



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

(10) **Patent No.:** **US 6,476,351 B1**
(45) **Date of Patent:** ***Nov. 5, 2002**

(54) **LASER MARKING SYSTEM**

(75) Inventors: **George R. Kaplan**, Rye Brook, NY (US); **Avigdor Shachrai**, Netanya (IL); **Oded Anner**, Kfar-Saba (IL); **Leonid Gurvich**, Rishon Lezion (IL)

(73) Assignee: **Lazare Kaplan International, Inc.**, New York, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/688,655**

(22) Filed: **Oct. 16, 2000**

Related U.S. Application Data

(62) Division of application No. 09/309,982, filed on May 11, 1999, now Pat. No. 6,211,484, which is a division of application No. 08/690,309, filed on Jul. 30, 1996, now Pat. No. 5,932,119.

(60) Provisional application No. 60/009,638, filed on Jan. 5, 1996.

(51) **Int. Cl.**⁷ **B23K 26/38**; B23K 26/03

(52) **U.S. Cl.** **219/121.69**; 219/121.68; 219/121.83

(58) **Field of Search** 283/70, 74; 219/121.68, 219/121.69, 121.83, 121.62, 121.82; 700/166; 380/51; 356/30

(56) **References Cited**

U.S. PATENT DOCUMENTS

- 671,830 A 4/1901 Loesser
- 671,831 A 4/1901 Loesser
- 694,215 A 2/1902 Stuurman
- 732,118 A 6/1903 Schenck
- 732,119 A 6/1903 Schenck
- 2,351,932 A 6/1944 Deckel et al.
- 3,407,364 A 10/1968 Turner
- 3,414,354 A 12/1968 Siegler, Jr.
- 3,440,388 A 4/1969 Otstot et al.
- 3,527,198 A 9/1970 Taksoka 125/30.01
- 3,537,198 A 11/1970 Barrett
- 3,622,739 A 11/1971 Steffen 219/121.7
- 3,700,850 A 10/1972 Lumley et al. 219/121.69
- 3,775,586 A 11/1973 Flint et al. 219/121.63
- 3,989,379 A 11/1976 Eickhorst
- 4,048,515 A 9/1977 Liu
- 4,056,952 A * 11/1977 Okuda
- 4,059,471 A 11/1977 Haigh 156/244
- 4,121,003 A 10/1978 Williams
- 4,178,404 A 12/1979 Allen et al.
- 4,199,615 A 4/1980 Wacks et al.
- 4,247,318 A 1/1981 Lee et al.
- 4,259,011 A 3/1981 Crumm et al.
- 4,275,810 A * 6/1981 Waldmeier
- 4,392,476 A 7/1983 Gresser et al. 125/30 R
- 4,394,580 A 7/1983 Gielisse
- 4,397,556 A 8/1983 Muller
- 4,401,876 A 8/1983 Cooper 219/121.69

- 4,405,829 A 9/1983 Rivest et al.
- 4,414,967 A 11/1983 Shapiro
- 4,463,250 A 7/1984 McNeight et al. 235/385
- 4,467,172 A 8/1984 Ehrenwald et al. 219/121.68
- 4,494,381 A 1/1985 Lessard
- 4,507,349 A 3/1985 Fromson et al.
- 4,507,744 A 3/1985 McFiggans et al.
- 4,514,085 A 4/1985 Kaye

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

- DE 133023 12/1900
- DE 130138 5/2001
- FR 643142 10/1927
- FR 2496888 12/1980
- GB 122470 1/1919
- GB 1057127 10/1963
- GB 1059249 12/1965
- GB 1094367 12/1965
- GB 1254120 12/1968
- GB 1292981 1/1969
- GB 1265241 2/1970
- GB 1326775 12/1970
- GB 1324903 4/1971
- GB 1377131 2/1972
- GB 1384813 2/1972
- GB 1405487 9/1972
- GB 1416568 10/1973
- GB 1446806 4/1974
- GB 2010474 1/1979
- GB 2052369 6/1980
- GB 2140555 5/1984
- JP 48100291 11/1973
- JP 50134362 5/1977
- JP 56-32131 * 4/1981
- JP 57137091 8/1982
- JP 01-58544 3/1989
- JP 4-08489 1/1992
- JP 4-66283 A * 3/1992 219/121.68
- JP 6170571 6/1994
- JP 7-77989 8/1995
- WO WO96/12496 * 6/1993
- WO WO 93/16631 9/1993

Primary Examiner—Geoffrey S. Evans

(74) *Attorney, Agent, or Firm*—Milde & Hoffberg, LLP

(57) **ABSTRACT**

A laser energy microinscribing system, including a semiconductor excited Q-switched solid state laser energy source; a cut gemstone mounting system, allowing optical access to a mounted workpiece; an optical system for focusing laser energy from the laser energy source onto a cut gemstone; a displaceable stage for moving the gemstone mounting system with respect to the optical system so that the focused laser energy is presented to desired positions on the gemstone, having a control input; an imaging system for viewing the gemstone from a plurality of vantage points; and a rigid frame supporting the laser, the optical system and the stage in fixed relation, to resist differential movements of the laser, the optical system and the stage and increase immunity to vibrational misalignments.

26 Claims, 16 Drawing Sheets

U.S. PATENT DOCUMENTS					
			5,267,756 A	* 12/1993	Molee et al. 283/74
4,620,284 A	10/1986	Schnell et al.	5,283,422 A	2/1994	Storch et al.
4,630,201 A	12/1986	White 364/408	5,337,362 A	8/1994	Gormish et al.
4,637,051 A	1/1987	Clark	5,367,148 A	11/1994	Storch et al.
4,693,377 A	9/1987	Gerrard et al.	5,367,319 A	11/1994	Graham
4,799,786 A	1/1989	Gerrard	5,370,763 A	12/1994	Curiel
4,812,965 A	3/1989	Taylor	5,375,170 A	12/1994	Shamir
4,814,589 A	3/1989	Storch et al.	5,379,102 A	* 1/1995	Tajeuchi
4,816,655 A	3/1989	Musyck et al.	5,380,047 A	1/1995	Molee et al.
4,853,961 A	8/1989	Pastor	5,384,846 A	1/1995	Berson et al.
4,875,771 A	10/1989	Bowley et al.	5,388,158 A	2/1995	Berson
4,913,858 A	4/1990	Miekka et al.	5,393,099 A	2/1995	D'Amato
4,981,370 A	1/1991	Dziewit et al.	5,410,125 A	4/1995	Winston et al. 219/121.69
5,018,767 A	5/1991	Wicker	5,420,924 A	5/1995	Berson et al.
5,056,826 A	* 10/1991	Suwa	5,422,954 A	6/1995	Berson
5,073,935 A	12/1991	Pastor	5,426,700 A	6/1995	Berson
5,113,445 A	5/1992	Wang	5,430,538 A	* 7/1995	Kobayashi
5,124,935 A	* 6/1992	Wallner et al.	5,464,690 A	11/1995	Boswell
5,142,577 A	8/1992	Pastor	5,499,294 A	3/1996	Friedman 380/10
5,149,938 A	9/1992	Winston et al. 219/121.69	5,521,984 A	* 5/1996	Denenberg et al.
5,163,091 A	11/1992	Graziano et al.	5,595,624 A	* 1/1997	Curiel
5,166,978 A	11/1992	Quisquater	5,799,092 A	* 8/1998	Kristol et al.
5,190,024 A	3/1993	Senanayake	5,828,405 A	* 10/1998	Vanier et al.
5,191,613 A	3/1993	Graziano et al.	5,899,503 A	* 5/1999	Yoshizawa
5,193,853 A	3/1993	Wicker	5,974,150 A	* 10/1999	Kaish et al.
5,243,641 A	9/1993	Evans et al.	5,983,238 A	* 11/1999	Becker et al.
5,263,085 A	11/1993	Shamir			

* cited by examiner

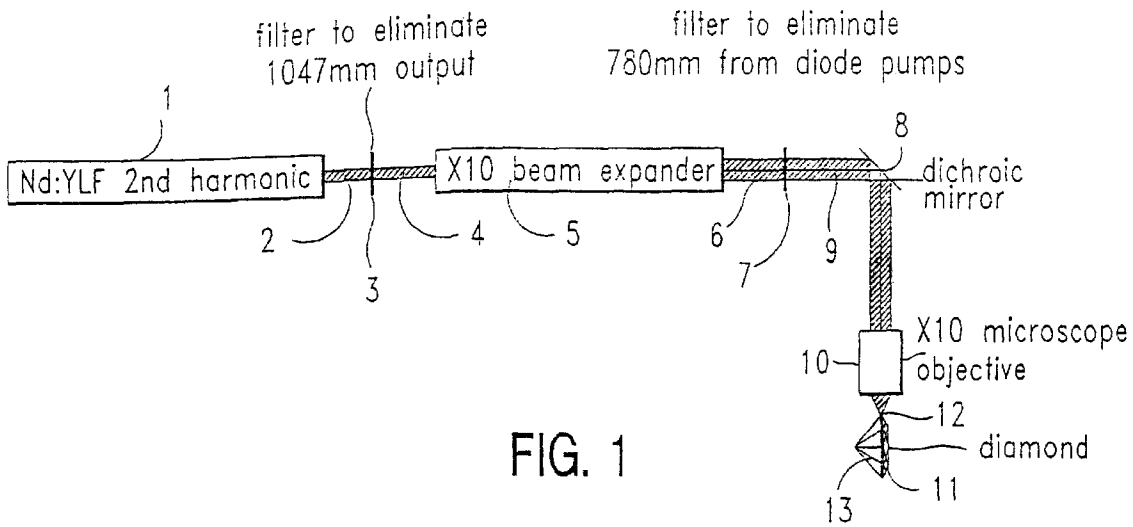


FIG. 1

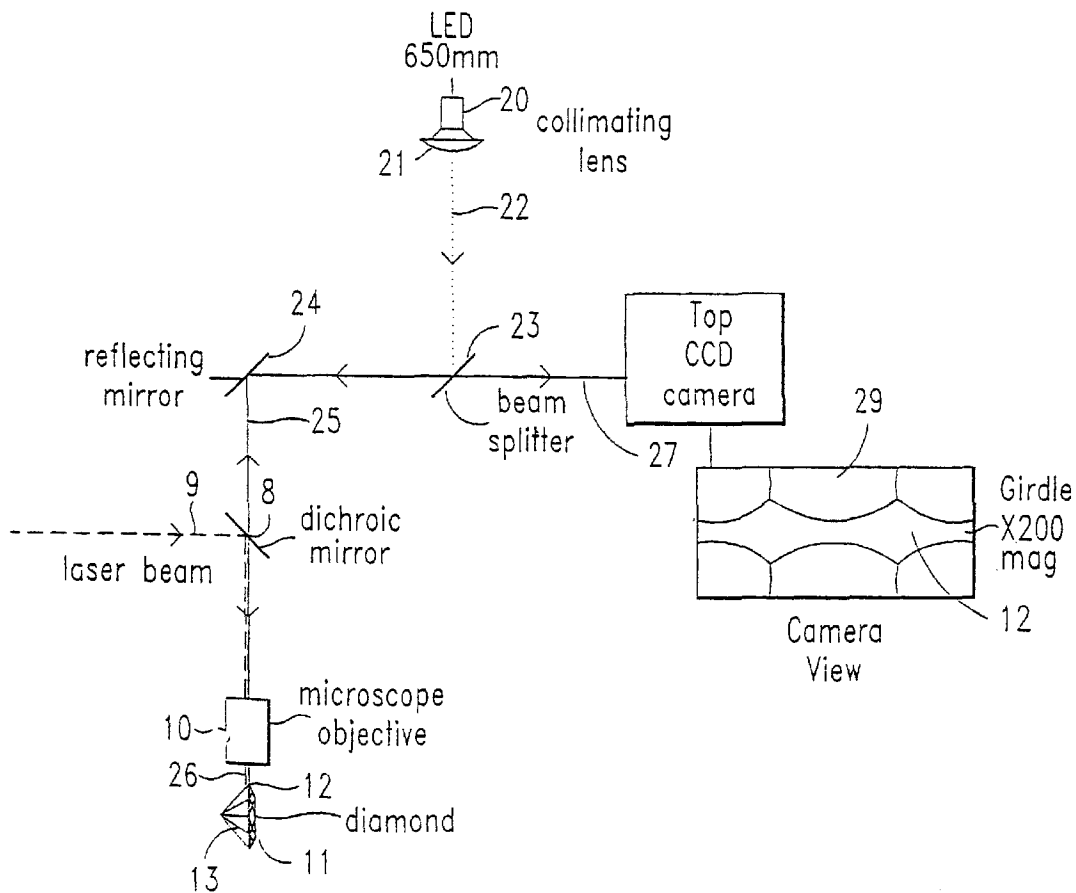


FIG. 2

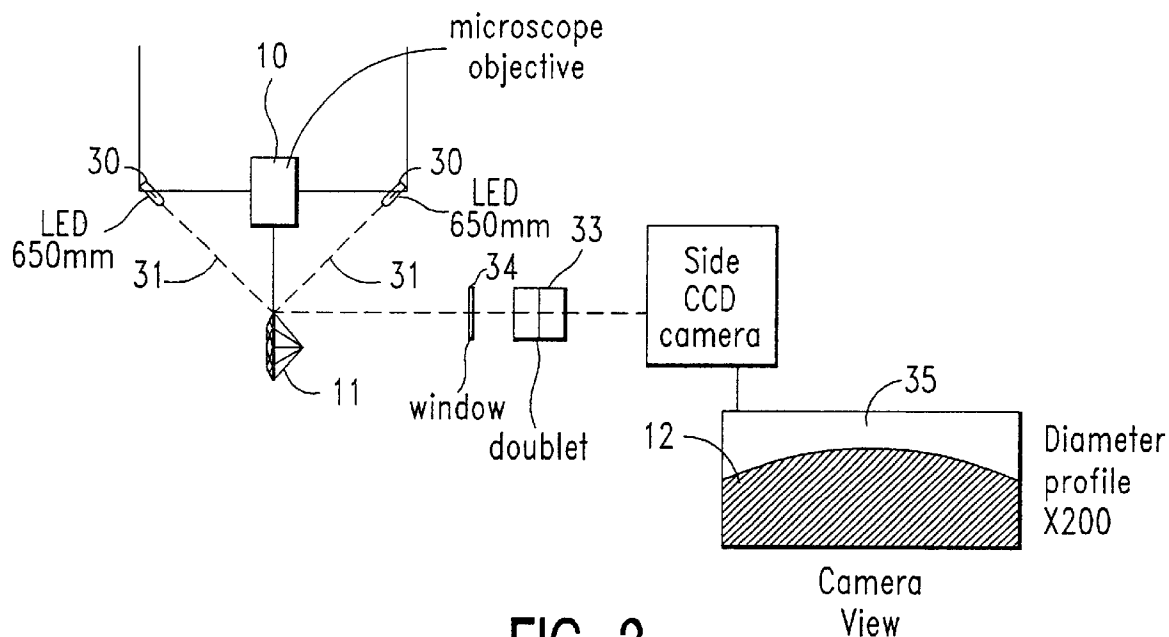


FIG. 3

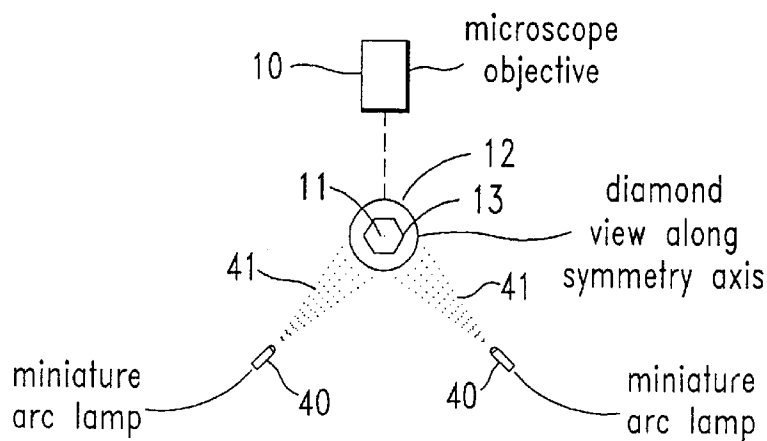


FIG. 4

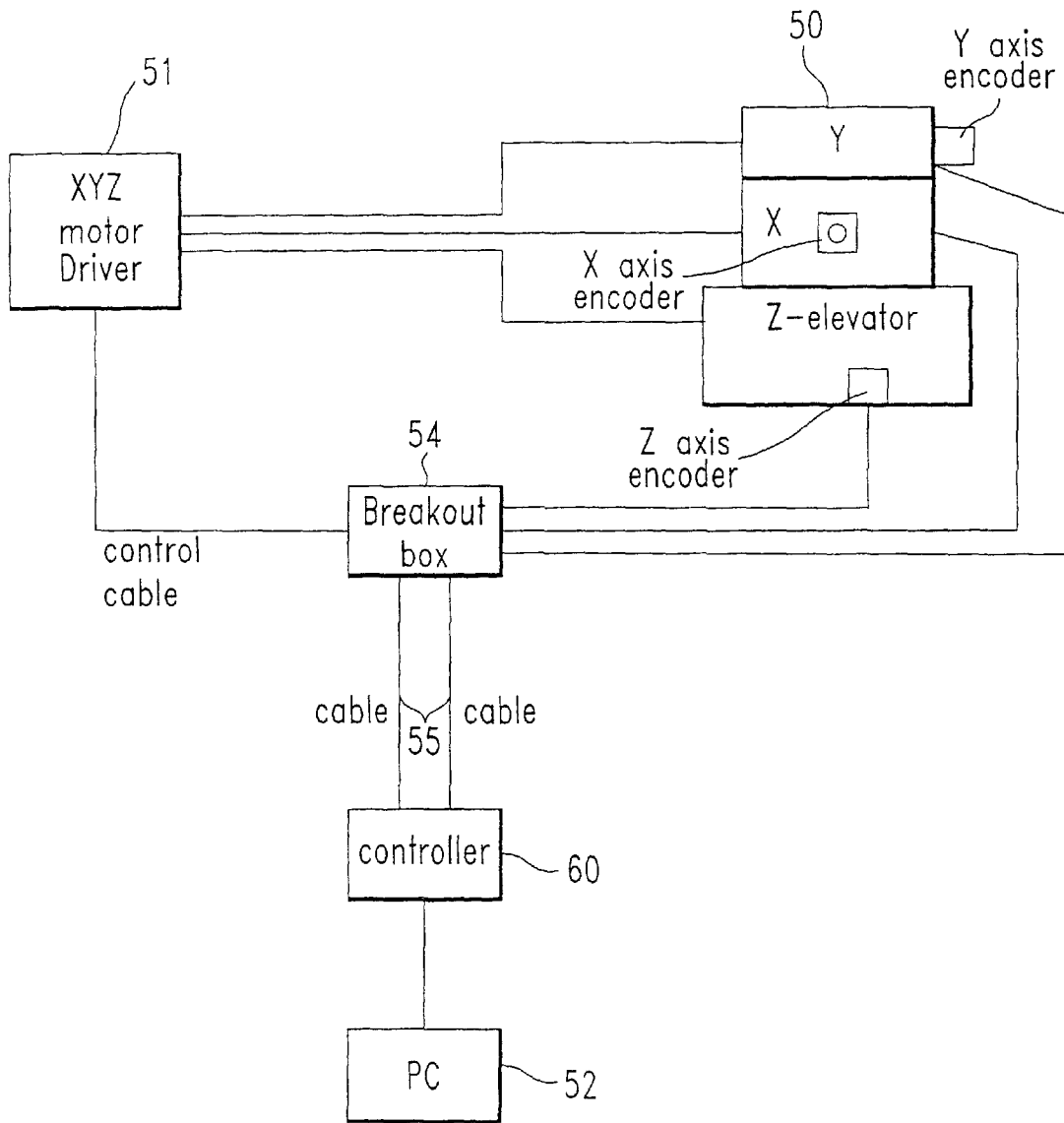


FIG. 5

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.