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(12) **United States Patent**  
**Vasylyev**

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(54) **LIGHT CONVERTING SYSTEM EMPLOYING PLANAR LIGHT TRAPPING AND LIGHT ABSORBING STRUCTURES**

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**Related U.S. Application Data**

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(51) **Int. Cl.**  
**H01L 27/00** (2006.01)  
**H01L 31/054** (2014.01)  
**G01J 1/04** (2006.01)  
**G01J 5/08** (2006.01)  
**G02B 5/02** (2006.01)  
**H01L 31/0232** (2014.01)

**H01L 31/0525** (2014.01)  
**G02B 19/00** (2006.01)

(52) **U.S. Cl.**  
 CPC ..... **H01L 31/0547** (2014.12); **G01J 1/0407** (2013.01); **G01J 5/0853** (2013.01); **G02B 5/0231** (2013.01); **G02B 5/0294** (2013.01); **G02B 19/0028** (2013.01); **H01L 31/02327** (2013.01); **H01L 31/0525** (2013.01); **H01L 31/0543** (2014.12); **Y02E 10/52** (2013.01)

(58) **Field of Classification Search**  
 CPC ..... H01L 31/0525; H01L 31/02327; H01L 31/0543; H01L 31/0547  
 USPC ..... 250/216, 203.1, 203.3, 203.4; 385/33, 385/36; 136/246, 256, 259  
 See application file for complete search history.

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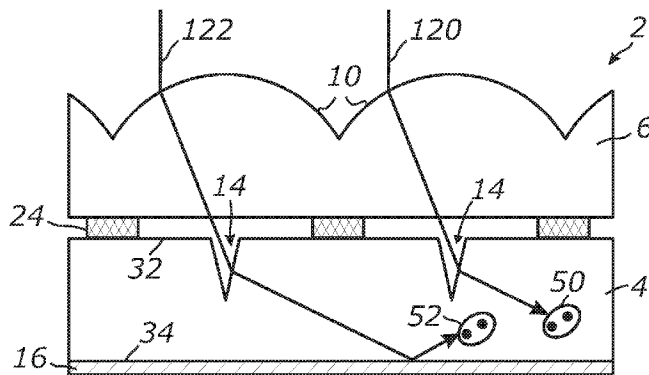
(Continued)

*Primary Examiner* — Kevin K Pyo

(57) **ABSTRACT**

A light converting optical system employing a planar light trapping optical structure illuminated by a source of monochromatic light. The light trapping optical structure includes a photoresponsive layer including semiconductor quantum dots. The photoresponsive layer is configured at a relatively low thickness and located between opposing broad-area surfaces that confine and redistribute light within the light trapping structure and cause multiple transverse propagation of light through the photoresponsive layer to enhance absorption. The light trapping optical structure further incorporates optical elements configured for injecting light into the light trapping structure.

**20 Claims, 7 Drawing Sheets**



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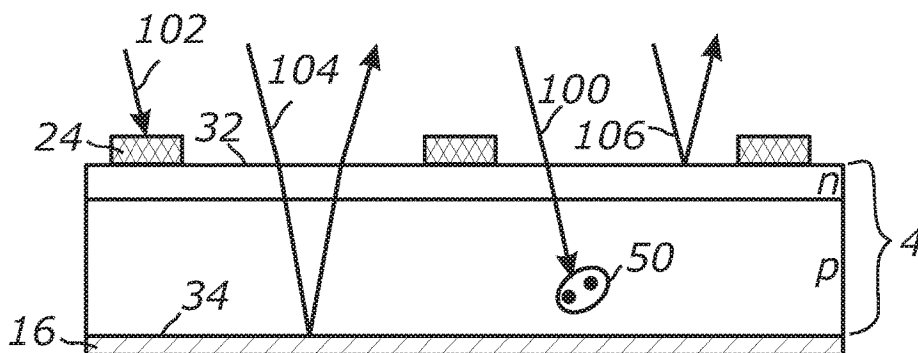


FIG. 1  
(PRIOR ART)

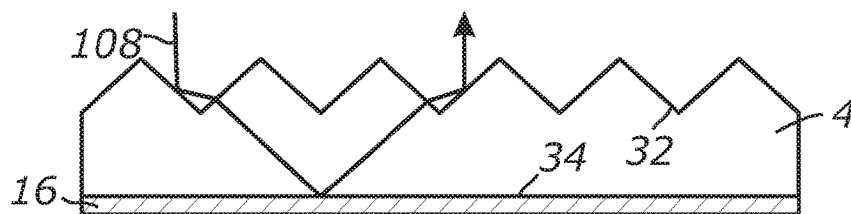


FIG. 2  
(PRIOR ART)

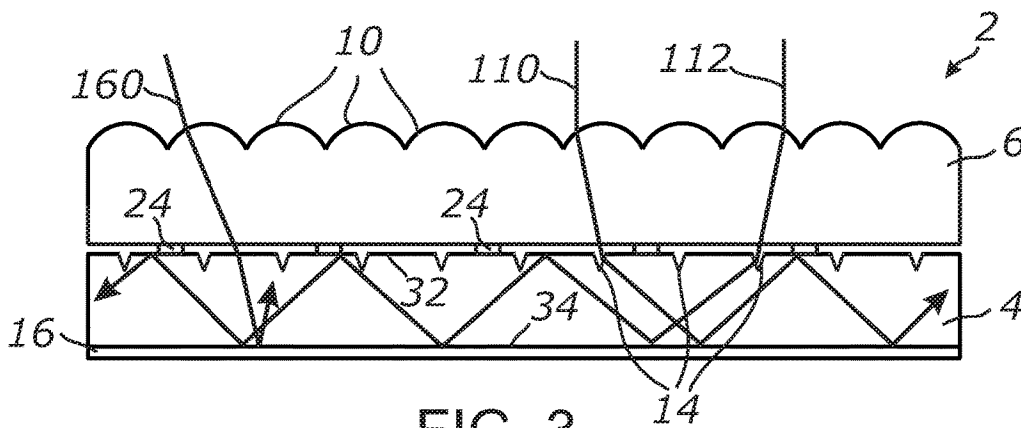


FIG. 3

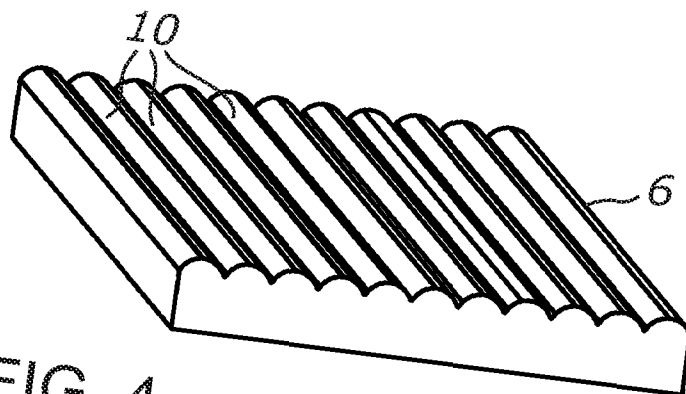


FIG. 4

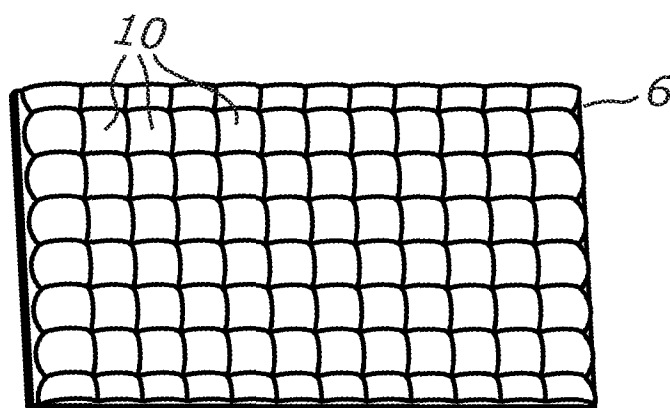


FIG. 5

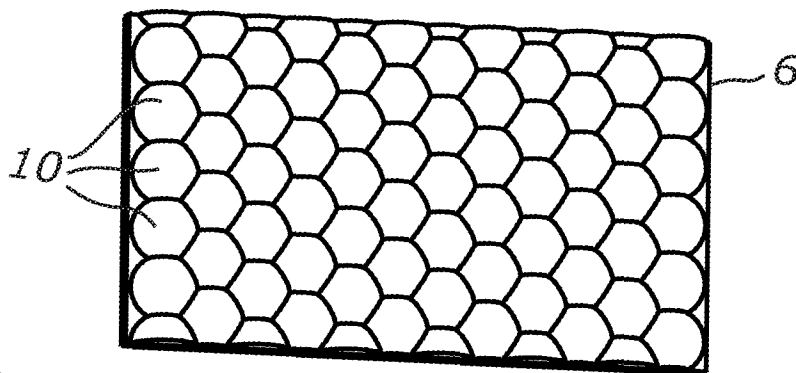


FIG. 6

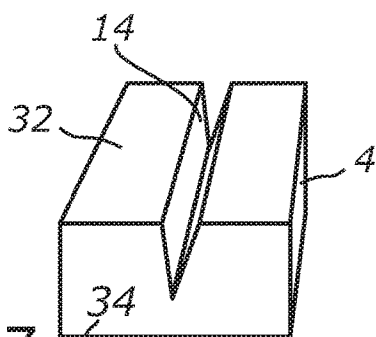


FIG. 7

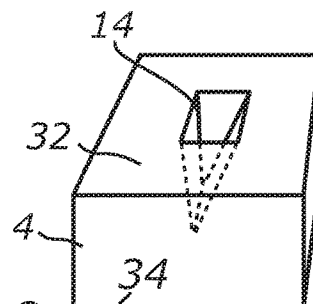


FIG. 8

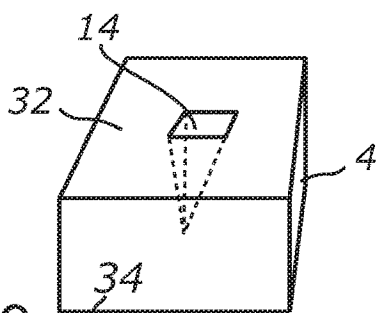


FIG. 9

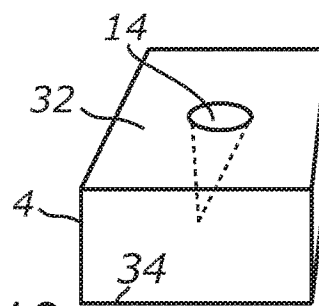


FIG. 10

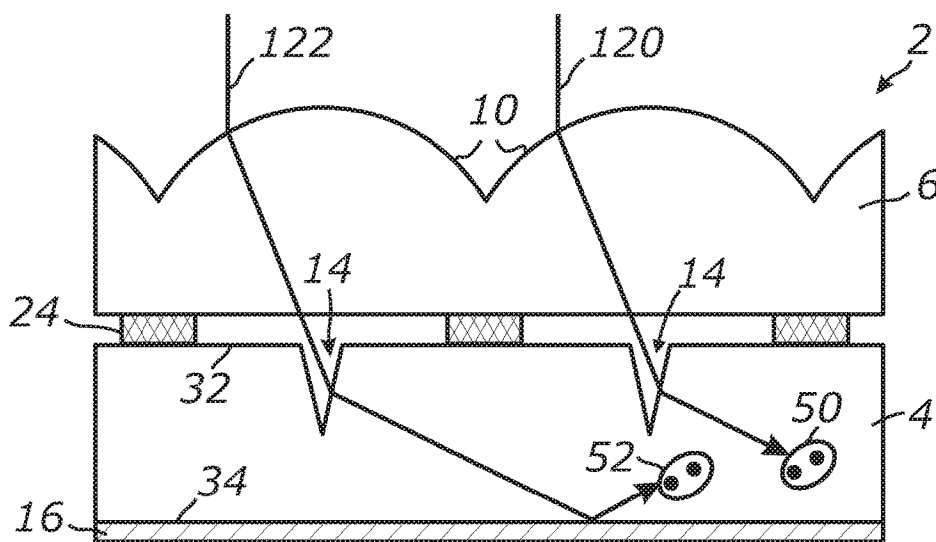


FIG. 11

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