



US007088040B1

(12) **United States Patent**
Ducharme et al.

(10) **Patent No.:** **US 7,088,040 B1**
(45) **Date of Patent:** **Aug. 8, 2006**

(54) **LIGHT SOURCE USING EMITTING PARTICLES TO PROVIDE VISIBLE LIGHT**

(75) Inventors: **Alfred D. Ducharme**, Orlando, FL (US); **Michael Bass**, Orlando, FL (US); **Alexandra Rapaport**, Orlando, FL (US)

(73) Assignee: **University of Central Florida Research Foundation, Inc.**, Orlando, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 301 days.

(21) Appl. No.: **10/606,551**

(22) Filed: **Jun. 26, 2003**

Related U.S. Application Data

(60) Provisional application No. 60/392,131, filed on Jun. 27, 2002.

(51) **Int. Cl.**
H01J 1/62 (2006.01)
H05B 33/00 (2006.01)

(52) **U.S. Cl.** **313/512**; 445/23

(58) **Field of Classification Search** 313/512;
257/98-100, 103

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,003,179 A 3/1991 Pollack 250/483.1

5,245,623 A	9/1993	McFarlane	372/69
5,684,621 A	11/1997	Downing	359/326
5,698,397 A *	12/1997	Zarling et al.	435/6
5,764,403 A	6/1998	Downing	359/326
5,914,807 A	6/1999	Downing	359/326
5,943,160 A	8/1999	Downing	359/326
5,956,172 A	9/1999	Downing	359/326
6,327,074 B1	12/2001	Bass	359/326
6,812,500 B1 *	11/2004	Reeh et al.	257/98

* cited by examiner

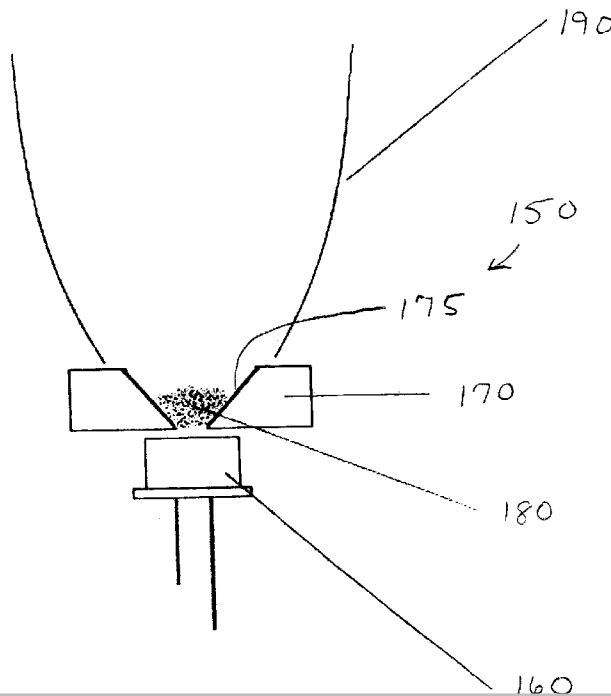
Primary Examiner—Joseph Williams

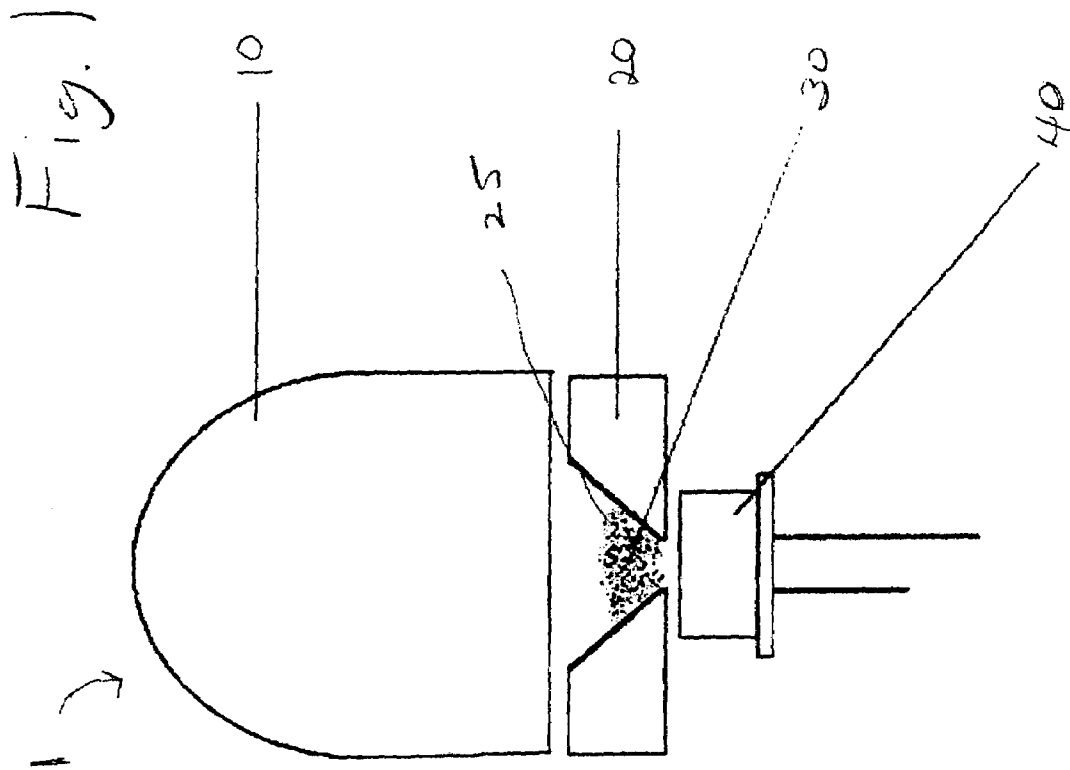
(74) *Attorney, Agent, or Firm*—Brian S. Steinberger; Law Office of Brian S. Steinberger

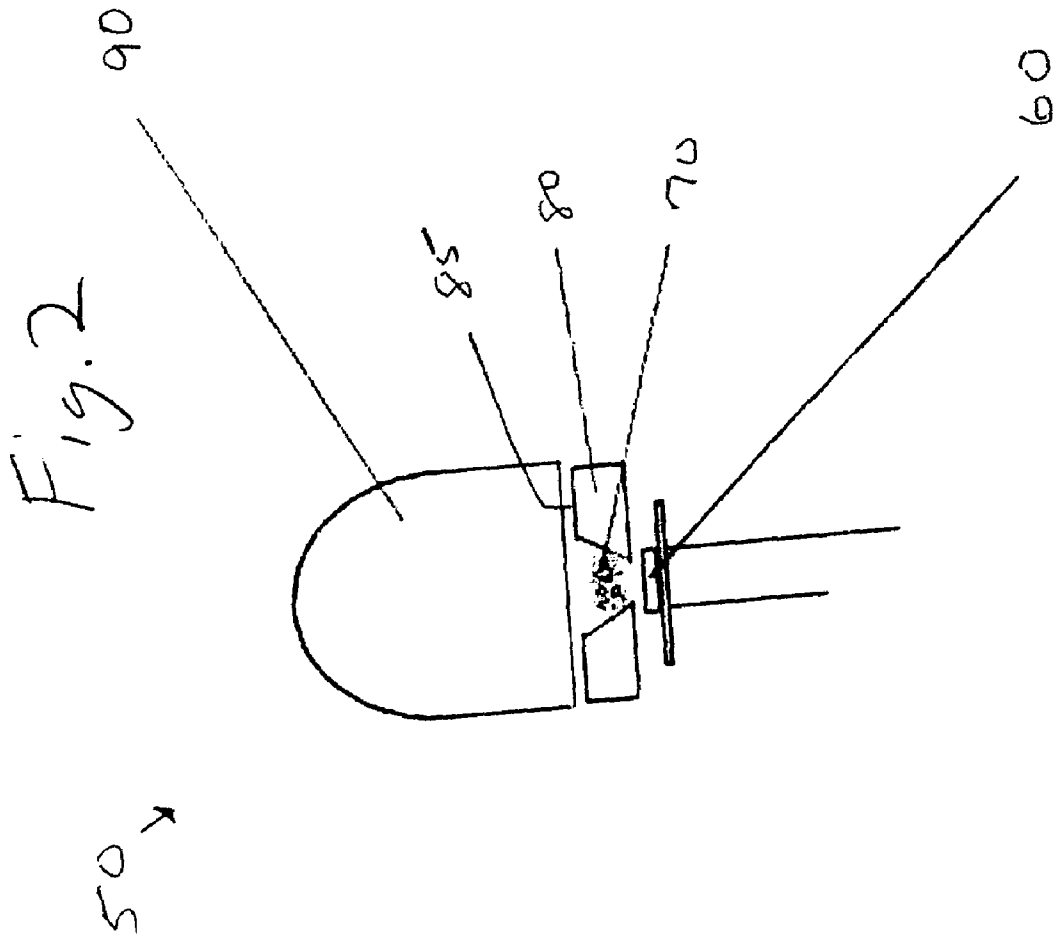
(57) **ABSTRACT**

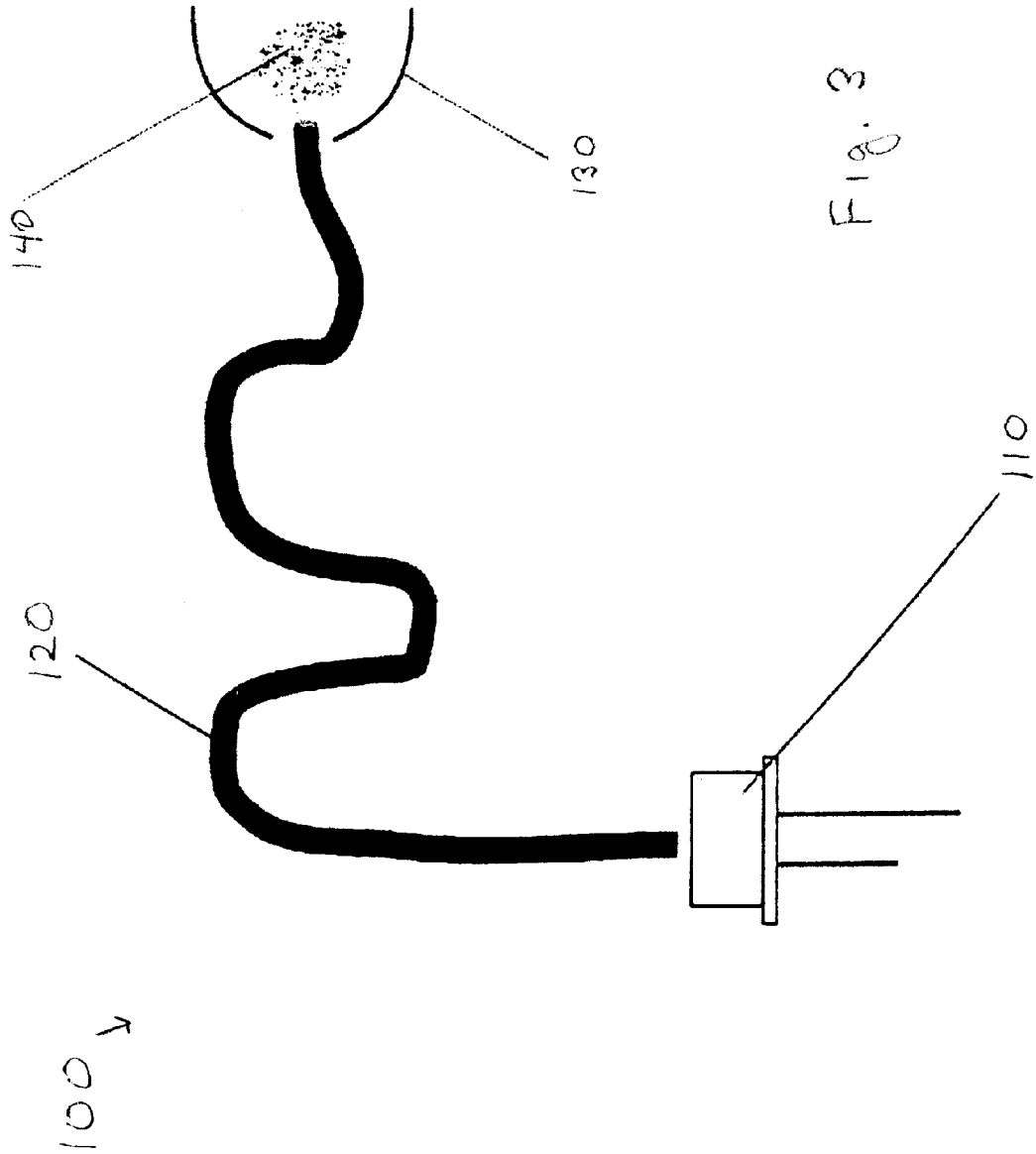
Upconversion methods and devices that converts near-infrared light to the visible spectrum using a rare-earth-doped crystalline host for use as general and decorative lighting. The pseudo-monochromatic output of the processes can be specified by altering the amount and type of rare-earth material used and by selection of an appropriate host. Using rare-earth materials such as ytterbium-erbium or ytterbium-thulium can produce red, green and blue emissions, where the additive mixture of these colors yields a high-quality white light. The materials can be adjusted to achieve white light with any color temperature and high color-rendering index (CRI) for any general and decorative lighting applications both indoors and outdoors.

29 Claims, 11 Drawing Sheets









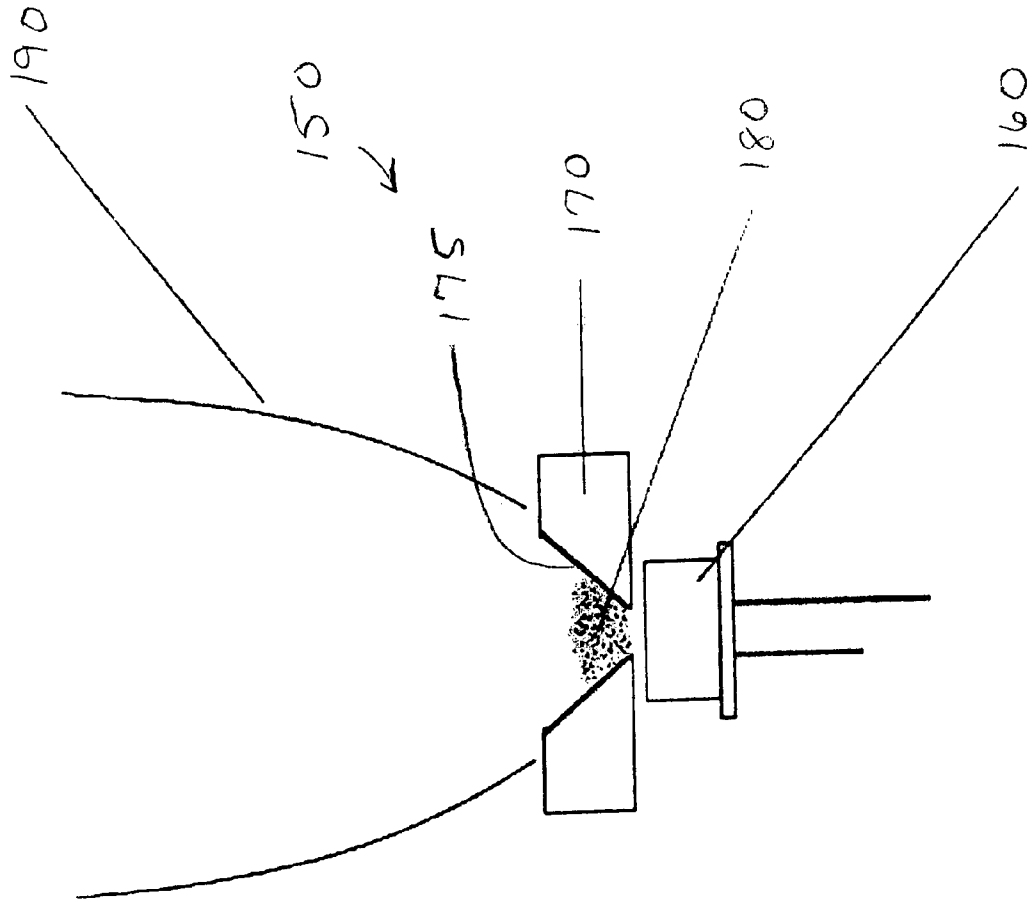


Fig. 4

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.