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Advanced Optical Equipment & Systems
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F29601-95C-0043Additional name(s) of conveying party(ies) attached? ☐ Yes ☒ No

2. Name and address of receiving party(ies):

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4. Application number(s) or patent number(s)

If this document is being filed together with a new application, the execution date of the application is: _____

A. Patent Application No.(s):

B. Patent No.(s):

6,049,557

Date of Patent: Apr 11, 2000

Additional numbers attached? ☐ Yes ☒ No5. Name and address of party to whom correspondence
concerning document should be mailed:

Name: Kenneth E. Callahan

Internal Address: 377 ABW/JAN

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6. Total number of applications and patents involved:

1

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☐ Enclosed☒ Not applicableThe instrument to be recorded is not an instrument
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Signature

4 December 2000

Total number of pages including cover sheet, attachments, and document:

2

PATENT

REEL: 011314 FRAME: 0533

CONFIRMATORY LICENSE

U. S. Patent Application for: (Title) "High Power Photolytic Iodine Laser"

Inventor(s): Philip R. Cunningham, Robert D. Rathge, and LaVerna A. Schlie

Serial No.: 09/092,844 now U.S. Patent Number 6,049,557

Filing Date: June 5, 1998 Date of Patent: April 11, 2000

Contract No.: F29601-95-C-0043, F29601-96-C-0042, and F29601-94-C-0073

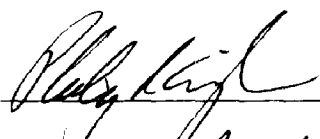
This Invention identified above is a "Subject Invention" under Patent Rights Clause (52.227-11
F29601-95-C-0043, F29601-96-C-0042,
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President Advanced
Optical Equipment

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P.O. Box 339
Edgewood, NM 87015



US006049557A

United States Patent [19]
Cunningham et al.

[11] **Patent Number:** **6,049,557**
[45] **Date of Patent:** **Apr. 11, 2000**

[54] **HIGH POWER PHOTOLYTIC IODINE LASER**

[76] Inventors: **Philip R. Cunningham**, 5 Falcon Ct., Edgewood, N.Mex. 87015; **Robert D. Rathge**, 9105 Lagrains De Oro, NE, Albuquerque, N.Mex. 87111; **LaVerne A. Schlie**, 7503 Lamplighter Lane, NE, Albuquerque, N.Mex. 87109

[21] Appl. No.: 09/092,844

[22] Filed: Jun. 5, 1998

Related U.S. Application Data

[63] Continuation-in-part of application No. 08/948, 53, Oct. 10, 1997, Pat. No. 5,889,807, which is a continuation-in-part of application No. 08/651,471, May 22, 1996, Pat. No. 5,802,093.

[51] Int. Cl.⁷ H01S 3/22; F01S 3/223

[52] U.S. Cl. 372/59

[58] Field of Search 372/55, 59

[56] **References Cited**

U.S. PATENT DOCUMENTS

5,260,961 11/1993 Zhou et al. 372/59
5,425,044 6/1995 Schlie et al. 372/55

Primary Examiner—Rodney Bovernick

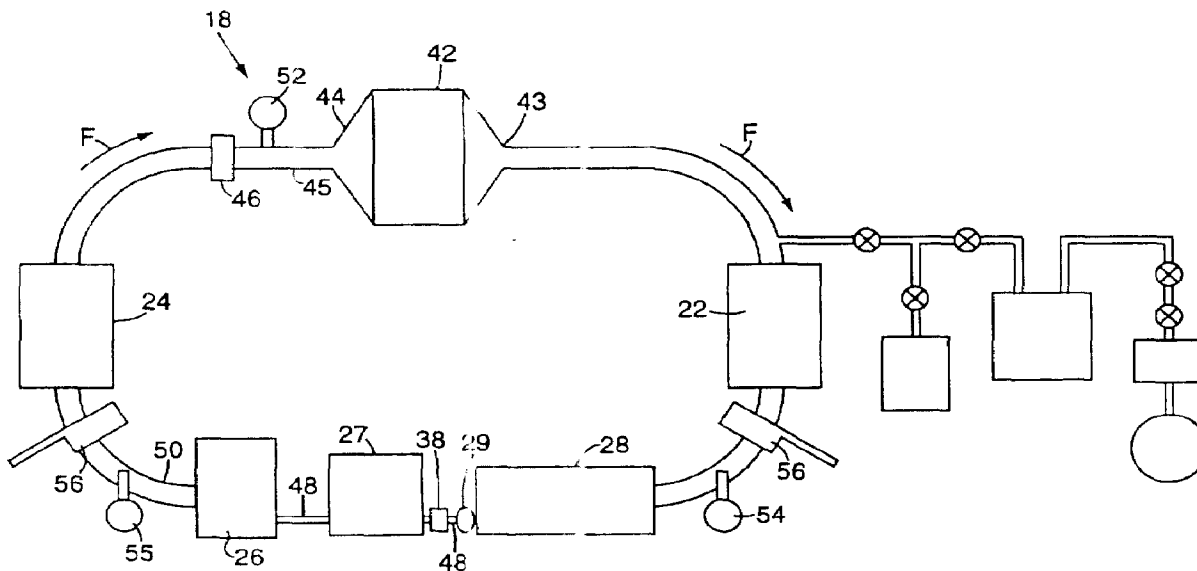
Assistant Examiner—Robert E. Wise

Attorney, Agent, or Firm—McCormick, Paulding & Huber LLP

[57] **ABSTRACT**

A continuous wave photolytic iodine laser has a gain cell for receiving a continuous supply of gaseous fuel. The gain cell is connected to laser beam transfer optics, a laser resonator for shaping a laser beam, and a lamp. The lamp is driven by a microwave subsystem such that a laser gain medium is pumped through the gain cell. The continuous wave photolytic iodine laser of the present invention incorporates a closed loop fuel system for presenting gaseous fuel to the gain cell at a rate sufficient to sweep any lasing by-products out of the gain cell, thereby preventing quenching of the lasing process. The fuel system also includes a condenser for converting the gaseous fuel to a liquid after it has passed through the gain cell, a scrubber for removing the by-products of the lasing process from the fuel, and an evaporator for converting the recycled liquefied fuel back to a gas. The closed loop fuel system also includes a pump for pressurizing and transporting the liquefied fuel. Provision of pulsed, high energy ultra-violet radiation to the interior gain modules provides a pulsed photolytic iodine laser with a plurality of gain modules, generating very high energy/high power laser output radiation pulses. These output pulses from a laser with a plurality of gain cells can be a frequency greater than 1 Hz.

28 Claims, 25 Drawing Sheets



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1b. ADDRESS (Include Zip Code) PO BOX 339 Edgewood, NM 87015	2b. ADDRESS (Include Zip Code)	a. INTERIM ☒ b. FINAL
c. CONTRACT NUMBER F29601-96C-0042	d. AWARD DATE (YYYYMMDD)	4. REPORTING PERIOD (YYYYMMDD)
+ 95C-0043		e. FROM 4/98
+ 94C-0073		f. TO 4/99

SECTION 1 - SUBJECT INVENTIONS

"SUBJECT INVENTIONS" REQUIRED TO BE REPORTED BY CONTRACTOR / SUBCONTRACTOR (If "None," so state)

NAME(S) OF INVENTOR(S) (Last, First, MI)	TITLE OF INVENTION(S)	DISCLOSURE NUMBER, PATENT APPLICATION SERIAL NUMBER OR PATENT NUMBER	ELECTION TO FILE PATENT APPLICATIONS ^d				CONFIRMATORY INSTRUMENT OR ASSIGNMENT FORWARDED TO CONTRACTING OFFICER	
			(1) UNITED STATES		(2) FOREIGN		(1) YES	(2) NO
			(a) YES	(b) NO	(a) YES	(b) NO		
Townsend, S.S. and Cunningham, P.P.	Continuous Wave Photolytic Iodine Laser	5,802,093	X			X		

SECTION II - SUBCONTRACTS (Containing a "Patents Rights" clause)

SUBCONTRACTS AWARDED BY CONTRACTOR / SUBCONTRACTOR (If "None" so state)

[illegible]

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b.	TITLE	d.	SIGNATURE		
	Cunningham, Philip R.				4/21/99
	President				

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