



US006158245A

United States Patent [19]

[11] Patent Number: **6,158,245**

Savant

[45] Date of Patent: **Dec. 12, 2000**

[54] **HIGH EFFICIENCY MONOLITHIC GLASS LIGHT SHAPING DIFFUSER AND METHOD OF MAKING**

[75] Inventor: **Gajendra D. Savant**, Torrance, Calif.

[73] Assignee: **Physical Optics Corporation**, Torrance, Calif.

[21] Appl. No.: **09/139,379**

[22] Filed: **Aug. 25, 1998**

Related U.S. Application Data

[63] Continuation-in-part of application No. 08/902,415, Jul. 29, 1997.

[51] Int. Cl.⁷ **C03B 8/02**

[52] U.S. Cl. **65/17.2**

[58] Field of Search **65/17.2**

References Cited

U.S. PATENT DOCUMENTS

3,597,252	8/1971	Schroder et al.	501/12
3,640,093	2/1972	Levene et al.	65/134
5,264,197	11/1993	Wang et al.	423/338
5,368,887	11/1994	Hoshino et al.	427/226
5,384,571	1/1995	Myers et al.	342/4
5,534,386	7/1996	Petersen et al.	430/320
5,538,674	7/1996	Nisper et al.	264/1.31
5,609,939	3/1997	Petersen et al.	428/141
5,766,680	6/1998	Schmidt et al.	427/226
5,861,113	1/1999	Choquette et al.	264/1.24

FOREIGN PATENT DOCUMENTS

61-68314 4/1986 Japan .

OTHER PUBLICATIONS

Lukosz et al, "Embossing technique for fabricating integrated optical components in hard inorganic waveguiding

materials", Optics Letters, vol. 8, No. 10, pp. 537-539, Oct. 1983.

Shagam, R.N., Ph.D., "Light Shaping Diffusers™ Simplify Aircraft Inspection," *Photonics Spectra*, Nov. 1994.

Dusinberre, B., "Light Shaping Diffusers Enhance Depth-Finder Performance," *Laser Focus World*, Jun. 1995.

Szczesniak, S., & Shie, R., "Machine Vision for Semiconductor Manufacture," *Photonics Spectra*, Nov. 1995.

"Directional Turning Film™", Physical Optics Corporation, 1996, Brochure (No Month Available).

Giancola, S., "Holographic Diffuser Makes Light Work of Screen Tests," *Photonics Spectra*, Aug. 1996.

Laine, J., "Mini Display," *Design News*, Dec. 15, 1997.

"Light Shaping Diffusers® Technical Data Sheet," Physical Optics Corporation, Jul. 1, 1998.

"Light Shaping Diffuser® Transmissive Thin Film Price List," Physical Optics Corporation, May 1, 1998.

"Light Shaping Diffuser® Transmission Kits Price List," Physical Optics Corporation, May 1, 1998.

"Light Shaping Diffuser® Transmission Sheet Price List," Physical Optics Corporation, May 1, 1998.

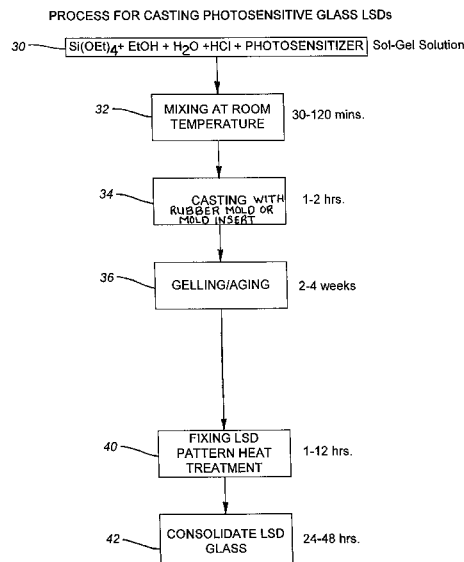
Primary Examiner—Sean Vincent

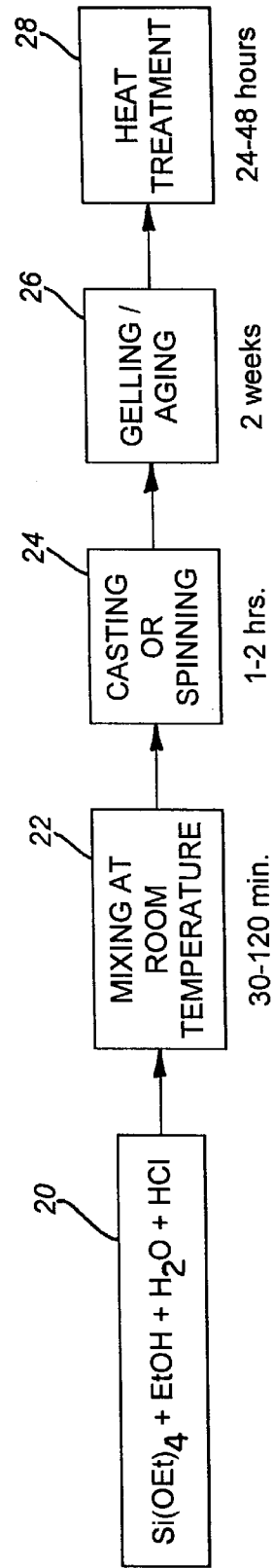
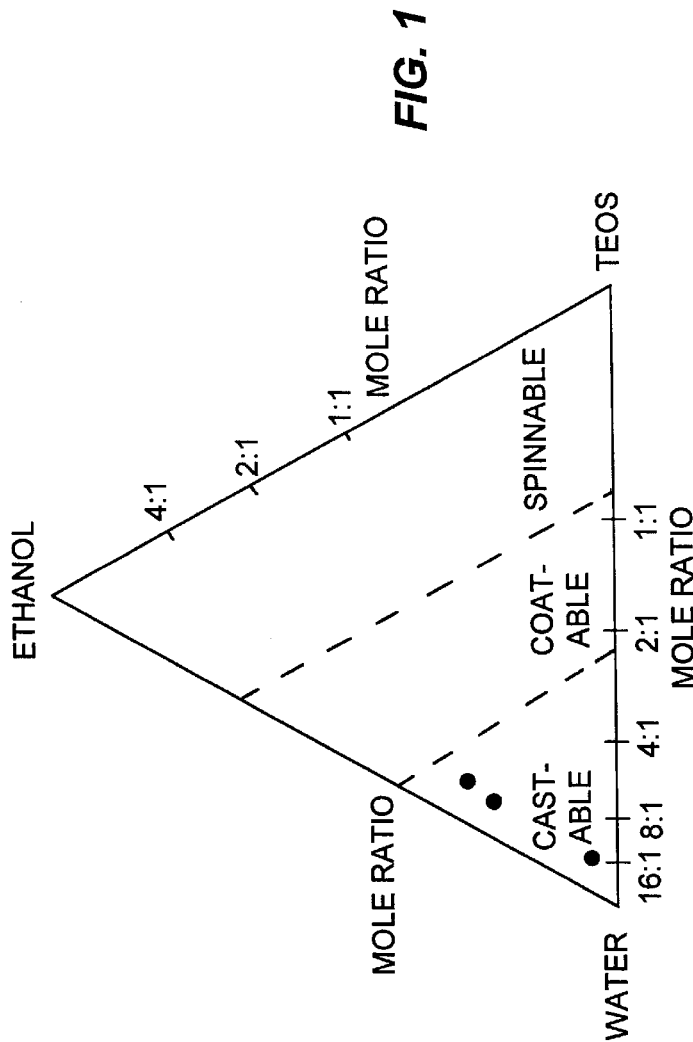
Attorney, Agent, or Firm—Nilles & Nilles, S.C.

[57] ABSTRACT

A surface light shaping diffuser (LSD) is formed from a monolithic glass material by recording light shaping structures on a surface of the material during its formation. A surface LSD is produced by embossing or molding light shaping structures onto a high quality optical glass or by embossing light shaping structures on a glass film layer coated onto a substrate. A rubber submaster carrying the light shaping structures is used as the master in such diffusers control the angular spread of transmitted light while homogenizing otherwise spatially noisy light sources such as LCDs and filamented light sources and while maintaining damage thresholds consistent with any glass optical element. The surface LSD has a transmission efficiency of over 90% from the Ultraviolet wavelengths through the physical spectrum and into the near-infrared.

23 Claims, 8 Drawing Sheets





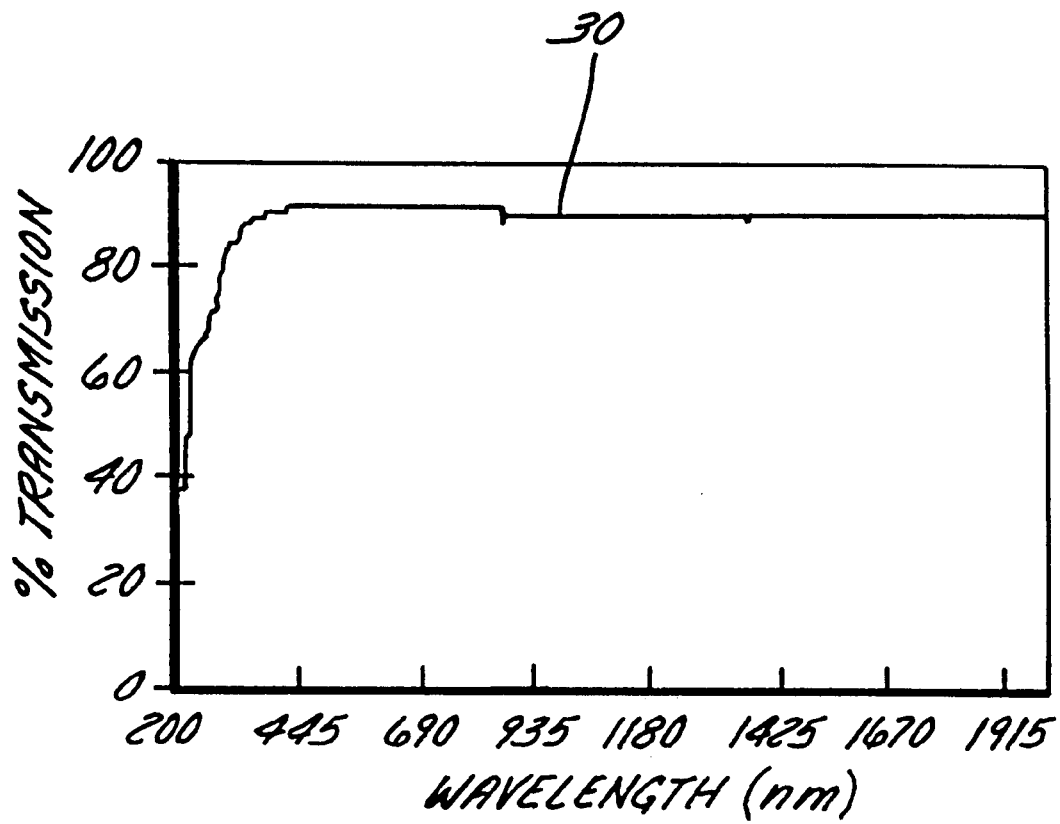


FIG. 3

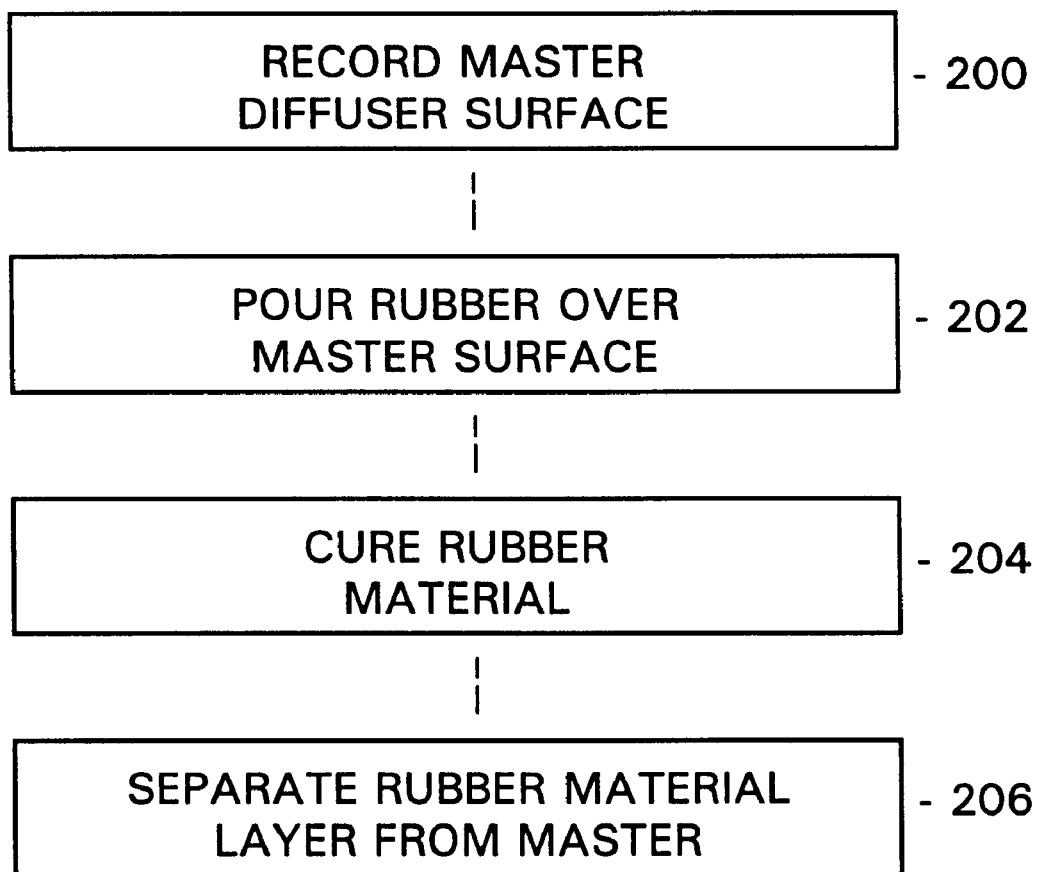


FIG. 4

COATING PROCESS FOR GLASS LSDs

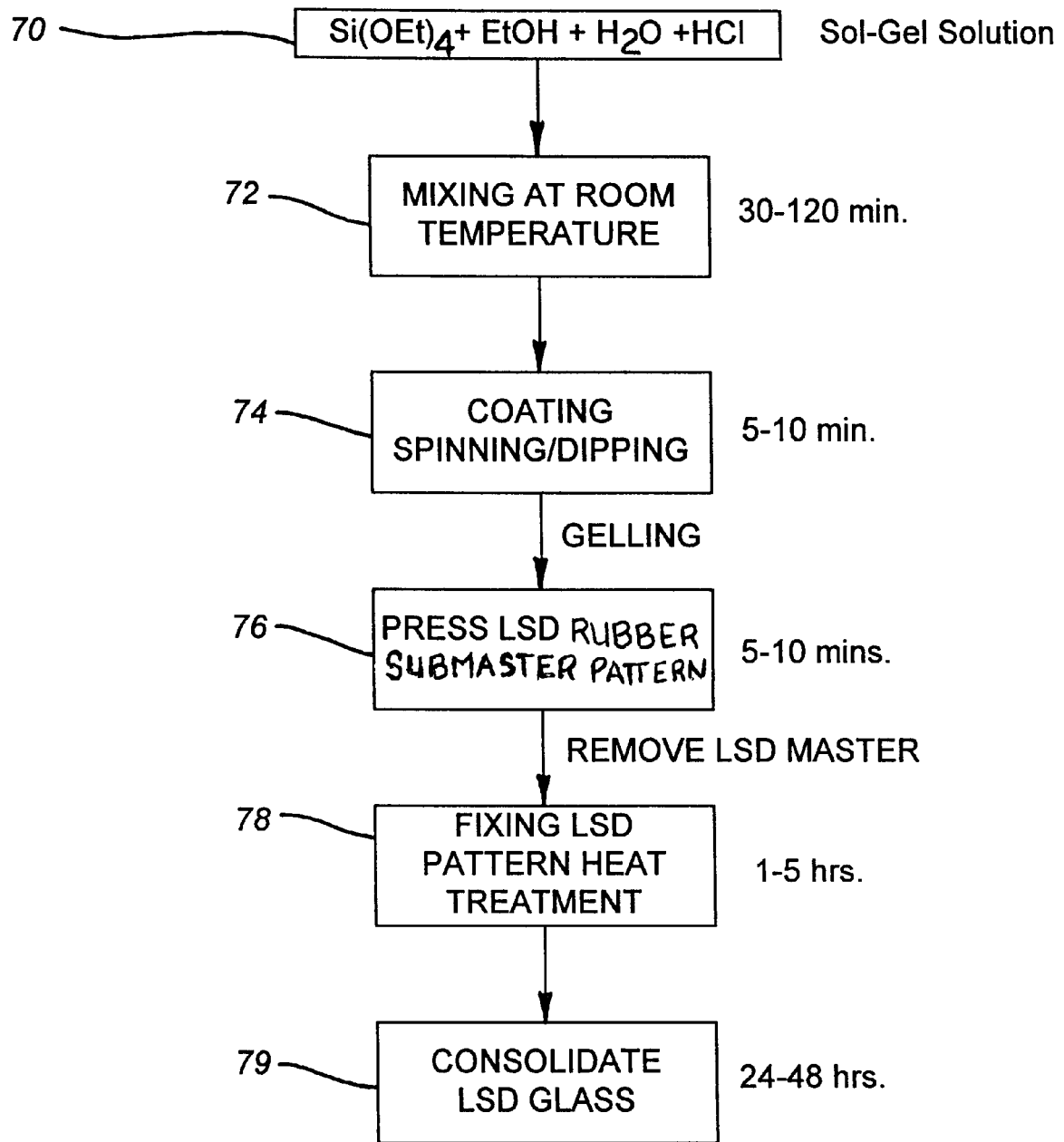


FIG. 5

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.