

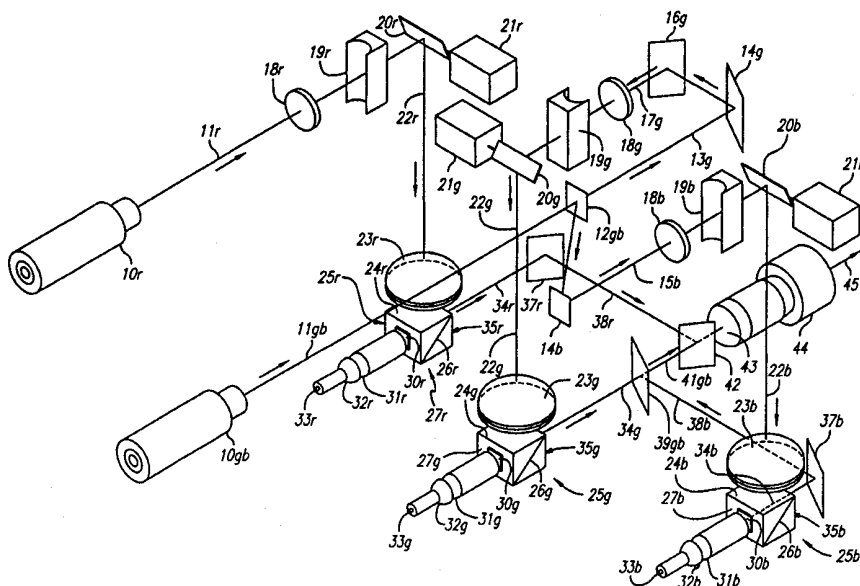
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US99/09501 (22) International Filing Date: 30 April 1999 (30.04.99) (30) Priority Data: 09/071,398 1 May 1998 (01.05.98) US (71)(72) Applicant and Inventor: TROYER, Diane [US/US]; 4554 Lennox Avenue, Sherman Oaks, CA 91403 (US). (74) Agent: LIPPMAN, Peter, I.; Ashen & Lippman, 4385 Ocean View Boulevard, Montrose, CA 91020 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 20 January 2000 (20.01.00)

(54) Title: LASER PROJECTION APPARATUS WITH LIQUID-CRYSTAL LIGHT VALVES AND SCANNING READING BEAM**(57) Abstract**

A laser projection system wherein speckle is suppressed through beam-path displacement, by deflecting the beam during projection, thereby avoiding both absorption and diffusion of the beam while preserving pseudocollimation (noncrossing rays). Path displacement is achieved by scanning the beam on liquid crystal light valves (LCLV's) (30), which also provide enhancements - in energy efficiency, brightness, contrast, beam uniformity (by suppressing both laser-mode ripple and artifacts). Preferably deflection is performed by a mirror (20) mounted on a galvanometer or motor (21) for oscillation; images are written incrementally on successive portions of an LCLV control stage while the laser "reading beam" is synchronized on an output stage. Beam splitter analyzer cubes (25) are preferred over polarizing sheets.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/09501

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : GO3B 21/28; HO4N9/31

US CL : 353/31, 122; 348/771; 359/221

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. : 353/31, 33, 34, 37, 122; 348/751, 761, 766, 790, 771; 349, 5, 22; 359/212, 215, 221, 223

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 practicable, 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.
X ----- Y	US 5,517,263 A (MINICH) 14 MAY 1996 (14.05.96) See entire document	74-76, 79 ----- 1-7, 10-15, 18, 21, 66-71, 73, 77- 78
Y	US 5,317,348 A (KNIZE) 31 MAY 1994 (31.05.94) See entire document	1-7, 10-15, 18, 21, 66-71, 73
X	US 5,534,950 A (HARGIS ET AL.) 09 JULY 1996 (09.07.96) See entire document	22, 32, 38
A	US 5,465,174 A (SPROTBERY) 07 NOVEMBER 1995 (07.11.95) See entire document	1-79

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*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
A document defining the general state of the art which is not considered to be of particular relevance	*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
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
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P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

22 OCTOBER 1999

Date of mailing of the international search report

17 NOV 1999

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/09501

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
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. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

Please See Extra Sheet.

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

4. ☐ 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 claims Nos.:

Remark on Protest

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/09501

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

*Group I, claim(s) 1-41, 63-73, drawn to a spatially modulated laser image projector, classified in class 353 subclass 31.

Group II, claim(s) 42-62, 74-79, drawn to optical elements of a laser projector, classified in Class 359 subclass 290.

*For the purpose of Chapter I processing and preparation of this paper, Fig 1-79 are referred to as claims 1-79

The inventions listed as Groups I and II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The Groups are subcombinations disclosed as usable together. Group II contains limitations not necessary for use of Group I.