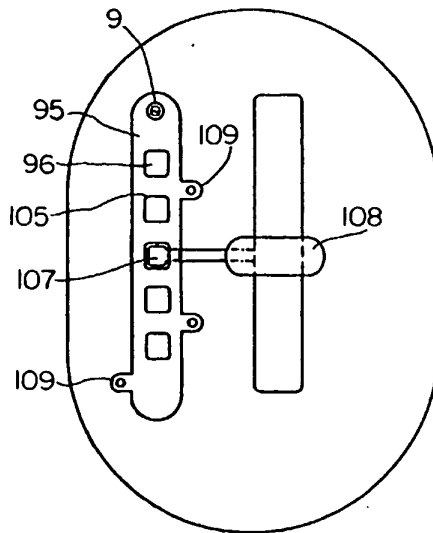


FIG. 18

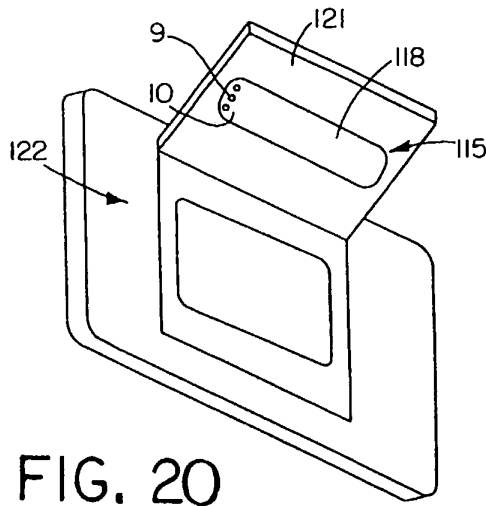


FIG. 20

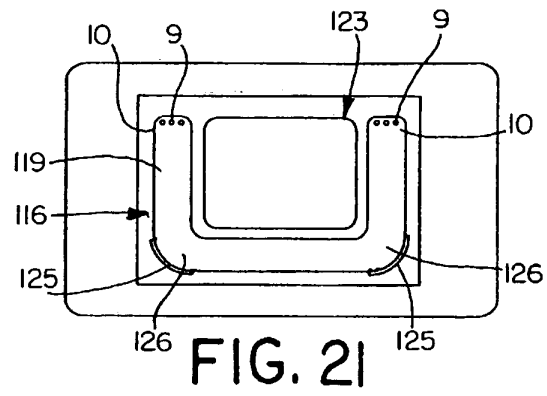


FIG. 21

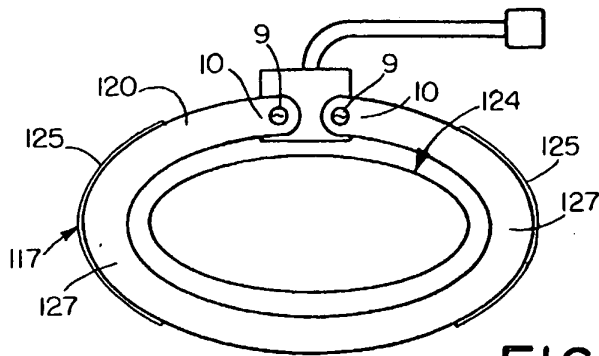


FIG. 22

**PATENT APPLICATION FEE DETERMINATION RECORD**  
Effective October 1, 2001

Application or Docket Number

10248307

**CLAIMS AS FILED - PART I**

	(Column 1)	(Column 2)
TOTAL CLAIMS	52	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	52 minus 20 = *	32
INDEPENDENT CLAIMS	6 minus 3 = *	3
MULTIPLE DEPENDENT CLAIM PRESENT <input type="checkbox"/>		

\* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE  OR

OTHER THAN SMALL ENTITY

RATE	FEE
BASIC FEE	370.00
X\$ 9=	
X42=	
+140=	
TOTAL	

RATE	FEE
BASIC FEE	740.00
X\$18=	252
X84=	576
+280=	
TOTAL	1568

**CLAIMS AS AMENDED - PART II**

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* 33 Minus ** 52	= 0
	Independent	* 5 Minus *** 6	= 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

SMALL ENTITY OR

OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
X\$ 9=	
X42=	
+140=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X84=	
+280=	
TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus **	=
	Independent	* Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

RATE	ADDITIONAL FEE
X\$ 9=	
X42=	
+140=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X84=	
+280=	
TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus **	=
	Independent	* Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

RATE	ADDITIONAL FEE
X\$ 9=	
X42=	
+140=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X84=	
+280=	
TOTAL ADDIT. FEE	

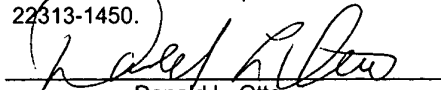
\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.  
 \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."  
 \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."  
 The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.



CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Date: November 11, 2003

  
Donald L. Otto

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Attorney Docket GLOLP0106USD

In re PATENT application of

Jeffery R. Parker et al

Serial No. 10/298,367

Filed November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Art Unit 2872  
Confirmation No. 3656  
Fayez G. Assaf, Examiner

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**REPLY TO OFFICE ACTION OF SEPTEMBER 8, 2003**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

In reply to the Office Action of September 8, 2003, please amend the above-identified application as follows:

**Amendments to the Specification** begin on page 3 of this paper.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 4 of this paper.

**Remarks/Arguments** begin on page 11 of this paper.

**Amendments to the Specification:**

Please replace the paragraph following the heading "ABSTRACT OF THE DISCLOSURE" on page 29 with the following amended paragraph:

Light emitting panel assemblies include in one form of the invention a light emitting panel member made of a transparent resiliently deformable elastomeric material that absorbs impact without breakage for use in automotive lighting applications of various types. In another form of the invention, a rigid light emitting panel member may be used with dome switches for switch area lighting or to backlight control buttons/key pads by providing holes or openings in the panel member for the control buttons/key pads. Also, a rigid light emitting panel member may be used as a structural member, and two or more such light emitting panel members may be stacked together and used to light an instrument panel or the like. ~~One or more light sources may be mounted within one or more light transition areas adjacent one or more light input surfaces of the light emitting panel members. Also one or more light sources may be positioned adjacent one side of the light emitting panel members for causing light to shine through the panel members or through holes in the panel members for performing specified lighting functions.~~

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

Claim 1 (original): A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, a plurality of closely spaced light sources along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one surface of said light guide.

Claim 2 (original): The assembly of claim 1 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 3 (original): The assembly of claim 1 wherein said substrate is attached to said light guide.

Claim 4 (original): The assembly of claim 1 wherein said substrate is positioned against said light guide.



Claim 5 (original): The assembly of claim 1 wherein said substrate covers said at least one surface of said light guide.

Claim 6 (original): The assembly of claim 1 wherein said deformities are at least one of depressions and raised surfaces on said one surface of said light guide.

Claim 7 (original): The assembly of claim 1 wherein said deformities vary on said one surface of said light guide.

Claim 8 (original): The assembly of claim 1 wherein at least one of said deformities is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 9 (original): The assembly of claim 1 wherein said light sources are light emitting diodes.

Claim 10 (currently amended): The assembly of claim 1 wherein said light sources are attached to a printed circuit board.

Claim 11 (original): The assembly of claim 1 wherein said light sources are embedded, potted, bonded or molded into said light guide.

Claim 12 (original): The assembly of claim 1 wherein said deformities are on more than one surface of said light guide.

Claim 13 (original): The assembly of claim 1 wherein said deformities are on two sides of said light guide.

Claim 14 (original): The assembly of claim 1 wherein at least some deformities are on said substrate.

Claim 15 (original): The assembly of claim 1 wherein said substrate has at least one of a prismatic lens, lenticular lens, and other device that changes the output ray angle distribution.

Claim 16 (original): The assembly of claim 1 wherein more than one said substrate overlies said light guide.

Claim 17 (original): A light emitting assembly for vehicle illumination comprising a light guide having at least one transparent substrate overlying a surface of said light guide, both said light guide and said substrate having deformities on at least one surface of each of said light guide and said substrate, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, the deformities on at least one of said light guide and

said substrate varying in at least one of the following characteristics: size, shape, placement, index of refraction, density, angle, depth, height and type.

Claim 18 (original): The assembly of claim 17 wherein the variations in the deformities are random.

Claim 19 (original): The assembly of claim 17 wherein said substrate comprises at least one of a sheet, film, lens and plate.

Claim 20 (original): The assembly of claim 17 wherein said substrate has reflective and refractive surfaces.

Claim 21 (original): The assembly of claim 17 wherein said substrate has a coating.

Claim 22 (original): The assembly of claim 17 wherein more than one said substrate overlies said light guide.

Claim 23 (original): The assembly of claim 17 wherein at least one surface of at least one of said substrate and said light guide is prismatic or lenticular.

Claim 24 (original): A light emitting assembly for vehicle illumination comprising a light guide, a transparent substrate overlying a surface of said light guide, at

least one of said light guide and said substrate having deformities on at least one surface, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, at least some of said deformities including prismatic surfaces having angles that vary.

Claim 25 (original): A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, at least one light source along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one surface of said light guide, said substrate providing at least one of the following: an exterior portion of a vehicle, protection for the light guide, at least one of text, an image and color, at least one of a prismatic lens, lenticular lens and another device that changes the output ray angle distribution, and improved uniformity of the light output distribution.

~~Claim 26 (currently amended): A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, at least one light source along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, a transparent substrate overlying at~~

~~least one surface of said light guide,~~ The assembly of claim 25 wherein at least one of said light guide and said substrate ~~having~~ has at least one of a coating and surface treatment that changes, wherein the changes in said at least one of the coating and surface treatment are at least one of the following: density, color, index of refraction, reflection, opaqueness, translucence, area, depth, shape, size and type.

Claim 27 (original): The assembly of claim 26 wherein said at least one of the coating and surface treatment are at least one of the following: paint, ink, coating and epoxy.

Claim 28 (original): The assembly of claim 26 wherein the coating is selected to improve at least one of the following: color correction, opaqueness, diffusion, reflection, translucence and transmission of light.

Claim 29 (original): The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

Claim 30 (original): The assembly of claim 26 wherein the coating on at least one of said light guide and said substrate randomly changes.

Claim 31 (original): The assembly of claim 26 wherein the surface treatment of at least one of said light guide and said substrate randomly changes.

Claim 32 (original): The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate varies in shape or geometry.

Claim 33 (original): The assembly of claim 32 wherein the shape or geometry of said one surface randomly varies.

Claims 34-52 (canceled)

## **REMARKS/ARGUMENTS**

In the specification, the ABSTRACT OF THE DISCLOSURE has been amended to reduce the number of words to less than 150 as required by the Examiner.

Claims 1-33 remain in the application. Claims 1-25 read on the elected species. Claims 26-33 have been withdrawn. Claims 34-52 have been canceled. In view of the Examiner's earlier restriction requirement, applicants retain the right to present claims 34-52 in a divisional application.

Claims 1-25 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-97 of U.S. Patent No. 5,613,751. According to the Examiner, although the conflicting claims are not identical, they are not patentably distinct from each other because the claims are substantially variant combinations of the patent's claims reciting inherent features and having different scopes. Applicants' attorney respectfully disagrees with this rejection. Nevertheless, a terminal disclaimer in compliance with 37 CFR 1.321(c) is filed herewith to overcome this rejection based on a non-statutory double patenting ground. Accordingly, claims 1-25 are submitted as allowable.

In view of the obviousness-type double patenting rejection based on U.S. Patent 5,613,751, the Examiner's attention is directed to two pending Applications Serial Nos. 10/232,047 and 10/324,882 which rely on U.S. Patent 5,613,751 for an earlier filing date. Also an Information Disclosure Statement is

enclosed identifying all of the prior art cited in these two pending applications and other prior art.

Withdrawn claims 26-33 have been amended to depend from claim 25 and are also submitted as allowable.

For the foregoing reasons, this application is now believed to be in condition for final allowance of all of the pending claims 1-33, and early action to that end is earnestly solicited. Should the Examiner disagree with applicants' attorney in any respect, it is respectfully requested that the Examiner telephone applicants' attorney in an effort to resolve such differences.

In the event that an extension of time is necessary, this should be considered a petition for such an extension. If required, fees are enclosed for the extension of time and/or for the presentation of new and/or amended claims. In the event any additional fees are due in connection with the filing of this amendment, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 (Charge No. GLOLP0106USD).

Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

By   
Donald L. Otto  
Registration No. 22,125

1621 Euclid Avenue  
Nineteenth Floor  
Cleveland, Ohio 44115-2191  
Phone: 216-621-1113  
Fax: 216-621-6165

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<b>TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT</b>	Docket Number (Optional) <b>GLOLP0106USD</b>
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In re Application of: Jeffery R. Parker et al

Application No.: 10/298,367

Filed: November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

The owner\*, Solid State Opto Limited, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 and 173, as presently shortened by any terminal disclaimer, of prior Patent No. 5,613,751. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.


In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1.  For submissions on behalf of an organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2.  The undersigned is an attorney or agent of record.

  
Signature 11/6/03  
Date

Donald L. Otto

Typed or printed name

216-621-1113

Telephone Number

- Terminal disclaimer fee under 37 CFR 1.20(d) included.

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\*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).  
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Application Docket No. GLLP0106USD

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re patent application of

Applicant: Jeffery R. Parker et al  
Serial No.: 10/298,367  
Filed: November 18, 2002  
For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE  
  
Art Unit: 2872  
Examiner: Fayez G. Assaf

**INFORMATION DISCLOSURE STATEMENT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

11/17/2003-JBALINAN 00000120 10298367

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Sir:

1. Pursuant to 37 C.F.R. 1.97 and 1.98, and in compliance with 37 C.F.R. 1.56, the Office's attention is directed to the patents, pending applications, publications and other information listed on the attached PTO-1449. A copy of each listed document is enclosed, except for (a) those previously cited or submitted to the Office in the following application(s) upon which this application relies for an earlier filing date under 35 U.S.C. 120, and (b) any U.S. patent or U.S. patent application publication if the present application was filed after June 30, 2003 or entered the national stage under 35 USC § 371 after June 30, 2003:

Serial No.:	<u>10/005,090</u>	<u>09/703,088</u>	<u>09/167,949</u>	<u>08/585,062</u>
Filing Date:	<u>12/5/01</u>	<u>10/31/00</u>	<u>10/7/98</u>	<u>1/16/96</u>
Pat. No.:	<u>6,508,563</u>	<u>6,367,940</u>	<u>6,158,867</u>	<u>5,895,115</u>
Issue Date:	<u>1/21/03</u>	<u>4/9/02</u>	<u>12/12/00</u>	<u>4/20/99</u>

Regarding any document, publication or other information for which a date is not given on the attached PTO-1449, Applicant(s) believe(s) the same may qualify as "prior" art to this application and should be treated accordingly, although Applicant(s) reserve(s) the right to contest the prior art status of any document, publication or information, should issue arise.

2. Regarding each listed document that is not in the English language, an English-language translation accompanies this Statement as indicated on the attached PTO-1449 or a concise explanation of the relevance of the document is set forth in the following document(s):

- (a)  A copy of each English language version of a search report (or EPO Search Report) indicating the degree of relevance found by the foreign office of each document being submitted from the search report, is being submitted herewith or has previously been submitted.
- (b)  Attached is a "Concise Explanation of Relevance of Non-English Language Documents".

3. Pursuant to 37 C.F.R. 1.97(b) this Statement is being filed (one must be checked):

- (a)  Within 3 months of the filing date, date of entry into the National Stage, or filing date of a CPA.
- (b)  Before the mailing date of a first Office Action on the merits. If this Statement is not filed before the mailing date of a first Office Action on the merits, the required certification is given below or, in the absence thereof, the Office is authorized to charge the required fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988 for consideration of this Statement.

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- (c)  Before the mailing date of a first Office Action on the merits after a first or second submission after final rejection under 37 C.F.R. 1.129(a).
- (d)  After the period set forth in 37 C.F.R. 1.97(b) but before the mailing date of either a final action or a notice of allowance.
- (1)  The required certification is given below, or
- (2)  Enclosed is a check in the amount of \$180.00 covering the fee set forth in 37 C.F.R. 1.17(p) for consideration of this Statement, or
- (3)  Charge the fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988
- (e)  After the mailing date of either a final action or a notice of allowance, but before payment of the issue fee. Petition hereby is made for consideration of this Statement and the required certification is indicated below.
- (1)  Enclosed is a check covering the fee set forth in 37 C.F.R. 1.17(p), or
- (2)  Charge the fee set forth in 37 C.F.R. 1.17(p) to Deposit Account No. 18-0988.

4. Certification (if applicable)

- (a)  The undersigned hereby certifies that each item of information contained in this Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than 3 months prior to the filing of this Statement.
- (b)  The undersigned hereby certifies that no item of information contained in this Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the undersigned's knowledge after making reasonable inquiry, no item of information contained in this statement was known to any individual designated in 37 C.F.R. 1.56(c) more than 3 months prior to the filing of this Statement.

5. The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No. 18-0988.

Respectfully Submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

By 

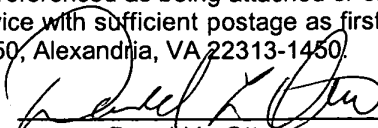
Donald L. Otto  
Reg. No. 22,125

1621 Euclid Avenue, 19th Floor  
Cleveland, Ohio 44115  
(216) 621-1113

**CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8**

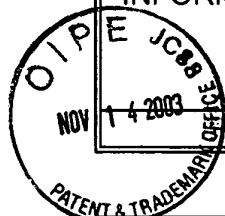
I hereby certify that this correspondence (along with any paper referenced as being attached or enclosed) is being deposited on the below date with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: November 11, 2003

  
Donald L. Otto

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Form PTO-1449 (Modified)  <b>LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT</b>  (Use several sheets if necessary)	Atty Docket No.	Serial No.
	GLOLP0106USD	10/298,367
	Applicant: Jeffery R. Parker et al	
Filing Date	Group	
November 18, 2002	2872	



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## U.S. PATENT DOCUMENTS

Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
	3,043,947	7/1962	Albinger, Jr. (enclosed)			
	3,070,913	1/1963	Miller (enclosed)			
	3,328,570	6/1967	Balchunas			
	3,543,014	11/1970	Bustad (enclosed)			
	3,571,585	3/1971	Schermerhorn (enclosed)			
	3,752,974	8/1973	Baker et al (enclosed)			
	3,761,703	9/1973	Mund et al (enclosed)			
	3,892,959	7/1975	Pulles			
	3,958,113	5/1976	Termohlen (enclosed)			
	4,043,636	8/1997	Eberhardt et al (enclosed)			
	4,118,111	10/1978	Laesser (enclosed)			
	4,177,501	12/1979	Karlin (enclosed)			
	4,183,628	1/1980	Laesser (enclosed)			
	4,257,084	3/1981	Reynolds			
	4,282,560	8/1981	Kringel et al (enclosed)			
	4,290,093	9/1981	Thompson et al (enclosed)			
	4,446,508	5/1984	Kinzie			
	4,542,449	9/1985	Whitehead (enclosed)			
	4,573,766	3/1986	Bournay, Jr. et al			
	4,630,895	12/1986	Abdala, Jr. et al			
	4,714,983	12/1987	Lang			
	4,729,185	3/1988	Baba			
	4,751,615	6/1988	Abrams			

Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
	4,763,984	8/1988	Awai et al (enclosed)			
	4,765,701	8/1988	Cheslak (enclosed)			
	4,906,070	3/1990	Cobb, Jr. (enclosed)			
	4,974,122	11/1990	Shaw			
	4,975,808	12/1990	Bond et al			
	4,978,952	12/1990	Irwin			
	5,005,108	4/1991	Pristash et al			
	5,027,258	6/1991	Schoniger et al (enclosed)			
	5,056,892	10/1991	Cobb, Jr. (enclosed)			
	5,070,431	12/1991	Kitazawa et al			
	5,093,765	3/1992	Kashima et al (enclosed)			
	5,134,549	7/1992	Yokoyama (enclosed)			
	5,136,483	8/1992	Schoniger et al			
	5,207,493	5/1993	Murase et al (enclosed)			
	5,262,928	11/1993	Kashima et al (enclosed)			
	5,283,673	2/1994	Murase et al (enclosed)			
	5,303,322	4/1994	Winston et al (enclosed)			
	5,307,244	4/1994	Gaudette (enclosed)			
	5,339,179	8/1994	Rudisill et al (enclosed)			
	5,349,503	9/1994	Blonder et al (enclosed)			
	5,375,043	12/1994	Tokunaga (enclosed)			
	5,377,084	12/1994	Kojima et al (enclosed)			
	5,390,085	2/1995	Mari-Roca et al (enclosed)			
	5,394,308	2/1995	Watanabe et al (enclosed)			
	5,396,350	3/1995	Beeson et al (enclosed)			
	5,442,523	8/1995	Kashima et al (enclosed)			
	5,467,208	11/1995	Kokawa et al (enclosed)			
	5,467,417	11/1995	Nakamura et al (enclosed)			

Examiner Initial	Document Number	Date (MM/YYYY)	Name	Class	Sub-class	Filing Date if Appropriate
	5,485,291	1/1996	Qiao et al (enclosed)			
	5,506,929	4/1996	Tai et al (enclosed)			
	5,521,342	5/1996	Barley et al (enclosed)			
	5,576,078	11/1996	Schatz (enclosed)			
	5,579,134	11/1996	Lengyel (enclosed)			
	5,598,280	1/1997	Nishio et al (enclosed)			
	5,598,281	1/1997	Zimmerman et al (enclosed)			
	5,600,462	2/1997	Suzuki et al (enclosed)			
	5,618,095	4/1997	Kashima et al (enclosed)			
	5,664,862	9/1997	Redmond et al (enclosed)			
	5,671,994	9/1997	Tai et al (enclosed)			
	5,711,592	1/1998	Hotta			
	5,719,649	2/1998	Shono et al (enclosed)			
	5,771,328	6/1998	Wortman et al (enclosed)			
	5,775,791	7/1998	Yoshikawa et al (enclosed)			
	5,779,338	7/1998	Ishikawa et al (enclosed)			
	5,808,784	9/1998	Ando et al (enclosed)			
	5,851,062	12/1998	Shinohara et al (enclosed)			
	5,961,198	10/1999	Hira et al (enclosed)			
	5,971,559	10/1999	Ishikawa et al (enclosed)			
	6,091,547	7/2000	Gardiner et al (enclosed)			

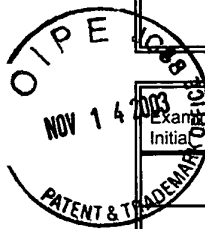


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## FOREIGN PATENT DOCUMENTS

Examiner Initial	Document Number	Date (MM/YYYY)	Country	Class	Sub-class	Translation	
						Yes	No
	0 453 092 A1 (enclosed)	23/10/91	EP				
	WO 96/17207 (enclosed)	06/06/96	PCT				

Examiner Initial	Document Number	Date (MM/YYYY)	Country	Class	Sub-class	Translation	
						Yes	No
	WO 96/27757 (enclosed)	9/1996	PCT				



OTHER ART

Examiner Initial	Author, Title, Date, Pertinent Pages, etc.

EXAMINER	DATE CONSIDERED
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EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

**Information Disclosure Statement PTO-1449 (Modified)**

The identification of any reference is not intended to be, and should not be understood as being, an admission that such publication, in fact, constitutes "prior art" within the meaning of applicable law since, for example, a given reference may have a later effective date than first seems apparent or the reference may have an effective date which can be antedated. The "prior art" status of any reference is a matter to be resolved during prosecution.

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TC 2800 MAIL ROOM



12 EUROPEAN PATENT APPLICATION

21 Application number: 91302247.1

51 Int. Cl.<sup>5</sup>: F21V 8/00

22 Date of filing: 15.03.91

30 Priority: 20.03.90 US 496485

43 Date of publication of application:  
23.10.91 Bulletin 91/43

64 Designated Contracting States:  
DE FR GB NL

71 Applicant: GENERAL ELECTRIC COMPANY  
1 River Road  
Schenectady, NY 12345 (US)

72 Inventor: Davenport, John Martin  
5128 Edenhurst Avenue  
Lyndhurst, Ohio 44124 (US)  
Inventor: Hansler, Richard Lowell  
28120 Belcourt Road  
Pepper Pike, Ohio 44124 (US)  
Inventor: Henkes, John Lawrence  
9 Henkes Lane  
Latham, New York 12110 (US)

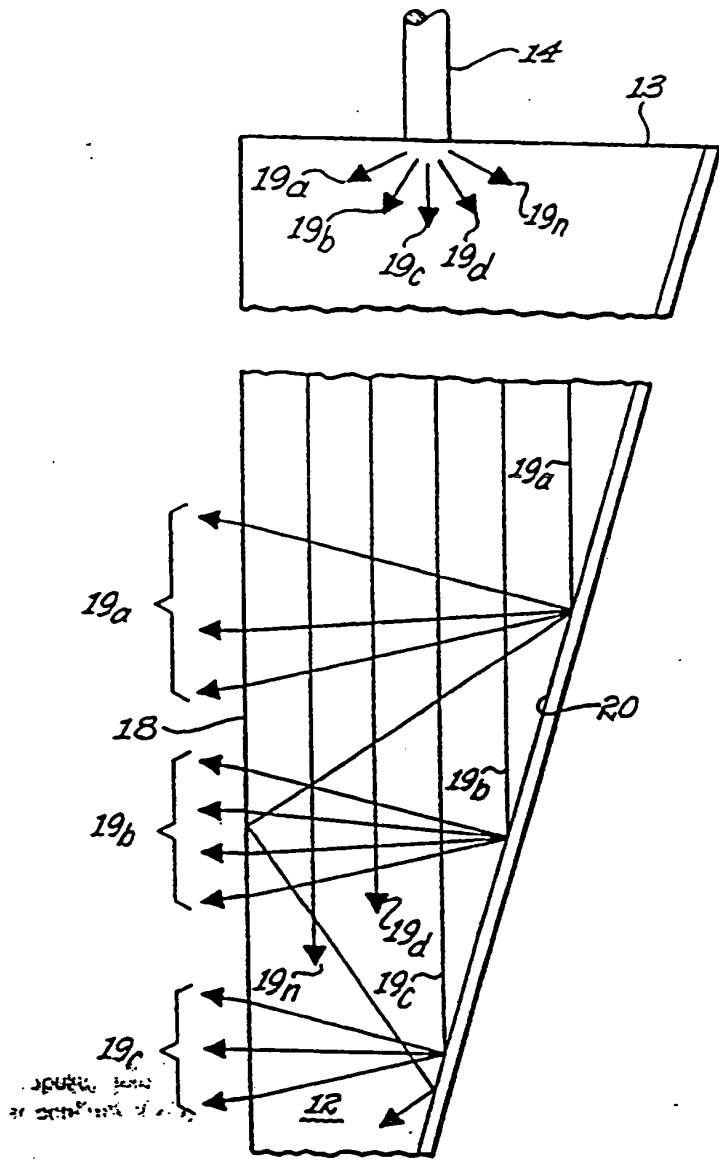
74 Representative: Smith, Thomas Ian  
Macdonald  
London Patent Operation G.E. Technical  
Services Co. Inc. Burdett House 15-16  
Buckingham Street  
London WC2N 6DU (GB)

54 Uniform illumination of large, thin surfaces particularly for automotive applications.

57 A thin, efficient and uniform illuminator for large areas comprises optically clear plastic wedge (12) or a series of such plastic wedges applied to or formed integrally with a back surface of an area to be illuminated. Light is collected and concentrated from a high efficiency light source. The concentrated light is focused as an input to one or more light guides (14). The light guides may be optical fibers. The light guides, or fibers are fused or mated in some other way to an edge (13) of the or each plastic wedge. The wedge shape increases the angle of the internal reflections of the edge coupled light per unit distance and intercepts more of the light as the wedge gets thinner. To further enhance the uniformity of the illuminating light, light scattering centers may be added to the surface or volume of the wedge. The number of scattering centers over the illuminating surface of the wedge or within the volume of the wedge may increase along the distance moving away from the light source.

P 0 453 092 A1





**Fig. 2**

## UNIFORM ILLUMINATION OF LARGE, THIN SURFACES PARTICULARLY SUITED FOR AUTOMOTIVE APPLICATIONS

The present invention generally relates to the illumination of large surfaces and, more particularly, to providing uniform illumination over large areas at a shallow depth which is particularly suited for automobiles.

In modern industrial design, there are a number of applications which call for illuminating large surface areas but the distance perpendicular to the surface area to be illuminated which is available for a light source is small. The problem then is to provide uniform illumination of a thin panel at an acceptable cost.

In one such application, automobile manufacturers have been adding large decorative reflectorized areas on the rear deck lids of some of their models. The reflectorized areas blend in well with the rear lighting on the quarter panels and have a pleasing appearance during the day. At night, however, these areas appear dark and unattractive. To light these large areas with incandescent lamps presents two problems. First, it is difficult to get even illumination over such a large area using point sources such as incandescent lamps. Secondly, the large accelerations experienced by lamps mounted on the rear deck lid when it is closed are sufficient to deform or even fracture the filament of the lamp. Light emitting diode (LEDs) may very well serve as an alternative light source so as to solve such incandescent lamp problems.

In another application, liquid crystal displays (LCDs) are commonly used for a variety of applications ranging from personal televisions to computer displays. One of the principal reasons for the popularity of LCDs is their small size and low power consumption. Current illuminators for LCDs use fluorescent lamps of high efficiency and light box cavities to provide uniform illumination. To make LCDs more acceptable, the LCDs are now generally provided with a source of back lighting. In order to retain the advantage of LCDs being used as a thin flat panel display, this back lighting source must also be thin. This type of design must be of a certain minimum thickness due to the lamp size and light box cavity size to achieve a uniform backlighting of the display.

Another type of illuminator which achieves uniform illumination over a large area and yet is thin is manufactured by Lumitex, Inc. The Lumitex device uses a high efficiency light source and collects and concentrates this light by focusing it into an optical fiber bundle. The fibers of the bundle are fanned out and woven into a flat panel. Light is made to leak from the woven panel by sharp bending of the fibers in the weave pattern. The disadvantages of this device are its cost of construction and the lack of directionality of

the leaked light and efficiency when designed to achieve a high degree of uniformity.

It is therefore a general object of the present invention to provide a device that provides uniform illumination over a large area of shallow depth.

It is another object of the invention to provide a thin, efficient and uniform illuminator for large areas.

It is a further object of the invention to provide an efficient means to collect and conduct light from a high efficiency light source and uniformly distribute and emit this light over a large area.

According to the invention, a plastic wedge or a series of plastic wedges are applied to or formed integrally with a back surface of an area to be illuminated. Light is collected and concentrated from a high efficiency light source. The concentrated light is focused as an input to one or more light guides which may be optical fibers. The light guides or fibers are fused or mated in some other way to an edge or edges of an optically clear plastic wedge or wedges. The wedge shape increases the angle of internal reflections of the edge coupled light as the wedge gets thinner. In addition, the sloping back surface of the wedge intercepts more of the illuminating light beam as it progresses through the wedge toward its apex. To further enhance the uniformity of the illuminating light, the number of scattering centers over the illuminating surface of the wedge or within the volume of the wedge are increased along the distance away from the light source.

The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings.

Figure 1 is an isometric drawing of the basic wedge shaped illuminating device according to the invention;

Figure 2 is an enlarged cross-sectional view of the wedge shaped illuminating device shown in Figure 1 illustrating the internal reflections of light within the device;

Figures 3A and 3B are enlarged portions of the light emitting surface of the wedge shaped illuminating device showing scattering centers on the surface;

Figure 4 is an enlarged cross-sectional view of the wedge shaped illuminating device showing scattering centers in the volume of the wedge;

Figure 5 is a top view of a double wedge embodiment of the invention;

Figure 6 is an end view of the double wedge embodiment shown in Figure 5; and

Figure 7 is an enlarged cross-sectional view of the double wedge embodiment shown in Figures

5 and 6 illustrating the internal reflections of light within the device.

Referring now to the drawings, and more particularly to Figure 1, there is shown a basic form of the illuminating device 10 according to the invention. The illuminating device includes a transparent plastic wedge 12. The wedge may be made of a moldable thermoplastic such as, for example, acrylics, polycarbonates or polystyrenes. Along a rectangular edge 13 of the wedge 12 are a plurality of optical fibers 14. The optical fibers 14 terminate in a common bundle which is positioned to collect concentrated light from a high efficiency source 16 which may be, for example, an arc lamp centrally located in a reflector preferably having a spherical shape. The coupling between the ends of the fibers 14 and the wedge 12 may be made by melting them together or mated in some other way so as to reduce any reflection losses and which provides for the light from the fibers to spread out in a direction perpendicular to the direction of the beam so as to provide uniform illumination over the front or light emitting surface 18. For the various applications of device 10, the front surface 18 is arranged to be co-extensive with the area to be illuminated. The back surface 20, shown in more detail in Figure 2, of the wedge is coated with a reflecting coating. Preferably, this reflecting coating is a diffuse reflector such as Barium Sulfate, BaSO<sub>4</sub>, as manufactured by Kodak of Rochester, New York, for this purpose. Alternatively, the reflecting coating may be a specular reflector, such as sputtered aluminum, but this generally does not produce as good a result as a diffuse reflector.

Figure 2 illustrates the reflections of light from one of the optical fibers 14 located at the rectangular edge 13 within the volume of the wedge 12. Figure 2 illustrates the back surface 20 in a different manner than it was shown in Figure 1 in that back surface 20 now converges relative to the light emitting surface 18. The challenge in illuminating a large area represented by illuminating device 18 is to make the illumination fairly uniform. To accomplish this by the practice of the present invention using edge lighting techniques, two principles are combined. First, the wedge 12 increases the angle of the reflections per unit distance as the wedge gets thinner and the back or reflecting surface 20 intercepts more of the light beam, shown as rays 19a...19n emitted from fiber 14 located at surface 13, as such a beam travels toward the apex of the wedge. Second, the number of scattering centers, related to the light emitting surface 18, which send light off in all directions as shown by groups of rays 19a...19n being emitted from surface 18. The scattering effect increases in the direction away from the source 14. The reflector or reflective coating on the back surface 20 ensures that all of the light not absorbed by the reflector is reflected by the reflector and comes out through the front surface 18. Either principle by itself provides some improvement in uniformity

so that in some applications, only one or the other might be used.

The scattering sources may be formed on the front surface 18, by scratching or grooving or coating the surface 18, where the density of scattering sources is low near the source 14 of the light and increases as the distance from the source increases. The scattering sources are illustrated in Figures 3A and 3B which show, respectively, grooves 17A and pits 17B as scattering sources which preferably increase in frequency of occurrence or density over the surface as their location moves away from the source of illumination 14 located at rectangular edge 13.

Alternatively, the scattering sources may be formed within the volume of the material, again with the guideline that the related density increases as the distance from the source increases. This is illustrated in Figure 4 which shows scattering particles 17c within the volume of the wedge 12. The scattered light rays are shown as groups 19a...19c which are composed of individual rays 19a...19n that are emitted from optical fiber 14 at rectangular edge 13. These particles may be passive or inert types mixed with the thermoplastic material and allowed to gradually settle toward the apex end of the wedge before curing the plastic thereby producing the increasing density of such light scattering centers as generally illustrated. The particles could be encapsulated liquid crystals such as those described in U.S. Patents No. 4,435,047 and No. 4,616,903 to Fergason and produced by Taliq Corp. of Sunnyvale, California.

Transparent electrodes 21 and 21' are applied over the front and back surfaces 18 and 20, respectively, of the wedge 12 for the purpose of applying an electric field. The application of an electric field has the effect of aligning the liquid crystals parallel to the direction of the field, in contrast to its normally structurally distorted shape in the absence of a field. When an electric field is present, the liquid crystals become more transparent, as their transparency is a function of the strength of the electric field. If the liquid crystals are nonuniformly distributed through the volume of the wedge, the application of a uniform electric field across the volume controls the light scattering effect desired. On the other hand, the use of encapsulated liquid crystals allows for some flexibility of manufacture. Specifically, the encapsulated liquid crystals may be uniformly distributed within the volume of the wedge 12 and a nonuniform electric field applied across the wedge to produce the effect of an increasing density of light scattering centers. In other words, by appropriately selecting the electric field applied across the envelope, the illuminating light emitted from the front surface 18 of the wedge 12 may be made more or less uniform as desired by the application.

When the illuminating device according to the

invention is used to illuminate, for example, an applique (cutout decoration fastened to a larger piece of material) on the rear deck of a car, the applique may be formed by molding plastic such that the back surface forms a series of wedges relative to the front surface and such that each wedge may be illuminated by means of fiber optics at the thick end or edge of the wedge. The back surface is roughened and coated with the previously discussed diffuse reflector so that all of the light not absorbed by the back surface is reflected by the back surface and comes through the front surface 18 of the applique. The purpose of the wedge shape is to provide illumination through the front surface 18 which is as uniform as possible. If it is desired that the applique be reflective, it may be made in two layers, the outer layer of which is provided with the usual corner cube reflective surface on the back, while the second layer has the wedge construction as generally shown in Figure 1.

For very large areas, such as the back of a car, it may be necessary to have a series of illuminators, each fed by its own source, for example the end of an optical fiber. As mentioned and as shown in Figure 1 with regard to reference number 16, the source of light into the fibers may be a discharge lamp light source centrally located with the reflector or a similar high efficiency light source. Unlike the incandescent lamp discussed previously, such discharge lamp may be mounted on the deck lid without fear of high acceleration, since there is no filament to fail.

It will be appreciated by those skilled in the art that there are several variables that must be considered in the practice of the invention. The first of these is the nature of the light beam introduced into the plastic wedge 12. Generally, it is preferred that the light beam be collimated, or nearly so, to achieve the best uniformity of illuminating light emitted from the front surface 18 of the wedge. Secondly, the thickness and the angle of the wedge should be determined for the specific application. And finally, when used, a decision must be made on the location and distribution of light scattering centers, either over the emitting surface 18 or within the volume of the wedge 12.

A practical example of the invention is shown in Figures 5 and 6 which illustrate a double wedge illuminating device 22 fabricated to illuminate an automobile speedometer. The speedometer itself was fabricated using LCD technology, and the double wedge structure was used to backlight the LCD. In the embodiment shown in Figures 5 and 6, light is collected and concentrated from a high efficiency light source (not shown) as before. The concentrated light is focused as an input to a pair of light guides 24 which transmit light, shown in Figure 5 as rays 25a...25n, into edges 28 and 30 of the double wedge 26. The edge 28 is comprised of portions 28A, 28B, 28C and 28D, whereas, edge 30 is comprised of portions 30A, 30B, 30C and 30D. The double wedge shape is best

seen in Figure 6 in which the two wedge portions 26 are joined at a common edge 33. The illuminator 22 having the back (32) and front (34) surfaces of each wedge 26 converge and the front surfaces 34 of the two wedges 26 forming a common illuminating surface conforming to a surface that is to be illuminated. As shown in Figure 5, the expanding beams of light 25a...25n are intercepted by serrated edge portions 28A...30D which reflect the light rays toward the thinner central part of the double wedge 26. The surfaces of the serrated edges 28 and 30 are coated with a specular reflector, such as sputtered aluminum. In the illustrated embodiment, the serrations are designed such that the light beams 25a...25n are divided into seven parts of roughly equal lumens. The seven distributed light beams of the serrated edges 28 and 30 are reflected by the back surface 32 (Figure 5) of the double wedge and are emitted from the front surface 34 (Figure 6) in the same manner as the generalized structure shown in Figure 1.

Figure 7 shows in more detail the back surface 32 of the double wedge 26 shown in Figure 6. The back surface may be grooved by means of grooves 17A, discussed with regards to Figure 3A, perpendicular to the direction from which the light (shown by rays 25a and 25n) is propagated from so as to form a surface that is stepped with 45° risers 36. The risers 36 intercept light rays 25a and 25n and redirect the light through the front surface 34 into groups of light rays 27. An alternative to grooving (17A) the back surface 32 is to texture the front surface 34 by simple rough sanding. The purpose of the sanding is to defeat total internal reflection and scatter the light striking this surface thereby allowing the light to escape. Except for the desired illuminating surface 34, the entire plastic form of wedge 22 is coated with a diffuse reflective coating 38 to assure that any light which is not totally internally reflected is returned to the plastic cavity of wedge 22 and contributes to the output of wedge 22.

While the embodiment shown in Figures 5 and 6 is particularly advantageous for use as a back light source for LCDs, such as the automobile speedometer mentioned, this particular embodiment of the invention may be used wherever uniform illumination of a large surface area is desired. Therefore, while the invention has been described in terms of preferred embodiments, those skilled in the art will recognize that the invention can be practiced with various modifications.

#### Claims

1. An illuminator for large surface areas comprising: a transparent wedge having back and front surfaces and a generally rectangular shaped edge between said surfaces, said front surface being co-extensive with an area to be illuminated;

- a high efficiency light source; and  
at least one light guide optically coupling light from said light source to said rectangular shaped edge so that light entering the wedge is internally reflected from the back surface and emitted from said front surface.
2. The illuminator according to claim 1 wherein said wedge is of a plastic material.
  3. The illuminator as recited in claim 2 further comprising a plurality of such transparent plastic wedges each having at least one converging back or front surface and a generally rectangular shaped edge between said surfaces, said front surface being co-extensive with an area to be illuminated.
  4. The illuminator as recited in claim 3 wherein the number of wedges is at least two and said two wedges are joined along a common edge where said back and front surfaces of each wedge converge and the front surfaces of said two wedges form a common illuminating surface conforming to a surface area to be illuminated.
  5. The illuminator as recited in claim 3 or 4 wherein there is at least one light guide for each of said wedges.
  6. The illuminator as recited in any preceding claim wherein the or each light guide is coupled to a wedge immediately adjacent and parallel to said rectangular edge thereof and said rectangular edge is serrated to reflect light from said light guide toward said back and front surfaces of the wedge.
  7. The illuminator as recited in any preceding claim wherein the back surface of the or each wedge is grooved to form stepped risers perpendicular to the direction of light propagating within said wedge whereby light is reflected from said stepped risers toward said front surface.
  8. The illuminator as recited in any of claims 2 - 7 wherein the or each said plastic wedge is provided with scattering centers over its said front surface, the number of scattering centers increasing along a distance moving away from said rectangular shaped edge of the wedge.
  9. The illuminator as recited in claim 8 wherein said scattering centers are grooves formed in said front surface perpendicular to a direction of propagation of the light within said wedge and having a frequency of occurrence which increases away from said rectangular shaped edge.
  10. The illuminator as recited in claim 8 wherein said scattering centers are pits formed in said front surface and have a density which increases away from said rectangular shaped edge.
  11. The illuminator as recited in any of claims 2 - 7 wherein the or each said plastic wedge is provided with scattering centers throughout its volume.
  12. The illuminator of claim 11 wherein the number of scattering centers increasing along a distance moving away from said rectangular shaped edge of the or each wedge.
  13. The illuminator as recited in claim 11 or 12 wherein said scattering centers are encapsulated liquid crystals and further comprising means for applying an electric field across said front and back surfaces of said wedge.
  14. The illuminator as recited in any preceding claim further comprising a reflective coating applied to said back surface of the or each said wedge.
  15. The illuminator as recited in claim 14 wherein said reflective coating is of a diffuse type.
  16. The illuminator as recited in any preceding claim wherein the or each said wedge is of a thermoplastic material and the light guide coupled thereto is fused with said wedge so as to reduce any reflection losses and cause light from said light guide to spread out within said plastic wedge.
  17. The illuminator as recited in any preceding claim wherein said front surface of each said wedge is integrally formed with the surface area to be illuminated.

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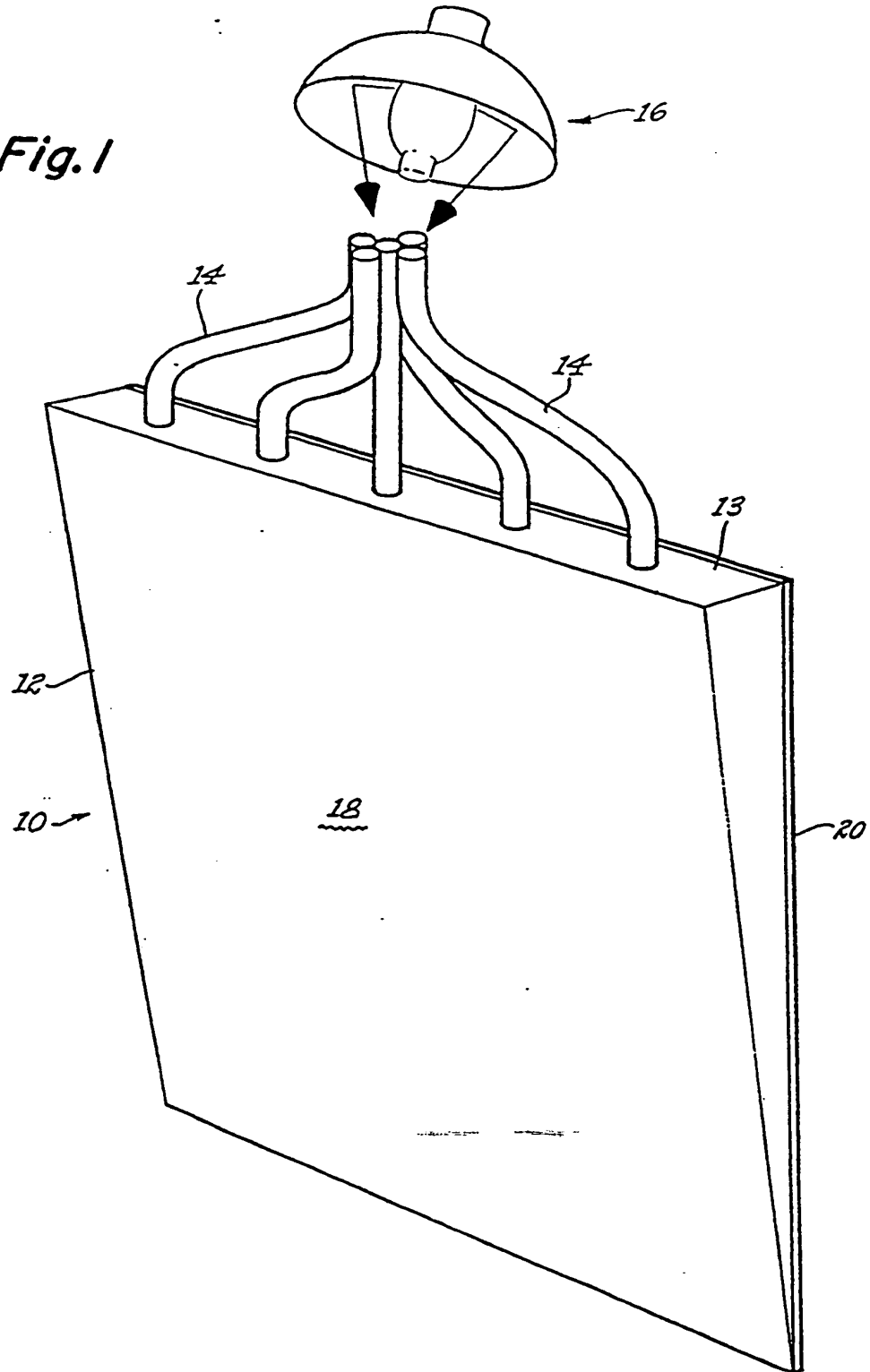
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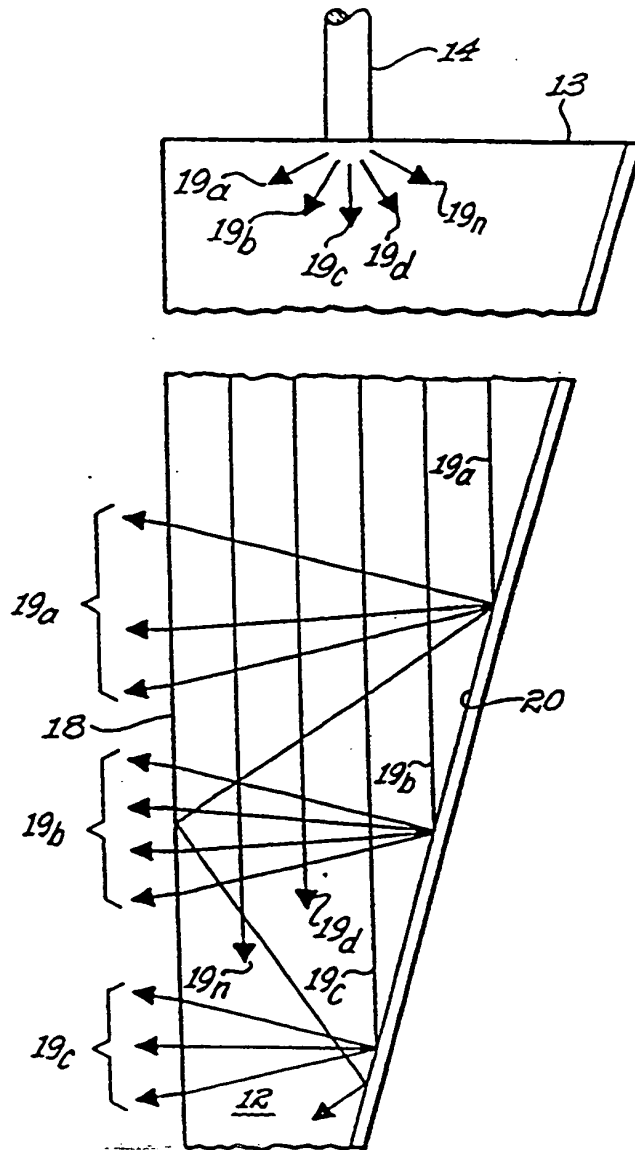
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*Fig. 1*





**Fig. 2**

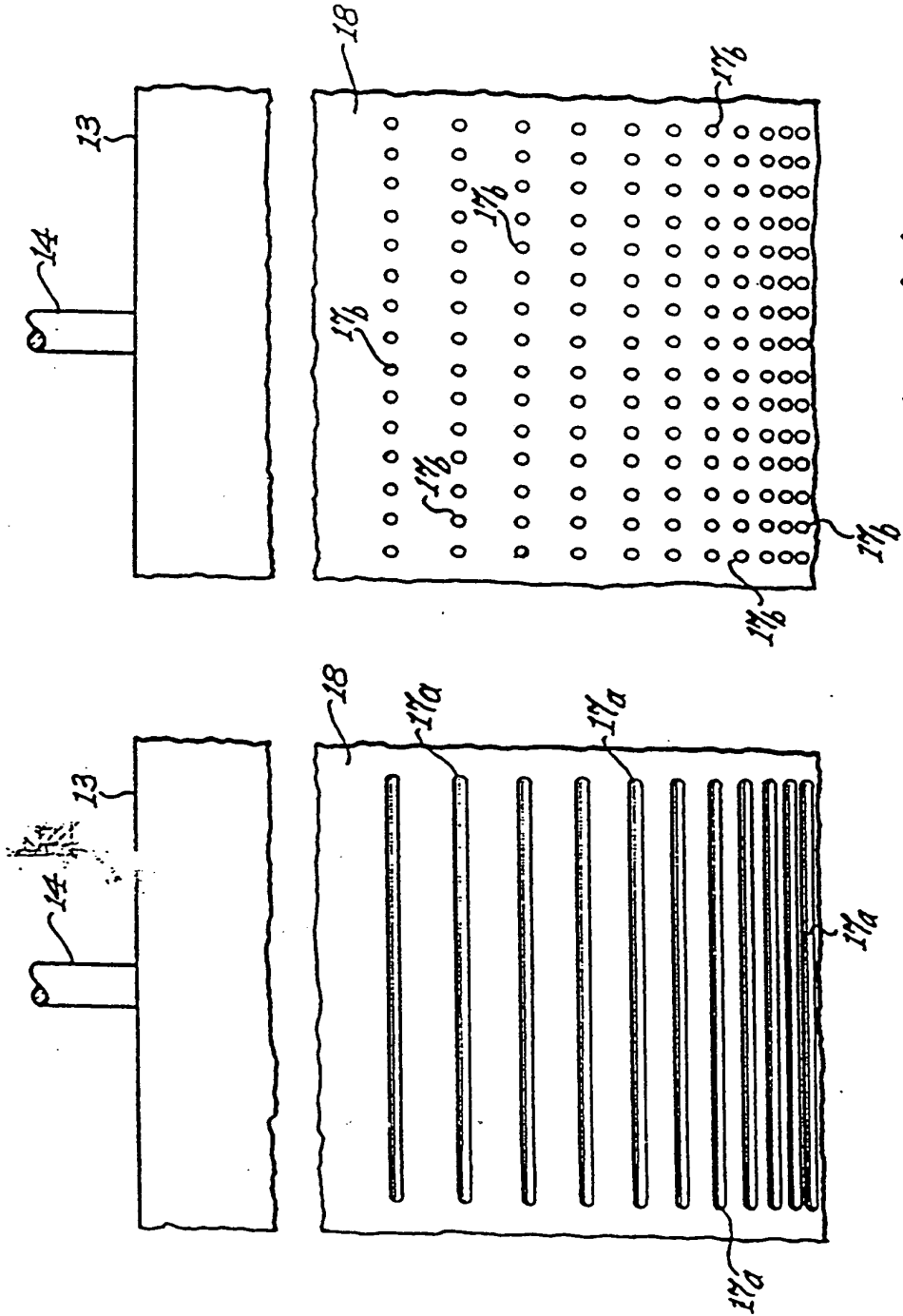
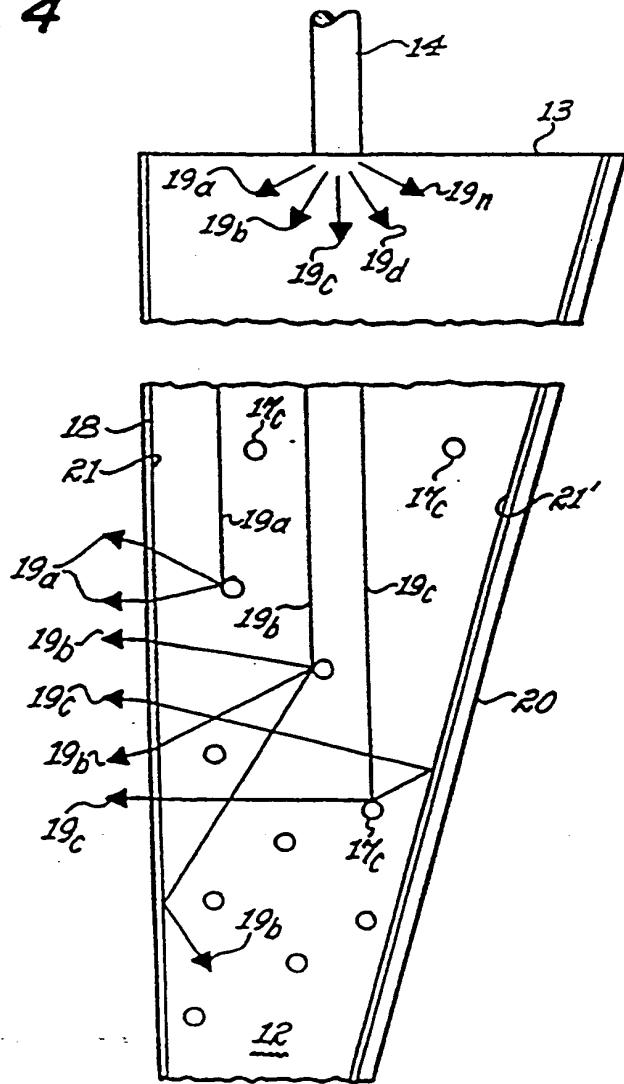


Fig. 3(b)

Fig. 3(a)



Fig. 4



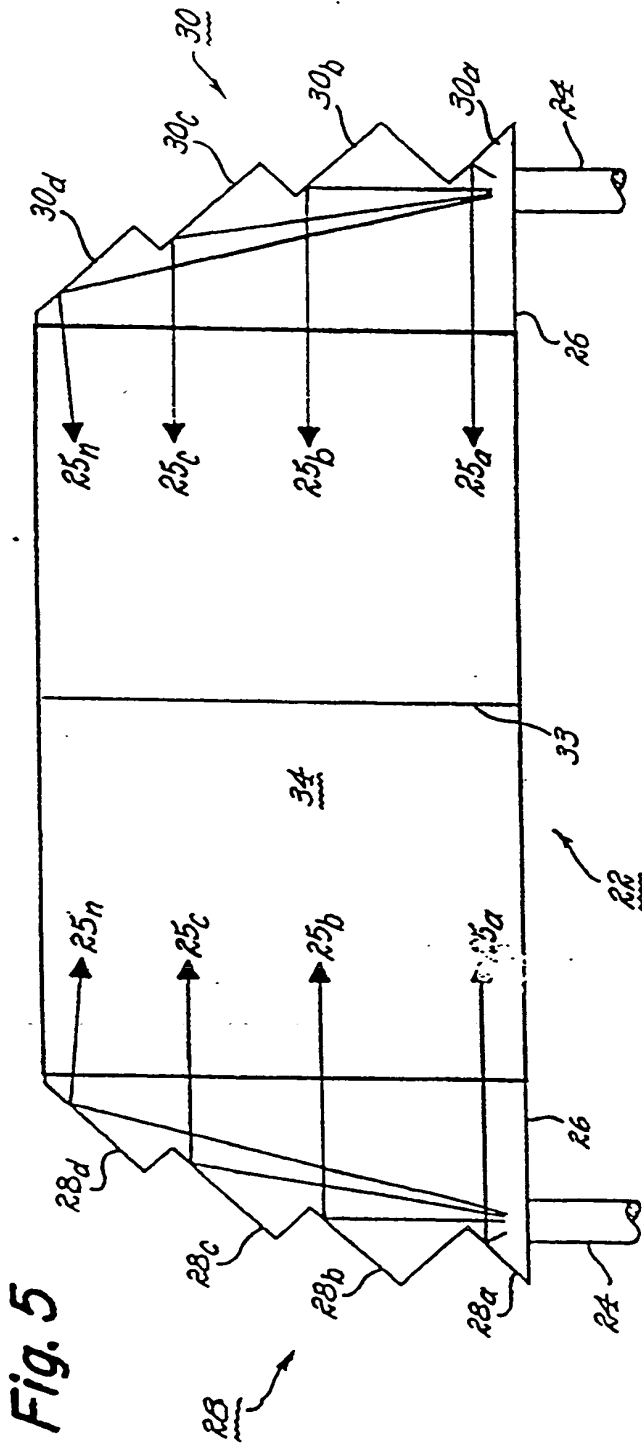


Fig. 5

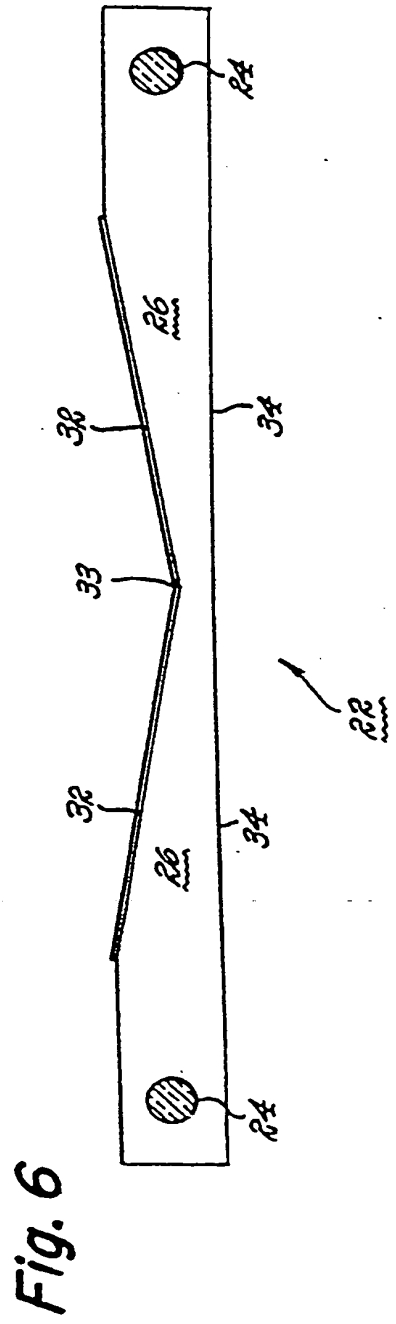
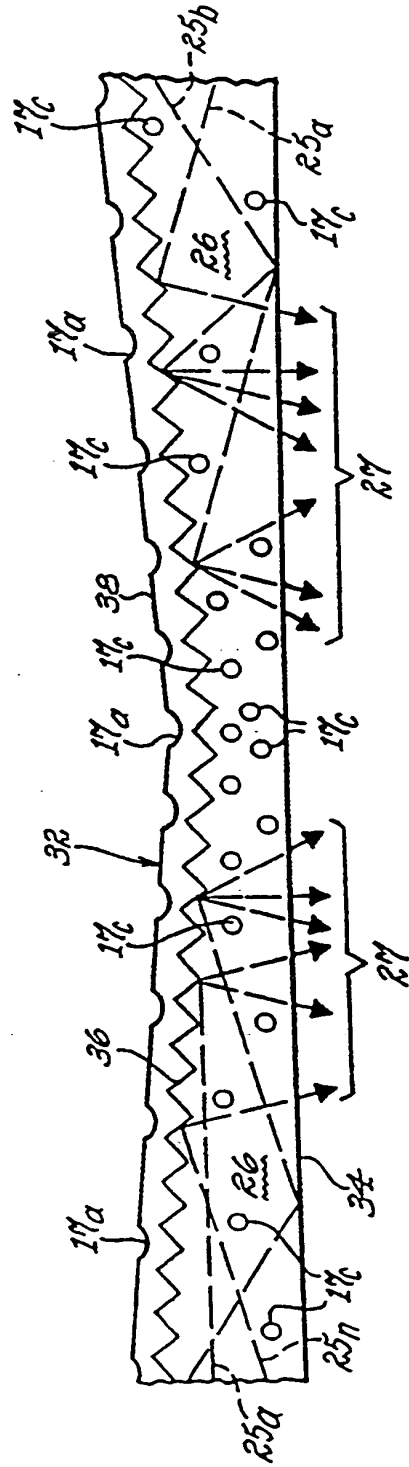


Fig. 6

Fig. 7





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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2247

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 528 617 (BLACKINGTON) * Column 2, line 20 - column 6, line 10; figures 1a-8a *	1-7, 14, 17	F 21 V 8/00
Y A	---	8, 10, 11 16	
Y	US-A-2 347 665 (CHRISTENSEN et al.) * Claim; figures 1, 2, 7-11 *	8, 10	
Y	US-A-4 466 697 (DANIEL) * Claims 1, 7, 11, 13; figure 2 *	11	
A, D	US-A-4 435 047 (FERGASON) * Column 8, lines 6-55; figure 2 *	13	
A	EP-A-0 229 863 (JOHNSEN VINTHER) * Abstract; figures 4, 5 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F 21 V
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27-06-1991	Examiner MARTIN C.P.A.
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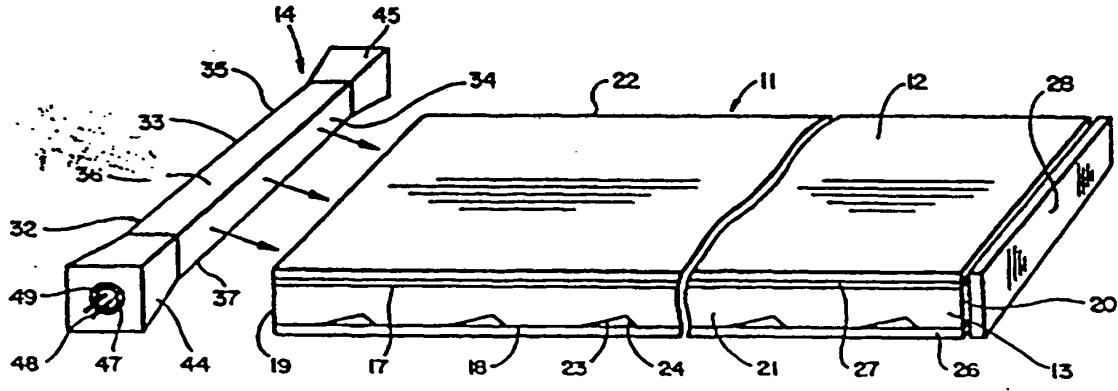
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<p>(21) International Application Number: PCT/US95/15338 (22) International Filing Date: 29 November 1995 (29.11.95) (30) Priority Data: 08/347,620 29 November 1994 (29.11.94) US (71) Applicant: PRECISION LAMP, INC. [US/US]; 720 Portal Street, Cotati, CA 94931 (US). (72) Inventors: REDMOND, William, F.; 11 Hop Ranch Road, Santa Rosa, CA 95403 (US). DUNAH, Richard, E.; 2436 Blucher Valley Road, Sebastopol, CA 95472 (US). QIAO, Yong; 622 Sant Ana Circle, Santa Rosa, CA 95404 (US). (74) Agents: TEST, Aldo, J. et al.; Flehr, Hobbach, Test, Albritton &amp; Herbert, 4 Embarcadero Center, Suite 3400, San Francisco, CA 94111-4187 (US).</p>	<p>(81) Designated States: AL, AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, LS, MW, SD, SZ, UG).  Published With international search report.</p>	

(54) Title: EDGE LIGHT FOR PANEL DISPLAY



(57) Abstract

An edge light (14) for projecting light into a lighting panel (13) through an end surface (19) of the lighting panel. The edge light includes a thin transparent optical guide member (32) having an elongate portion (33) and a least one end portion (44, 45) extending from the elongate portion. The elongate portion has a planar surface (34) and a shaped surface (35) generally parallel to the planar surface and configured for reflecting light within the guide member through one of the planar surface and the shaped surface. Either the planar surface or the shaped surface is positioned adjacent the end surface of the lighting panel when the edge light is used to illuminate the panel. The edge light also includes a light source (47) positioned at the end portion for projecting light into the elongate portion of the optical guide member.

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## EDGE LIGHT FOR PANEL DISPLAY

Brief Description of the Invention

This invention relates generally to a light source for illuminating a panel display and, more particularly, to an edge light for illuminating a lighting panel.

5

Background of the Invention

Large area light sources have many applications including, for example, backlighting liquid crystal displays (LCDs) for watches, clocks, pagers, hand-held computers, organizers and the like. Such large area light sources typically employ a thin, flat lighting panel illuminated by one or more miniature lamps, light emitting diodes or the like positioned along at least one of the edges of the lighting panel. The light radiated by the lamps enters the edges of the lighting panel and is reflected through the panel and emitted from one of the planar surfaces of the panel for illuminating the LCD.

It is generally desirable to provide the LCD with a uniform distribution of light so that the entire surface of the LCD may be easily read in most ambient light conditions. Many available lighting panels are configured to maximize the uniform distribution of light emitted from the lighting panel. However, one limitation in achieving a uniform light distribution is that the light radiated by the light source (lamp) is not uniformly distributed along the edge of the lighting panel even when a reflector or the like is used to improve the light coupling efficiency of the lamp. The light radiated by the lamp typically has a bright spot or area of high light concentration. If several lamps are required, the lamps are separated by areas of shadow or low light intensity which may produce longitudinal striations in the output of the lighting panel. Using several lamps to illuminate the lighting panel also increases the cost of the large area light source. Providing uniform lighting along the edge of the lighting panel would increase the uniform distribution of light emitted by the lighting panel.

### Objects and Summary of the Invention

It is an object of this invention to provide an edge light for illuminating a lighting panel.

It is another object of this invention to provide an edge light for uniformly  
5 illuminating the edge of a lighting panel.

It is another object of this invention to provide a large area light source employing a lighting panel and an edge light having a planar surface and a faceted surface for uniformly illuminating the edge of the lighting panel.

It is yet another object of this invention to provide an edge light minimizing the  
10 number of lamps, light-emitting diodes, or the like which are used to illuminate the lighting panel of a large area light source.

The foregoing and other objects of the invention are achieved by an edge light having a thin transparent optical guide for projecting light into the lighting panel through one of the ends of the panel. The optical guide has an elongate portion with a planar  
15 surface and a shaped surface and at least one end portion extending from the elongate portion. A light source positioned at the end portion of the optical guide projects light into the elongate portion of the optical guide. The shaped surface is configured to reflect light within the elongate portion through the planar surface or the shaped surface. In a preferred form of the invention, the planar surface is positioned adjacent the end of the  
20 lighting panel and the optical guide has two end portions each having a light source for illuminating the optical guide. The edge light also preferably includes one or more reflectors adjacent the surfaces of the optical guide for reflecting light back into the guide. In one form of the invention, the end portion is flared outward relative to the plane of the planar and shaped surfaces and the light source is supported in an opening  
25 formed in the end portion.

### Brief Description of the Drawings

The foregoing and other objects of the invention will be more readily apparent from the following detailed description and appended claims when taken in conjunction with the drawings of which:

30 Figure 1 is a perspective view of an edge light and display assembly in accordance with one embodiment of the invention;



Figure 1A is an enlarged cross-sectional view, partially broken away, of a modification of the edge light of Figure 1;

Figure 2 is an enlarged cross-sectional view of the edge light of Figure 1;

Figure 3 is a view taken along the line 3-3 of Figure 2;

5 Figure 4 is a view taken along the line 4-4 of Figure 2;

Figure 5 is an enlarged cross-sectional view, partially broken away, of an edge light in accordance with another embodiment of the invention;

Figure 6 is an enlarged cross-sectional view, partially broken away, of an edge light in accordance with another embodiment of the invention;

10 Figure 7 is an enlarged cross-sectional view, partially broken away, of an edge light in accordance with still another embodiment of the invention;

Figure 8 is an enlarged front view, partially broken away, of an edge light in accordance with yet another embodiment of the invention; and

15 Figures 9 and 10 are enlarged cross-sectional views of an edge light in accordance with other embodiments of the invention.

#### Detailed Description of the Invention

Reference will now be made in detail to the preferred embodiment of the invention, which is illustrated in the accompanying figures. Turning now to the drawings, wherein like components are designated by like reference numbers throughout  
20 the various figures, attention is directed to Figs. 1-4.

A display assembly 11 including an LCD 12, a lighting panel 13 and an edge light 14 incorporating the invention is shown in Figure 1. In the illustrated embodiment, the uniformly thin lighting panel 13 has an upper planar major surface 17 and a lower shaped major surface 18 parallel to the planar surface 17. Parallel first and second end surfaces 19 and 20 and parallel side surfaces 21 and 22 join the planar major surface 17 and the shaped major surface 18. The planar major surface 17, end surfaces 19 and 20 and side surfaces 21 and 22 are preferably polished to a smooth optical finish. A thin, flat  
25 member 26 with a highly reflective light scattering surface is positioned below the shaped major surface 18 and a reflector 28 is positioned adjacent the second end surface 20 to  
30 reflect light back into the lighting panel 13. A diffuser 27 may be placed between the LCD 12 and lighting panel 13 to scatter the light emitted from the panel and illuminates

the LCD. If a more intense light source is desired, a second edge light (not shown) may be positioned adjacent the end surface 20 instead of the reflector 28.

The shaped major surface 18 of the lighting panel 13 has a plurality of optically flat facets 23 and 24 which extend between the side surfaces 21 and 22 and are generally parallel to the front end surface 19. The inclination, spacing and depth of the facets 23 and 24 may vary as desired. Preferably, the facets 23 and 24 are shaped so that light entering the lighting panel through end surface 19 is reflected along the panel toward the end surface 20 by facets 23. Light reflected back into the lighting panel at end 20 strikes the facets 24 and is either specularly reflected upward through the planar major surface 17 or transmitted further along the lighting panel. In the illustrated embodiment, the facets 23 are inclined upwardly between 1° and 15° from the plane of the lower surface 18. The second facets 24 are inclined downwardly at a steep angle between 35° and 55° with respect to the plane of the shaped major surface 18, preferably between 40° and 50°. The grooves defined by the facets 23 and 24 are separated by planar sections having a width between 1 and 200 microns. However, facets 23 and 24 may have other configurations depending upon the desired uniformity and intensity of light emitted from the lighting panel 13.

The edge light 14 provides a uniform distribution of light for illuminating the lighting panel 13. As shown particularly in Figures 1 and 2, edge light 14 includes a transparent, optical guide 32 having an elongated portion 33 with a planar front surface 34 adjacent the end 19 of the lighting panel 13 and a shaped back surface 35 generally parallel to the planar front surface 34. The planar surface 34 preferably has a length and height substantially equivalent to the dimensions of the end surface 19 of the lighting panel 13. The planar and shaped surfaces 34 and 35 are joined by a top surface 36 and a bottom surface 37. The shaped surface 35 has a plurality of optically flat facets 38 and 39, Figure 2, separated by polished planar portions 40. The optical guide 32 also includes first and second end portions 44 and 45 extending from the elongate portion 33.

The optical guide 32 is typically an injection molded light transmissive plastic member which, depending on the light source, can emit white light or can be tinted to any desired color for respective colored light emission. The planar surface 34, the top and bottom surfaces 36 and 37 and the surfaces of the end portions 44 and 45 are preferably polished to an optical finish.

In the present embodiment, the surfaces of the end portions 44 and 45 are flared outwardly relative to the planar and shaped surfaces 34 and 35 and the top and bottom surfaces 36 and 37 as shown in Fig. 1 to accommodate a light source. The end portions 44 and 45 are each formed with an opening 46 (Figure 2) which holds an incandescent lamp 47 with the leads 48 projecting from the end portions 44 and 45 of the guide 32. The lamps 47 are coupled to the end portions 44 and 45 by a transparent, resilient light coupling material 49 which fills the opening 46 around the lamp 47. The material 49 provides shock and vibration protection, and preferably has an index of refraction for efficient transfer of light into the light guide 32. If desired, the material 49 may be tinted to provide colored illumination. Instead of the incandescent lamps 47, other light sources such as fluorescent lamps, light-emitting diodes, etc. may be used to illuminate the edge light 14. The light source may also be provided by an optical fiber 50 as shown in Figure 1A. The optical fiber may be coupled to the guide 32 by inserting one end 51 of the fiber 50 into opening 46. A remote light source 52 injects light into the opposite end of the optical fiber. The optical fiber 50 transmits light from the remote light source 52 to the guide 32, emitting light through fiber end 51 into the end portion of the guide 32.

In the present embodiment, facets 38 face one of the lamps 47 as shown in Figure 2. Facets 38 in the shaped surface 35 are inclined inwardly at an angle between  $1^\circ$  and  $15^\circ$  with respect to the plane of the shaped surface. The second facets 39 are inclined outwardly at a steep angle of between  $35^\circ$  and  $55^\circ$ , preferably  $40^\circ$  and  $50^\circ$ , with respect to the plane of the shaped surface. The depth of the grooves defining the facets is between 1 and 25 microns, and the width of the planar portions 40 separating the grooves is between 1 and 200 microns. As is illustrated by light rays 53 in Figure 2, light injected into the light guide 32 by lamps 47 is reflected along the elongate portion 33 by the planar surface 34, the facets 38 and planar portions 40 of the shaped surface 35, and the top and bottom surfaces 36 and 37. The facets 39 of the shaped surface 35 specularly reflect light through the planar surface 34 if the light strikes the facet 39 at an angle greater than or equal to the critical angle or, if the light strikes the facets 39 at an angle less than the critical angle, the facets 39 transmit light along the elongate portion 33. The light emitted from the planar surface 34 is projected into the lighting panel 13 and used to illuminate the display.

Any light escaping from the shaped surface 35 or the top and bottom surfaces 36 and 37 is reflected back into the elongate portion 33 of the guide 32 by a reflector 54 which covers the shaped surface and the top and bottom surfaces. In the present embodiment, the reflector 54 is provided by a reflector tape or other suitable material having a specular reflecting surface. Reflectors 55 and 56 reflect light emitted from the end portions 44 and 45 back into the light guide 32. The reflectors 54, 55 and 56 ensure that all of the light emitted from the optical guide 32 is directed toward the lighting panel 13, improving the efficiency of the edge light 14.

The shaped surface 35 is configured to provide a uniform distribution of light across the planar surface 34. The inclination and spacing of the facets may be uniform across the length of the shaped surface 35 as shown in Figure 2 or the inclination and spacing of the facets may be varied as necessary to provide a uniform distribution of light across the planar surface 35. The inclination of the facets 38 provides multiple reflections of light within the elongate portion 33 which uniformly distribute the light throughout the optical guide 32. The multiple reflections prevent the light from being concentrated in the area of the optical guide opposite the lamp 47. Thus, a uniform distribution of light may be provided.

If desired, the shaped surface 35 may be formed with other configurations to provide a uniform distribution of light across the planar surface 34. In the embodiment shown in Figure 5, shaped surface 35 has a plurality of facets 60 and 61 inclined at an angle of  $45^\circ$  to the plane of the shaped surface 35. The facets 60 and 61 define a plurality of transversely extending V-shaped grooves 62 having a depth of 1 to 25 microns. The grooves 62 are separated by a spacing of 1 to 250 microns.

As is demonstrated by light rays 53, light radiated from lamps 47 is reflected along the elongate portion 33 by the planar surface 34, the planar portions 40 of the shaped surface 35 and the top and bottom surfaces 36 and 37. The light striking one of the facets 60, 61 of groove 62 leaves the elongate portion 33, strikes the other facet of the groove 62 and is reflected outwardly toward the reflector 54. The reflector 54 specularly reflects the light back into the elongate portion 33 and through the planar surface 34. Any light escaping from the shaped surface 35 and top and bottom surfaces 36 and 37 is reflected back into the guide 32 and, in some instances, through the planar

surface 34. The light emitted from the optical guide 32 is uniformly distributed across the planar surface 34.

In the embodiment shown in Figure 5, the end portions 44 and 45 have a slanted surface 63 extending outwardly at an angle of  $15^\circ$  to  $30^\circ$  relative to the planar surface 34 of the elongate portion 33. The lamp source 47 is oriented with the longitudinal axis of the lamp 47 and the leads 48 extending in a direction perpendicular to the plane of the shaped surface 35. Light radiated from the lamp 47 is reflected along the optical guide 32 by the surfaces of the end portions 44 and 45.

Another embodiment of an edge light 14 is shown in Figure 6. The elongate portion 33 has a shaped surface 35 formed with a plurality of facets 65 and 66. Preferably, the facets are inclined at an angle of  $35^\circ$  to  $45^\circ$  relative to the plane of the shaped surface 34. The grooves 67 defined by the facets 65 and 66 have a depth of 1 to 25 microns. The planar portions 40 separating the grooves 67 have a width of 1 to 250 microns, although it should be understood that the depth and spacing of the grooves 67 along the elongate portion 33 may be varied to achieve a uniform distribution of light across the planar surface 34. As shown by light rays 53, light radiated from the lamps 47 is reflected along the elongate portion 33 by the planar surface 34, planar portions of the shaped surface 35 and the top and bottom surfaces 36 and 37. Light striking the facets 65 and 66 is reflected through the planar surface of the elongate portion 33 and projected into the end surface 19 of the lighting panel 13.

Figure 7 illustrates still another embodiment of the edge light 14. The shaped surface 35 of the elongate portion 33 has parallel facets 70 joined by parallel facets 71. The facets 70 are inclined at an angle of  $35^\circ$  to  $45^\circ$  relative to the plane of the shaped surface 35. The depth of the facets 70 is approximately 1 to 25 microns, while the spacing between the facets 70 is approximately 1 to 250 microns. The inclination of facets 71 will vary depending upon the depth and spacing of the facets 70. Light radiated by the lamp 47 is reflected along the elongate portion 33 by the planar surface 34 and the facets 71 of the shaped surface 35. Light striking the facets 70 is reflected through the planar surface 34 and projected into the end surface 19 of the lighting panel 13. Any light escaping from the shaped surface 35 or the top and bottom surfaces 36 and 37 is reflected back into the elongate portion 33 by the reflector 54. The light emitted from the optical guide 32 is uniformly distributed across the planar surface 34.

Another embodiment of an edge light 14 is shown in Figure 8. The elongate portion 33 has a plurality of horizontally spaced, vertical scratches 74 formed in the front surface 34. The shaped rear surface 35 may have any of the configurations of the previously described embodiments. Light radiated by the lamps 47 is reflected through the optical guide 32. The vertical scratches 74 scatter the light to provide a more uniform light distribution across the front surface 34 of the edge light 14.

In each of the previously described embodiments, the edge light 14 has a lamp 47 supported in each end portion 44 and 45 of the optical guide 32. However, as shown in Figure 9 one of the lamps 47 may be omitted if desired. For example, using only one lamp 47 may be suitable when the edge light 14 is used with a narrow lighting panel 13 or when a low intensity light source is required. Reflector 56 enhances the efficiency of the lamp 47 by reflecting light back into the optical guide 32 where it is reflected within the guide as previously described until it is eventually extracted from the front surface 34.

Figure 10 shows another embodiment of the invention in which the reflector 54 covers the planar surface 34 and the shaped surface 35 is positioned adjacent the end 19 of the lighting panel 13. The light reflected by the facets 39 through the planar surface 34 strikes the reflector 54 and is specularly reflected back into the optical guide 32 and through the shaped surface 35, as indicated. Although the shaped surface 35 has the configuration shown in Figure 7, it should be understood that the shaped surface 35 may have any of the configurations of the previous embodiments.

Except as set forth above, the construction of the embodiments in Figures 5-10 are identical to that of Figures 1-4, and like reference numerals have been applied to like parts.

As is apparent from the foregoing discussion, the edge light 14 of the invention provides a light source with a uniform light distribution. The edge light 14 requires only one or two lamps, minimizing the number of light sources required to illuminate the lighting panel 13. The edge light 14 of the invention may be used to illuminate any suitable lighting panel. Moreover, as mentioned above the shaped major surface 18 of the lighting panel 13 may have other configurations. For example, the shaped major surface 18 of the lighting panel 13 may be provided with any of the shaped surfaces 35 described in relation to embodiments of the edge light 14 shown in the Figures.

## WHAT IS CLAIMED IS:

1. A large area light source comprising:
  - a lighting panel having upper and lower major surfaces, side surfaces joining said first and second major surfaces, and a pair of end surfaces,
  - a thin transparent optical guide for projecting light into said lighting panel through one of said end surfaces, said optical guide having an elongate portion and at least one end portion extending from said elongate portion, said elongate portion having a planar surface and a shaped surface generally parallel to said planar surface, one of said planar surface and said shaped surface being positioned adjacent said end surface of said lighting panel, said shaped surface being configured for reflecting light through one of said planar surface and said shaped surface, and
  - a light source positioned at said end portion for projecting light into said elongate portion of said optical guide.
2. The large area light source of Claim 1 in which said planar surface of said elongate portion is positioned adjacent said end surface of said light guide.
3. The large area light source of Claim 1 in which said planar surface has a plurality of transversely extending scratches formed thereon.
4. The large area light source of Claim 1 in which said shaped surface has a plurality of transversely extending first and second facets formed therein, said first facets facing said end portion and said second facets facing away from said end portion.
5. The large area light source of Claim 4 in which said first facets are inclined at an angle of  $1^{\circ}$  to  $15^{\circ}$  relative to the plane of said shaped surface for reflecting light along said light guide and said second facets are inclined at an angle of  $35^{\circ}$  to  $55^{\circ}$  relative to the plane of said shaped surface for reflecting light through said planar surface of said elongate portion.

6. The large area light source of Claim 4 in which said first and second facets are inclined at an angle of  $45^\circ$  to  $67.5^\circ$  relative to the plane of said shaped surface for reflecting light through said shaped surface.
7. The large area light source of Claim 6 which further comprises a reflector adjacent said shaped surface for reflecting the emitted light back into said optical guide and through said planar surface.
8. The large area light source of Claim 4 in which said first and second facets are inclined at an angle of  $35^\circ$  to  $45^\circ$  relative to the plane of said shaped surface for reflecting light through said planar surface of said elongate portion.
9. The large area light source of Claim 4 in which said first facets are inclined at an angle of  $35^\circ$  to  $45^\circ$  relative to the plane of said shaped surface for reflecting light through said planar surface of said elongate portion, said second facets joining adjacent ones of said first facets.
10. The large area light source of Claim 4 in which said shaped surface has a plurality of transversely extending grooves defined by adjacent ones of said first facets and said second facets and a plurality of planar portions extending between said grooves for reflecting light within said optical guide along said elongate portion.
11. The large area light source of Claim 10 in which said planar portions have a width of 1 to 250 microns.
12. The large area light source of Claim 4 in which said first and second facets have a depth of 1 to 25 microns.
13. The large area light source of Claim 1 in which the dimensions of said planar surface and said shaped surface are substantially equal to the dimensions of said end surface of said lighting panel.



14. The large area light source of Claim 1 in which said optical guide includes a second end portion extending from said elongate portion, and which further comprises a second light source positioned at said second end portion.

15. The large area light source of Claim 1 in which said end portion has an opening formed therein, said light source being supported in said opening in said end portion.

16. The large area light source of Claim 15 which further comprises a resilient material filling said opening around said light source, said material coupling said light source to said end portion.

17. The large area light source of Claim 16 in which said resilient material is tinted to provide colored light.

18. The large area light source of Claim 1 in which said light source is an optical fiber which transmits light from a remote light source and emits light into said optical guide.

19. The large area light source of Claim 1 in which said end portion has a slanted surface extending outwardly from one of said planar surface and said shaped surface, said slanted surface being inclined at an angle of 15° to 30° relative to the plane of said planar surface and said shaped surface.

20. The large area light source of Claim 1 in which said end portion has flared surfaces inclined outwardly relative to said planar surface and said shaped surface.

21. The large area light source of Claim 1 in which said elongate portion has upper and lower surfaces joining said planar surface and said shaped surface, and which further comprises a reflector adjacent said shaped surface and said upper and lower surfaces for reflecting light escaping from said shaped surface and said upper and lower surfaces into said optical guide.

22. The large area light source of Claim 1 in which said optical guide has a second end portion opposite said first-mentioned end portion, and which further comprises reflectors adjacent said end portions.
23. An edge light for projecting light into a lighting panel through an end surface of said lighting panel, said edge light comprising:
- a thin transparent optical guide member having an elongate portion and at least one end portion extending from said elongate portion, said elongate portion having a planar surface and a shaped surface generally parallel to said planar surface, said shaped surface being configured for reflecting light within said guide member through one of said planar surface and said shaped surface, said end portion having flared surfaces inclined outwardly relative to said planar surface and said shaped surface and an opening formed therein, and
  - a light source positioned in said opening of said end portion for projecting light into said elongate portion of said guide member.
24. The edge light of Claim 23 which further comprises a second end portion extending from said elongate portion opposite said first-mentioned end portion, said second end portion having flared surfaces inclined outwardly relative to said planar surface and said shaped surface and an opening formed therein, and a second light source positioned in said opening of said end portion for projecting light into said elongate portion of said guide member.
25. The edge light of Claim 23 in which said light source is an optical fiber which transmits light from a remote light source and emits light into said optical guide.
26. The edge light of Claim 23 which further comprises a resilient material filling said opening around said light source and coupling said light source to said end portion.
27. The edge light of Claim 26 in which said resilient material is tinted to provide colored light.

28. The edge light of Claim 23 in which at least one of said flared surfaces is inclined at an angle of  $15^\circ$  to  $30^\circ$  relative to the plane of said planar surface and said shaped surface.
29. The edge light of Claim 23 in which said shaped surface has a plurality of facets configured for reflecting light through one of said planar surface and said shaped surface.
30. The edge light of Claim 28 in which said shaped surface has a plurality of planar portions between said facets for reflecting light within said guide member along said elongate portion.
31. The edge light of Claim 23 in which said elongate portion has upper and lower surfaces joining said planar surface and said shaped surface, and which further comprises a reflector adjacent said shaped surface and said upper and lower surfaces for reflecting light back into said guide member.

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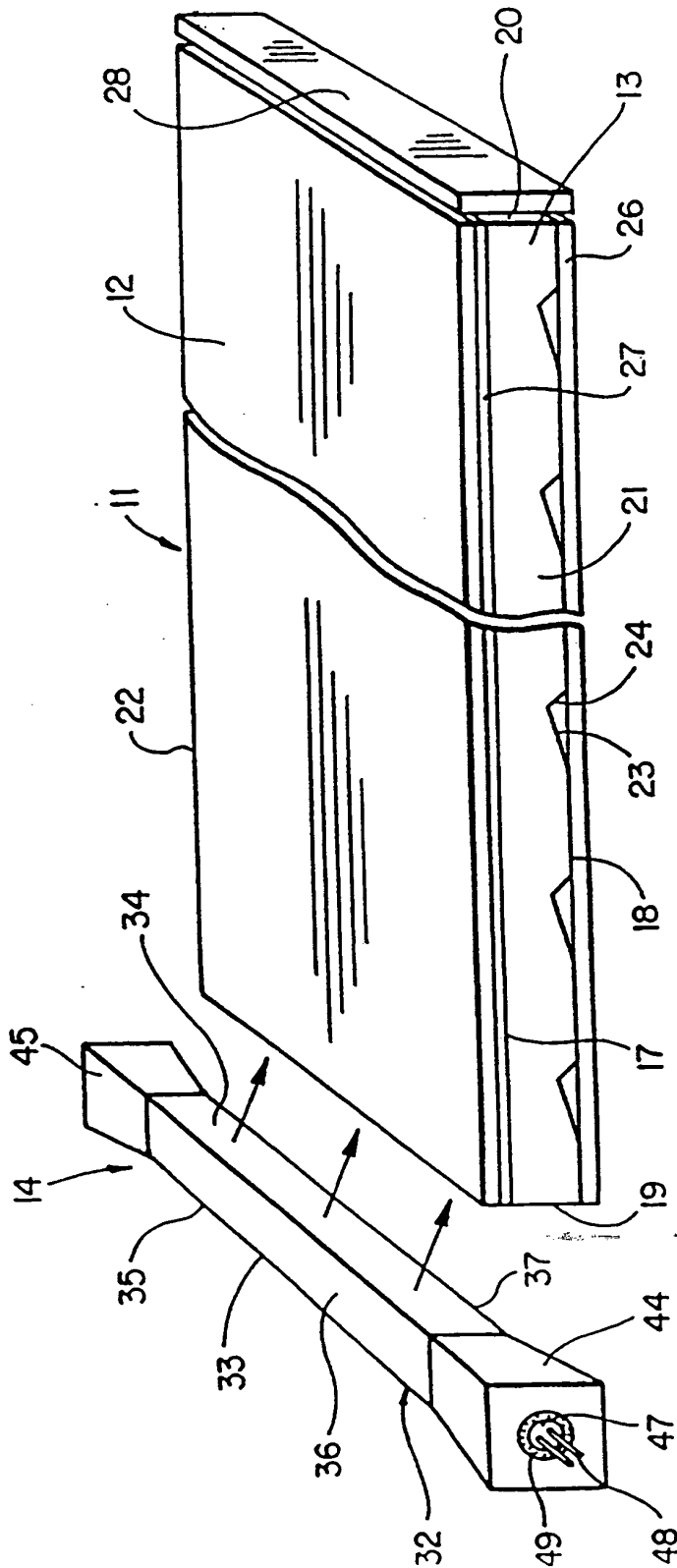
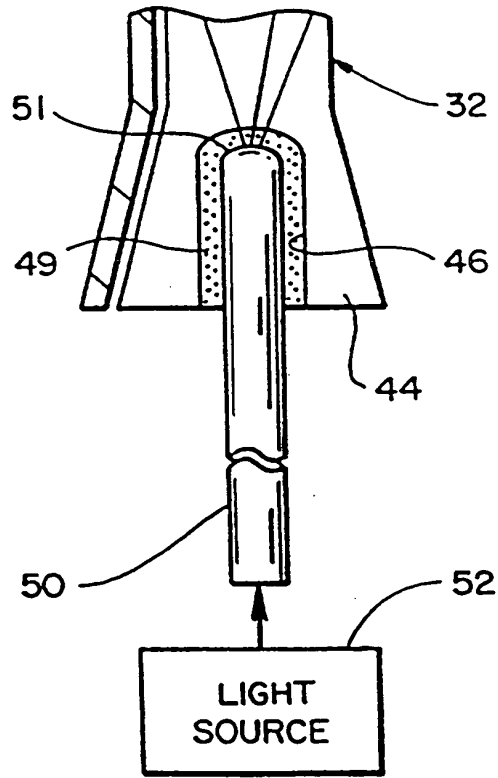


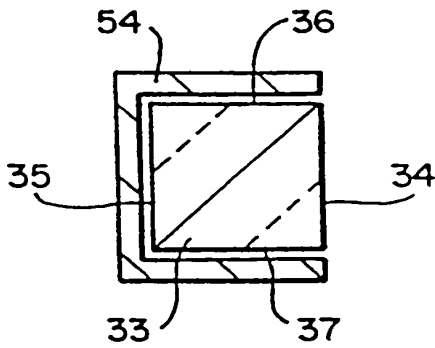
FIG. 1

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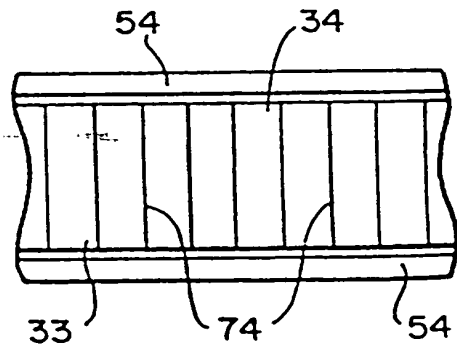
2/5



**FIG\_1A**

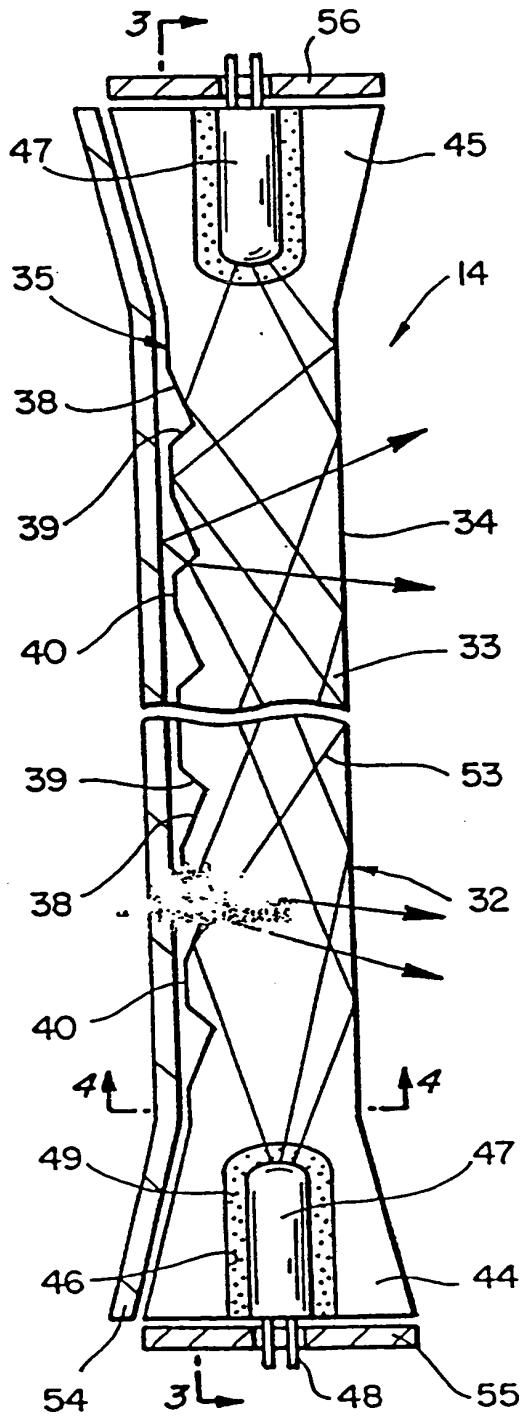


**FIG\_4**

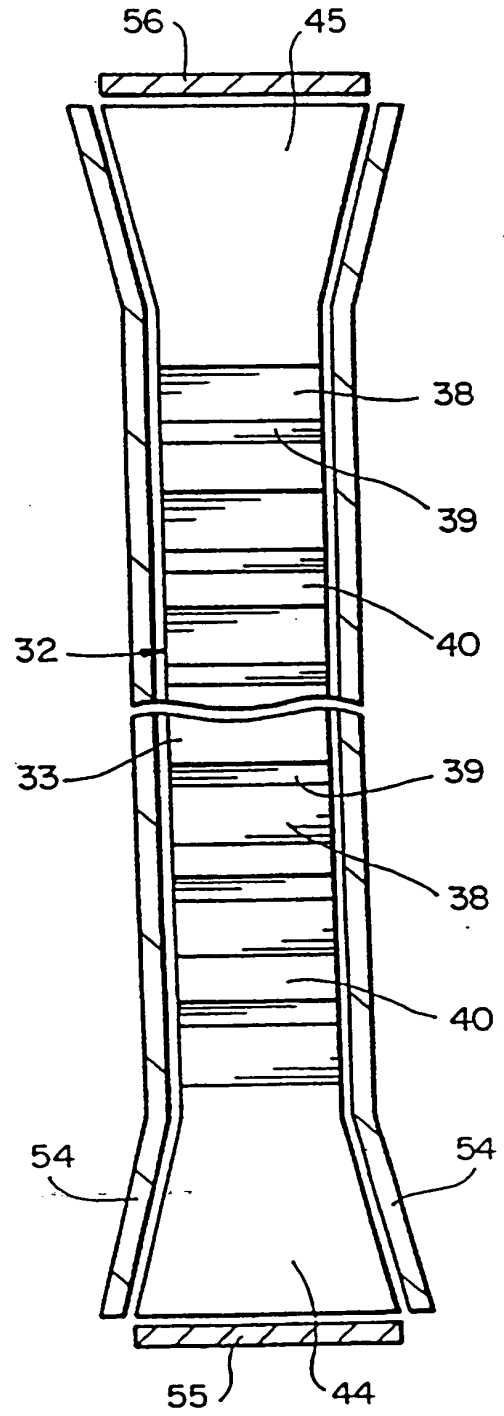


**FIG\_8**

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FIG\_2



FIG\_3

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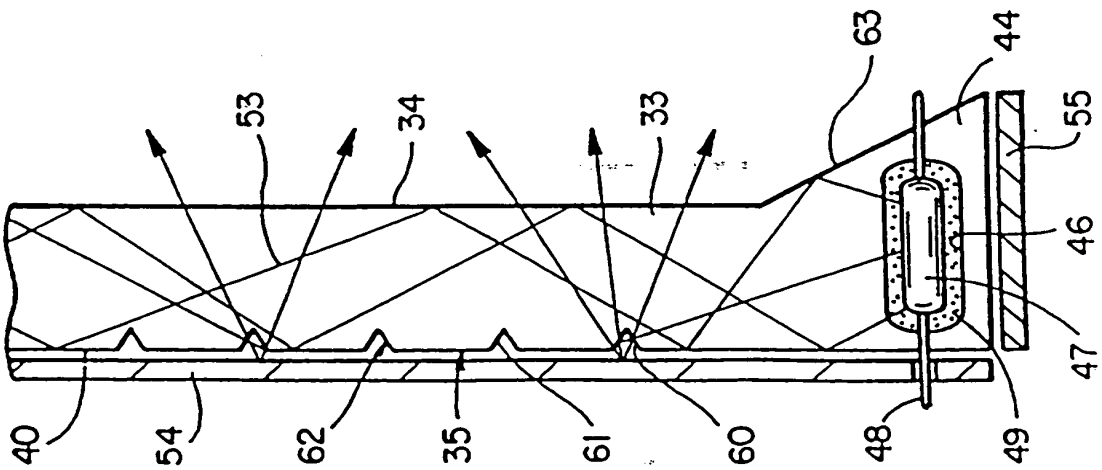


FIG-5

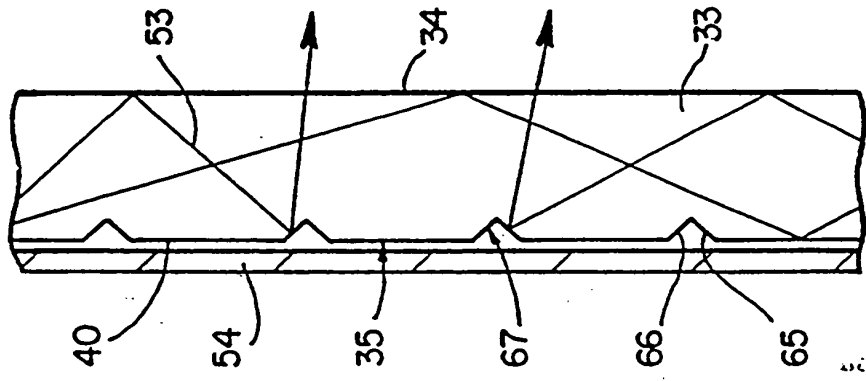


FIG-6

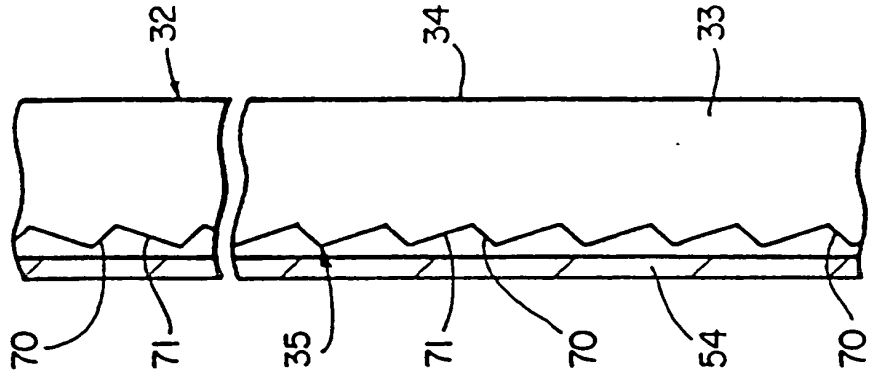
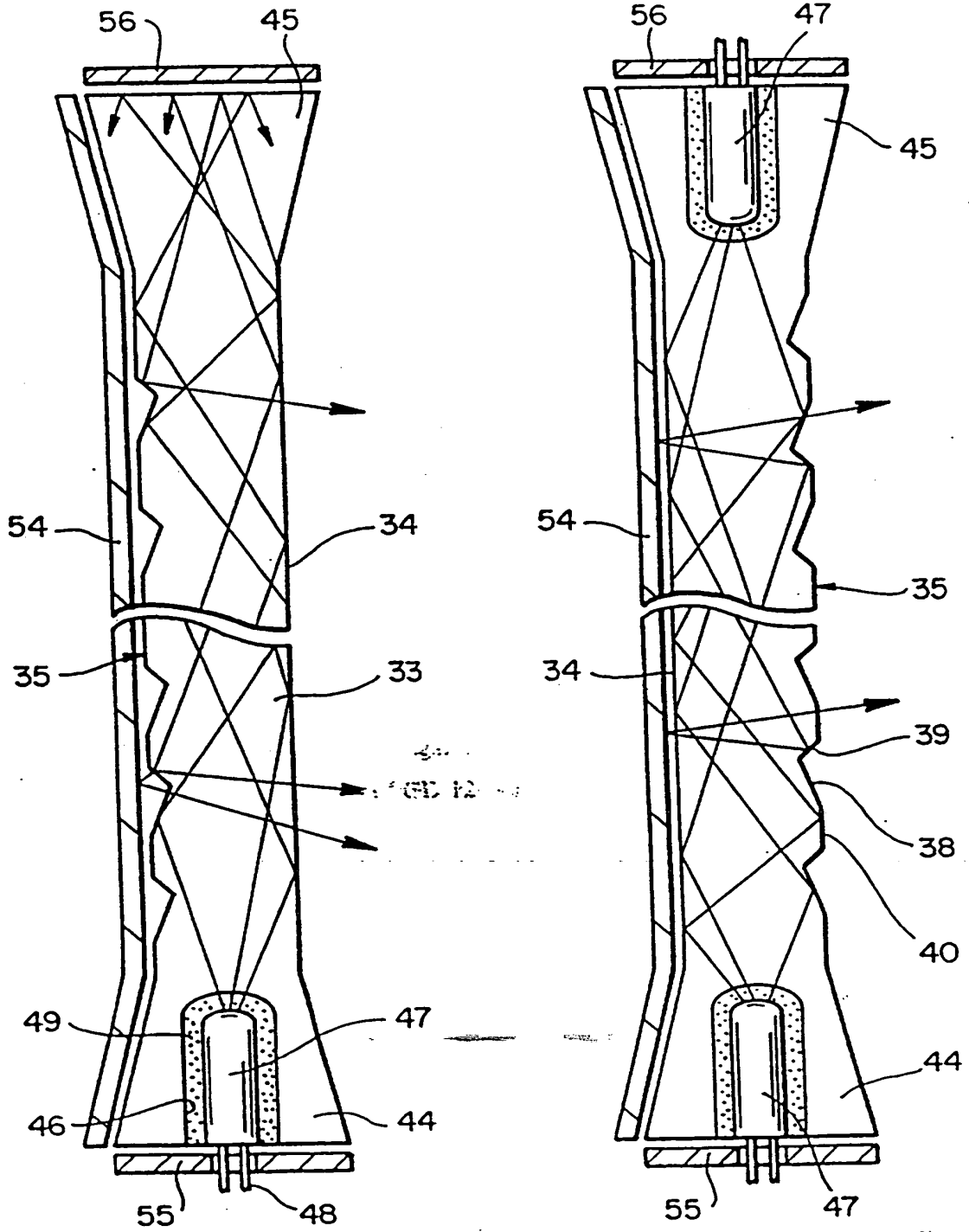


FIG-7

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FIG\_9

FIG\_10

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INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US95/15338

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : F21V 8/00; G02B 6/00

US CL : 362/31, 32, 293, 255, 369, 390, 800; 385/31, 88, 901

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)

U.S. : 362/31, 32, 293, 255, 369, 390, 800; 385/31, 88, 901

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

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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, A, 5,375,043 (TOKUNAGA) 20 December 1994, col. 2, line 43, col. 3, lines 21, 39, 40.	1, 15, 18, 23, 25
A	US, A, 5,233,679 (OYAMA) 03 August 1993, see col. 4, lines 48-66.	1-22
Y	US, A, 5,027,258 (SCHÖNIGER ET AL.) 25 June 1991, see col. 4, lines 47-56.	23-25, 28-31
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A		1-15, 18-22
Y	US, A, 3,968,584 (KINGSTON) 13 July 1976, see col. 2, line 34.	21, 22, 31
Y	US, A, 3,692,383 (HEROD ET AL.) 19 September 1991, see col. 1, lines 41-67, and col. 2, lines 1-35.	23-25, 28-31
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A		1-14, 17-22
A	US, A, 4,845,596 (MOUISSIE) 04 July 1989, see figure 6.	18
A	WO, A, 90/04132 (GULTON INDUSTRIES, INC.) 19 April 1990, see figure 4.	1
Y	US, A, 5,005,108 (PRISTASH ET AL.) 02 April 1991, see figure 1.	18, 25

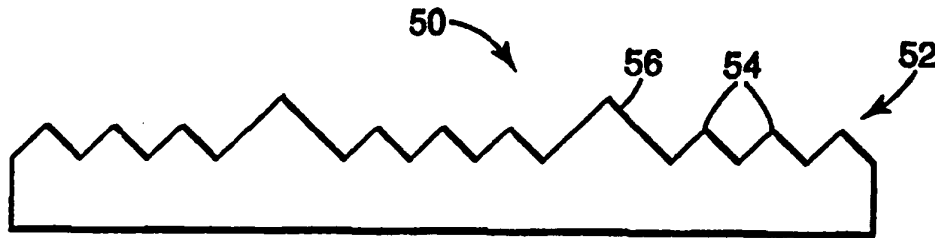
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : <b>F21V 5/02</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 96/27757</b> (43) International Publication Date: 12 September 1996 (12.09.96)</p>
<p>(21) International Application Number: PCT/US96/00796 (22) International Filing Date: 18 January 1996 (18.01.96) (30) Priority Data: 08/400,052 3 March 1995 (03.03.95) US (71) Applicant: MINNESOTA MINING AND MANUFACTURING COMPANY [US/US]; 3M Center, P.O. Box 33427, Saint Paul, MN 55133-3427 (US). (72) Inventors: WORTMAN, David, L.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). COBB, Sanford, Jr.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). GARDINER, Mark, E.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). (74) Agents: JORDAN, Robert, H. et al.; Minnesota Mining and Manufacturing Company, Office of Intellectual Property Counsel, P.O. Box 33427, Saint Paul, MN 55133-3427 (US).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KG, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: LIGHT DIRECTING FILM HAVING VARIABLE HEIGHT STRUCTURED SURFACE AND LIGHT DIRECTING ARTICLE CONSTRUCTED THEREFROM



(57) Abstract

A light directing film (50) including a first surface and a second structured surface (52). The structured surface (52) includes a repeating pattern of prism zones including at least a first zone having a plurality of prism elements (56) with peaks disposed at a first distance from a reference plane and a second zone having a plurality of prism elements (54) with peaks disposed less than the first distance from a reference plane. The width of the first zone preferably measures less than about 300 microns.

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LIGHT DIRECTING FILM HAVING VARIABLE HEIGHT STRUCTURED  
SURFACE  
AND LIGHT DIRECTING ARTICLE CONSTRUCTED THEREFROM

5

FIELD OF THE INVENTION

The present invention relates generally to light directing films. In particular, the present invention relates to light directing films having a variable height structured surface and to a light directing article constructed therefrom.

10

BACKGROUND

Some optical display designers have adopted the practice of using light directing film to increase the amount of light exiting an optical display in a direction approximately normal, or 'on axis', to the surface of the display. One commonly used light directing film has a substantially planar surface and an opposing structured surface which includes an array of linear prisms. Increasing the amount of on axis light reduces the amount of energy required to generate a desired on axis luminance. This feature becomes particularly important if the optical display includes a light source which is driven by battery power such as, for example, in laptop computers, calculators, digital wristwatches, or cellular telephones because the light source is typically a significant portion of the power consumed.

It is also known to place two sheets of light directing film adjacent one another with their prisms oriented approximately perpendicular to one another to further increase the amount of light directed approximately normal to the axis of the display. While this construction effectively increases the amount of on axis light exiting the display, the resulting structure may exhibit uneven light transmission across the surface area of the display under certain conditions. This uneven light transmission is typically manifested by visibly apparent bright spots, streaks, or lines on the surface of the display--a condition caused by optical coupling between contacting, or very nearly contacting, surfaces of the adjacent sheets of light directing film. Such visibly apparent variations in the intensity of transmitted light across the surface area of the display are undesirable.

These variations in intensity are particularly noticable in light redirecting films which have a well-defined 'cut-off' region such as the Brightness Enhancement Film manufactured by the Minnesota Mining and Manufacturing Company. This film exhibits a relatively sharp reduction in the intensity of transmitted light in specific angular ranges of deviation from an axis normal to the surface of the film. The angular ranges of relatively lower intensity light may be considered 'cut-off' regions. When the display is viewed 'on axis', the amount of light transmitted by optical coupling is small in relation to the total amount of light passing through the film. By contrast, when the display is viewed along an axis which is within a 'cut-off' region, the amount of light transmitted by optical coupling is relatively larger in relation to the total amount of light passing through the film. Accordingly, the uneven light transmission is substantially more visible when viewed at an angular range which is within a cut-off region of the film.

One method reducing the visibility of optical coupling across the surface area of the films is to use a diffuser to scatter the light. However, this has the effect of reducing the amount of light which is directed normal to the surface of the display. This is considered undesirable in most circumstances.

There is, therefore, a need in the art for a light directing article for use in optical displays which reduces undesirable optical coupling between adjacent sheets of light directing film without sacrificing the optical performance of the article. There is also a need in the art for a light directing film construction which controls undesirable optical coupling between its structured surface and an adjacent surface.

#### SUMMARY

The present invention provides a novel construction for a light directing film having a first surface and an opposing structured surface which includes an array of prism elements. In a preferred embodiment, the array includes a repeating pattern of prism zones which includes at least a first zone having a plurality of prism elements which have their peaks disposed at a first distance above a reference plane and a second zone having a plurality of prism elements which have their peaks disposed at a lesser distance from the reference plane. The

height of the prism elements in each zone may be tailored to achieve a desired optical performance objective. Additionally, the width of the respective zones may be tailored to achieve a desired optical performance objective. It is preferable, however, that the first zone be less than about 200 to 300 microns in width. A construction in accordance with this invention inhibits the occurrence of visible optical coupling when a second sheet of light directing film is placed closely adjacent to the film's structured surface by closely controlling the physical proximity of the two sheets. More specifically, this construction concentrates optical coupling in the first zones of the film, which preferably are sufficiently narrow to be virtually unresolvable by the human eye under normal viewing conditions. One significant advantage of the present invention over the prior art is that visible optical coupling is inhibited without substantially reducing the overall amount of light redirected toward an axis which is perpendicular to the surface of the film.

The present invention also encompasses a light directing article including at least one sheet of light directing film according to the present invention. The light directing article is preferably constructed by placing a second sheet of light directing film closely adjacent to the structured surface of a sheet constructed in accordance with the present invention with the prism elements of the first and second sheets disposed at a predetermined angle relative to one another. In practice, this predetermined angle typically measures between about 70 and 90 degrees and preferably about 90 degrees. Advantageously, a light directing article constructed in accordance with the present invention inhibits visibly apparent optical coupling without substantially reducing the amount of light redirected toward an axis which is normal to the surface of the article.

Other advantages of the present invention will be explained below with reference to the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a representative embodiment of a light directing film in accordance with the prior art;

Fig. 2 is an exploded perspective view of a light directing article constructed from two sheets of the light directing film depicted in Fig. 1 placed adjacent one another and having their prism elements crossed at about 90 degrees;

Fig. 3 is a cross-sectional view of one embodiment of a light directing film in accordance with the present invention which has prism elements of varying height;

Fig. 4 is a cross-sectional view of another embodiment of a light directing film in accordance with the present invention which has prism elements of varying height;

Fig. 5 is a cross-sectional view of another embodiment of a light directing film in accordance with the present invention;

Fig. 6 is a cross-sectional view of an embodiment of the present invention in which the prism elements are of different heights and have their bases in different planes;

Fig. 7 is a cross-sectional view of an optical display including a light directing article in accordance with the present invention; and

Fig. 8 is a cross-sectional view of a light guide assembly illustrating a second application of a film in accordance with the present invention.

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#### DETAILED DESCRIPTION

A representative example of a light directing film in accordance with the prior art is illustrated in Fig. 1. This film 10 may be manufactured from a suitable polymeric, acrylic, polycarbonate, UV-cured acrylate, or like material and has a smooth surface 14 and a structured surface 12 opposite the smooth surface. The structured surface 12 includes an array of linear prism elements 16 arranged side by side to form a plurality of peaks 17 and grooves 18 running the length of the film. In use, light which is incident upon the smooth surface 14 of this film at a relatively high incidence angles is refracted at the smooth surface 14 and the structured surface 12 of the film and is redirected toward an axis which is perpendicular to the smooth surface of the film. Additionally, light which strikes the structured surface 12 at greater than the critical angle undergoes total internal



reflection from both side surfaces, or facets, 20 of a prism element 16 and is directed back into the display, where it may be recycled by a reflective surface. By a combination of refraction and total internal reflection, the film 10 increases the amount of light which is directed 'on axis' and decreases the amount of light which is directed 'off axis'.

As previously stated, it is known to place a second sheet of light directing film closely adjacent the first sheet with the prism elements crossed at approximately 90 degrees to further increase the amount of light directed approximately normal to the plane of the film. Fig. 2 illustrates, in an exploded view, the orientation of crossed sheets of light directing film. In use, the lower, smooth surface 14' of the upper sheet 10' is contacting, or very nearly contacting, the structured surface 12 of lower sheet 10.

Figs. 3-6 illustrate representative embodiments of a novel construction for a light directing film in accordance with principles of the present invention. It should be noted that these drawings are not to scale and that, in particular, the size of the structured surface is greatly exaggerated for illustrative purposes. Although each of these embodiments may be used as a light directing film by itself, the disclosed films are particularly useful when crossed with a second sheet of light directing film to form a light directing article analogous to the article illustrated in Fig. 2.

Referring to Fig. 3, there is illustrated a representative cross-section of a portion of one embodiment of a light directing film in accordance with the present invention. The film 30 includes a first surface 32 and an opposing structured surface 34 which includes a plurality of substantially linearly extending prism elements 36. Each prism element 36 has a first side surface 38 and a second side surface 38', the top edges of which intersect to define the peak, or apex 42 of the prism element 36. The bottom edges of side surfaces 38, 38' of adjacent prism elements 36 intersect to form a linearly extending groove 44 between prism elements. In the embodiment illustrated in Fig. 3, the dihedral angle defined by the prism apex 42 measures approximately 90 degrees, however it will be appreciated that the exact measure of the dihedral angle in this and other embodiments may be

varied in accordance with desired optical parameters. It is known in the art to use prism elements having dihedral angles which measure between 70° degrees and 110°.

The structured surface 34 of film 30 may be described as having a plurality  
5 of alternating zones of prism elements having peaks which are spaced at different distances from a common reference plane. The common reference plane may be arbitrarily selected. One convenient example of a common reference plane is the plane which contains first surface 32; another is the plane defined by the bottom of the lower most grooves of the structured surface, indicated by dashed line 39. In  
10 the embodiment illustrated in Fig. 3, the shorter prism elements measure approximately 50 microns in width and approximately 25 microns in height, measured from dashed line 39, while the taller prism elements measure approximately 50 microns in width and approximately 26 microns in height. Importantly, the width of the zone which includes the taller prism elements  
15 preferably measures between about 1 micron and 300 microns. By contrast, the width of the zone which includes the shorter prism elements is not critical and, in the disclosed embodiment, measures between 200 microns and 4000 microns. It is preferable, however, that in any given embodiment the zone of shorter prism elements be at least as wide as the zone of taller prism elements. It will be  
20 appreciated by one of ordinary skill in the art that the article depicted in Fig. 3 is merely exemplary and is not intended to limit the scope of the present invention. For example, the height or width of the prism elements may be changed within practicable limits--it is practicable to machine precise prisms in ranges extending from about 1 micron to about 175 microns. Additionally, the dihedral angles may  
25 be changed or the prism axis may be tilted to achieve a desired optical effect.

In use, when a second sheet of light directing film is placed adjacent structured surface 34, its physical proximity to sheet 30 is limited by the peaks of the taller prism elements. It has been determined that introducing a variation of as little as about 0.5 microns between the height of taller and shorter prism elements  
30 significantly inhibits the occurrence of undesired optical coupling in the zone of shorter prism elements. Thus, utilizing a variable height structured surface 34 to

physically control the proximity of an adjacent surface dramatically reduces the surface area of structured surface 34 which is susceptible to undesired optical coupling. Instead, optical coupling occurs only within the zones which include the taller prism elements.

5           A second aspect of the present invention is that the width of the first zone is preferably less than about 200 to 300 microns. Under normal viewing conditions, the human eye has difficulty resolving small variations in the intensity of light which occur in regions less than about 200 to 300 microns in width. Thus, when the width of the first zone is reduced to less than about 200 to 300 microns,  
10 any optical coupling which may occur in this zone is not detectable to the human eye under normal viewing conditions.

          Although a preferred embodiment of the present invention implements a variable height structured surface by varying the height of adjacent zones of prism elements, a variable height structured surface may also be implemented by varying  
15 the height of one or more prism elements along its linear extent to create alternating zones which include portions of prism elements having peaks disposed at varying heights above a common reference plane. Alternatively, these two features could be combined to produce a structured surface having alternating zones of relatively higher and lower peaks along both dimensions.

20           Fig. 4 illustrates a second embodiment of the present invention which is similar to Fig. 3 except that the film 50 includes a structured surface 52 which has a zone of relatively shorter prism elements 54 separated by a zone including a single taller prism element 56. Much like the embodiment depicted in Fig. 3, the taller prism element limits the physical proximity of a second sheet of film to  
25 structured surface 52, thereby reducing the likelihood of a visible wet-out condition. It has been determined that the human eye is sensitive to changes in facet heights in light directing films and that relatively wide zones of taller prism elements will appear as visible lines on the surface of a film. While this does not materially affect the optical performance of the film, the lines may be undesirable  
30 in certain commercial circumstances. Reducing the width of a zone of taller prism

elements correspondingly reduces the ability of a human eye to detect the lines in the film caused by the taller prism elements.

Fig. 5 is a representative example of an embodiment of a light directing film in accordance with the present invention in which the prism elements are approximately the same size but are arranged in a repeating stair step or ramp pattern. The film 60 depicted in Fig. 5 includes a first surface 62 and an opposing structured surface 64 including a plurality of substantially linear prism elements 66. Each prism element has opposing lateral faces 68, 68' which intersect at their upper edge to define the prism peaks 70. The dihedral angle defined by opposing lateral faces 68, 68' measures approximately 90 degrees. In this embodiment the highest prisms may be considered a first zone and adjacent prisms may be considered a second zone. Again, the first zone preferably measures less than about 200 to 300 microns. Similar to the previously disclosed embodiments, the physical proximity of a second film placed closely adjacent structured surface 64 is limited by the highest peaks of the prism element which, in turn, reduces the likelihood of undesired optical coupling between the surfaces.

Fig. 6 illustrates a further embodiment of a light directing film in accordance with the present invention. The film 80 disclosed in Fig. 6 includes a first surface 82 and an opposing structured surface 84. This film may be characterized in that the second zone which includes relatively shorter prism elements contains prism elements of varying height. Similar to the previously disclosed embodiments, the film depicted in Fig. 6 inhibits undesired optical coupling in the second zone by controlling the physical proximity of a closely adjacent surface. The structured surface depicted in Fig. 6 has the additional advantage of substantially reducing the visibility to the human eye of lines on the surface of the film caused by the variations in the height of the prism elements.

Fig. 7 illustrates, in cross-section, a representative embodiment of a display 100 incorporating a light directing article in accordance with the principles of the present invention. Display 100 includes a case 112, a light source 116, a first sheet of light directing film 118, a second sheet of light directing film 118', a light gating device 126, and a substantially transparent cover sheet 128. In the

embodiment disclosed in Fig. 7 the light source 116 is an electroluminescent panel, however it will be appreciated that other light sources, such as, for example a fluorescent backlighting assembly commonly used with laptop computers or a passive reflective display commonly used in some calculators, are within the scope of the present invention. Additionally, while the light gating device 126 disclosed in Fig. 7 is preferably a liquid crystal device, other light gating devices are within the scope of the present invention.

The first sheet of light directing film 118 is exemplary of the embodiment illustrated in Fig. 3. It will be appreciated that Fig. 8 is not drawn to scale and that, in particular, the size of the structured surface of light directing film 118 is greatly exaggerated for illustrative purposes. As shown in Fig. 7, the higher peaks of the structured surface of light directing film 118 control the physical proximity of the second sheet of light directing film 118' to the first sheet 118. In accordance with the previous discussion, optical coupling is concentrated in the zones which have relatively higher peaks, which are preferably between about 50 and 300 microns in width.

Fig. 8 illustrates another useful application of a sheet of light directing film in accordance with the present invention. Fig. 8 is a schematic illustration of a commonly used light guide assembly 150 for use in an optical display. Light guide assembly 150 includes a light source 152, a wedge-shaped light guide 154, a diffusive reflector 156, and a sheet of light directing film 158. In use, light from the light source 152 is directed into light guide 154. Light rays which strike the surface of light guide 154 at greater than the critical angle undergo total internal reflection and are propagated along light guide 154. By contrast, light rays which strike the surface of light guide 154 at less than the critical angle are transmitted and refracted.

Light rays which exit the bottom surface of light guide 154 are reflected by diffusive reflector 156 and are "recycled" for use. Light rays which exit the top surface of light guide 154 are passed through a light gating means such as a liquid crystal device to produce an image on a display.

It is known to use a light directing film having its structured surface positioned adjacent light guide 154 as illustrated in Fig. 8 to increase the amount of an axis light leaving the light guide assembly 150. However, conventional light directing films, as depicted in Fig. 1, may allow optical coupling to occur between the structured surface of the light directing film and the upper surface of light guide 154. Light directing film 158 inhibits the occurrence of visible optical coupling by controlling the proximity of the structured surface of light directing film 158 to light guide 154.

Although the particular material used for the film may vary, it is essential that the material be substantially transparent to ensure high optical transmission. Useful polymeric materials for this purpose are commercially available such as, for example, acrylics and polycarbonates having nominal indices of refraction of about 1.493 and 1.586, respectively. Other useful polymers include polypropylene, polyurethane, polystyrene, polyvinyl chloride, and the like. While the particular material is not critical, materials having higher indices of refraction will generally be preferred.

Films in accordance with the present invention may be manufactured by various methods. Conventional methods include using a precision tool, such as a diamond turning tool, to cut a mold in a machinable substrate and replicating the mold using an embossing or UV curing process. Depending upon the manufacturing process, these films typically measure between 4 mils and 20 mils in thickness.

The following examples illustrate aspects of the present invention.

25

#### EXAMPLE 1

This example was conducted to determine whether the optical performance of a light directing film having a structured surface with periodically raised structures is similar to the optical performance of a light directing film having a structured surface with peaks of substantially the same height. To make this determination the optical performance of a sample sheet of standard light directing film, such as depicted in Fig. 1 was compared to the optical performance of two

samples of the structured surface geometries discussed above. The results are presented in Table 1.

Table 1

PATTERN	GAIN B1	GAIN S1	GAIN B2	GAIN S2	GAIN B3	GAIN S3	GAIN B4	AVG. GAIN
SQUARE	375.6	576.7	373	571.8	370.4	568.9	368.6	53.9%
TRIANGLE	370.7	568.9	368.9	565.9	365.7	557.5	363.4	53.6%
STANDARD	370.4	567.7	367.2	563.3	365.1	561.3	364	53.8%
SQUARE	369.8	567.7	367.8	563.3	364.5	560.4	363.4	53.9%
TRI	366	562.1	364.8	560.1	363.4	558.1	362.8	53.8%
STD	365.4	561.3	364.2	559.5	363.1	556.6	361.9	53.8%
STD	365.4	559.2	363.7	556.3	362.2	555.7	361.3	53.4%
TRI	364	557.8	362.2	554.5	361.3	555.1	360.5	53.5%
SQUARE	365.1	561.6	363.4	558.6	361.9	552.5	360.5	53.7%
AVERAGES								
STD	53.6%							
TRI	53.6%							
SQUARE	53.7%							

- 5 The first experimental structured surface had successive zones of six tall prism elements, measuring about 200 microns in width, adjacent 61 rows of short prism elements as shown in the post pattern in Fig. 3. The second experimental structured surface was of a ramp configuration similar to that disclosed in Fig. 4. First, a luminance meter was used to measure the on-axis luminance (in candelas
- 10 per square meter) at four different positions on a bare backlight. The results were recorded in the columns marked B1, B2, B3, and B4. Next a sheet of light directing film was placed on the backlight and the luminance meter was used to measure the on-axis luminance at the same four positions. The results were recorded in the columns marked S1, S2, S3, and S4. The average increase in on-
- 15 axis luminance is expressed as a percent of the on-axis luminance in the column marked AVG. This procedure was repeated several times for each of the sheets of

films and the results indicate that there is no significant change in optical performance between the structured surface geometries.

**EXAMPLE 2**

5            This example was conducted to determine the effects of a microstructured surface having periodic raised prism elements on the optical performance of a light directing article constructed by placing two sheets of light directing film closely adjacent one another with the respective prism elements oriented at approximately ninety degrees. Again, standard light directing film was compared with two  
 10 samples of the structured surface geometries discussed above. The first experimental structured surface had successive zones of six relatively taller prism elements, measuring about 200 microns in width, adjacent 61 rows of short prism elements. The second experimental structured surface was of a ramp configuration similar to that disclosed in Fig. 4. First, a luminance meter was  
 15 used to measure the on-axis luminance (in candelas per square meter) at five different positions on a bare backlight corresponding to the four corners and the center of the light. Next, two crossed sheets of standard light directing film were placed on the backlight and the on axis luminance was measured at the same five points. This procedure was repeated for two crossed sheets of the experimental  
 20 structured surfaces. The luminance values (in candelas per square meter) in the five different measurement points are as follows:

Table 2

		MEASUREMENT POINT				
<u>Configuration</u>		1	2	3	4	5
25	Bare Backlight	1150	1129	1177	1010	937.5
	Standard Film (Fig. 1)	2262	2274	2232	1952	1834
	Ramp Pattern (Fig. 4)	2248	2249	2306	1941	1813
	Post Pattern (Fig. 3)	2267	2242	2266	1957	1837



The increase in luminance resulting from the use of the film may be expressed as a multiple of the luminance measurement for the bare backlight, frequently referred to as the 'gain' resulting from use of a light directing film, as follows:

Table 3

5 <u>Configuration</u>	MEASUREMENT POINT					AVG.
	1	2	3	4	5	
Standard Film (Fig. 1)	1.97	2.01	1.90	1.93	1.96	1.95
Ramp Pattern (Fig. 3)	1.95	1.99	1.96	1.92	1.93	1.95
10 Post Pattern (Fig. 4)	1.97	1.99	1.93	1.94	1.96	1.96

Accordingly, the optical performance of a light directing article constructed from two crossed sheets of light directing film was not reduced by incorporating a raised structure into the structured surface of the film.

The samples were also evaluated to assess the impact of the experimental  
 15 structured surfaces on wet-out. The crossed sheets of film were placed between glass plates to apply a relatively even pressure across the surface area of the sheets. The glass plates were then placed on top of a lightbox and the films were analyzed to observe the wet-out patterns. Consistent with prior practice, the wet-out pattern of the standard light directing film, corresponding to Fig. 1, appeared  
 20 as random areas of relatively higher intensity over the surface of the film. However, the wet-out pattern of the experimental surfaces appeared as very faint lines coincident with the the zones of relatively higher prisms. By reducing the width of these zones, it is expected that the wet-out pattern will be rendered unresolvable by the human eye under normal viewing conditions.

What is claimed is:

1. A light directing film comprising:  
a first surface;  
5 a structured surface opposite said first surface and having an array of prism elements, each prism element having opposing facets which intersect at a peak, said array including a repeating pattern of prism zones, including at least:  
a first zone comprising at least a portion of a first prism element having a peak disposed at a first distance from a reference plane; and  
10 a second zone adjacent said first zone and comprising at least a portion of a first prism element having a peak disposed at a second distance from the reference plane which is less than said first.
2. The light directing film of Claim 1, wherein:  
15 said first distance measures between 1 micron and 175 microns.
3. The light directing film of Claim 1, wherein:  
said second distance measures between .5 microns and 174.5 microns.
- 20 4. The light directing film of Claim 1, wherein:  
said second distance is at least about 0.5 microns less than said first distance.
5. The light directing film of Claim 1, wherein:  
25 said second distance less than said first distance by at least about 1.0 wavelength of light.
6. The light directing film of Claim 1, wherein:  
said second distance less than said first distance by at least about 2.0  
30 wavelengths of light.

7. The light directing film of Claim 1, wherein:  
said second distance is between about 33 and 95 percent of said first  
distance.
- 5 8. The light directing film of Claim 1, wherein:  
said first zone measures less than about 300 microns in width.
9. The light directing film of Claim 1, wherein:  
said second zone measures between 200 and 4000 microns in width.
- 10 10. The light directing film of Claim 1, wherein:  
optical coupling occurs primarily in said first zone.
11. The light directing film of Claim 1, wherein:  
15 said second zone includes a plurality of prisms having peaks which are  
disposed at a different height above the reference plane.
12. A light directing article comprising:  
a first sheet of light directing film having a first surface and a structured  
20 surface opposite said planar surface, said structured surface including a linear  
array of prism elements oriented along a first major axis, said array including a  
repeating pattern of prism zones, including at least a first zone comprising at least  
a portion of a first prism element having a peak disposed at a first distance from a  
reference plane and a second zone adjacent said first zone and comprising at least  
25 a portion of a first prism element having a peak disposed at a second distance from  
the reference plane which is less than said first distance;  
a second sheet of light directing film having a first surface disposed  
proximate said first sheet of light directing film and having a structured surface  
opposite said first surface having a linear array of prism elements oriented along a  
30 second major axis;

said first major axis intersecting said second major axis within a predetermined angular range.

13. An optical display, comprising:

5 a light source;

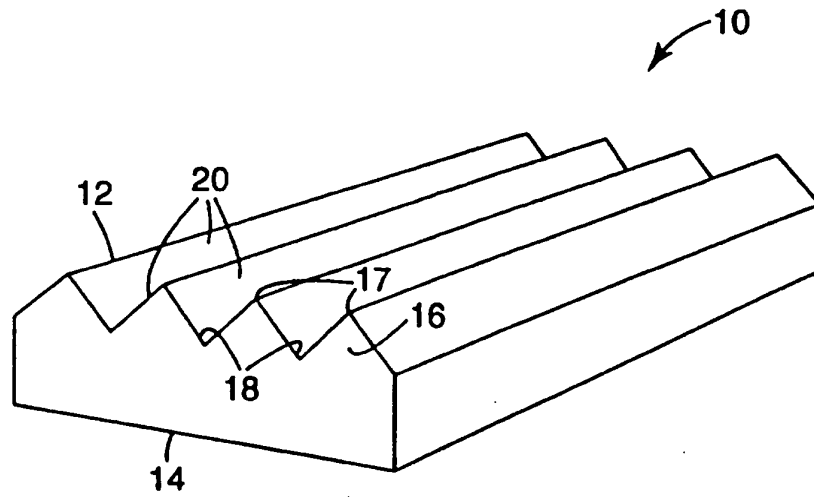
a viewing screen;

light transfer means for directing light from said light source to said viewing screen, said light transfer means including at least a first sheet of light directing film, said film including a first surface, a structured surface opposite said first surface and having an array of prism elements, each prism element having  
10 opposing facets which intersect at a peak, said array including a repeating pattern of prism zones, including at least:

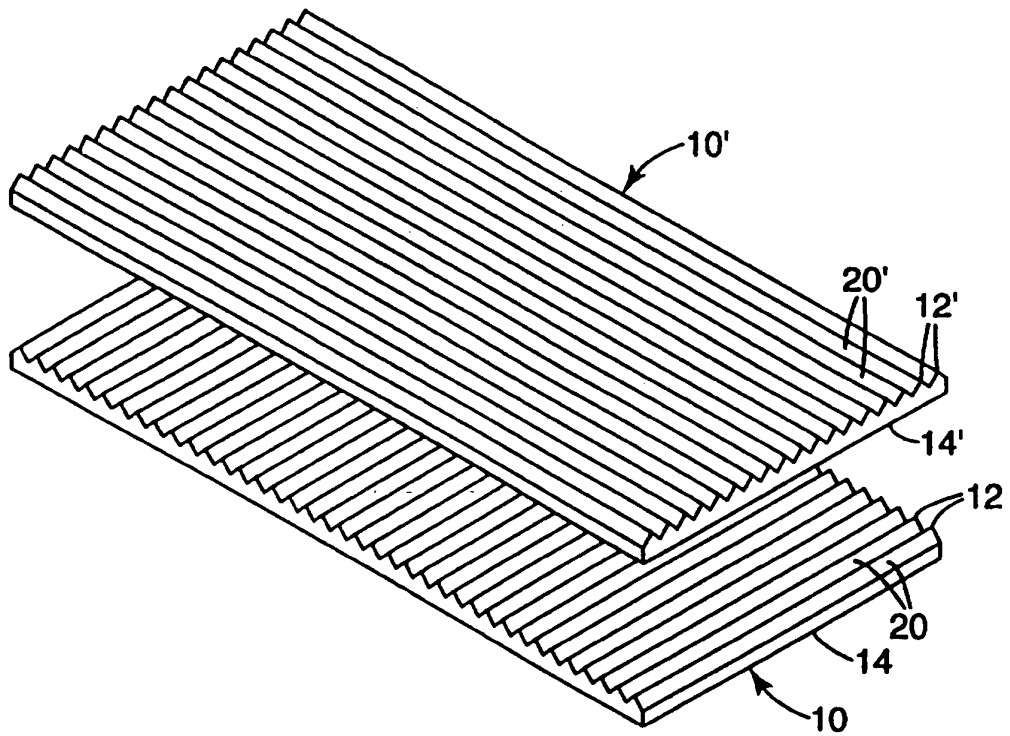
a first zone comprising at least a portion of a first prism element having a peak disposed at a first distance from a reference plane; and

15 a second zone adjacent said first zone and comprising at least a portion of a first prism element having a peak disposed at a second distance from the reference plane which is less than said first distance.

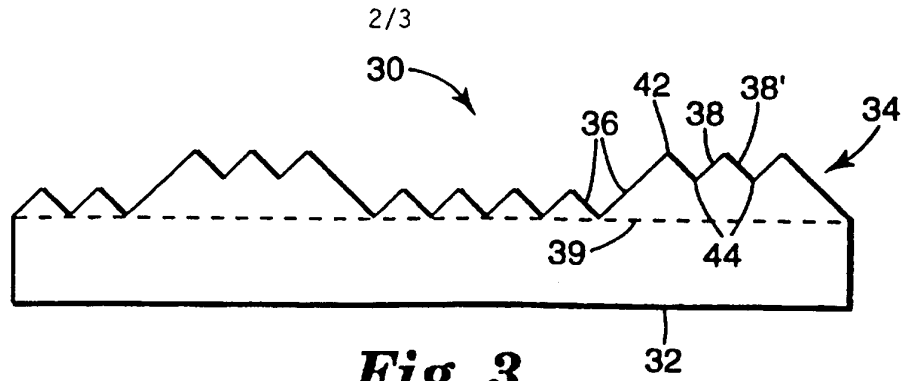
1/3



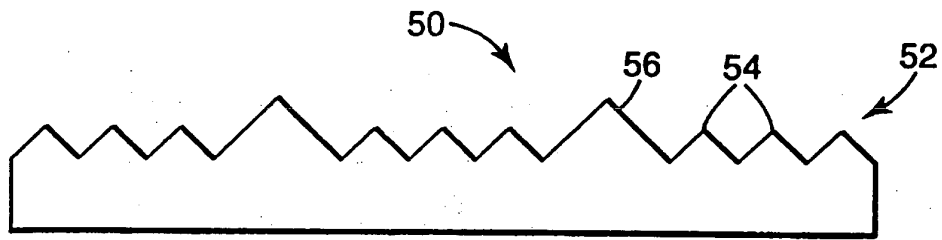
**Fig. 1**



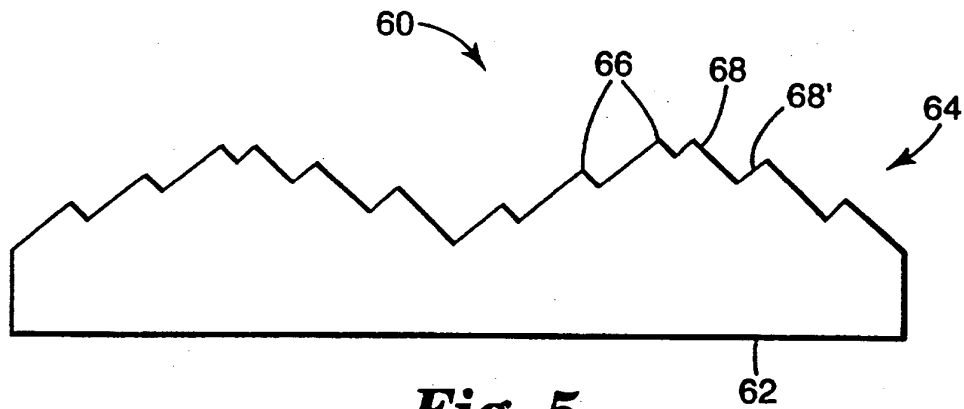
**Fig. 2**



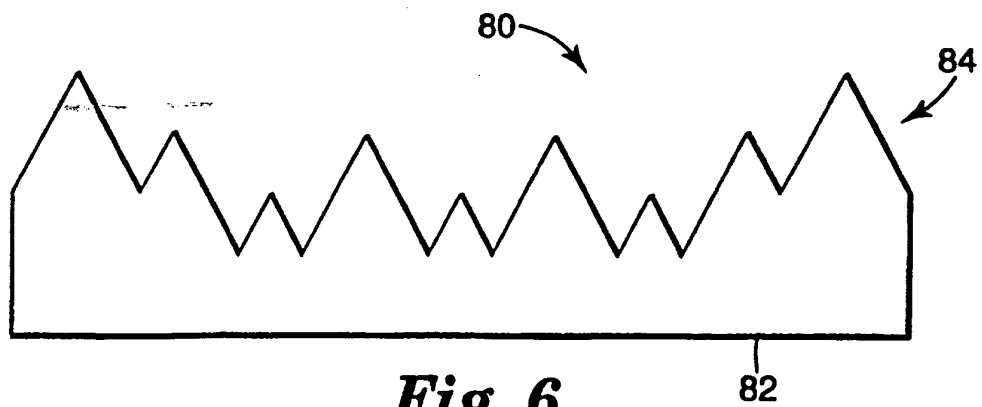
**Fig. 3**



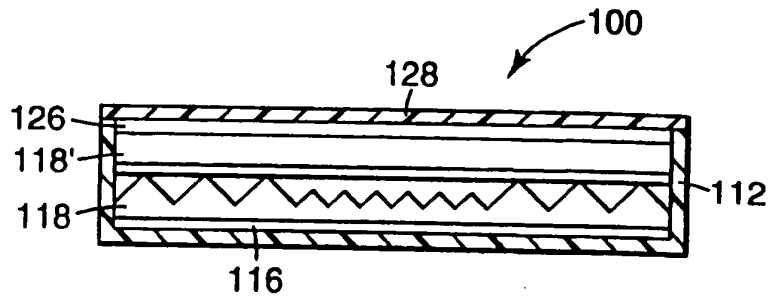
**Fig. 4**



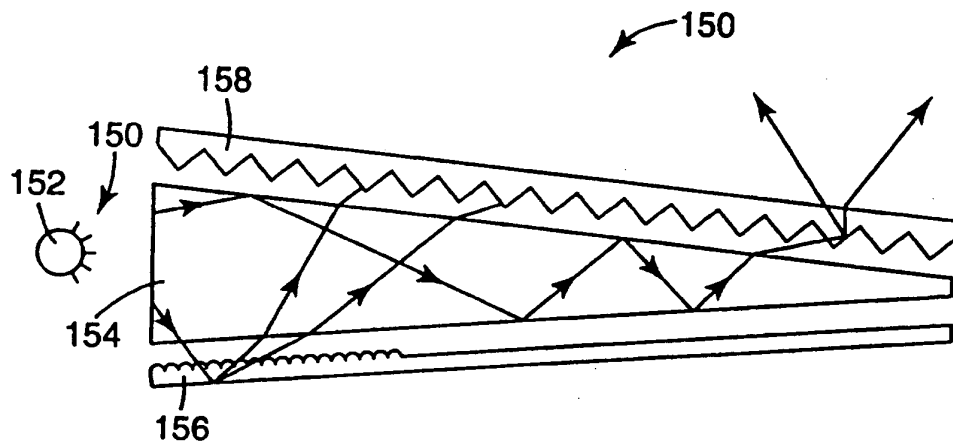
**Fig. 5**



**Fig. 6**



**Fig. 7**



**Fig. 8**

INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 96/00796

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 F21V5/02

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)  
IPC 6 F21V 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 242 723 (FABBRI WILLIAM C ET AL) 30 December 1980 see abstract; figures 3-5 ---	1,12
A	GB,A,762 769 (METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED) 5 December 1956 see page 2, line 83 - line 123; figures 1,1A ---	1
A	US,A,5 247 390 (HED AHARON Z) 21 September 1993 see column 5, line 15 - line 26 see column 5, line 47 - column 6, line 8 see column 6, line 27 - line 33; figures 1D,1E,5,6E -----	1,13

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents:

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- \*E\* earlier document 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
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- \*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
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Date of the actual completion of the international search

2 July 1996

Date of mailing of the international search report

10.07.96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+ 31-70) 340-3016

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Martin, C



INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 96/00796

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4242723	30-12-80	NONE	
GB-A-762769		NONE	
US-A-5247390	21-09-93	NONE	

Form PCT/ISA/210 (patent family annex) (July 1992)



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PTO/SB/21 (08-03) Approved for use through 08/30/2003. OMB 0651-0031 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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<b>TRANSMITTAL FORM</b> <small>(to be used for all correspondence after initial filing)</small>	Application Number	10/298,367
	Filing Date	November 18, 2002
	First Named Inventor	Jeffery R. Parker
	Art Unit	2872
	Examiner Name	Fayez G. Assaf
	Attorney Docket Number	GL0LP0106USD
Total Number of Pages in This Submission		

ENCLOSURES (Check all that apply)		
<input checked="" type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance communication to Technology Center (TC)
<input checked="" type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
<input checked="" type="checkbox"/> Amendment/Reply	<input type="checkbox"/> Petition	<input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
<input type="checkbox"/> After Final	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address	<input type="checkbox"/> Status Letter
<input type="checkbox"/> Extension of Time Request	<input checked="" type="checkbox"/> Terminal Disclaimer	<input checked="" type="checkbox"/> Other Enclosure(s) (please identify below):
<input type="checkbox"/> Express Abandonment Request	<input type="checkbox"/> Request for Refund	
<input checked="" type="checkbox"/> Information Disclosure Statement	<input type="checkbox"/> CD, Number of CD(s) _____	
<input type="checkbox"/> Certified Copy of Priority Document(s)	Remarks Terminal Disclaimer fee of \$110.00 is enclosed. Information Disclosure fee of \$180.00 is enclosed.	
<input type="checkbox"/> Response to Missing Parts/Incomplete Application		
<input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53		

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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
Firm or Individual name	Donald L. Otto, Registration No. 22,125
Signature	
Date	11/11/03

CERTIFICATE OF TRANSMISSION/MAILING	
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.	
Typed or printed name	Donald L. Otto
Signature	
Date	11/11/03

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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# FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 290.00

### Complete if Known

Application Number	10/298,367
Filing Date	November 18, 2003
First Named Inventor	Jeffery R. Parker
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<h4>METHOD OF PAYMENT (check all that apply)</h4> <p><input checked="" type="checkbox"/> Check <input type="checkbox"/> Credit card <input type="checkbox"/> Money Order <input type="checkbox"/> Other <input type="checkbox"/> None</p> <p><input checked="" type="checkbox"/> Deposit Account:</p> <p>Deposit Account Number: 18-0988</p> <p>Deposit Account Name: Renner, Otto, Boisselle &amp; Sklar, LLP</p> <p>The Director is authorized to: (check all that apply)</p> <p><input type="checkbox"/> Charge fee(s) indicated below <input checked="" type="checkbox"/> Credit any overpayments</p> <p><input checked="" type="checkbox"/> Charge any additional fee(s) during the pendency of this application</p> <p><input type="checkbox"/> Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.</p>	<h4>FEE CALCULATION (continued)</h4> <h3>3. ADDITIONAL FEES</h3> <table border="1"> <thead> <tr> <th colspan="2">Large Entity</th> <th colspan="2">Small Entity</th> <th rowspan="2">Fee Description</th> <th rowspan="2">Fee Paid</th> </tr> <tr> <th>Fee Code</th> <th>Fee (\$)</th> <th>Fee Code</th> <th>Fee (\$)</th> </tr> </thead> <tbody> <tr> <td>1051</td> <td>130</td> <td>2051</td> <td>65</td> <td>Surcharge - late filing fee or oath</td> <td></td> </tr> <tr> <td>1052</td> <td>50</td> <td>2052</td> <td>25</td> <td>Surcharge - late provisional filing fee or cover sheet</td> <td></td> </tr> <tr> <td>1053</td> <td>130</td> <td>1053</td> <td>130</td> <td>Non-English specification</td> <td></td> </tr> <tr> <td>1812</td> <td>2,520</td> <td>1812</td> <td>2,520</td> <td>For filing a request for <i>ex parte</i> reexamination</td> <td></td> </tr> <tr> <td>1804</td> <td>920*</td> <td>1804</td> <td>920*</td> <td>Requesting publication of SIR prior to Examiner action</td> <td></td> </tr> <tr> <td>1805</td> <td>1,840*</td> <td>1805</td> <td>1,840*</td> <td>Requesting publication of SIR after Examiner action</td> <td></td> </tr> <tr> <td>1251</td> <td>110</td> <td>2251</td> <td>55</td> <td>Extension for reply within first month</td> <td></td> </tr> <tr> <td>1252</td> <td>420</td> <td>2252</td> <td>210</td> <td>Extension for reply within second month</td> <td></td> </tr> <tr> <td>1253</td> <td>950</td> <td>2253</td> <td>475</td> <td>Extension for reply within third month</td> <td></td> </tr> <tr> <td>1254</td> <td>1,480</td> <td>2254</td> <td>740</td> <td>Extension for reply within fourth month</td> <td></td> </tr> <tr> <td>1255</td> <td>2,010</td> <td>2255</td> <td>1,005</td> <td>Extension for reply within fifth month</td> <td></td> </tr> <tr> <td>1401</td> <td>330</td> <td>2401</td> <td>165</td> <td>Notice of Appeal</td> <td></td> </tr> <tr> <td>1402</td> <td>330</td> <td>2402</td> <td>165</td> <td>Filing a brief in support of an appeal</td> <td></td> </tr> <tr> <td>1403</td> <td>290</td> <td>2403</td> <td>145</td> <td>Request for oral hearing</td> <td></td> </tr> <tr> <td>1451</td> <td>1,510</td> <td>1451</td> <td>1,510</td> <td>Petition to institute a public use proceeding</td> <td></td> </tr> <tr> <td>1452</td> <td>110</td> <td>2452</td> <td>55</td> <td>Petition to revive - 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late filing fee or oath		1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet		1053	130	1053	130	Non-English specification		1812	2,520	1812	2,520	For filing a request for <i>ex parte</i> reexamination		1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action		1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action		1251	110	2251	55	Extension for reply within first month		1252	420	2252	210	Extension for reply within second month		1253	950	2253	475	Extension for reply within third month		1254	1,480	2254	740	Extension for reply within fourth month		1255	2,010	2255	1,005	Extension for reply within fifth month		1401	330	2401	165	Notice of Appeal		1402	330	2402	165	Filing a brief in support of an appeal		1403	290	2403	145	Request for oral hearing		1451	1,510	1451	1,510	Petition to institute a public use proceeding		1452	110	2452	55	Petition to revive - unavoidable		1453	1,330	2453	665	Petition to revive - unintentional		1501	1,330	2501	655	Utility issue fee (or reissue)		1502	480	2502	240	Design issue fee		1503	640	2503	320	Plant issue fee		1460	130	1460	130	Petitions to the Commissioner		1807	50	1807	50	Processing fee under 37 CFR 1.17(q)		1806	180	1806	180	Submission of Information Disclosure Stmt	180	8021	40	8021	40	Recording each patent assignment per property (times number of properties)		1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))		1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))		1801	770	2801	385	Request for Continued Examination (RCE)		1802	900	1802	900	Request for expedited examination of a design application		Other fee (specify) Terminal Disclaimer					110	*Reduced by Basic Filing Fee Paid						<b>SUBTOTAL (3)</b>					<b>290.00</b>
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<b>SUBMITTED BY</b>		(Complete if applicable)	
Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22,125
Telephone	(216) 621-1113	Date	11/11/03
Signature			

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Date: November 11, 2003

  
Donald L. Otto

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Attorney Docket GLOLP0106USD

In re PATENT application of

Jeffery R. Parker et al

Serial No. 10/298,367

Filed November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Art Unit 2872  
Confirmation No. 3656  
Fayez G. Assaf, Examiner

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**REPLY TO OFFICE ACTION OF SEPTEMBER 8, 2003**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

In reply to the Office Action of September 8, 2003, please amend the above-identified application as follows:

**Amendments to the Specification** begin on page 3 of this paper.

**Amendments to th Claims** are reflected in the listing of claims which begins on page 4 of this paper.

**Remarks/Arguments** begin on page 11 of this paper.

**Amendments to the Specification:**

Please replace the paragraph following the heading "ABSTRACT OF THE DISCLOSURE" on page 29 with the following amended paragraph:

Light emitting panel assemblies include in one form of the invention a light emitting panel member made of a transparent resiliently deformable elastomeric material that absorbs impact without breakage for use in automotive lighting applications of various types. In another form of the invention, a rigid light emitting panel member may be used with dome switches for switch area lighting or to backlight control buttons/key pads ~~by providing holes or openings in the panel member for the control buttons/key pads.~~ Also, a rigid light emitting panel member may be used as a structural member, and two or more such light emitting panel members may be stacked together and used to light an instrument panel or the like. ~~One or more light sources may be mounted within one or more light transition areas adjacent one or more light input surfaces of the light emitting panel members. Also one or more light sources may be positioned adjacent one side of the light emitting panel members for causing light to shine through the panel members or through holes in the panel members for performing specified lighting functions.~~



UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office  
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/298,367	11/18/2002	Jeffery R. Parker	GLOLP0106USD	3656

7590 09/08/2003

Donald L. Otto  
Renner, Otto, Boisselle & Sklar, LLP  
19th Floor  
1621 Euclid Avenue  
Cleveland, OH 44115-2191

EXAMINER

ASSAF, FAYEZ G

ART UNIT PAPER NUMBER

2872

DATE MAILED: 09/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/298,367	Applicant(s) PARKER ET AL. <i>W</i>
	Examiner Fayez G. Assaf	Art Unit 2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1)  Responsive to communication(s) filed on 16 July 2003.
- 2a)  This action is FINAL.                      2b)  This action is non-final.
- 3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4)  Claim(s) 1-52 is/are pending in the application.
- 4a) Of the above claim(s) 26-52 is/are withdrawn from consideration.
- 5)  Claim(s) \_\_\_\_\_ is/are allowed.
- 6)  Claim(s) 1-25 is/are rejected.
- 7)  Claim(s) \_\_\_\_\_ is/are objected to.
- 8)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9)  The specification is objected to by the Examiner.
- 10)  The drawing(s) filed on 18 November 2002 is/are: a)  accepted or b)  objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11)  The proposed drawing correction filed on \_\_\_\_\_ is: a)  approved b)  disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12)  The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a)  All b)  Some \* c)  None of:  
    1.  Certified copies of the priority documents have been received.  
    2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
    3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14)  Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a)  The translation of the foreign language provisional application has been received.
- 15)  Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other:  |



Art Unit: 2872

**DETAILED ACTION*****Specification***

The abstract of the disclosure is objected to because it exceeds 150 words. Correction is required. See MPEP § 608.01(b).

***Election/Restrictions***

Applicant's election of Species 1: claims 1-25 in Paper No. 5 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election **without** traverse (MPEP § 818.03(a)). Claims 26-52 are withdrawn from further consideration pursuant to 37 CFR 1.142(b).

***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA

Art Unit: 2872

1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-16, 24 and 25 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-97 of U.S. Patent No. 5,613,751. Although the conflicting claims are not identical, they are not patentably distinct from each other because, the claims are substantially variant combinations of the patent's claims reciting inherent features and having different scopes, for example:

Claims 2 and 25 of the instant application are substantially composed of limitations extracted from claims 12 and 88 of said patent. The panel member has been renamed broadly as a light guide.

Art Unit: 2872

Claims 12 and 13 of the instant application are substantially composed of limitations extracted from claim 72 of said patent.

Claims 6, 8 and 24 of the instant application are substantially composed of limitations extracted from claim 10 of said patent.

Claims 17-23 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-97 of U.S. Patent No. 5,613,751. Although the conflicting claims are not identical, they are not patentably distinct from each other because, the claims of U.S. Patent No. 5,613,751, disclose the claimed invention including the transparent substrate being a diffuser (claim 12). However, the claims do not recite the surface of said substrate/film having deformities.

It would have been obvious, at the time the invention was made, to a person having ordinary skill in the art to utilize a diffuser having deformities thereon, because such diffusers are suitable in motor vehicle applications.

#### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fayez G.

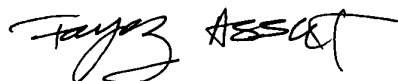
Art Unit: 2872

Assaf whose telephone number is (703) 306-5526. The examiner can normally be reached on 8-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (703) 305-0024. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Fayez G. Assaf  
Examiner  
Art Unit 2872



FA  
9/3/03

<b>Notice of References Cited</b>	Application/Control No. 10/298,367	Applicant(s)/Patent Under Reexamination PARKER ET AL.	
	Examiner Fayez G. Assaf	Art Unit 2872	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A US-5,613,751	03-1997	Parker et al.	362/31
	B US-			
	C US-			
	D US-			
	E US-			
	F US-			
	G US-			
	H US-			
	I US-			
	J US-			
	K US-			
	L US-			
	M US-			

**FOREIGN PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N				
	O				
	P				
	Q				
	R				
	S				
	T				

**NON-PATENT DOCUMENTS**

*	Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U
	V
	W
	X

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
 Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

2872 / 14



PTO/SB/21 (05-03)  
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 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b> <small>(to be used for all correspondence after initial filing)</small>	Application Number	10/298,367
	Filing Date	November 18, 2002
	First Named Inventor	Jeffery R. Parker
	Art Unit	2872
	Examiner Name	Fayaz G. Assaf
Total Number of Pages in This Submission	6	Attorney Docket Number GLOLP0106USD

ENCLOSURES (Check all that apply)		
<input checked="" type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached <input checked="" type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input checked="" type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Response to Missing Parts/Incomplete Application <input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____	<input type="checkbox"/> After Allowance communication to Group <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to Group (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input type="checkbox"/> Other Enclosure(s) (please identify below):
Remarks		

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 JUN 10 2003  
 TECHNOLOGY CENTER 2800

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
Firm or Individual name	Donald L. Otto, Reg. No. 22,125
Signature	<i>Donald L. Otto</i>
Date	July 3, 2003

CERTIFICATE OF TRANSMISSION/MAILING	
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.	
Typed or printed name	Donald L. Otto
Signature	<i>Donald L. Otto</i>
Date	July 3, 2003

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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OIP JUL 07 2003 PATENT & TRADEMARK OFFICE

OIP JUL 07 2003 PATENT & TRADEMARK OFFICE

PTO/SB/17 (01-03)

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# FEE TRANSMITTAL for FY 2003

Patent fees are subject to annual revision.

Complete if Known:

Application Number	10/298,367
Filing Date	November 18, 2000
First Named Inventor	Jeffery R. Parke
Examiner Name	Fayaz G. Assaf
Art Unit	2872
Attorney Docket No.	GLOLP0106USD

Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 110.00

### METHOD OF PAYMENT (check all that apply)

Check  Credit card  Money Order  Other  None

Deposit Account:

Deposit Account Number: 18-0988  
Deposit Account Name: Renner, Otto, Boisselle & Sklar, LLP

The Commissioner is authorized to: (check all that apply)

Charge fee(s) indicated below  Credit any overpayments  
 Charge any additional fee(s) during the pendency of this application  
 Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

### FEE CALCULATION

#### 1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 750	2001 375	Utility filing fee	
1002 330	2002 165	Design filing fee	
1003 520	2003 260	Plant filing fee	
1004 750	2004 375	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	
SUBTOTAL (1) (\$)			

#### 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	-20** =	X	=
Multiple Dependent	-3** =	X	=

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1202 18	2202 9	Claims in excess of 20	
1201 84	2201 42	Independent claims in excess of 3	
1203 280	2203 140	Multiple dependent claim, if not paid	
1204 84	2204 42	** Reissue independent claims over original patent	
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent	
SUBTOTAL (2) (\$)			

\*\*or number previously paid, if greater; For Reissues, see above

### FEE CALCULATION (continued)

#### 3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	1053 130	Non-English specification	
1812 2,520	1812 2,520	For filing a request for <i>ex parte</i> reexamination	
1804 920*	1804 920*	Requesting publication of SIR prior to Examiner action	
1805 1,840*	1805 1,840*	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 410	2252 205	Extension for reply within second month	110
1253 930	2253 465	Extension for reply within third month	
1254 1,450	2254 725	Extension for reply within fourth month	
1255 1,970	2255 985	Extension for reply within fifth month	
1401 320	2401 160	Notice of Appeal	
1402 320	2402 160	Filing a brief in support of an appeal	
1403 280	2403 140	Request for oral hearing	
1451 1,510	1451 1,510	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,300	2453 650	Petition to revive - unintentional	
1501 1,300	2501 650	Utility issue fee (or reissue)	
1502 470	2502 235	Design issue fee	
1503 630	2503 315	Plant issue fee	
1460 130	1460 130	Petitions to the Commissioner	
1807 50	1807 50	Processing fee under 37 CFR 1.17(q)	
1806 180	1806 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 750	2809 375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 750	2810 375	For each additional invention to be examined (37 CFR 1.129(b))	
1801 750	2801 375	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	

Other fee (specify)

\*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$) 110

### SUBMITTED BY

Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22,125	Telephone	(216) 621-1113
Signature		Date	7-3-03		

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.



4/ Election  
7/16/03  
DBE11

CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Date: July 3, 2003

Donald L. Otto

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Attorney Docket GLOLP0106USD

In re PATENT application of

Jeffery R. Parker et al

Serial No. 10/298,367

Filed November 18, 2002

For: LIGHT EMITTING PANEL ASSEMBLIES FOR USE IN AUTOMOTIVE APPLICATIONS AND THE LIKE

Art Unit 2872  
Confirmation No. 3656  
Fayaz G. Assaf, Examiner

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JUN 10 2003  
TECHNOLOGY CENTER 2800

**REPLY TO OFFICE ACTION OF MAY 6, 2003**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In the Office Action of May 6, 2003, the Examiner states that this application contains claims directed to the following patentably distinct species of the claimed invention:



Species 1: A light assembly for a vehicle having a plurality of light extracting deformities: claims 1-25.

Species 2: A light assembly for a vehicle having a substrate which has at least one of a coating and surface treatment that changes: claims 26-33.

Species 3: A light assembly for a vehicle having light guides positioned relative to one another such that the light emitted from at least one of the light guides passes through another of the light guides: claims 34-41 (also presumably claims 42-52).

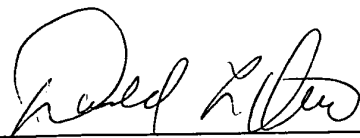
In reply to this requirement, applicants hereby elect Species 1, on which claims 1-25 read.

In view of the foregoing, further and favorable consideration of all of the elected claims 1-25 is respectfully requested.

In the event an extension of time is necessary, this should be considered a petition for such an extension. If required, fees are enclosed for the extension of time and/or for the presentation of new and/or amended claims. In the event any additional fees are due in connection with the filing of this reply, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 (Charge No. GLOLP0106USD).

Respectfully submitted,

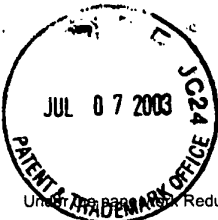
RENNER, OTTO, BOISSELLE & SKLAR, LLP

By  \_\_\_\_\_

Donald L. Otto  
Registration No. 22,125

1621 Euclid Avenue  
Nineteenth Floor  
Cleveland, Ohio 44115-2191  
Phone: 216-621-1113  
Fax: 216-621-6165

Z:\SEC177\GLOLIP108USD\REPLY TO OA OF 5-6-03.doc



# 3/EOT (1)  
7/16/03  
DBE11

PTO/SB/22 (06-03)  
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE  
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<b>PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b>		Docket Number (Optional) <b>GLOLP0106USD</b>	
In re Application of <b>Jeffery R. Parker et al</b>			
Application Number <b>10/298,367</b>		Filed <b>11/18/02</b>	
For <b>LIGHT EMITTING PANEL ASSEMBLIES ...</b>			
Art Unit <b>2872</b>		Examiner <b>Fayaz G. Assaf</b>	

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and appropriate non-small-entity fee are as follows (check time period desired):

One month (37 CFR 1.17(a)(1)) \$ 110.00

Two months (37 CFR 1.17(a)(2)) \$ \_\_\_\_\_

Three months (37 CFR 1.17(a)(3)) \$ \_\_\_\_\_

Four months (37 CFR 1.17(a)(4)) \$ \_\_\_\_\_

Five months (37 CFR 1.17(a)(5)) \$ \_\_\_\_\_

Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee amount shown above is reduced by one-half, and the resulting fee is: \$ \_\_\_\_\_

A check in the amount of the fee is enclosed.

Payment by credit card. Form PTO-2038 is attached.

The Director has already been authorized to charge fees in this application to a Deposit Account.

The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 18-0988.

I have enclosed a duplicate copy of this sheet.

I am the  applicant/inventor.

assignee of record of the entire interest. See 37 CFR 3.71.  
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96);

attorney or agent of record. Registration Number 22,125

attorney or agent under 37 CFR 1.34(a).  
Registration number if acting under 37 CFR 1.34(a) \_\_\_\_\_

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

July 3, 2003  
Date

216-621-1113  
Telephone Number

Donald L. Otto  
Signature

Donald L. Otto  
Typed or printed name

Total of \_\_\_\_\_ forms are submitted.

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JUN 10 2003  
TECHNOLOGY CENTER 2800

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

07/09/2003 CNGUYEN 00000110 10298367

01 FC:1251 110. OP



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UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/298,367	11/18/2002	Jeffery R. Parker	GLOLP0106USD	3656

7590 05/06/2003  
Donald L. Otto  
Renner, Otto, Boisselle & Sklar, LLP  
19th Floor  
1621 Euclid Avenue  
Cleveland, OH 44115-2191

EXAMINER

ASSAF, FAYEZ G

ART UNIT PAPER NUMBER

2872

DATE MAILED: 05/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.



Art Unit: 2872

**DETAILED ACTION**

***Election/Restrictions***

This application contains claims directed to the following patentably distinct species of the claimed invention:

Species 1: A light assembly for a vehicle having a plurality of light extracting deformities: Claims 1-25.

Species 2: A light assembly for a vehicle having a substrate which has at least one of a coating and surface treatment that changes: Claims 26-33.

Species 3: A light assembly for a vehicle having light guide being positioned relative to one another such that the light emitted from at least one of the light guide passes through another of the light guide: Claims 34-41.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claim appears to be generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are

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generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in

Art Unit: 2872

compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fayez G. Assaf whose telephone number is (703) 306-5526. The examiner can normally be reached on 8-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on (703) 308-1687. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Fayez G. Assaf  
Examiner  
Art Unit 2872



FA  
May 3, 2003



11-19-02 11/18/02

11/18/02  
11131 U.S. PTO

Please type a plus sign (+) inside this box  **+**  
 Approved for use through 10/31/2002 OMB 0651-0032  
 U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE  
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<b>UTILITY PATENT APPLICATION TRANSMITTAL</b> <small>(Only for new nonprovisional applications under 37 CFR 1.53(b))</small>	Attorney Docket No.	GLOLP0106USD
	First Inventor	Jeffery R. Parker
	Title	LIGHT EMITTING PANEL ASSEMBLIES ..
	Express Mail Label No.	EV164823617US

J0979 U.S. PTO  
 10/298367  
 11/18/02

<b>APPLICATION ELEMENTS</b> <small>See MPEP chapter 600 concerning utility patent application contents.</small>	<b>ADDRESS TO:</b> Assistant Commissioner for Patents Box Patent Application Washington, DC 20231
--	---

<p>1. <input checked="" type="checkbox"/> Fee Transmittal Form (e.g., PTO/SB/17) <small>(Submit an original and a duplicate for fee processing)</small></p> <p>2. <input type="checkbox"/> Applicant claims small entity status See 37 CFR 1.27</p> <p>3. <input checked="" type="checkbox"/> Specification [Total Pages <input ]<br="" type="text" value="29"/><small>(preferred arrangement set forth below)</small></p> <ul style="list-style-type: none"> <li>- Descriptive title of the invention</li> <li>- Cross Reference to Related Applications</li> <li>- Statement Regarding Fed sponsored R &amp; D</li> <li>- Reference to sequence listing, a table, or a computer program listing appendix</li> <li>- Background of the Invention</li> <li>- Brief Summary of the Invention</li> <li>- Brief Description of the Drawings (if filed)</li> <li>- Detailed Description</li> <li>- Claim(s)</li> <li>- Abstract of the Disclosure</li> </ul> <p>4. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets <input ]<br="" type="text" value="5"/><small>- Drawings are Formal</small></p> <p>5. Oath or Declaration [Total Pages <input ]<="" p="" type="text" value="3"/> <p>a. <input type="checkbox"/> Newly executed (original or copy)</p> <p>b. <input checked="" type="checkbox"/> Copy from a prior application (37 CFR 1.63 (d)) <small>(for continuation/divisional with Box 18 completed)</small></p> <p>i. <input type="checkbox"/> <b>DELETION OF INVENTOR(S)</b> <small>Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).</small></p> <p>6. <input checked="" type="checkbox"/> Application Data Sheet See 37 CFR 1.76</p> </p>	<p>7. <input type="checkbox"/> CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)</p> <p>8 Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)</p> <p>a. <input type="checkbox"/> Computer Readable Form (CRF)</p> <p>b. Specification Sequence Listing on.</p> <p>i. <input type="checkbox"/> CD-ROM or CD-R (2 copies); or</p> <p>ii. <input type="checkbox"/> paper</p> <p>c. <input type="checkbox"/> Statements verifying identity of above copies</p>
--	--

<b>ACCOMPANYING APPLICATION PARTS</b>	
9. <input type="checkbox"/> Assignment Papers (cover sheet & document(s))	
10. <input type="checkbox"/> 37 CFR 3.73(b) Statement (when there is an assignee) <input type="checkbox"/> Power of Attorney	
11. <input type="checkbox"/> English Translation Document (if applicable)	
12. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations	
13. <input type="checkbox"/> Preliminary Amendment	
14. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) (Should be specifically itemized)	
15. <input type="checkbox"/> Certified Copy of Priority Document(s) (if foreign priority is claimed)	
16. <input type="checkbox"/> Request and Certification under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent	
17. <input checked="" type="checkbox"/> Other: Cert. of Express Mailing	

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

Continuation  Divisional  Continuation-in-part (CIP) of prior application No. 10 005,090

Prior application information Examiner Fayez G Assaf Group Art Unit 2872

**For CONTINUATION OR DIVISIONAL APPS only:** The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

**19. CORRESPONDENCE ADDRESS**

Customer Number or Bar Code Label  Correspondence address below

Name	Donald L. Otto			
Address	RENNER, OTTO, BOISSELLE & SKLAR, LLP 1621 Euclid Avenue, Nineteenth Floor			
City	Cleveland	State	Ohio	Zip Code 44115-2191
Country	U.S.	Telephone	(216) 621-1113	Fax 216) 621-6165

Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22, 125
Signature		Date	11/18/02

**Burden Hour Statement** This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

<h1 style="margin: 0;">FEE TRANSMITTAL</h1> <h2 style="margin: 0;">for FY 2002</h2> <p style="font-size: small; margin: 5px 0;">Patent fees are subject to annual revision.</p>	Complete if Known	
	Application Number	
	Filing Date	Herewith
	First Named Inventor	Jeffery R. Parker
	Examiner Name	
	Group Art Unit	
TOTAL AMOUNT OF PAYMENT	(\$)	1568.00
Attorney Docket No.		GL0LP0106USD

METHOD OF PAYMENT	FEE CALCULATION (continued)																																																																																																																																																																																										
<p>1. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:</p> <p>Deposit Account Number: <input type="text" value="18-0988"/></p> <p>Deposit Account Name: <input type="text" value="Renner, Otto, Boisselle &amp; Sklar, LLP"/></p> <p><input checked="" type="checkbox"/> Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17</p> <p><input type="checkbox"/> Applicant claims small entity status See 37 CFR 1.27</p> <p>2. <input checked="" type="checkbox"/> Payment Enclosed:</p> <p><input checked="" type="checkbox"/> Check    <input type="checkbox"/> Credit card    <input type="checkbox"/> Money Order    <input type="checkbox"/> Other</p>	<p>3. ADDITIONAL FEES</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th>Fee Code</th> <th>Large Entity Fee (\$)</th> <th>Small Entity Fee Code</th> <th>Small Entity Fee (\$)</th> <th>Fee Description</th> <th>Fee Paid</th> </tr> </thead> <tbody> <tr><td>105</td><td>130</td><td>205</td><td>65</td><td>Surcharge - late filing fee or oath</td><td></td></tr> <tr><td>127</td><td>50</td><td>227</td><td>25</td><td>Surcharge - late provisional filing fee or cover sheet</td><td></td></tr> <tr><td>139</td><td>130</td><td>139</td><td>130</td><td>Non-English specification</td><td></td></tr> <tr><td>147</td><td>2,520</td><td>147</td><td>2,520</td><td>For filing a request for <i>ex parte</i> reexamination</td><td></td></tr> <tr><td>112</td><td>920*</td><td>112</td><td>920*</td><td>Requesting publication of SIR prior to Examiner action</td><td></td></tr> <tr><td>113</td><td>1,840*</td><td>113</td><td>1,840*</td><td>Requesting publication of SIR after Examiner action</td><td></td></tr> <tr><td>115</td><td>110</td><td>215</td><td>55</td><td>Extension for reply within first month</td><td></td></tr> <tr><td>116</td><td>400</td><td>216</td><td>200</td><td>Extension for reply within second month</td><td></td></tr> <tr><td>117</td><td>920</td><td>217</td><td>460</td><td>Extension for reply within third month</td><td></td></tr> <tr><td>118</td><td>1,440</td><td>218</td><td>720</td><td>Extension for reply within fourth month</td><td></td></tr> <tr><td>128</td><td>1,960</td><td>228</td><td>980</td><td>Extension for reply within fifth month</td><td></td></tr> <tr><td>119</td><td>320</td><td>219</td><td>160</td><td>Notice of Appeal</td><td></td></tr> <tr><td>120</td><td>320</td><td>220</td><td>160</td><td>Filing a brief in support of an appeal</td><td></td></tr> <tr><td>121</td><td>280</td><td>221</td><td>140</td><td>Request for oral hearing</td><td></td></tr> <tr><td>138</td><td>1,510</td><td>138</td><td>1,510</td><td>Petition to institute a public use proceeding</td><td></td></tr> <tr><td>140</td><td>110</td><td>240</td><td>55</td><td>Petition to revive - unavoidable</td><td></td></tr> <tr><td>141</td><td>1,280</td><td>241</td><td>640</td><td>Petition to revive - unintentional</td><td></td></tr> <tr><td>142</td><td>1,280</td><td>242</td><td>640</td><td>Utility issue fee (or reissue)</td><td></td></tr> <tr><td>143</td><td>460</td><td>243</td><td>230</td><td>Design issue fee</td><td></td></tr> <tr><td>144</td><td>620</td><td>244</td><td>310</td><td>Plant issue fee</td><td></td></tr> <tr><td>122</td><td>130</td><td>122</td><td>130</td><td>Petitions to the Commissioner</td><td></td></tr> <tr><td>123</td><td>50</td><td>123</td><td>50</td><td>Processing fee under 37 CFR 1.17(q)</td><td></td></tr> <tr><td>126</td><td>180</td><td>126</td><td>180</td><td>Submission of Information Disclosure Stmt</td><td></td></tr> <tr><td>581</td><td>40</td><td>581</td><td>40</td><td>Recording each patent assignment per property (times number of properties)</td><td></td></tr> <tr><td>146</td><td>740</td><td>246</td><td>370</td><td>Filing a submission after final rejection (37 CFR § 1.129(a))</td><td></td></tr> <tr><td>149</td><td>740</td><td>249</td><td>370</td><td>For each additional invention to be examined (37 CFR § 1.129(b))</td><td></td></tr> <tr><td>179</td><td>740</td><td>279</td><td>370</td><td>Request for Continued Examination (RCE)</td><td></td></tr> <tr><td>169</td><td>900</td><td>169</td><td>900</td><td>Request for expedited examination of a design application</td><td></td></tr> <tr><td colspan="5">Other fee (specify)</td><td></td></tr> <tr> <td colspan="5" style="text-align: right;">*Reduced by Basic Filing Fee Paid</td> <td style="text-align: right;">SUBTOTAL (3) (\$)</td> </tr> </tbody> </table>	Fee Code	Large Entity Fee (\$)	Small Entity Fee Code	Small Entity Fee (\$)	Fee Description	Fee Paid	105	130	205	65	Surcharge - late filing fee or oath		127	50	227	25	Surcharge - late provisional filing fee or cover sheet		139	130	139	130	Non-English specification		147	2,520	147	2,520	For filing a request for <i>ex parte</i> reexamination		112	920*	112	920*	Requesting publication of SIR prior to Examiner action		113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action		115	110	215	55	Extension for reply within first month		116	400	216	200	Extension for reply within second month		117	920	217	460	Extension for reply within third month		118	1,440	218	720	Extension for reply within fourth month		128	1,960	228	980	Extension for reply within fifth month		119	320	219	160	Notice of Appeal		120	320	220	160	Filing a brief in support of an appeal		121	280	221	140	Request for oral hearing		138	1,510	138	1,510	Petition to institute a public use proceeding		140	110	240	55	Petition to revive - unavoidable		141	1,280	241	640	Petition to revive - unintentional		142	1,280	242	640	Utility issue fee (or reissue)		143	460	243	230	Design issue fee		144	620	244	310	Plant issue fee		122	130	122	130	Petitions to the Commissioner		123	50	123	50	Processing fee under 37 CFR 1.17(q)		126	180	126	180	Submission of Information Disclosure Stmt		581	40	581	40	Recording each patent assignment per property (times number of properties)		146	740	246	370	Filing a submission after final rejection (37 CFR § 1.129(a))		149	740	249	370	For each additional invention to be examined (37 CFR § 1.129(b))		179	740	279	370	Request for Continued Examination (RCE)		169	900	169	900	Request for expedited examination of a design application		Other fee (specify)						*Reduced by Basic Filing Fee Paid					SUBTOTAL (3) (\$)
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SUBMITTED BY		Complete (if applicable)	
Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22,125
Signature		Telephone	(216) 621-1113
		Date	11/18/02

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"EXPRESS MAIL" Mailing Label Number EV164823617US  
Date of Deposit: November 18, 2002

I hereby certify that this PATENT APPLICATION (along with any other paper referred to as being attached or enclosed) is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to:

BOX PATENT APPLICATION  
COMMISSIONER FOR PATENTS  
WASHINGTON, DC 20231.

David Friedman  
(Typed or printed name of Sender)

  
(Signature)

D:\share\107\GLOL\106D\37 CFR 1.10 EXPRESS MAIL.wpd

**Initial Information Data Sheet**

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**Inventor Information**

Inventor One Given Name:: Jeffery R.  
Family Name:: Parker  
Postal Address Line One:: 3050 Whitetail Ct.  
City:: Richfield  
State or Province:: Ohio  
Postal or Zip Code:: 44286  
Citizenship Country:: USA

Inventor Two Given Name:: Mark D.  
Family Name:: Miller  
Postal Address Line One:: 2250 W. Pleasant Valley Road  
City:: Parma  
State or Province:: Ohio  
Postal or Zip Code:: 44134  
Citizenship Country:: USA

Inventor Three Given Name:: Thomas A.  
Family Name:: Hough  
Postal Address Line One:: 1368 Marlowe Avenue  
City:: Lakewood  
State or Province:: Ohio  
Postal or Zip Code:: 44107  
Citizenship Country:: USA

**Correspondence Information**

Name Line One:: Donald L. Otto  
Name Line Two:: Renner, Otto, Boisselle & Sklar, LLP  
Address Line One:: 1621 Euclid Avenue  
Address Line Two:: 19<sup>th</sup> Floor  
City:: Cleveland  
State or Province:: Ohio  
Postal or Zip Code:: 44115-2191  
Telephone One:: (216) 621-1113  
Fax:: (216) 621-6165  
Electronic Mail:: dotto@rennerotto.com

**Application Information**

Title Line One:: LIGHT EMITTING PANEL ASSEMBLIES  
 Title Line Two:: FOR USE IN AUTOMOTIVE  
 Title Line Three:: APPLICATIONS AND THE LIKE  
 Total Drawing Sheets:: 5  
 Formal Drawings?:: Yes  
 Application Type:: Utility  
 Docket Number:: GLOLP0106USD

**Continuity Information**

This application is a:: Continuation  
 Application One:: 10/005,090  
 Filing Date:: December 5, 2001

which is a:: Continuation  
 Application Two:: 09/703,088  
 Filing Date:: October 31, 2000  
 U.S. Pat No.:: 6,367,940  
 Dated:: April 9, 2002

which is a:: Continuation  
 Application Three:: 09/167,949  
 Filing Date:: October 7, 1998  
 U.S. Pat. No.:: 6,158,867  
 Dated:: December 12, 2000

which is a:: Division  
 Application Four:: 08/585,062  
 Filing Date:: January 16, 1996  
 U.S. Pat. No.:: 5,895,115  
 Dated:: April 20, 1999

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ATTORNEY DOCKET GLOLP0106USD

**LIGHT EMITTING PANEL ASSEMBLIES FOR USE  
IN AUTOMOTIVE APPLICATIONS AND THE LIKE**

**CROSS-REFERENCE TO RELATED APPLICATIONS**

5           This application is a continuation of Application Serial No.  
10/005,090, filed December 5, 2001, which is a continuation of Application  
Serial No. 09/703,088, filed October 31, 2000, now U.S. Patent No.  
6,367,940, dated April 9, 2002, which is a continuation of Application Serial  
No. 09/167,949, filed October 7, 1998, now U.S. Patent No. 6,158,867,  
10           dated December 12, 2000, which is a division of Application Serial No.  
08/585,062, filed January 16, 1996, now U.S. Patent No. 5,895,115, dated  
April 20, 1999.

**FIELD OF THE INVENTION**

15           This invention relates generally as indicated to light emitting panel  
assemblies especially for automotive applications.

**BACKGROUND OF THE INVENTION**

20           Light emitting panel assemblies are generally known. The present  
invention relates to certain improvements in light emitting panel assemblies  
especially for automotive applications. Also, this invention is concerned with  
passing/shining light directly through a light emitting panel member or  
through holes in the panel member for performing specified lighting  
functions, for example, providing brake or turn signal lights and/or turning or  
backup illumination for a vehicle.

**SUMMARY OF THE INVENTION**

25           In accordance with one aspect of the invention, the light emitting  
panel assemblies of the present invention may include a light emitting panel  
member made out of a suitable transparent resiliently deformable  
elastomeric material that absorbs impact without breakage. Such panel  
members are especially suitable for use both in interior automotive lighting

applications to reduce the possibility of serious injury to a driver or passenger of a vehicle when thrown into contact with the panel member during a traffic accident, and in exterior automotive lighting applications to help eliminate damage to the panel member if impacted during a traffic accident.

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Examples where such a resiliently deformable light emitting panel member may be effectively used in interior automotive lighting applications to reduce injury during accidents are steering wheel and dash lighting applications for lighting controls, switches, instrument panels, headliner lighting, logos and/or accent lighting.

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In steering wheel applications, a resiliently deformable light emitting panel member may be mounted in the hub portion of the steering wheel outwardly of an air bag for lighting controls and/or switches or logos on the steering wheel hub and for accent lighting.

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When used on a dash or other flush mount applications such as instrument panels and headliner lighting, a resiliently deformable panel member will absorb impact/shock, and may be contoured to match the shape of the dash or other surface.

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Examples where such a resiliently deformable panel member may be effectively used in exterior automotive lighting applications to reduce or eliminate damage to the panel member during accidents are running or accent lights in the bumper or other exterior body portions of a vehicle. The light emitting panel member may also be incorporated into a trunk lid of a vehicle to provide running lights and/or license plate or logo illumination in the trunk lid. In applications where the trunk lid is recessed, the panel member may be rigid. However, if the trunk lid is substantially flush with the body exterior, the panel member is desirably resiliently deformable to withstand impacts during accidents without breakage of the panel member.

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In accordance with another aspect of the invention, one or more light sources may be mounted within one or more light transition areas or regions adjacent one or more light input surfaces of a light emitting panel member.

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5 In accordance with another aspect of the invention, one or more light sources may be positioned adjacent one side of the panel member for causing light to shine through the panel member or through holes in the panel member for performing specified lighting functions, for example, providing brake or turn signal lights and/or turning or backup illumination for a vehicle.

10 In accordance with another aspect of the invention, one or more light sources may be selectively positioned along an edge or side of the panel member for increasing the light output from selected light output areas/regions on one or both sides of the panel member.

15 In accordance with another aspect of the invention, a resiliently deformable light emitting panel member may be used to backlight a liquid crystal display (LCD) and/or multiple control switches or key pads of a radio or other electrical device. Such a panel member upon being engaged by a control button/key pad will be deformed into electrical contact with a switch or other circuitry such as a printed circuit inwardly of the panel member for performing a selected switching function.

20 In accordance with another aspect of the invention, a rigid light emitting panel member may be used to backlight an LCD and/or multiple control buttons/key pads of a radio or other electrical device by providing holes or openings through the panel member for movement of a portion of the control buttons/key pads into and out of electrical contact with a printed circuit inwardly of the panel member. Surface irregularities such as print patterns or molded in shapes may be provided on the panel surfaces around the holes/openings to flood the areas around the buttons/key pads with light.

25 In accordance with another aspect of the invention, a rigid light emitting panel member may be used with dome and other such switches for switch area lighting. One or more such rigid light emitting panel members each with its own separate light source and transition region may support a series of push buttons that float on the panel members to permit the push buttons to be moved into contact with the dome switches.

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In accordance with another aspect of the invention, two or more stacked light emitting panel members may be used to light an instrument panel or the like. One of the panel members may be used to provide general backlighting for graphic displays on the instrument panel, whereas an other panel member may be used to light dial pointers or other elements on the instrument panel. Common or separate light sources may be used to supply light to input surfaces of two or more panel members. Also, separate indicator lights may be provided behind the panel members for providing through illumination to indicators on the graphic displays of the instrument panel.

In accordance with another aspect of the invention, a rigid light emitting panel member may be used as a structural member for graphic overlays or decals, to provide for example lighting for designating the gear shift lever positions of a vehicle. One or more light sources may be inserted/embedded within light transition regions at one or more locations along the length of the panel member to direct light into input surfaces of the panel member. Indicator lights may be provided adjacent an edge or side of the panel member in line with each indicator position for providing increased light output at the selected position. Also, a movable color filter may be provided between the panel member and label to provide a different colored light output at any selected gear shift position. For example, a movable red filter may be used to change the color of the light output at the selected gear shift lever position from white to red.

In accordance with another aspect of the invention, the light emitting panel member may have a secondary reflective/refractive surface for reflecting/refracting a portion of the light entering an input surface of the panel member around a corner of the panel member.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of

the invention, these being indicative, however, of but several of the various ways in which the principles of the invention may be employed.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In the annexed drawings:

5 Fig. 1 is a schematic top plan view of a steering wheel of a vehicle incorporating one form of light emitting panel assembly in accordance with this invention in the hub portion of the steering wheel;

Fig. 2 is a fragmentary transverse section through the panel assembly within the hub portion of Fig. 1 taken on the plane of the line 2-2 thereof;

10 Fig. 2A is an enlarged plan view of a portion of a light output surface area of a panel assembly schematically showing a pattern of light extracting deformities on the light output surface area;

15 Fig. 3 is a schematic end view of a rear portion of a vehicle incorporating other forms of light emitting panel assemblies in accordance with this invention;

Fig. 4 is a fragmentary transverse section through the vehicle end portion and panel assemblies of Fig. 3 taken on the plane of the line 4-4 thereof;

20 Fig. 5 is a schematic plan view of a radio or other electronic device incorporating another form of light emitting panel assembly in accordance with this invention;

Fig. 6 is a transverse section through the assembly of Fig. 5 taken on the plane of the line 6-6 thereof;

25 Fig. 7 is a schematic fragmentary section through a portion of a control panel incorporating another form of light emitting panel assembly in accordance with this invention;

30 Fig. 7A is a fragmentary top plan view of a portion of the light emitting panel member of Fig. 7 showing light extracting deformities on light emitting surfaces of the panel member around a hole or opening in the panel member in alignment with a control button/key pad;

Fig. 8 is a schematic fragmentary section through a contoured surface such as the dash of a vehicle showing other forms of light emitting panel assemblies in accordance with this invention interposed between a printed circuit and a series of key pads either molded into the contoured surface or extending through openings therein;

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Fig. 9 is a schematic side elevation view of another form of light emitting panel assembly in accordance with this invention used for supporting and illuminating a series of floating push buttons above a series of dome switches;

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Fig. 10 is a transverse section through the assembly of Fig. 9 taken on the plane of the line 10-10 thereof;

Fig. 11 is a top plan view of another form of light emitting panel assembly in accordance with this invention which is also used to support and illuminate a series of floating push buttons;

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Fig. 12 is a schematic vertical section through an instrument panel incorporating other forms of light emitting panel assemblies in accordance with this invention;

Fig. 13 is a top plan view of a graphic overlay for the instrument panel of Fig. 12 as seen from the plane of the line 13-13 thereof;

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Fig. 14 is a top plan view of one light emitting panel assembly in accordance with this invention incorporated in the instrument panel of Fig. 12 as seen from the plane of the line 14-14 thereof;

Fig. 15 is a top plan view of another form of light emitting panel assembly in accordance with this invention incorporated in the instrument panel of Fig. 12 as seen from the plane of the line 15-15 thereof;

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Figs. 16 through 18 are schematic plan views showing other forms of light emitting panel assemblies in accordance with this invention which provide a structural support for graphic overlays/decals used for example to designate the various gear shift lever positions of an engine;

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Fig. 19 is a fragmentary transverse section through one such light emitting panel member used as a structural support; and

Figs. 20 through 22 are schematic illustrations showing light emitting panel assemblies in accordance with this invention used to provide lighting for vanity mirrors and the like.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

5 Referring now in detail to the drawings, and initially to Figs. 1 and 2, there is schematically shown one form of light emitting panel assembly 1 in accordance with this invention mounted in the hub portion 2 of a steering wheel 3 of a vehicle outwardly of an air bag 4 to provide backlighting for control switches/buttons 5, the horn, logos, or other accent lighting on the steering wheel.

10 The light emitting panel assembly 1 includes a transparent light emitting panel member 8 having one or more light sources 9 mounted within one or more light transition areas or regions 10 at one or both ends of the panel member mounted within the air bag/steering wheel covering 11 outwardly of the air bag 4. In Figs. 1 and 2, two such light transition areas or regions 10 and light sources 9 are shown at one end of one or two panel members 8 for selectively lighting one or two rows of control buttons 5. The light that enters the transparent light emitting panel members 8 from the light transition region(s) 10 may be emitted along the entire length of the panel members or from one or more light output surface areas along their length as desired to produce a desired light output distribution to fit a particular application.

20 The light sources 9 may be mechanically held in any suitable manner in slots, cavities or openings machined, molded or otherwise formed in the light transition regions of the panel assemblies. However, the light sources may be embedded, potted or bonded in the light transition regions in order to eliminate any air gaps or air interface surfaces between the light sources and surrounding light transition regions, thereby reducing light loss and increasing the light output emitted by the light emitting panels. Bonding may be accomplished using a suitable embedding, potting or bonding material or

30 by a variety of methods that do not incorporate extra material, for example,



rays either to be emitted out of the panel members through the side or sides on which the light extraction deformities are provided or reflected back through the panel members and emitted out the other side.

Such deformities or disruptions can be produced in a variety of manners, for example, by providing a painted pattern, an etched pattern, a machined pattern, a printed pattern, a painted pattern, a hot stamped pattern, or a molded pattern or the like at selected light output areas on the surfaces of the panel members. An ink or adhesive pattern or printed pattern may be applied for example by pad printing, silk screening, ink jet, photolithography, heat transfer film process or the like. The deformities may also be printed on a sheet or film which is used to apply the deformities to the sides of the panel members. This sheet or film may become a permanent part of the light panel assemblies for example by attaching or otherwise positioning the sheet or film against one or both sides of the panel members in order to produce a desired effect.

By varying the density, opaqueness or translucence, shape, depth, color, area, index of refraction, or type of deformities on an area or areas of the panel members, the light output of the panel members can be controlled. The deformities or disruptions may be used to control the percent of light emitted from any surface area of the panel members. For example, less and/or smaller size deformities may be placed on panel surface areas where less light output is wanted. Conversely, a greater percentage of and/or larger deformities may be placed on surface areas of the panels where greater light output is desired.

Varying the percentages and/or size of deformities in different surface areas of the panels is necessary in order to provide a uniform light output distribution. For example, the amount of light traveling through the panels will ordinarily be greater in areas closer to the light source than in other areas further removed from the light source. A pattern of light extracting deformities may be used to adjust for the light variances within the panel members, for example, by providing a denser concentration of light extracting deformities with increased distance from the light source thereby

resulting in a more uniform light output distribution from the light emitting panels.

5 The deformities may also be used to control the output ray angle distribution of the emitted light to suit a particular application. For example, if the panel assemblies are used to provide a liquid crystal display backlight, the light output will be more efficient if the deformities cause the light rays to be emitted from the panels at predetermined ray angles such that they will pass through the liquid crystal display with low loss.

10 Additionally, the pattern of light extracting deformities may be used to adjust for light output variances attributed to light extractions of the panel members. The pattern of light extracting deformities may be printed on the light output surface areas utilizing a wide spectrum of paints, inks, coatings, epoxies, adhesives, or the like, ranging from glossy to opaque or both, and may employ half-tone separation techniques to vary the deformity coverage. 15 If an adhesive is used to provide a pattern of light extracting deformities, the adhesive may also be used to secure a back reflector to the panel member. Moreover, the pattern of light extracting deformities may be multiple layers or vary in index of refraction.

20 Print patterns of light extracting deformities may vary in shapes such as dots, squares, diamonds, ellipses, stars, random shapes, and the like, and are desirably .006 square inch per deformity/element or less. Also, print patterns that are 60 lines per inch or finer are desirably employed, thus making the deformities or shapes in the print patterns nearly invisible to the human eye in a particular application thereby eliminating the detection of 25 gradient or banding lines that are common to light extracting patterns utilizing larger elements. Additionally, the deformities may vary in shape and/or size along the length and/or width of the panel members. Also, a random placement pattern of the deformities may be utilized throughout the length and/or width of the panel members. The deformities may have 30 shapes or a pattern with no specific angles to reduce moire or other interference effects. Examples of methods to create these random patterns are printing a pattern of shapes using stochastic print pattern techniques,

frequency modulated half tone patterns, or random dot half tones. Moreover, the deformities may be colored in order to effect color correction in the panel members. The color of the deformities may also vary throughout the panel members, for example to provide different colors for the same or different light output surface areas.

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In addition to or in lieu of these light extracting deformities, other light extracting deformities including prismatic surfaces, depressions or raised surfaces of various shapes using more complex shapes in a mold pattern may be molded, etched, stamped, thermoformed, hot stamped or the like into or on one or more surface areas of the panel members. The prismatic surfaces, depressions or raised surfaces will cause a portion of the light rays contacted thereby to be emitted from the panel members. Also, the angles of the prisms, depressions or other surfaces may be varied to direct the light in different directions to produce a desired light output distribution or effect. Moreover, the reflective or refractive surfaces may have shapes or a pattern with no specific angles to reduce moire or other interference effects.

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A back reflector or reflective coating (including trans reflectors) (see Fig. 2) may be applied to a bottom side of the panel members using a suitable adhesive or other method in order to improve light output efficiency of the panel assemblies by reflecting the light emitted from that side back through the panel members for emission through the opposite side. If adhesive is used to adhere the back reflector to the panel members, the adhesive is desirably applied only along the side edges of the panel members so that there is a slight air gap between the back reflector and panel members except where there is adhesive, since the adhesive changes the internal critical angle of the light in a less controllable manner than the air gap between the panel surface and back reflector.

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Additionally, a pattern of light extracting deformities may be provided on one or both sides of the panel members in order to change the path of the light so that the internal critical angle is exceeded and a portion of the light is emitted from one or both sides of the panel members. Where the deformities are created by a print pattern, the back reflector can be the same

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color as the print pattern so that print pattern is not visible through the back reflector. Moreover, a transparent film, sheet or plate may be attached or positioned against the side or sides of the panel members from which light is emitted using a suitable adhesive or other method in order to produce a desired effect.

The transparent film may be used to further improve the uniformity of the light output distribution or change the output ray angle distribution. For example, the film may be a colored film, a diffuser, or a label or display, a portion of which may be a transparent overlay that may be colored and/or have text or an image thereon. Also the film may be a prismatic or lenticular lens or other device that changes the output ray angle distribution.

In Fig. 1 the light transition regions or areas 10 are shown as an integral extension of one end of the light emitting panel members 8 and as having curved edges 16 to more efficiently reflect and/or refract and focus the light emitted from the light sources that impinges on the curved edges 16 back through the light transition regions at an acceptable angle for entering the light input surface of the light emitting panel members. Also, a suitable reflective material or coating 17 may be provided on any portions of the edges of the light transition regions of the panel members on which any portion of the light impinges for maximizing the amount of light or otherwise changing the light that is reflected back through the light transition regions and into the light emitting panel members.

A suitable pattern of light extracting deformities or disruptions 12 may be provided on selected areas on one or both sides of the panel members 8 corresponding to the location of the control buttons 5 on the air bag covering 11 above the panel members. In the example shown, the pattern of light extracting deformities or depressions is provided on the bottom side 14 of the panel member 3 (*i.e.*, the side facing away from the control buttons), and a reflective film or coating 15 is provided on that side to reflect the light emitted from that side back through the panel members.

Preferably the light emitting panel members 8 are made of a transparent resiliently deformable material such as a thermoplastic

elastomer or silicone rubber which allows areas of the panel members in line with the control buttons to be flexed into engagement with a printed circuit 19 located beneath the panel members when the respective control buttons are depressed to complete an associated control circuit. Also if the air bag 4 should ever be deployed or if the driver's head should be forced into engagement with the hub portion 2 of the steering wheel 3 during a traffic accident, the resiliently deformable panel members 8 will absorb shock, thus greatly reducing the possibility of serious injury to the driver because of such contact.

The printed circuit 19 may be made of a suitable thermoplastic elastomer, silicone rubber or flexible film or laminated circuit or membrane or dome switch to absorb shock, thus further reducing the possibility of serious injury to the driver should the driver's head impact against the hub portion of the steering wheel or should the steering wheel air bag be deployed and force the panel members and circuit outwardly into contact with the driver.

Light emitting panel assemblies similar to that shown in Figs. 1 and 2 may also be advantageously employed in other automotive applications as well such as the dash, instrument panel, headliner, and exterior lighting. Figs. 3 and 4 show several automotive exterior lighting applications including one in which a light emitting panel assembly 21 is mounted in a back end or bumper 22 of a vehicle 23 to provide running lights in the back end/bumper, another in which light emitting panel assemblies 24 are mounted in body panels 25 along the rear, front and/or sides of a vehicle to provide running lights or accent lights or to light a logo, step, running board, or other surface area of a vehicle; and still another in which a light emitting panel assembly 26 is mounted in a vehicle trunk lid 27 for providing a running light or illumination for a logo, accent light or license plate mounted on the trunk lid. In each case the respective light emitting panel members 28, 29 and 30 are shaped to fit the particular application and may be made of a transparent resiliently deformable material such as a thermoplastic elastomer or silicone rubber that will flex upon impact during minor traffic accidents without breakage.

The number and location of light sources 9 and associated light transition regions 10 for a given light emitting panel member may vary for a given application depending on the overall size and shape of each panel member and desired amount of light output therefrom. For example, the back end/bumper running light application shown in Figs. 3 and 4 may only require one light source 9 and associated light transition region 10 at each end of the panel member 28, whereas the body panel and trunk lid running light applications shown in Figs. 3 and 4 may require a plurality of closely spaced light sources 9 and associated light transition regions 10 along one or more light input surfaces of the panel members. Figs. 3 and 4 show several such light sources and associated light transition regions along the back edges of the panel members 29 used to provide running taillights for a vehicle and along a top edge of the panel member 30 used to provide illumination on a trunk lid. Mounting all of the light sources for the tail running lights along the back edges of the panel members 29 (*i.e.*, the edges closest to the trunk lid) minimizes the risk that the light sources themselves will be damaged in the event the tail running lights are impacted during minor traffic accidents and the like. These panel members may have a relatively thin, low profile, for example, less than one quarter inch thick, so as not to take up much space. Also, these panel members 29 may form the exterior surface of the body panel 25 as shown at the left hand side of Fig. 4 or a lens or film 34 may cover the panel members as shown at the right hand side of Fig. 4.

In the usual case the light sources are embedded, potted or bonded in the light transition regions of the panels as previously described. However, Fig. 3 shows the light source 9 at the left end of panel member 28 mechanically held in place by a holder 63 received in a slot in an edge of the panel member. Also a fiber optic light pipe 64 is shown at the right end of the panel member 28 of Fig. 3 for transmitting light to the panel member from a remote light source 65 located for example in the trunk or other remote location in the vehicle.



engaged areas of the panel member will flex into engagement with associated dome switches 39' or other circuitry on a printed circuit 39 beneath the panel member to effect the selected switching function.

Alternatively, a light emitting panel member 40 in accordance with this invention may be made of a relatively rigid transparent material such as polycarbonate or acrylic plastic, with through holes 41 in the panel member in alignment with membrane switches or elastomeric key pads 42 or other such control buttons (see Fig. 7) to permit contact portions 43 on the control buttons to engage appropriate circuitry on a printed circuit 44 inwardly of the panel member when the control buttons are depressed. Alternatively, the control buttons 42 may be used to activate dome switches (one such dome switch 57 being shown toward the right end of Fig. 7), in which event the contact portions 43 may be eliminated.

The holes 41 may be of various shapes or have angled or textured walls 45 (the wall 45 of the right most hole 41 of Fig. 7 being shown angled) to cause a portion of the light to be emitted toward the control buttons.

In this particular embodiment, light entering the panel member from the light source 9 and associated light transition region 10 will be emitted from the walls 45 of the holes 41 in the panel member to backlight the switches/pads. Also, surface irregularities 46 such as print patterns may be provided around the holes 41 in the panel member as schematically shown in Fig. 7A to cause light to be emitted around the control buttons to flood the area around the control buttons with light. Surface irregularities 46 such as print patterns or molded in shapes may also be provided on other surface areas of the panel member 36, for example, behind the LCD 37 and control buttons 38 for backlighting purposes, etc.

Fig. 8 schematically shows a flush mount application for a light emitting panel assembly 47 in accordance with this invention in which a resiliently deformable elastomeric transparent light emitting panel member 48 is mounted behind a contoured surface such as the dash 49 of a vehicle on which control switches 50 or a logo or the like are mounted. The switches 50 include transparent or translucent key pads 51 or 51' that may

5 be molded into the contoured surface as shown in the center portion of Fig. 8 or molded onto the panel member 48 and extend through openings 49' in the contoured surface as shown to the left and right of center in Fig. 8. Also, the key pads 51, 51' are desirably made of an elastomeric or other flexible material, which together with the panel member 48, provide a soft assembly that absorbs impact to minimize injury to a person thrown against the dash during a traffic accident or the like. Also making the panel member 48 out of a resiliently deformable elastomeric material permits selected areas of the panel member to be pressed into contact/engagement with a printed circuit 10 52 therebeneath when the key pads are depressed. The printed circuit and panel member may include appropriate circuitry 53, 54 such as conducting ink printed on adjacent surfaces to complete an appropriate circuit when brought into contact with each other. Alternatively dome switches 57 may be provided for engagement by the key pads (one such dome switch being shown toward the right end of Fig. 8) thus eliminating the need for the 15 circuitry 53, 54. Also, the printed circuit 52 may be made of a suitable resiliently deformable elastomeric material or flexible film for contouring and to help in providing a soft assembly to absorb impact during a traffic accident or the like.

20 Figs. 9 and 10 schematically illustrate another form of light emitting panel assembly 56 in accordance with this invention for use with dome switches 57 for switch array lighting, keyless entry, radio and/or tape/CD controls or other such applications. In this particular embodiment, a relatively rigid transparent light emitting panel member 58 extends through transverse openings or slots 59 (see Fig. 10) in an array of push buttons 60 25 in line with the dome switches 57. The ends or other sections of the panel member are supported by a rigid tray 61 containing or in close proximity to a printed circuit 62 on which the dome switches may be mounted. The height of the slots 59 through the push buttons 60 is greater than the thickness of the panel member 58 whereby the push buttons will float on the panel 30 member, thus allowing the push buttons to be pressed into contact with the

respective dome switches on the printed circuit to activate appropriate circuitry.

Figs. 9 and 10 show a single panel member 58 with associated light sources 9 and light transition regions 10 at one or both ends thereof for illuminating single indicator buttons 60, whereas Fig. 11 shows two light emitting panel members 66, 67 with separate light sources 9 and associated light transition regions 10 for illuminating dual indicator buttons 68 for illuminating radio controls and/or tape/CD controls or the like. Surface irregularities such as print patterns or molded in shapes may be provided on selected surface areas of the panel members within and/or around the push buttons to cause light to illuminate the buttons.

Figs. 12 through 15 schematically illustrate another form of light emitting panel assembly 70 in accordance with this invention including two or more stacked relatively rigid transparent light emitting panel members 71, 72 in a multi-layer instrument panel 73. The outer (*i.e.* upper) panel member 71, shown in plan view in Fig. 14, provides a structural support for a graphic overlay 74, shown in plan view in Fig. 13. Pointers 75 are supported outwardly of the graphic overlay 74 by shafts 76 (see Fig. 12) which extend through the panel members and are rotatably driven by motor controllers 77 inwardly (*i.e.* below) of the panel members. The pointers may be illuminated as by providing prismatic surfaces 78 and/or surface irregularities around openings 79 in the outer panel member 71 through which the shafts 76 extend for reflecting/refracting light within the outer panel member into the pointers 75. The pointers 75 may also be made of a light transmitting material, with prismatic surfaces 80 at one end of the pointers to cause light received from the outer panel member to be reflected/refracted back through the pointers and emitted through light emitting surface areas on the pointers.

The inner (*i.e.* lower) panel member 72, shown in plan view in Fig. 15, includes different shaped light emitting surface areas 83, 84 and 85 for emitting light entering the panel member from one or more light sources for backlighting the graphic overlay 74 mounted on the outer surface of the outer panel member 71.

Separate or common light sources may be provided for each panel member 71, 72 as desired. In the embodiment shown in Figs. 12 through 15, common light sources 86 for both panel members 71, 72 extend into aligned openings 87, 88 in the panel members. Also, separate indicator lights 89 may be mounted at selected positions on a printed circuit 90 inwardly of both panel members 71, 72 for shining light through both panel members to different indicators 91 on the graphic overlay 74 as schematically shown in Figs. 12 and 13. Suitable shields/reflectors 92 may be provided around/between the indicator lights 89 (see Fig. 12) to shield the light and direct it to the appropriate indicators.

Fig. 16 shows another form of light emitting panel assembly 93 in accordance with this invention including a rigid transparent light emitting panel member 94 which may act as a structural support for a graphic overlay/decals 95 used, for example, to designate the various gear shift lever positions for the engine of a vehicle. One or more light sources 9 may be inserted/

embedded within light transition regions 10 on the panel member to provide backlighting at selected surface areas 96 along the length of the panel member corresponding for example to the different gear shift selector positions (*viz.* P R N D L) or to provide accent lighting or backlighting for a logo. The panel member 94 shown in Fig. 16 is generally L shaped, with an angled reflective surface 97 interconnecting the legs 98, 99 of the panel member for reflecting a portion of the light from the light source 9 on one of the legs 98 of the panel member around a corner 100 for providing backlighting at one or more selected areas 101 on the other leg 99 of the panel member.

Instead of being generally L shaped, the panel member 102 can be curved in one or more planes as schematically shown in Fig. 17. Also, two such panel members 102, 102' may be provided as shown in Fig. 17 for designating the different gear shift lever positions of a four wheel drive vehicle. In this particular embodiment, the two panel members are joined together and a common light source 9 is used to supply light to both panel



members, with reflective surfaces 103, 103' at the corners 104, 104' for reflecting/refracting a portion of the light around the corners.

Alternatively, the panel member 105 may be substantially straight as schematically shown in Fig. 18.

5 A plurality of indicator lights 106 may also be located along an edge of the panel members in line with the light emitting surface areas 96 corresponding to the respective gear shift lever positions as schematically shown in Fig. 16 for providing increased light output at these positions. Also, additional light sources 106' may be placed behind the panel members  
10 for shining light through the light emitting surface areas or other surface areas of the panel member as shown in phantom lines in Fig. 16.

A filter 107 may be interposed between the panel members and associated graphic overlay 95 for movement with a gear selector shift lever 108 into overlying relation with any one of the light emitting surface areas 96  
15 on the panel members corresponding to the selected gear shift position as schematically shown in Fig. 18 to provide a different color or shade of light output at the selected gear shift position. For example, the filter 107 may be a red filter that changes the color of the light output at the selected gear shift position from white to red.

20 Along both side edges of the panel member are tabs 109 which may be used for example to heat stake the panel member to a back reflector tray 110 for the panel member as schematically shown in Fig. 19. Also, posts 111 may be provided on the panel members for heat staking the overlay/label 95 to the panel members and/or heat staking the panel  
25 members to an interior body panel of the vehicle.

Figs. 20 through 22 show other forms of light emitting panel assemblies 115, 116 and 117 in accordance with this invention including respective light emitting panel members 118, 119 and 120 mounted on the flap 121 of a vanity mirror 122 (see Fig. 20), extending around three sides of  
30 a generally rectangular vanity mirror 123 (see Fig. 21), and extending substantially completely around an elliptical vanity mirror 124 (see Fig. 21). Such panel members 118, 119 and 120 have a relatively thin, low profile, for

example less than one quarter inch thick, with one or more light sources 9 and light transition regions 10 at one or both ends of the panel members to produce a uniform diffuse, shadowless light around the vanity mirror. In the Fig. 20 embodiment, where the panel member 118 is shown mounted on the vanity mirror flap 121, the panel member is generally straight and extends substantially the entire length of the mirror in generally parallel relation thereto, with light sources 9 and associated light transition region 10 at one end of the panel member. In the Fig. 21 embodiment, the panel member 116 is generally U shaped and is configured to extend substantially the full length of three sides of the mirror in generally parallel relation and in close proximity thereto, whereas in the Fig. 22 embodiment, the panel member 120 is generally elliptical in shape. In both the Figs. 21 and 22 embodiments, the panel members 119 and 120 have one or more light sources 9 and associated light transition regions 10 at both ends of the panel members. Also, reflective surfaces 125 are provided at the corners/curves 126, 127 of the panel members 119, 120 for reflecting a portion of the light around the corners/curves.

Although the invention has been shown and described with respect to certain preferred embodiments, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of the specification. The present invention includes all such equivalent alterations and modifications and is limited only by the scope of the claims.

WHAT IS CLAIMED IS:

1. A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, a plurality of closely spaced light sources along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one surface of said light guide.

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2. The assembly of claim 1 wherein said substrate comprises at least one of a sheet, film, lens and plate.

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3. The assembly of claim 1 wherein said substrate is attached to said light guide.

4. The assembly of claim 1 wherein said substrate is positioned against said light guide.

15

5. The assembly of claim 1 wherein said substrate covers said at least one surface of said light guide.

6. The assembly of claim 1 wherein said deformities are at least one of depressions and raised surfaces on said one surface of said light guide.

20

7. The assembly of claim 1 wherein said deformities vary on said one surface of said light guide.

8. The assembly of claim 1 wherein at least one of said deformities is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

9. The assembly of claim 1 wherein said light sources are light emitting diodes.

10. The assembly of claim 1 wherein said light sources are attached to a printed circuit board.

5 11. The assembly of claim 1 wherein said light sources are embedded, potted, bonded or molded into said light guide.

12. The assembly of claim 1 wherein said deformities are on more than one surface of said light guide.

10 13. The assembly of claim 1 wherein said deformities are on two sides of said light guide.

14. The assembly of claim 1 wherein at least some deformities are on said substrate.

15 15. The assembly of claim 1 wherein said substrate has at least one of a prismatic lens, lenticular lens, and other device that changes the output ray angle distribution.

16. The assembly of claim 1 wherein more than one said substrate overlies said light guide.

20 17. A light emitting assembly for vehicle illumination comprising a light guide having at least one transparent substrate overlying a surface of said light guide, both said light guide and said substrate having deformities on at least one surface of each of said light guide and said substrate, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, the deformities on at least one of said light guide and said substrate varying in at least one of the following



of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one surface of said light guide, said substrate providing at least one of the following: an exterior portion of a vehicle, protection for the light guide, at least one of text, an image and color, at least one of a prismatic lens, lenticular lens and another device that changes the output ray angle distribution, and improved uniformity of the light output distribution.

26. A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, at least one light source along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, a transparent substrate overlying at least one surface of said light guide, at least one of said light guide and said substrate having at least one of a coating and surface treatment that changes, wherein the changes in said at least one of the coating and surface treatment are at least one of the following: density, color, index of refraction, reflection, opaqueness, translucence, area, depth, shape, size and type.

27. The assembly of claim 26 wherein said at least one of the coating and surface treatment are at least one of the following: paint, ink, coating and epoxy.

28. The assembly of claim 26 wherein the coating is selected to improve at least one of the following: color correction, opaqueness, diffusion, reflection, translucence and transmission of light.

29. The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

30. The assembly of claim 26 wherein the coating on at least one of said light guide and said substrate randomly changes.

31. The assembly of claim 26 wherein the surface treatment of at least one of said light guide and said substrate randomly changes.

5 32. The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate varies in shape or geometry.

33. The assembly of claim 32 wherein the shape or geometry of said one surface randomly varies.

10 34. A light emitting assembly for vehicle illumination comprising a plurality of relatively rigid light guides in overlying relation to one another, each of said light guides having at least one light input surface, at least one light source positioned along said light input surface for supplying light to said light guides, and a plurality of light extracting deformities on at least one surface of each of said light guides for controlling an output ray angle  
15 distribution of emitted light to suit a particular application, said light guides being positioned relative to one another such that the light emitted from at least one of said light guides passes through another of said light guides in a desired direction or output ray angle distribution.

20 35. The assembly of claim 34 wherein said light source is common to more than one of said light guides.

36. The assembly of claim 34 wherein a separate light source is provided for each of said light guides.

25 37. The assembly of claim 34 wherein said deformities have shape and are at least one of depressions and raised surfaces on said at least one surface of each of said light guides.









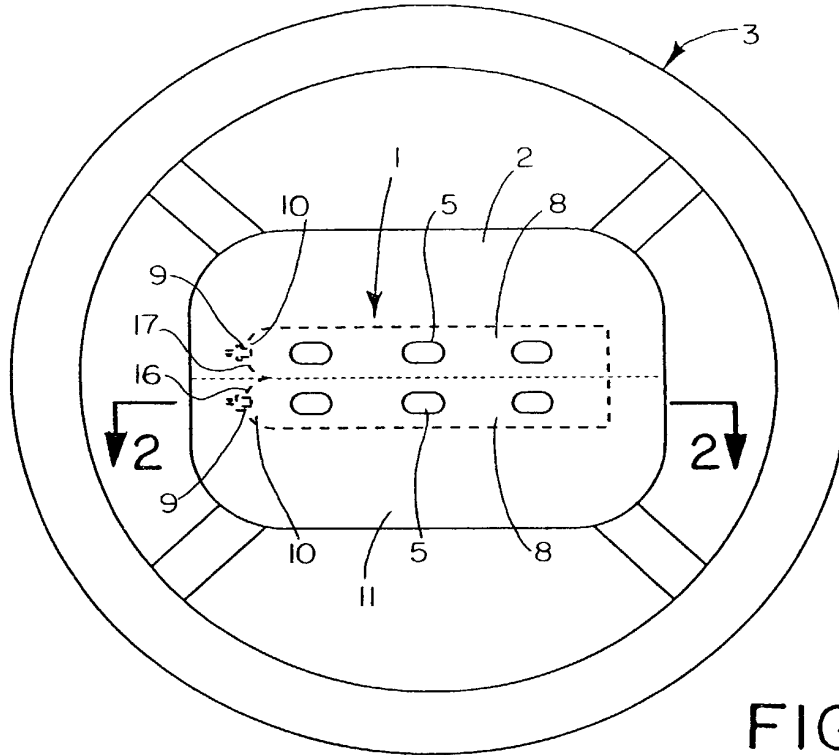


FIG. 1

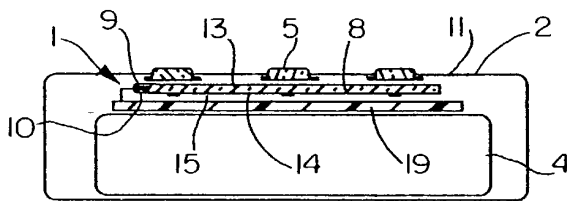


FIG. 2

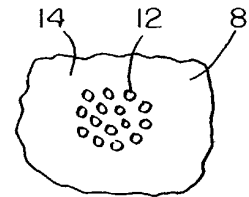


FIG. 2A

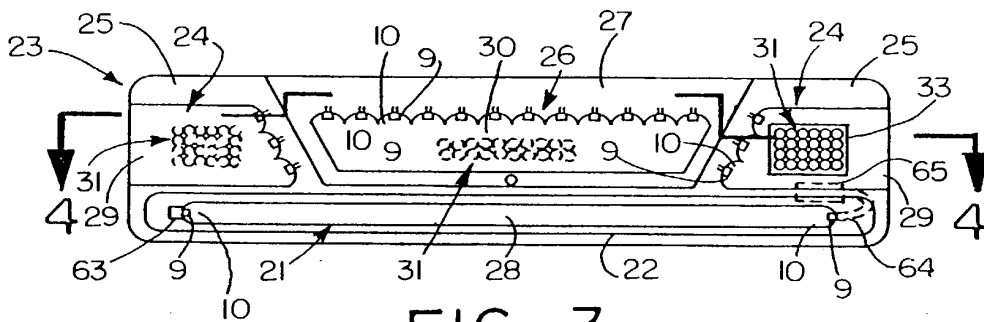


FIG. 3



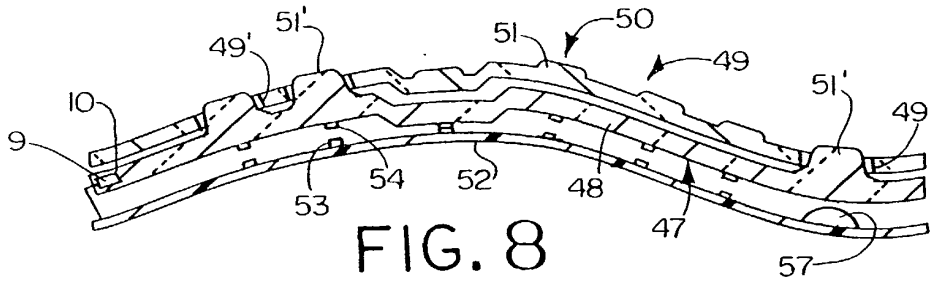


FIG. 8

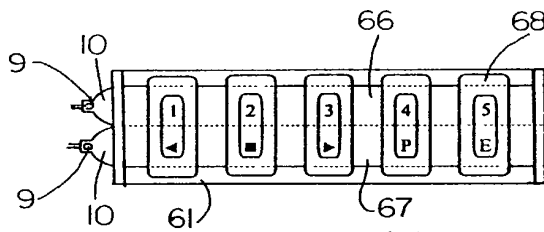


FIG. 9

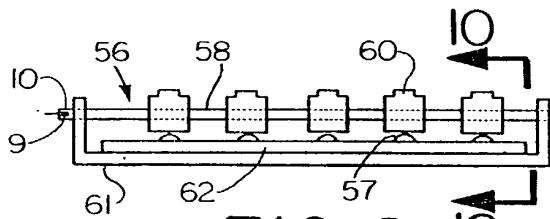


FIG. 10

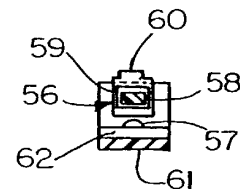


FIG. 11

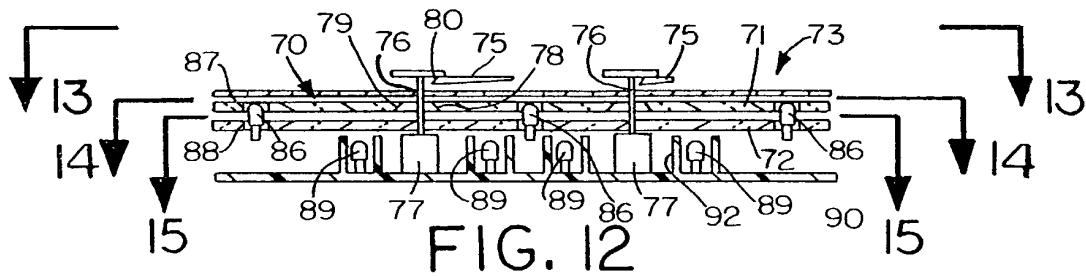


FIG. 12

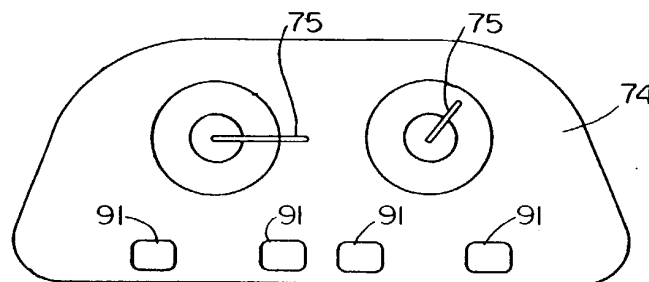


FIG. 13

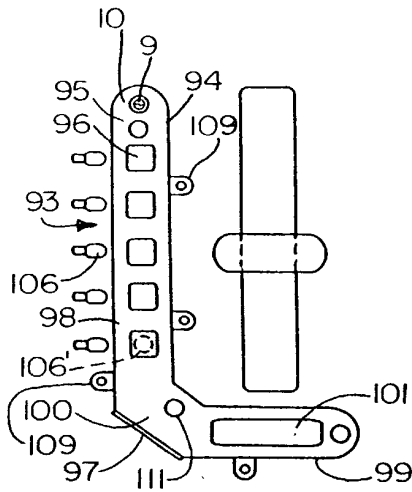


FIG. 16

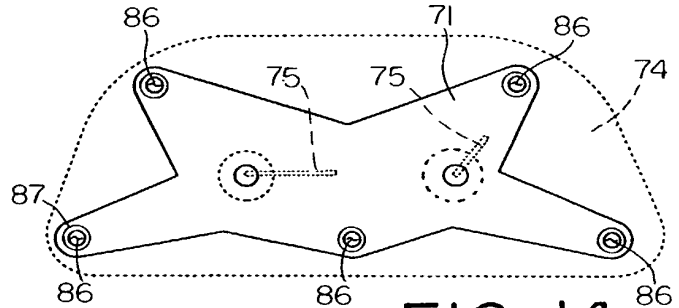


FIG. 14

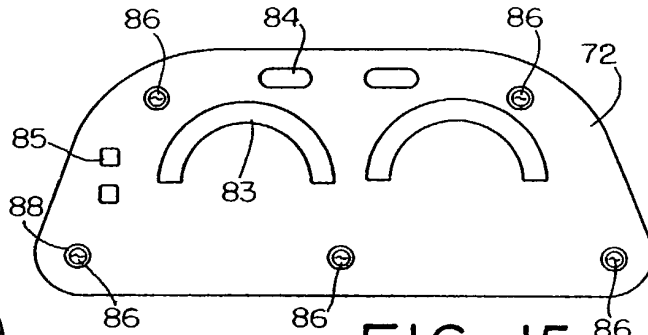


FIG. 15

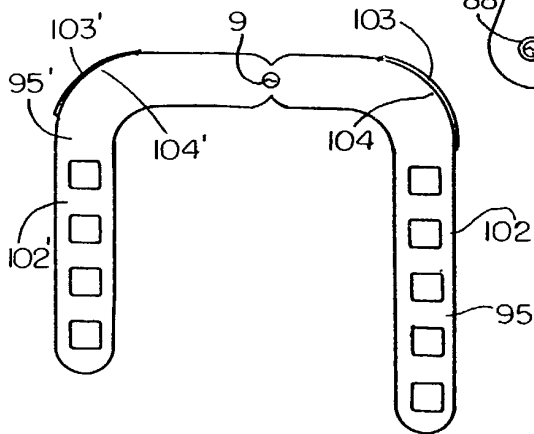


FIG. 17

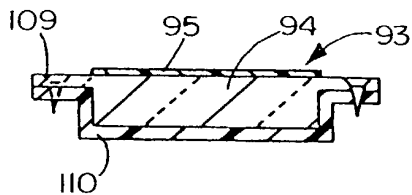


FIG. 19

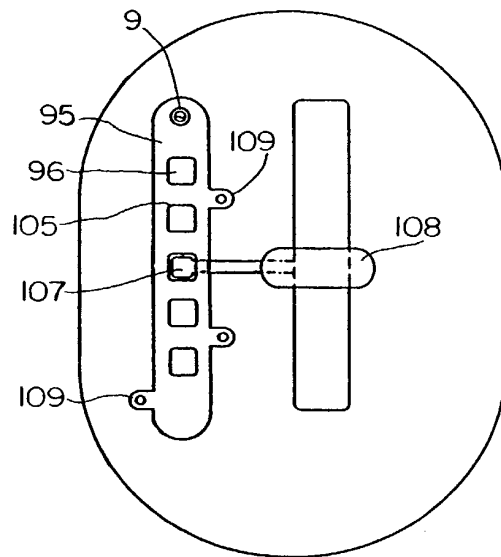


FIG. 18











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10/29/02  
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PATENT NUMBER and  
ISSUE DATE

U.S. UTILITY Patent Application

APPL NUM	FILING DATE	CLASS	SUBCLASS	GAU	EXAMINER
10298367	11/18/2002	362	29	2872	ASSAF

**\*\*APPLICANTS:** Parker Jeffery; Miller Mark; Hough Thomas;  
*Case 362185, 28, 200/513*  
*Fig. 12*

**\*\*CONTINUING DATA VERIFIED:** *20119*  
 This application is a CON of 10/005,090 12/05/2001 PAT 6,508,563  
 which is a CON of 09/703,088 10/31/2000 PAT 6,367,940  
 which is a CON of 09/167,949 10/07/1998 PAT 6,158,867  
 which is a DIV of 08/585,062 01/18/1996 PAT 5,895,115

**\*\* FOREIGN APPLICATIONS VERIFIED:**

PG-PUB	DO NOT PUBLISH <input type="checkbox"/>	RESCIND <input type="checkbox"/>	
Foreign priority claimed	<input type="checkbox"/> yes <input type="checkbox"/> no	ATTORNEY DOCKET NO.	
35 USC 119 conditions met	<input type="checkbox"/> yes <input type="checkbox"/> no	GLOLP0106USD	
Verified and Acknowledged Examiners's initials			
TITLE : Light emitting panel assemblies for use in automotive applications and the like			

U.S. DEPT. OF COMM./PAT. & TM-PTO-436L (Rev. 12-94)

<b>NOTICE OF ALLOWANCE MAILED</b>		<b>CLAIMS ALLOWED</b>	
		Total Claims	Print Claim for O.G.
<b>ISSUE FEE</b>		<b>DRAWING</b>	
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<b>UTILITY PATENT APPLICATION TRANSMITTAL</b>	Attorney Docket No.	GLOLP0106USD
	First Inventor	Jeffery R. Parker
	Title	LIGHT EMITTING PANEL ASSEMBLIES ...
	Express Mail Label No.	EV164823617US

(Only for new nonprovisional applications under 37 CFR 1.53(b))

<p><b>APPLICATION ELEMENTS</b></p> <p>See MPEP chapter 600 concerning utility patent application contents.</p> <p>1. <input checked="" type="checkbox"/> Fee Transmittal Form (e.g., PTO/SB/17) <i>(Submit an original and a duplicate for fee processing)</i></p> <p>2. <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.</p> <p>3. <input checked="" type="checkbox"/> Specification [Total Pages <input ]<br="" type="text" value="29"/><i>(preferred arrangement set forth below)</i></p> <ul style="list-style-type: none"> <li>- Descriptive title of the invention</li> <li>- Cross Reference to Related Applications</li> <li>- Statement Regarding Fed sponsored R &amp; D</li> <li>- Reference to sequence listing, a table, or a computer program listing appendix</li> <li>- Background of the Invention</li> <li>- Brief Summary of the Invention</li> <li>- Brief Description of the Drawings (if filed)</li> <li>- Detailed Description</li> <li>- Claim(s)</li> <li>- Abstract of the Disclosure</li> </ul> <p>4. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets <input ]<br="" type="text" value="5"/>- Drawings are Formal</p> <p>5. Oath or Declaration [Total Pages <input ]<="" p="" type="text" value="3"/> <p>a. <input type="checkbox"/> Newly executed (original or copy)</p> <p>b. <input checked="" type="checkbox"/> Copy from a prior application (37 CFR 1.63 (d)) <i>(for continuation/divisional with Box 18 completed)</i></p> <p>i. <input type="checkbox"/> <b>DELETION OF INVENTOR(S)</b> Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).</p> <p>6. <input checked="" type="checkbox"/> Application Data Sheet. See 37 CFR 1.76</p> </p>	<p><b>ADDRESS TO:</b> Assistant Commissioner for Patents Box Patent Application Washington, DC 20231</p> <p>7. <input type="checkbox"/> CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)</p> <p>8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)</p> <p>a. <input type="checkbox"/> Computer Readable Form (CRF)</p> <p>b. Specification Sequence Listing on:</p> <p>i. <input type="checkbox"/> CD-ROM or CD-R (2 copies); or</p> <p>ii. <input type="checkbox"/> paper</p> <p>c. <input type="checkbox"/> Statements verifying identity of above copies</p>
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<p>9. <input type="checkbox"/> Assignment Papers (cover sheet &amp; document(s))</p> <p>10. <input type="checkbox"/> 37 CFR 3.73(b) Statement <input type="checkbox"/> Power of Attorney <i>(when there is an assignee)</i></p> <p>11. <input type="checkbox"/> English Translation Document (if applicable)</p> <p>12. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations</p> <p>13. <input type="checkbox"/> Preliminary Amendment</p> <p>14. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) <i>(Should be specifically itemized)</i></p> <p>15. <input type="checkbox"/> Certified Copy of Priority Document(s) <i>(if foreign priority is claimed)</i></p> <p>16. <input type="checkbox"/> Request and Certification under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.</p> <p>17. <input checked="" type="checkbox"/> Other: <u>Cert. of Express Mailing</u></p>	

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Continuation  Divisional  Continuation-in-part (CIP) of prior application No.: 10 / 005,090

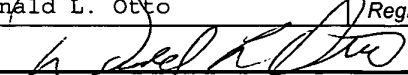
Prior application information: Examiner Fayez G. Assaf Group Art Unit: 2872

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

**19. CORRESPONDENCE ADDRESS**

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Name	Donald L. Otto				
Address	RENNER, OTTO, BOISSELLE & SKLAR, LLP 1621 Euclid Avenue, Nineteenth Floor				
City	Cleveland	State	Ohio	Zip Code	44115-2191
Country	U.S.	Telephone	(216) 621-1113	Fax	(216) 621-6165

Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22,125
Signature		Date	11/18/02

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Application Number													
Filing Date	Herewith												
First Named Inventor	Jeffery R. Parker												
Examiner Name													
Group Art Unit													
Attorney Docket No.	GLOLP0106USD												
<p><b>TOTAL AMOUNT OF PAYMENT</b> (\$) 1568.00</p>													

METHOD OF PAYMENT	FEE CALCULATION (continued)																																																																																																																												
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unavoidable</td><td></td></tr> <tr><td>141 1,280 241 640</td><td></td><td>Petition to revive - unintentional</td><td></td></tr> <tr><td>142 1,280 242 640</td><td></td><td>Utility issue fee (or reissue)</td><td></td></tr> <tr><td>143 460 243 230</td><td></td><td>Design issue fee</td><td></td></tr> <tr><td>144 620 244 310</td><td></td><td>Plant issue fee</td><td></td></tr> <tr><td>122 130 122 130</td><td></td><td>Petitions to the Commissioner</td><td></td></tr> <tr><td>123 50 123 50</td><td></td><td>Processing fee under 37 CFR 1.17(q)</td><td></td></tr> <tr><td>126 180 126 180</td><td></td><td>Submission of Information Disclosure Stmt</td><td></td></tr> <tr><td>581 40 581 40</td><td></td><td>Recording each patent assignment per property (times number of properties)</td><td></td></tr> <tr><td>146 740 246 370</td><td></td><td>Filing a submission after final rejection (37 CFR § 1.129(a))</td><td></td></tr> <tr><td>149 740 249 370</td><td></td><td>For each additional invention to be examined (37 CFR § 1.129(b))</td><td></td></tr> <tr><td>179 740 279 370</td><td></td><td>Request for Continued Examination (RCE)</td><td></td></tr> <tr><td>169 900 169 900</td><td></td><td>Request for expedited examination of a design application</td><td></td></tr> <tr><td colspan="3">Other fee (specify) _____</td><td></td></tr> <tr> <td colspan="3" style="text-align: right;"><b>SUBTOTAL (3)</b> (\$)</td> <td></td> </tr> </tbody> </table>	Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid	105 130 205 65		Surcharge - late filing fee or oath		127 50 227 25		Surcharge - late provisional filing fee or cover sheet		139 130 139 130		Non-English specification		147 2,520 147 2,520		For filing a request for <i>ex parte</i> reexamination		112 920* 112 920*		Requesting publication of SIR prior to Examiner action		113 1,840* 113 1,840*		Requesting publication of SIR after Examiner action		115 110 215 55		Extension for reply within first month		116 400 216 200		Extension for reply within second month		117 920 217 460		Extension for reply within third month		118 1,440 218 720		Extension for reply within fourth month		128 1,960 228 980		Extension for reply within fifth month		119 320 219 160		Notice of Appeal		120 320 220 160		Filing a brief in support of an appeal		121 280 221 140		Request for oral hearing		138 1,510 138 1,510		Petition to institute a public use proceeding		140 110 240 55		Petition to revive - unavoidable		141 1,280 241 640		Petition to revive - unintentional		142 1,280 242 640		Utility issue fee (or reissue)		143 460 243 230		Design issue fee		144 620 244 310		Plant issue fee		122 130 122 130		Petitions to the Commissioner		123 50 123 50		Processing fee under 37 CFR 1.17(q)		126 180 126 180		Submission of Information Disclosure Stmt		581 40 581 40		Recording each patent assignment per property (times number of properties)		146 740 246 370		Filing a submission after final rejection (37 CFR § 1.129(a))		149 740 249 370		For each additional invention to be examined (37 CFR § 1.129(b))		179 740 279 370		Request for Continued Examination (RCE)		169 900 169 900		Request for expedited examination of a design application		Other fee (specify) _____				<b>SUBTOTAL (3)</b> (\$)			
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<b>SUBMITTED BY</b>		<b>Complete (if applicable)</b>	
Name (Print/Type)	Donald L. Otto	Registration No. (Attorney/Agent)	22,125
Signature		Telephone	(216) 621-1113
		Date	11/18/02

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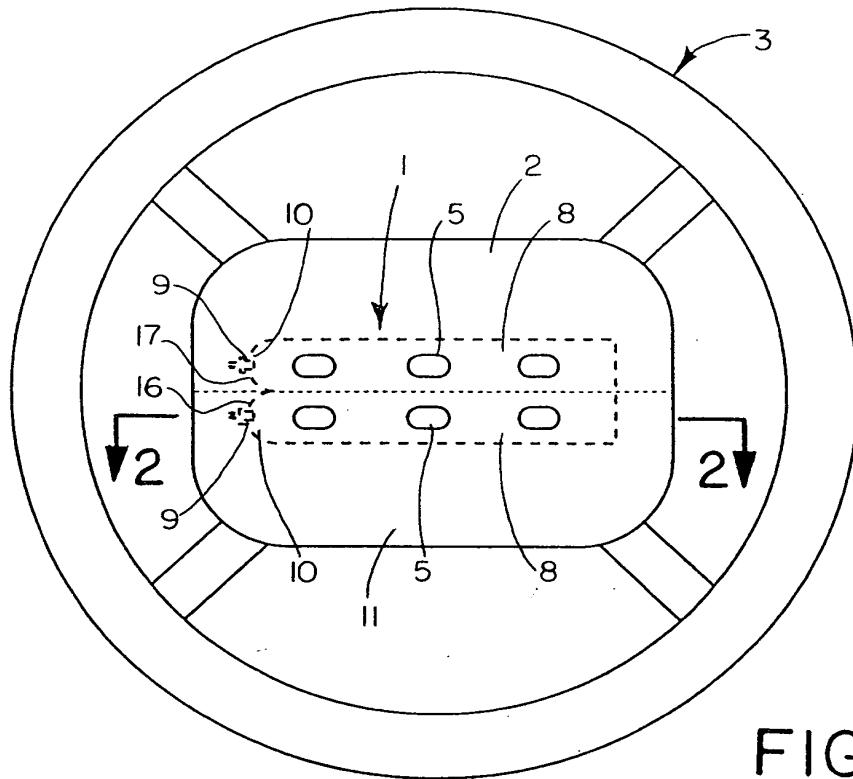


FIG. 1

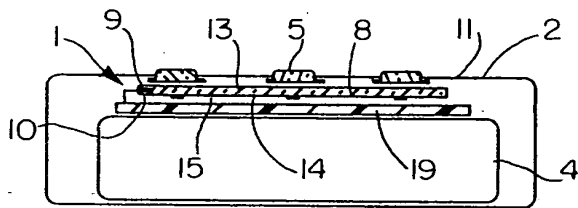


FIG. 2

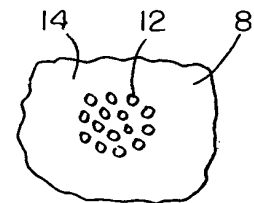


FIG. 2A

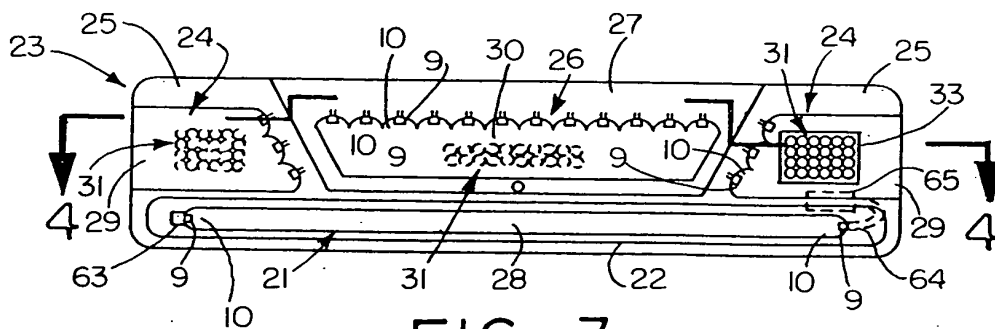
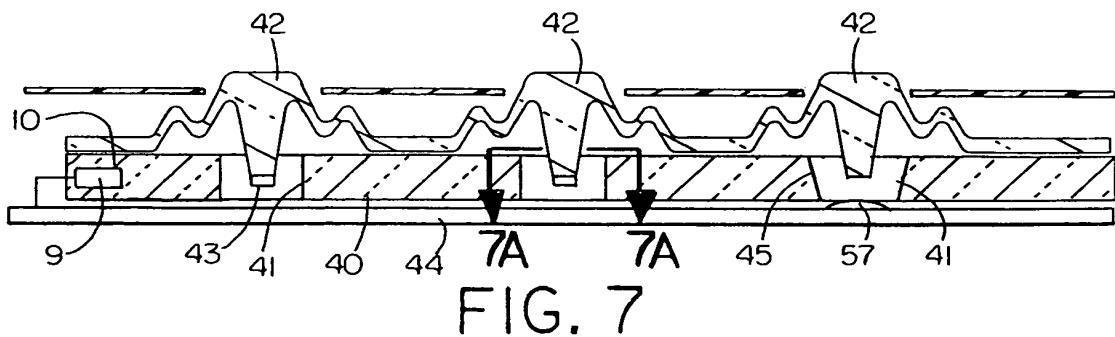
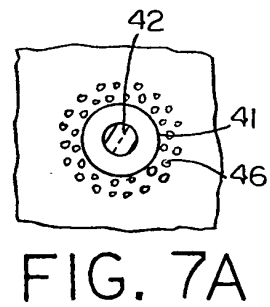
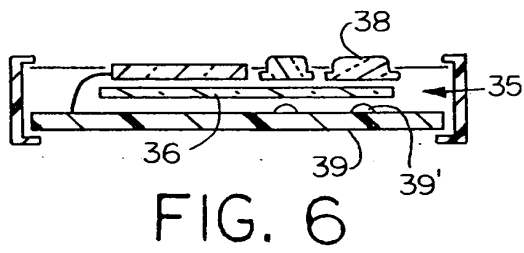
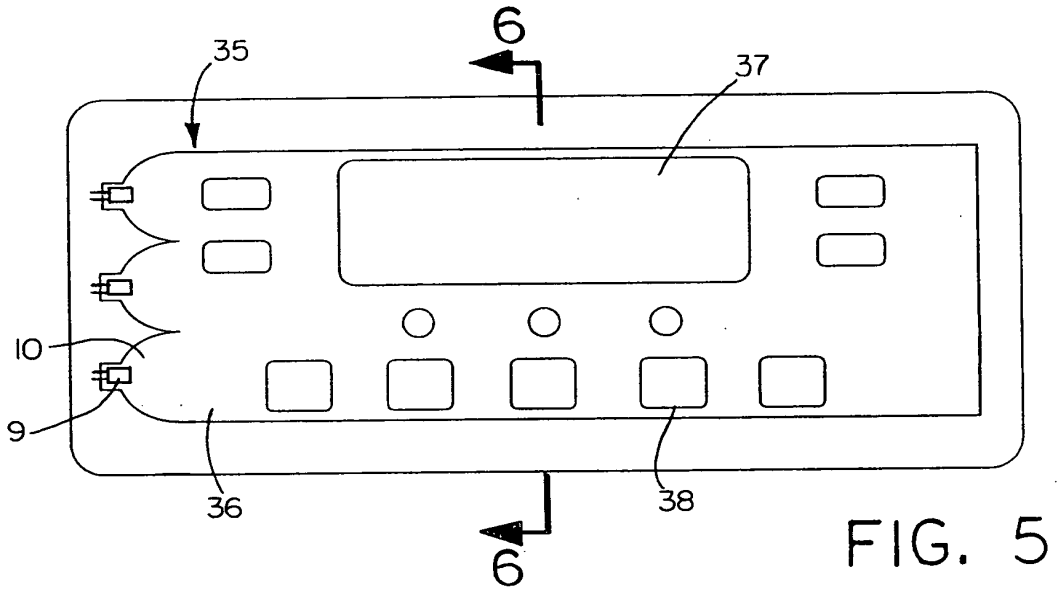
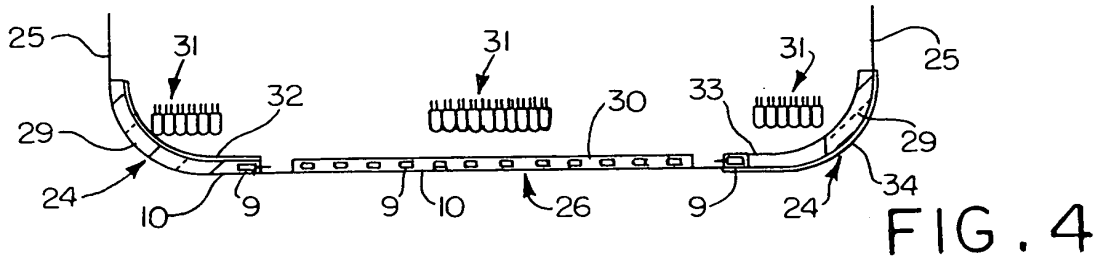


FIG. 3



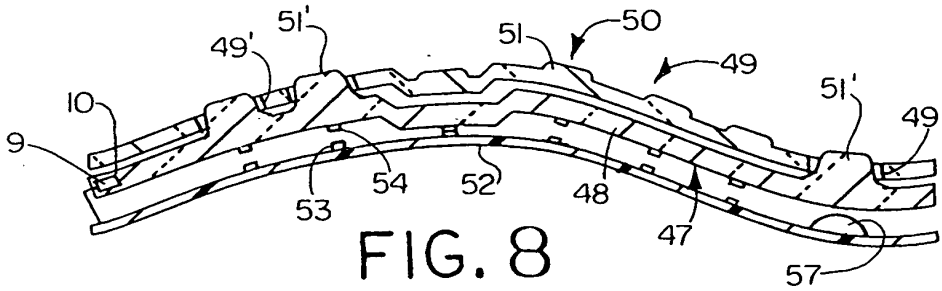


FIG. 8

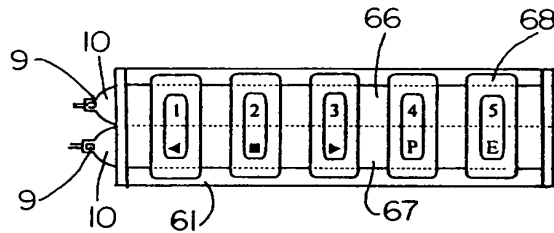


FIG. 11

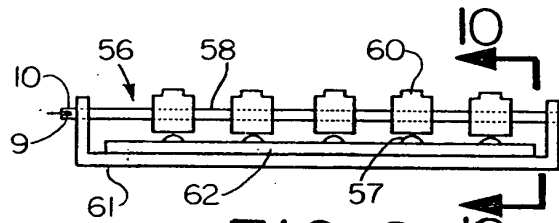


FIG. 9

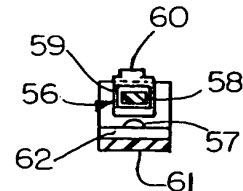


FIG. 10

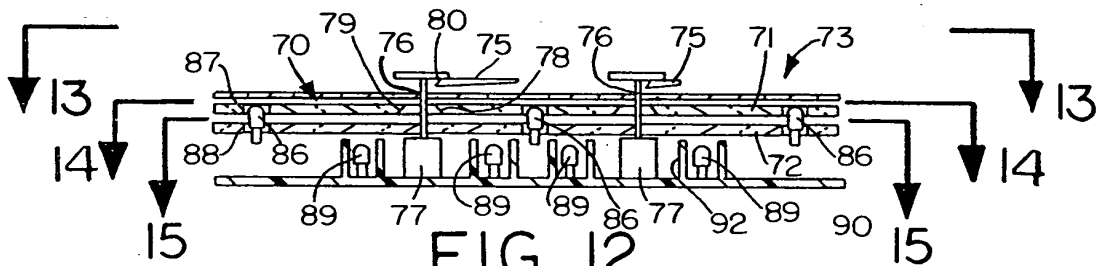


FIG. 12

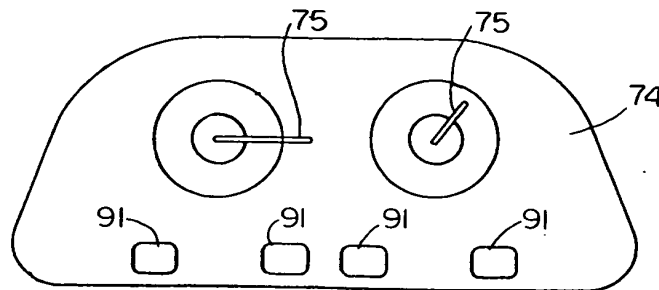


FIG. 13

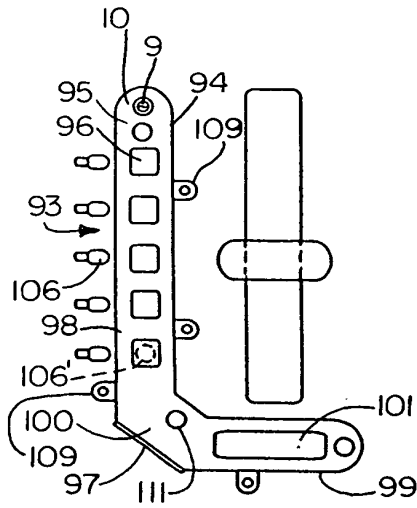


FIG. 16

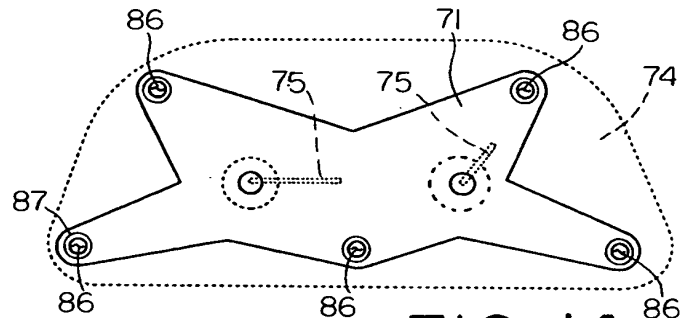


FIG. 14

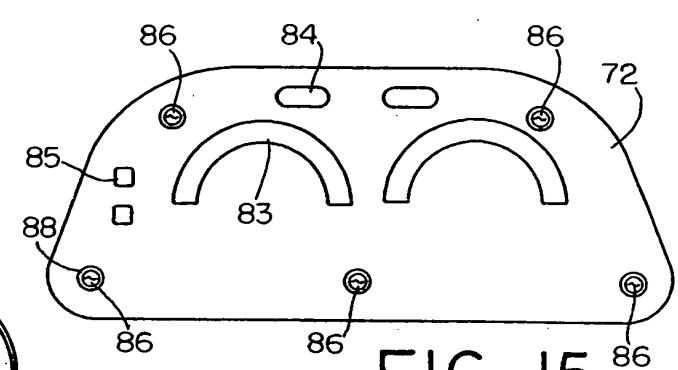


FIG. 15

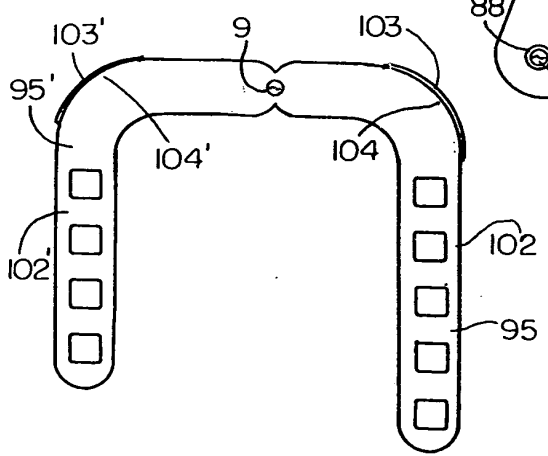


FIG. 17

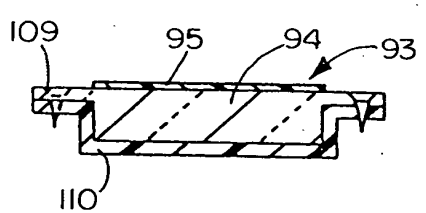


FIG. 19

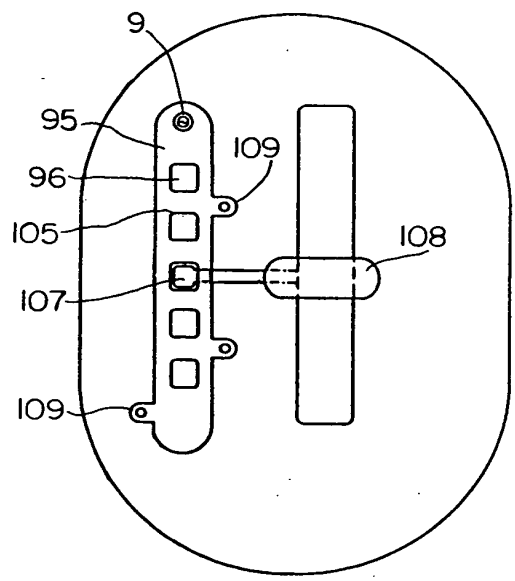


FIG. 18

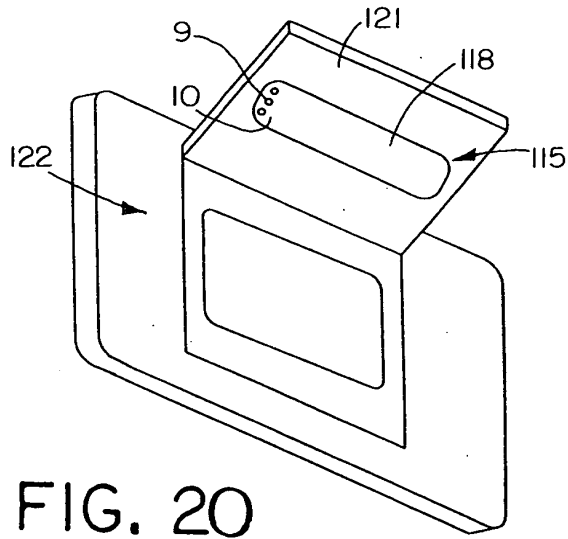


FIG. 20

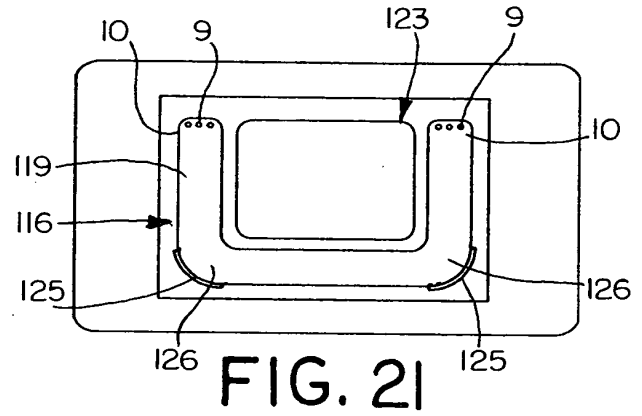


FIG. 21

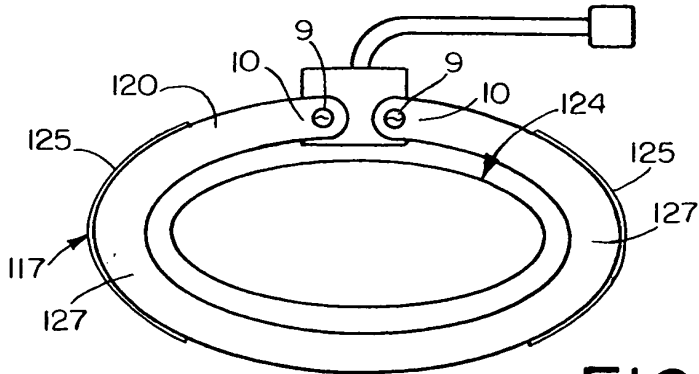


FIG. 22

ATTORNEY DOCKET GLOLP0106USD

**LIGHT EMITTING PANEL ASSEMBLIES FOR USE  
IN AUTOMOTIVE APPLICATIONS AND THE LIKE****CROSS-REFERENCE TO RELATED APPLICATIONS**

5           This application is a continuation of Application Serial No.  
10/005,090, filed December 5, 2001, which is a continuation of Application  
Serial No. 09/703,088, filed October 31, 2000, now U.S. Patent No.  
6,367,940, dated April 9, 2002, which is a continuation of Application Serial  
10          No. 09/167,949, filed October 7, 1998, now U.S. Patent No. 6,158,867,  
dated December 12, 2000, which is a division of Application Serial No.  
08/585,062, filed January 16, 1996, now U.S. Patent No. 5,895,115, dated  
April 20, 1999.

**FIELD OF THE INVENTION**

15           This invention relates generally as indicated to light emitting panel  
assemblies especially for automotive applications.

**BACKGROUND OF THE INVENTION**

20           Light emitting panel assemblies are generally known. The present  
invention relates to certain improvements in light emitting panel assemblies  
especially for automotive applications. Also, this invention is concerned with  
passing/shining light directly through a light emitting panel member or  
through holes in the panel member for performing specified lighting  
functions, for example, providing brake or turn signal lights and/or turning or  
backup illumination for a vehicle.

**SUMMARY OF THE INVENTION**

25           In accordance with one aspect of the invention, the light emitting  
panel assemblies of the present invention may include a light emitting panel  
member made out of a suitable transparent resiliently deformable  
elastomeric material that absorbs impact without breakage. Such panel  
members are especially suitable for use both in interior automotive lighting

applications to reduce the possibility of serious injury to a driver or passenger of a vehicle when thrown into contact with the panel member during a traffic accident, and in exterior automotive lighting applications to help eliminate damage to the panel member if impacted during a traffic accident.

5

Examples where such a resiliently deformable light emitting panel member may be effectively used in interior automotive lighting applications to reduce injury during accidents are steering wheel and dash lighting applications for lighting controls, switches, instrument panels, headliner lighting, logos and/or accent lighting.

10

In steering wheel applications, a resiliently deformable light emitting panel member may be mounted in the hub portion of the steering wheel outwardly of an air bag for lighting controls and/or switches or logos on the steering wheel hub and for accent lighting.

15

When used on a dash or other flush mount applications such as instrument panels and headliner lighting, a resiliently deformable panel member will absorb impact/shock, and may be contoured to match the shape of the dash or other surface.

20

Examples where such a resiliently deformable panel member may be effectively used in exterior automotive lighting applications to reduce or eliminate damage to the panel member during accidents are running or accent lights in the bumper or other exterior body portions of a vehicle. The light emitting panel member may also be incorporated into a trunk lid of a vehicle to provide running lights and/or license plate or logo illumination in the trunk lid. In applications where the trunk lid is recessed, the panel member may be rigid. However, if the trunk lid is substantially flush with the body exterior, the panel member is desirably resiliently deformable to withstand impacts during accidents without breakage of the panel member.

25

In accordance with another aspect of the invention, one or more light sources may be mounted within one or more light transition areas or regions adjacent one or more light input surfaces of a light emitting panel member.

30



In accordance with another aspect of the invention, one or more light sources may be positioned adjacent one side of the panel member for causing light to shine through the panel member or through holes in the panel member for performing specified lighting functions, for example, providing brake or turn signal lights and/or turning or backup illumination for a vehicle.

In accordance with another aspect of the invention, one or more light sources may be selectively positioned along an edge or side of the panel member for increasing the light output from selected light output areas/regions on one or both sides of the panel member.

In accordance with another aspect of the invention, a resiliently deformable light emitting panel member may be used to backlight a liquid crystal display (LCD) and/or multiple control switches or key pads of a radio or other electrical device. Such a panel member upon being engaged by a control button/key pad will be deformed into electrical contact with a switch or other circuitry such as a printed circuit inwardly of the panel member for performing a selected switching function.

In accordance with another aspect of the invention, a rigid light emitting panel member may be used to backlight an LCD and/or multiple control buttons/key pads of a radio or other electrical device by providing holes or openings through the panel member for movement of a portion of the control buttons/key pads into and out of electrical contact with a printed circuit inwardly of the panel member. Surface irregularities such as print patterns or molded in shapes may be provided on the panel surfaces around the holes/openings to flood the areas around the buttons/key pads with light.

In accordance with another aspect of the invention, a rigid light emitting panel member may be used with dome and other such switches for switch area lighting. One or more such rigid light emitting panel members each with its own separate light source and transition region may support a series of push buttons that float on the panel members to permit the push buttons to be moved into contact with the dome switches.





In accordance with another aspect of the invention, two or more stacked light emitting panel members may be used to light an instrument panel or the like. One of the panel members may be used to provide general backlighting for graphic displays on the instrument panel, whereas an other panel member may be used to light dial pointers or other elements on the instrument panel. Common or separate light sources may be used to supply light to input surfaces of two or more panel members. Also, separate indicator lights may be provided behind the panel members for providing through illumination to indicators on the graphic displays of the instrument panel.

In accordance with another aspect of the invention, a rigid light emitting panel member may be used as a structural member for graphic overlays or decals, to provide for example lighting for designating the gear shift lever positions of a vehicle. One or more light sources may be inserted/embedded within light transition regions at one or more locations along the length of the panel member to direct light into input surfaces of the panel member. Indicator lights may be provided adjacent an edge or side of the panel member in line with each indicator position for providing increased light output at the selected position. Also, a movable color filter may be provided between the panel member and label to provide a different colored light output at any selected gear shift position. For example, a movable red filter may be used to change the color of the light output at the selected gear shift lever position from white to red.

In accordance with another aspect of the invention, the light emitting panel member may have a secondary reflective/refractive surface for reflecting/refracting a portion of the light entering an input surface of the panel member around a corner of the panel member.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of

the invention, these being indicative, however, of but several of the various ways in which the principles of the invention may be employed.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

In the annexed drawings:

5 Fig. 1 is a schematic top plan view of a steering wheel of a vehicle incorporating one form of light emitting panel assembly in accordance with this invention in the hub portion of the steering wheel;

Fig. 2 is a fragmentary transverse section through the panel assembly within the hub portion of Fig. 1 taken on the plane of the line 2-2 thereof;

10 Fig. 2A is an enlarged plan view of a portion of a light output surface area of a panel assembly schematically showing a pattern of light extracting deformities on the light output surface area;

15 Fig. 3 is a schematic end view of a rear portion of a vehicle incorporating other forms of light emitting panel assemblies in accordance with this invention;

Fig. 4 is a fragmentary transverse section through the vehicle end portion and panel assemblies of Fig. 3 taken on the plane of the line 4-4 thereof;

20 Fig. 5 is a schematic plan view of a radio or other electronic device incorporating another form of light emitting panel assembly in accordance with this invention;

Fig. 6 is a transverse section through the assembly of Fig. 5 taken on the plane of the line 6-6 thereof;

25 Fig. 7 is a schematic fragmentary section through a portion of a control panel incorporating another form of light emitting panel assembly in accordance with this invention;

30 Fig. 7A is a fragmentary top plan view of a portion of the light emitting panel member of Fig. 7 showing light extracting deformities on light emitting surfaces of the panel member around a hole or opening in the panel member in alignment with a control button/key pad;

Fig. 8 is a schematic fragmentary section through a contoured surface such as the dash of a vehicle showing other forms of light emitting panel assemblies in accordance with this invention interposed between a printed circuit and a series of key pads either molded into the contoured surface or extending through openings therein;

Fig. 9 is a schematic side elevation view of another form of light emitting panel assembly in accordance with this invention used for supporting and illuminating a series of floating push buttons above a series of dome switches;

Fig. 10 is a transverse section through the assembly of Fig. 9 taken on the plane of the line 10-10 thereof;

Fig. 11 is a top plan view of another form of light emitting panel assembly in accordance with this invention which is also used to support and illuminate a series of floating push buttons;

Fig. 12 is a schematic vertical section through an instrument panel incorporating other forms of light emitting panel assemblies in accordance with this invention;

Fig. 13 is a top plan view of a graphic overlay for the instrument panel of Fig. 12 as seen from the plane of the line 13-13 thereof;

Fig. 14 is a top plan view of one light emitting panel assembly in accordance with this invention incorporated in the instrument panel of Fig. 12 as seen from the plane of the line 14-14 thereof;

Fig. 15 is a top plan view of another form of light emitting panel assembly in accordance with this invention incorporated in the instrument panel of Fig. 12 as seen from the plane of the line 15-15 thereof;

Figs. 16 through 18 are schematic plan views showing other forms of light emitting panel assemblies in accordance with this invention which provide a structural support for graphic overlays/decals used for example to designate the various gear shift lever positions of an engine;

Fig. 19 is a fragmentary transverse section through one such light emitting panel member used as a structural support; and

Figs. 20 through 22 are schematic illustrations showing light emitting panel assemblies in accordance with this invention used to provide lighting for vanity mirrors and the like.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

5 Referring now in detail to the drawings, and initially to Figs. 1 and 2, there is schematically shown one form of light emitting panel assembly 1 in accordance with this invention mounted in the hub portion 2 of a steering wheel 3 of a vehicle outwardly of an air bag 4 to provide backlighting for control switches/buttons 5, the horn, logos, or other accent lighting on the  
10 steering wheel.

The light emitting panel assembly 1 includes a transparent light emitting panel member 8 having one or more light sources 9 mounted within one or more light transition areas or regions 10 at one or both ends of the panel member mounted within the air bag/steering wheel covering 11  
15 outwardly of the air bag 4. In Figs. 1 and 2, two such light transition areas or regions 10 and light sources 9 are shown at one end of one or two panel members 8 for selectively lighting one or two rows of control buttons 5. The light that enters the transparent light emitting panel members 8 from the light transition region(s) 10 may be emitted along the entire length of the panel  
20 members or from one or more light output surface areas along their length as desired to produce a desired light output distribution to fit a particular application.

The light sources 9 may be mechanically held in any suitable manner in slots, cavities or openings machined, molded or otherwise formed in the  
25 light transition regions of the panel assemblies. However, the light sources may be embedded, potted or bonded in the light transition regions in order to eliminate any air gaps or air interface surfaces between the light sources and surrounding light transition regions, thereby reducing light loss and increasing the light output emitted by the light emitting panels. Bonding may  
30 be accomplished using a suitable embedding, potting or bonding material or by a variety of methods that do not incorporate extra material, for example,

thermal bonding, heat staking, ultrasonic or plastic welding or the like. Other methods of bonding include insert molding and casting around the light sources.

5 The light sources may be of any suitable type including, for example, any of the types disclosed in U.S. Patent Nos. 4,897,771 and 5,005,108, assigned to the same assignee as the present application, the entire disclosures of which are incorporated herein by reference. In particular, the light sources may be non-

10 linear such as an arc lamp, an incandescent bulb which also may be colored, filtered or painted, a lens end bulb, a halogen lamp, a light emitting diode (LED), a chip from an LED, a neon bulb, a fiber optic light pipe transmitting light from a remote light source, a laser or laser diode, or linear such as a line light or fluorescent tube, or any other suitable light source.

15 Also, the light sources may be a multiple colored LED, or a combination of multiple colored radiation sources in order to provide a desired colored or white light output distribution. For example, a plurality of colored lights such as LEDs of different colors (red, blue, green) or a single LED with multiple colored chips may be employed to create white light or any other color or shade light output distribution by varying the intensities of each individual  
20 colored light. A label/overlay with different color light emitting regions can be used in conjunction with a panel assembly having a plurality of colored light sources for specific indication based on color or the frequency of light emitted by the different light emitting regions.

25 A pattern of light extracting deformities or disruptions 12 (see fig. 2A) may be provided on one or both sides 13, 14 of the panel members along the entire length thereof or at one or more selected areas of the panel members as desired. The terms deformities or disruptions are used interchangeably herein to mean any change in the shape or geometry of the panel surface and/or coating or surface treatment that causes a portion of  
30 the light to be emitted. A pattern of light extracting deformities may include a variable pattern which breaks up the light rays such that the internal angle of reflection of a portion of the light rays will be great enough to cause the light

rays either to be emitted out of the panel members through the side or sides on which the light extraction deformities are provided or reflected back through the panel members and emitted out the other side.

Such deformities or disruptions can be produced in a variety of manners, for example, by providing a painted pattern, an etched pattern, a machined pattern, a printed pattern, a painted pattern, a hot stamped pattern, or a molded pattern or the like at selected light output areas on the surfaces of the panel members. An ink or adhesive pattern or printed pattern may be applied for example by pad printing, silk screening, ink jet, photolithography, heat transfer film process or the like. The deformities may also be printed on a sheet or film which is used to apply the deformities to the sides of the panel members. This sheet or film may become a permanent part of the light panel assemblies for example by attaching or otherwise positioning the sheet or film against one or both sides of the panel members in order to produce a desired effect.

By varying the density, opaqueness or translucence, shape, depth, color, area, index of refraction, or type of deformities on an area or areas of the panel members, the light output of the panel members can be controlled. The deformities or disruptions may be used to control the percent of light emitted from any surface area of the panel members. For example, less and/or smaller size deformities may be placed on panel surface areas where less light output is wanted. Conversely, a greater percentage of and/or larger deformities may be placed on surface areas of the panels where greater light output is desired.

Varying the percentages and/or size of deformities in different surface areas of the panels is necessary in order to provide a uniform light output distribution. For example, the amount of light traveling through the panels will ordinarily be greater in areas closer to the light source than in other areas further removed from the light source. A pattern of light extracting deformities may be used to adjust for the light variances within the panel members, for example, by providing a denser concentration of light extracting deformities with increased distance from the light source thereby

resulting in a more uniform light output distribution from the light emitting panels.

5 The deformities may also be used to control the output ray angle distribution of the emitted light to suit a particular application. For example, if the panel assemblies are used to provide a liquid crystal display backlight, the light output will be more efficient if the deformities cause the light rays to be emitted from the panels at predetermined ray angles such that they will pass through the liquid crystal display with low loss.

10 Additionally, the pattern of light extracting deformities may be used to adjust for light output variances attributed to light extractions of the panel members. The pattern of light extracting deformities may be printed on the light output surface areas utilizing a wide spectrum of paints, inks, coatings, epoxies, adhesives, or the like, ranging from glossy to opaque or both, and may employ half-tone separation techniques to vary the deformity coverage. 15 If an adhesive is used to provide a pattern of light extracting deformities, the adhesive may also be used to secure a back reflector to the panel member. Moreover, the pattern of light extracting deformities may be multiple layers or vary in index of refraction.

20 Print patterns of light extracting deformities may vary in shapes such as dots, squares, diamonds, ellipses, stars, random shapes, and the like, and are desirably .006 square inch per deformity/element or less. Also, print patterns that are 60 lines per inch or finer are desirably employed, thus making the deformities or shapes in the print patterns nearly invisible to the human eye in a particular application thereby eliminating the detection of 25 gradient or banding lines that are common to light extracting patterns utilizing larger elements. Additionally, the deformities may vary in shape and/or size along the length and/or width of the panel members. Also, a random placement pattern of the deformities may be utilized throughout the length and/or width of the panel members. The deformities may have 30 shapes or a pattern with no specific angles to reduce moire or other interference effects. Examples of methods to create these random patterns are printing a pattern of shapes using stochastic print pattern techniques,

frequency modulated half tone patterns, or random dot half tones.

Moreover, the deformities may be colored in order to effect color correction in the panel members. The color of the deformities may also vary throughout the panel members, for example to provide different colors for the same or different light output surface areas.

In addition to or in lieu of these light extracting deformities, other light extracting deformities including prismatic surfaces, depressions or raised surfaces of various shapes using more complex shapes in a mold pattern may be molded, etched, stamped, thermoformed, hot stamped or the like into or on one or more surface areas of the panel members. The prismatic surfaces, depressions or raised surfaces will cause a portion of the light rays contacted thereby to be emitted from the panel members. Also, the angles of the prisms, depressions or other surfaces may be varied to direct the light in different directions to produce a desired light output distribution or effect. Moreover, the reflective or refractive surfaces may have shapes or a pattern with no specific angles to reduce moire or other interference effects.

A back reflector or reflective coating (including trans reflectors) (see Fig. 2) may be applied to a bottom side of the panel members using a suitable adhesive or other method in order to improve light output efficiency of the panel assemblies by reflecting the light emitted from that side back through the panel members for emission through the opposite side. If adhesive is used to adhere the back reflector to the panel members, the adhesive is desirably applied only along the side edges of the panel members so that there is a slight air gap between the back reflector and panel members except where there is adhesive, since the adhesive changes the internal critical angle of the light in a less controllable manner than the air gap between the panel surface and back reflector.

Additionally, a pattern of light extracting deformities may be provided on one or both sides of the panel members in order to change the path of the light so that the internal critical angle is exceeded and a portion of the light is emitted from one or both sides of the panel members. Where the deformities are created by a print pattern, the back reflector can be the same



color as the print pattern so that print pattern is not visible through the back reflector. Moreover, a transparent film, sheet or plate may be attached or positioned against the side or sides of the panel members from which light is emitted using a suitable adhesive or other method in order to produce a desired effect.

The transparent film may be used to further improve the uniformity of the light output distribution or change the output ray angle distribution. For example, the film may be a colored film, a diffuser, or a label or display, a portion of which may be a transparent overlay that may be colored and/or have text or an image thereon. Also the film may be a prismatic or lenticular lens or other device that changes the output ray angle distribution.

In Fig. 1 the light transition regions or areas 10 are shown as an integral extension of one end of the light emitting panel members 8 and as having curved edges 16 to more efficiently reflect and/or refract and focus the light emitted from the light sources that impinges on the curved edges 16 back through the light transition regions at an acceptable angle for entering the light input surface of the light emitting panel members. Also, a suitable reflective material or coating 17 may be provided on any portions of the edges of the light transition regions of the panel members on which any portion of the light impinges for maximizing the amount of light or otherwise changing the light that is reflected back through the light transition regions and into the light emitting panel members.

A suitable pattern of light extracting deformities or disruptions 12 may be provided on selected areas on one or both sides of the panel members 8 corresponding to the location of the control buttons 5 on the air bag covering 11 above the panel members. In the example shown, the pattern of light extracting deformities or depressions is provided on the bottom side 14 of the panel member 3 (*i.e.*, the side facing away from the control buttons), and a reflective film or coating 15 is provided on that side to reflect the light emitted from that side back through the panel members.

Preferably the light emitting panel members 8 are made of a transparent resiliently deformable material such as a thermoplastic

5 elastomer or silicone rubber which allows areas of the panel members in line with the control buttons to be flexed into engagement with a printed circuit 19 located beneath the panel members when the respective control buttons are depressed to complete an associated control circuit. Also if the air bag 4 should ever be deployed or if the driver's head should be forced into engagement with the hub portion 2 of the steering wheel 3 during a traffic accident, the resiliently deformable panel members 8 will absorb shock, thus greatly reducing the possibility of serious injury to the driver because of such contact.

10 The printed circuit 19 may be made of a suitable thermoplastic elastomer, silicone rubber or flexible film or laminated circuit or membrane or dome switch to absorb shock, thus further reducing the possibility of serious injury to the driver should the driver's head impact against the hub portion of the steering wheel or should the steering wheel air bag be deployed and force the panel members and circuit outwardly into contact with the driver.

15 Light emitting panel assemblies similar to that shown in Figs. 1 and 2 may also be advantageously employed in other automotive applications as well such as the dash, instrument panel, headliner, and exterior lighting. Figs. 3 and 4 show several automotive exterior lighting applications including one in which a light emitting panel assembly 21 is mounted in a back end or bumper 22 of a vehicle 23 to provide running lights in the back end/bumper, another in which light emitting panel assemblies 24 are mounted in body panels 25 along the rear, front and/or sides of a vehicle to provide running lights or accent lights or to light a logo, step, running board, or other surface area of a vehicle; and still another in which a light emitting panel assembly 26 is mounted in a vehicle trunk lid 27 for providing a running light or illumination for a logo, accent light or license plate mounted on the trunk lid. In each case the respective light emitting panel members 28, 29 and 30 are shaped to fit the particular application and may be made of a transparent resiliently deformable material such as a thermoplastic elastomer or silicone rubber that will flex upon impact during minor traffic accidents without breakage.

5 The number and location of light sources 9 and associated light transition regions 10 for a given light emitting panel member may vary for a given application depending on the overall size and shape of each panel member and desired amount of light output therefrom. For example, the back end/bumper running light application shown in Figs. 3 and 4 may only require one light source 9 and associated light transition region 10 at each end of the panel member 28, whereas the body panel and trunk lid running light applications shown in Figs. 3 and 4 may require a plurality of closely spaced light sources 9 and associated light transition regions 10 along one or more light input surfaces of the panel members. Figs. 3 and 4 show several such light sources and associated light transition regions along the back edges of the panel members 29 used to provide running taillights for a vehicle and along a top edge of the panel member 30 used to provide illumination on a trunk lid. Mounting all of the light sources for the tail running lights along the back edges of the panel members 29 (*i.e.*, the edges closest to the trunk lid) minimizes the risk that the light sources themselves will be damaged in the event the tail running lights are impacted during minor traffic accidents and the like. These panel members may have a relatively thin, low profile, for example, less than one quarter inch thick, so as not to take up much space. Also, these panel members 29 may form the exterior surface of the body panel 25 as shown at the left hand side of Fig. 4 or a lens or film 34 may cover the panel members as shown at the right hand side of Fig. 4.

25 In the usual case the light sources are embedded, potted or bonded in the light transition regions of the panels as previously described. However, Fig. 3 shows the light source 9 at the left end of panel member 28 mechanically held in place by a holder 63 received in a slot in an edge of the panel member. Also a fiber optic light pipe 64 is shown at the right end of the panel member 28 of Fig. 3 for transmitting light to the panel member from a remote light source 65 located for example in the trunk or other remote location in the vehicle.

An additional array of light sources 31 such as LEDs or incandescent or halogen lamps (with or without reflectors) may also be strategically mounted inwardly (*i.e.*, behind) the inner surface of the light emitting panel members 29 and/or 30 to cause a more intense light to shine through the panel members and a trans reflector 32 if provided on the panel members or through one or more clear areas or holes 33 through the panel members where no print pattern, back reflector or trans reflector is provided on the panel members as also schematically shown in Figs. 3 and 4 for specific applications, for example, to provide brake or turn signal lights, turning or backup illumination, etc. By locating the light sources 9 for illuminating the panel members 29 themselves adjacent one or more ends of the panel members, they will not interfere with or obstruct the visibility of the array of light sources 31 shining through the panel members.

In automotive applications such as a trunk lid 27 where the light emitting panel assembly 26 may be sufficiently recessed such that the light emitting panel member 30 will typically not be impacted during minor traffic accidents, the panel member could be made of a rigid transparent material such as polycarbonate or acrylic plastic instead of a resiliently deformable material if desired.

Figs. 5 and 6 schematically show another form of light emitting panel assembly 35 in accordance with this invention including a resiliently deformable transparent light emitting panel member 36 mounted behind an LCD 37 and/or multiple control buttons 38 of a radio or other device for illumination of the LCD and control buttons either by causing light to be uniformly emitted from the entire surface of the panel member or from specific surface areas of the panel member in the regions of the LCD and control buttons as desired. Any number of light sources 9 and associated light transition regions 10 may be provided for the panel member 36 as desired. Also, the panel member 36 is desirably made of a resiliently deformable elastomeric material so that when the control buttons 38, which may either be membrane switches or elastomeric key pads that are molded or embossed, are depressed into engagement with the panel member, the

engaged areas of the panel member will flex into engagement with associated dome switches 39' or other circuitry on a printed circuit 39 beneath the panel member to effect the selected switching function.

5 Alternatively, a light emitting panel member 40 in accordance with this invention may be made of a relatively rigid transparent material such as polycarbonate or acrylic plastic, with through holes 41 in the panel member in alignment with membrane switches or elastomeric key pads 42 or other such control buttons (see Fig. 7) to permit contact portions 43 on the control buttons to engage appropriate circuitry on a printed circuit 44 inwardly of the panel member when the control buttons are depressed. Alternatively, the control buttons 42 may be used to activate dome switches (one such dome switch 57 being shown toward the right end of Fig. 7), in which event the contact portions 43 may be eliminated.

10 The holes 41 may be of various shapes or have angled or textured walls 45 (the wall 45 of the right most hole 41 of Fig. 7 being shown angled) to cause a portion of the light to be emitted toward the control buttons.

15 In this particular embodiment, light entering the panel member from the light source 9 and associated light transition region 10 will be emitted from the walls 45 of the holes 41 in the panel member to backlight the switches/pads. Also, surface irregularities 46 such as print patterns may be provided around the holes 41 in the panel member as schematically shown in Fig. 7A to cause light to be emitted around the control buttons to flood the area around the control buttons with light. Surface irregularities 46 such as print patterns or molded in shapes may also be provided on other surface areas of the panel member 36, for example, behind the LCD 37 and control buttons 38 for backlighting purposes, etc.

20 Fig. 8 schematically shows a flush mount application for a light emitting panel assembly 47 in accordance with this invention in which a resiliently deformable elastomeric transparent light emitting panel member 48 is mounted behind a contoured surface such as the dash 49 of a vehicle on which control switches 50 or a logo or the like are mounted. The switches 50 include transparent or translucent key pads 51 or 51' that may

be molded into the contoured surface as shown in the center portion of Fig. 8 or molded onto the panel member 48 and extend through openings 49' in the contoured surface as shown to the left and right of center in Fig. 8. Also, the key pads 51, 51' are desirably made of an elastomeric or other flexible material, which together with the panel member 48, provide a soft assembly that absorbs impact to minimize injury to a person thrown against the dash during a traffic accident or the like. Also making the panel member 48 out of a resiliently deformable elastomeric material permits selected areas of the panel member to be pressed into contact/engagement with a printed circuit 52 therebeneath when the key pads are depressed. The printed circuit and panel member may include appropriate circuitry 53, 54 such as conducting ink printed on adjacent surfaces to complete an appropriate circuit when brought into contact with each other. Alternatively dome switches 57 may be provided for engagement by the key pads (one such dome switch being shown toward the right end of Fig. 8) thus eliminating the need for the circuitry 53, 54. Also, the printed circuit 52 may be made of a suitable resiliently deformable elastomeric material or flexible film for contouring and to help in providing a soft assembly to absorb impact during a traffic accident or the like.

Figs. 9 and 10 schematically illustrate another form of light emitting panel assembly 56 in accordance with this invention for use with dome switches 57 for switch array lighting, keyless entry, radio and/or tape/CD controls or other such applications. In this particular embodiment, a relatively rigid transparent light emitting panel member 58 extends through transverse openings or slots 59 (see Fig. 10) in an array of push buttons 60 in line with the dome switches 57. The ends or other sections of the panel member are supported by a rigid tray 61 containing or in close proximity to a printed circuit 62 on which the dome switches may be mounted. The height of the slots 59 through the push buttons 60 is greater than the thickness of the panel member 58 whereby the push buttons will float on the panel member, thus allowing the push buttons to be pressed into contact with the

respective dome switches on the printed circuit to activate appropriate circuitry.

5 Figs. 9 and 10 show a single panel member 58 with associated light sources 9 and light transition regions 10 at one or both ends thereof for illuminating single indicator buttons 60, whereas Fig. 11 shows two light emitting panel members 66, 67 with separate light sources 9 and associated light transition regions 10 for illuminating dual indicator buttons 68 for illuminating radio controls and/or tape/CD controls or the like. Surface irregularities such as print patterns or molded in shapes may be provided on  
10 selected surface areas of the panel members within and/or around the push buttons to cause light to illuminate the buttons.

Figs. 12 through 15 schematically illustrate another form of light emitting panel assembly 70 in accordance with this invention including two or more stacked relatively rigid transparent light emitting panel members 71, 72 in a multi-layer instrument panel 73. The outer (*i.e.* upper) panel member 71, shown in plan view in Fig. 14, provides a structural support for a graphic overlay 74, shown in plan view in Fig. 13. Pointers 75 are supported outwardly of the graphic overlay 74 by shafts 76 (see Fig. 12) which extend through the panel members and are rotatably driven by motor controllers 77 inwardly (*i.e.* below) of the panel members. The pointers may be illuminated as by providing prismatic surfaces 78 and/or surface irregularities around openings 79 in the outer panel member 71 through which the shafts 76 extend for reflecting/refracting light within the outer panel member into the pointers 75. The pointers 75 may also be made of a light transmitting  
20 material, with prismatic surfaces 80 at one end of the pointers to cause light received from the outer panel member to be reflected/refracted back through the pointers and emitted through light emitting surface areas on the pointers.

25 The inner (*i.e.* lower) panel member 72, shown in plan view in Fig. 15, includes different shaped light emitting surface areas 83, 84 and 85 for emitting light entering the panel member from one or more light sources for backlighting the graphic overlay 74 mounted on the outer surface of the  
30 outer panel member 71.

Separate or common light sources may be provided for each panel member 71, 72 as desired. In the embodiment shown in Figs. 12 through 15, common light sources 86 for both panel members 71, 72 extend into aligned openings 87, 88 in the panel members. Also, separate indicator lights 89 may be mounted at selected positions on a printed circuit 90 inwardly of both panel members 71, 72 for shining light through both panel members to different indicators 91 on the graphic overlay 74 as schematically shown in Figs. 12 and 13. Suitable shields/reflectors 92 may be provided around/between the indicator lights 89 (see Fig. 12) to shield the light and direct it to the appropriate indicators.

Fig. 16 shows another form of light emitting panel assembly 93 in accordance with this invention including a rigid transparent light emitting panel member 94 which may act as a structural support for a graphic overlay/decal 95 used, for example, to designate the various gear shift lever positions for the engine of a vehicle. One or more light sources 9 may be inserted/

embedded within light transition regions 10 on the panel member to provide backlighting at selected surface areas 96 along the length of the panel member corresponding for example to the different gear shift selector positions (*viz.* P R N D L) or to provide accent lighting or backlighting for a logo. The panel member 94 shown in Fig. 16 is generally L shaped, with an angled reflective surface 97 interconnecting the legs 98, 99 of the panel member for reflecting a portion of the light from the light source 9 on one of the legs 98 of the panel member around a corner 100 for providing backlighting at one or more selected areas 101 on the other leg 99 of the panel member.

Instead of being generally L shaped, the panel member 102 can be curved in one or more planes as schematically shown in Fig. 17. Also, two such panel members 102, 102' may be provided as shown in Fig. 17 for designating the different gear shift lever positions of a four wheel drive vehicle. In this particular embodiment, the two panel members are joined together and a common light source 9 is used to supply light to both panel



members, with reflective surfaces 103, 103' at the corners 104, 104' for reflecting/refracting a portion of the light around the corners.

Alternatively, the panel member 105 may be substantially straight as schematically shown in Fig. 18.

5 A plurality of indicator lights 106 may also be located along an edge of the panel members in line with the light emitting surface areas 96 corresponding to the respective gear shift lever positions as schematically shown in Fig. 16 for providing increased light output at these positions. Also, additional light sources 106' may be placed behind the panel members  
10 for shining light through the light emitting surface areas or other surface areas of the panel member as shown in phantom lines in Fig. 16.

A filter 107 may be interposed between the panel members and associated graphic overlay 95 for movement with a gear selector shift lever 108 into overlying relation with any one of the light emitting surface areas 96  
15 on the panel members corresponding to the selected gear shift position as schematically shown in Fig. 18 to provide a different color or shade of light output at the selected gear shift position. For example, the filter 107 may be a red filter that changes the color of the light output at the selected gear shift position from white to red.

20 Along both side edges of the panel member are tabs 109 which may be used for example to heat stake the panel member to a back reflector tray 110 for the panel member as schematically shown in Fig. 19. Also, posts 111 may be provided on the panel members for heat staking the overlay/label 95 to the panel members and/or heat staking the panel  
25 members to an interior body panel of the vehicle.

Figs. 20 through 22 show other forms of light emitting panel assemblies 115, 116 and 117 in accordance with this invention including respective light emitting panel members 118, 119 and 120 mounted on the  
30 flap 121 of a vanity mirror 122 (see Fig. 20), extending around three sides of a generally rectangular vanity mirror 123 (see Fig. 21), and extending substantially completely around an elliptical vanity mirror 124 (see Fig. 21). Such panel members 118, 119 and 120 have a relatively thin, low profile, for

example less than one quarter inch thick, with one or more light sources 9 and light transition regions 10 at one or both ends of the panel members to produce a uniform diffuse, shadowless light around the vanity mirror. In the Fig. 20 embodiment, where the panel member 118 is shown mounted on the vanity mirror flap 121, the panel member is generally straight and extends substantially the entire length of the mirror in generally parallel relation thereto, with light sources 9 and associated light transition region 10 at one end of the panel member. In the Fig. 21 embodiment, the panel member 116 is generally U shaped and is configured to extend substantially the full length of three sides of the mirror in generally parallel relation and in close proximity thereto, whereas in the Fig. 22 embodiment, the panel member 120 is generally elliptical in shape. In both the Figs. 21 and 22 embodiments, the panel members 119 and 120 have one or more light sources 9 and associated light transition regions 10 at both ends of the panel members. Also, reflective surfaces 125 are provided at the corners/curves 126, 127 of the panel members 119, 120 for reflecting a portion of the light around the corners/curves.

Although the invention has been shown and described with respect to certain preferred embodiments, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of the specification. The present invention includes all such equivalent alterations and modifications and is limited only by the scope of the claims.

## WHAT IS CLAIMED IS:

5 1. A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, a plurality of closely spaced light sources along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one surface of said light guide.

10 2. The assembly of claim 1 wherein said substrate comprises at least one of a sheet, film, lens and plate.

3. The assembly of claim 1 wherein said substrate is attached to said light guide.

4. The assembly of claim 1 wherein said substrate is positioned against said light guide.

15 5. The assembly of claim 1 wherein said substrate covers said at least one surface of said light guide.

6. The assembly of claim 1 wherein said deformities are at least one of depressions and raised surfaces on said one surface of said light guide.

20 7. The assembly of claim 1 wherein said deformities vary on said one surface of said light guide.

8. The assembly of claim 1 wherein at least one of said deformities is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

9. The assembly of claim 1 wherein said light sources are light emitting diodes.

10. The assembly of claim 1 wherein said light sources are attached to a printed circuit board.

5 11. The assembly of claim 1 wherein said light sources are embedded, potted, bonded or molded into said light guide.

12. The assembly of claim 1 wherein said deformities are on more than one surface of said light guide.

10 13. The assembly of claim 1 wherein said deformities are on two sides of said light guide.

14. The assembly of claim 1 wherein at least some deformities are on said substrate.

15 15. The assembly of claim 1 wherein said substrate has at least one of a prismatic lens, lenticular lens, and other device that changes the output ray angle distribution.

16. The assembly of claim 1 wherein more than one said substrate overlies said light guide.

20 17. A light emitting assembly for vehicle illumination comprising a light guide having at least one transparent substrate overlying a surface of said light guide, both said light guide and said substrate having deformities on at least one surface of each of said light guide and said substrate, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, the deformities on at least one of said light guide and said substrate varying in at least one of the following

characteristics: size, shape, placement, index of refraction, density, angle, depth, height and type.

18. The assembly of claim 17 wherein the variations in the deformities are random.

5 19. The assembly of claim 17 wherein said substrate comprises at least one of a sheet, film, lens and plate.

20. The assembly of claim 17 wherein said substrate has reflective and refractive surfaces.

10 21. The assembly of claim 17 wherein said substrate has a coating.

22. The assembly of claim 17 wherein more than one said substrate overlies said light guide.

23. The assembly of claim 17 wherein at least one surface of at least one of said substrate and said light guide is prismatic or lenticular.

15 24. A light emitting assembly for vehicle illumination comprising a light guide, a transparent substrate overlying a surface of said light guide, at least one of said light guide and said substrate having deformities on at least one surface, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, at least  
20 some of said deformities including prismatic surfaces having angles that vary.

25. A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, at least one light source along said light input surface for supplying light to said light guide, a plurality

of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, and a transparent substrate overlying at least one surface of said light guide, said substrate providing at least one of the following: an exterior portion of a vehicle, protection for the light guide, at least one of text, an image and color, at least one of a prismatic lens, lenticular lens and another device that changes the output ray angle distribution, and improved uniformity of the light output distribution.

26. A light emitting assembly for vehicle illumination comprising a light guide having at least one light input surface, at least one light source along said light input surface for supplying light to said light guide, a plurality of light extracting deformities on at least one surface of said light guide, said deformities having shapes for controlling an output ray angle distribution of emitted light to suit a particular application, a transparent substrate overlying at least one surface of said light guide, at least one of said light guide and said substrate having at least one of a coating and surface treatment that changes, wherein the changes in said at least one of the coating and surface treatment are at least one of the following: density, color, index of refraction, reflection, opaqueness, translucence, area, depth, shape, size and type.

27. The assembly of claim 26 wherein said at least one of the coating and surface treatment are at least one of the following: paint, ink, coating and epoxy.

28. The assembly of claim 26 wherein the coating is selected to improve at least one of the following: color correction, opaqueness, diffusion, reflection, translucence and transmission of light.

29. The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

30. The assembly of claim 26 wherein the coating on at least one of said light guide and said substrate randomly changes.

31. The assembly of claim 26 wherein the surface treatment of at least one of said light guide and said substrate randomly changes.

5 32. The assembly of claim 26 wherein at least one surface of at least one of said light guide and said substrate varies in shape or geometry.

33. The assembly of claim 32 wherein the shape or geometry of said one surface randomly varies.

10 34. A light emitting assembly for vehicle illumination comprising a plurality of relatively rigid light guides in overlying relation to one another, each of said light guides having at least one light input surface, at least one light source positioned along said light input surface for supplying light to said light guides, and a plurality of light extracting deformities on at least one surface of each of said light guides for controlling an output ray angle  
15 distribution of emitted light to suit a particular application, said light guides being positioned relative to one another such that the light emitted from at least one of said light guides passes through another of said light guides in a desired direction or output ray angle distribution.

20 35. The assembly of claim 34 wherein said light source is common to more than one of said light guides.

36. The assembly of claim 34 wherein a separate light source is provided for each of said light guides.

25 37. The assembly of claim 34 wherein said deformities have shape and are at least one of depressions and raised surfaces on said at least one surface of each of said light guides.

38. The assembly of claim 34 wherein said deformities vary.

39. The assembly of claim 34 wherein at least one of said deformities on at least one of said light guides is at least one of prismatic, lenticular and other device that changes the output ray angle distribution.

5 40. The assembly of claim 34 wherein at least one of said light guides has said deformities on more than one surface.

41. The assembly of claim 39 wherein at least one of said light guides has said deformities on two sides.

10 42. The assembly of claim 34 wherein said light source is a light emitting diode.

43. The assembly of claim 34 wherein said light source is attached to a printed circuit board.

15 44. The assembly of claim 34 wherein a separate light source is provided for each of said light guides, said light source for each of said light guides being embedded, potted, bonded or molded in said light guides.

45. The assembly of claim 34 further comprising a transparent substrate overlying at least one surface of at least one of said light guides.

46. The assembly of claim 45 wherein said substrate comprises at least one of a sheet, film, lens and plate.

20 47. The assembly of claim 45 wherein said substrate is attached to said one light guide.



48. The assembly of claim 45 wherein said substrate is positioned against said one light guide.

49. The assembly of claim 45 wherein said substrate covers said one surface of said one light guide.

5 50. The assembly of claim 45 where at least some deformities are on said substrate.

51. The assembly of claim 45 wherein said substrate has at least one of a prismatic lens, lenticular lens, and other device that changes the output ray angle distribution.

10 52. The assembly of claim 34 further comprising a plurality of transparent substrates overlying at least one surface of at least one of said light guides.

### ABSTRACT OF THE DISCLOSURE

Light emitting panel assemblies include in one form of the invention a light emitting panel member made of a transparent resiliently deformable elastomeric material that absorbs impact without breakage for use in automotive lighting applications of various types. In another form of the invention, a rigid light emitting panel member may be used with dome switches for switch area lighting or to backlight control buttons/key pads by providing holes or openings in the panel member for the control buttons/key pads. Also, a rigid light emitting panel member may be used as a structural member, and two or more such light emitting panel members may be stacked together and used to light an instrument panel or the like. One or more light sources may be mounted within one or more light transition areas adjacent one or more light input surfaces of the light emitting panel members. Also one or more light sources may be positioned adjacent one side of the light emitting panel members for causing light to shine through the panel members or through holes in the panel members for performing specified lighting functions.

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## POWER OF ATTORNEY

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number)

Donald L. Otto  
Registration No. 22,125

## Send Correspondence To

Donald L. Otto  
Renner, Otto, Boisselle & Sklar, P.L.L.  
1621 Euclid Avenue - 19th Floor  
Cleveland, Ohio 44115

Direct Telephone Calls To:  
(name and telephone number)

Donald L. Otto  
216-621-1113

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therein.

Full name of sole or first inventor Jeffery R. Parker  
Inventor's signature *Jeffery R. Parker*  
Date 12/21/95 Country of Citizenship U.S.A.  
Residence 14389 Placid Cove Drive, Strongsville, Ohio 44136  
Post Office Address Same as residence

Full name of second joint inventor, if any Mark D. Miller  
Inventor's signature *Mark D. Miller*  
Date 12/21/95 Country of Citizenship U.S.A.  
Residence 2250 W. Pleasant Valley Road, Parma, Ohio 44134  
Post Office Address Same as residence

CHECK FOR ANY OF THE FOLLOWING ADDED PAGE(S) WHICH  
FORM A PART OF THIS DECLARATION

Signature for third and subsequent joint inventors. Number of pages added 1.

Added page to combined declaration and power of attorney for signature by one joint inventor on behalf of omitted inventor(s) who refuses to sign or cannot be reached.

This declaration ends with this page.

ADDED PAGE TO COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR SIGNATURE BY THIRD AND SUBSEQUENT INVENTORS

Full name of third joint inventor Thomas A. Hough  
Inventor's signature [Signature]  
Date 12/21/95 Country of Citizenship U.S.A.  
Residence 1368 Marlowe Ave 2nd Fl. Lakewood OH 44107  
Post Office Address Same as residence

Full name of fourth joint inventor, if any \_\_\_\_\_  
Inventor's signature \_\_\_\_\_  
Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_  
Residence \_\_\_\_\_  
Post Office Address \_\_\_\_\_

Full name of fifth joint inventor \_\_\_\_\_  
Inventor's signature \_\_\_\_\_  
Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_  
Residence \_\_\_\_\_  
Post Office Address \_\_\_\_\_

Full name of sixth joint inventor \_\_\_\_\_  
Inventor's signature \_\_\_\_\_  
Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_  
Residence \_\_\_\_\_  
Post Office Address \_\_\_\_\_

PATENT APPLICATION SERIAL NO. \_\_\_\_\_

U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE  
FEE RECORD SHEET

11/20/2002 EFLORES 00000010 10298367

01 FC:1001	740.00	OP
02 FC:1201	252.00	OP
03 FC:1202	576.00	OP

PTO-1556  
(5/87)

\*U.S. GPO: 2000-468-987/39595

**PATENT APPLICATION FEE DETERMINATION RECORD**  
Effective October 1, 2001

Application or Docket Number

10248307

**CLAIMS AS FILED - PART I**

(Column 1) (Column 2)

TOTAL CLAIMS	52	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	52 minus 20= *	32
INDEPENDENT CLAIMS	4 minus 3 = *	1
MULTIPLE DEPENDENT CLAIM PRESENT <input type="checkbox"/>		

\* If the difference in column 1 is less than zero, enter "0" in column 2

**SMALL ENTITY TYPE**  OR

**OTHER THAN SMALL ENTITY**

RATE	FEE	OR	RATE	FEE
BASIC FEE	370.00	OR	BASIC FEE	740.00
X\$ 9=		OR	X\$18=	252
X42=		OR	X84=	574
+140=		OR	+280=	
TOTAL		OR	TOTAL	1708

**CLAIMS AS AMENDED - PART II**

(Column 1) (Column 2) (Column 3)

AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**
	Independent	*	Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

**SMALL ENTITY** OR

**OTHER THAN SMALL ENTITY**

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
X\$ 9=		OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

(Column 1) (Column 2) (Column 3)

AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**
	Independent	*	Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
X\$ 9=		OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

(Column 1) (Column 2) (Column 3)

AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**
	Independent	*	Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <input type="checkbox"/>			

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
X\$ 9=		OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."

\*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET (FOR USE WITH FORM PTO-875)							SERIAL NO.	FILING DATE
							APPLICANT(S)	
CLAIMS								
	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT			
	IND.	DEP.	IND.	DEP.	IND.	DEP.	IND.	DEP.
1	1							
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TOTAL DEP.	46							
TOTAL CLAIMS	52							
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TOTAL IND.								
TOTAL DEP.								
TOTAL CLAIMS								

PTO-1360 (3-78)

\*MAY BE USED FOR ADDITIONAL CLAIMS OR AMENDMENTS U.S. DEPARTMENT OF COMMERCE  
Patent and Trademark Office



**Initial Information Data Sheet**

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**Inventor Information**

Inventor One Given Name:: Jeffery R.  
Family Name:: Parker  
Postal Address Line One:: 3050 Whitetail Ct.  
City:: Richfield  
State or Province:: Ohio  
Postal or Zip Code:: 44286  
Citizenship Country:: USA

Inventor Two Given Name:: Mark D.  
Family Name:: Miller  
Postal Address Line One:: 2250 W. Pleasant Valley Road  
City:: Parma  
State or Province:: Ohio  
Postal or Zip Code:: 44134  
Citizenship Country:: USA

Inventor Three Given Name:: Thomas A.  
Family Name:: Hough  
Postal Address Line One:: 1368 Marlowe Avenue  
City:: Lakewood  
State or Province:: Ohio  
Postal or Zip Code:: 44107  
Citizenship Country:: USA

**Correspondence Information**

Name Line One:: Donald L. Otto  
Name Line Two:: Renner, Otto, Boisselle & Sklar, LLP  
Address Line One:: 1621 Euclid Avenue  
Address Line Two:: 19<sup>th</sup> Floor  
City:: Cleveland  
State or Province:: Ohio  
Postal or Zip Code:: 44115-2191  
Telephone One:: (216) 621-1113  
Fax:: (216) 621-6165  
Electronic Mail:: dotto@rennerotto.com

**Application Information**

Title Line One:: LIGHT EMITTING PANEL ASSEMBLIES  
Title Line Two:: FOR USE IN AUTOMOTIVE  
Title Line Three:: APPLICATIONS AND THE LIKE  
Total Drawing Sheets:: 5  
Formal Drawings?:: Yes  
Application Type:: Utility  
Docket Number:: GLOLP0106USD

**Continuity Information**

This application is a:: Continuation  
Application One:: 10/005,090  
Filing Date:: December 5, 2001

which is a:: Continuation  
Application Two:: 09/703,088  
Filing Date:: October 31, 2000  
U.S. Pat No.:: 6,367,940  
Dated:: April 9, 2002

which is a:: Continuation  
Application Three:: 09/167,949  
Filing Date:: October 7, 1998  
U.S. Pat. No.:: 6,158,867  
Dated:: December 12, 2000

which is a:: Division  
Application Four:: 08/585,062  
Filing Date:: January 16, 1996  
U.S. Pat. No.:: 5,895,115  
Dated:: April 20, 1999

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