United States Patent [19]

Wan

[11] **Patent Number:** 5,852,620

[45] **Date of Patent:** Dec. 22, 1998

[54] **TUNABLE TIME PLATE**

[75] Inventor: **Chaozhi Wan**, Arcadia, Calif.

[73] Assignee: **Uniwave Technology, Inc.**, Chatsworth, Calif.

[21] Appl. No.: **784,767**

[22] Filed: **Jan. 16, 1997**

[51] Int. Cl.^{6} **H01G 3/10**

[52] U.S. Cl. **372/22**; 372/25; 372/27; 372/105; 372/700

[58] **Field of Search** 372/25, 22, 700, 372/27, 105, 92

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,880,996	11/1989	Peterson et al. .
4,884,276	11/1989	Dixon et al. .
4,961,195	10/1990	Skupsky et al. .
5,065,046	11/1991	Guyer .
5,117,126	5/1992	Geiger .
5,123,022	6/1992	Ebbers et al. .
5,144,630	9/1992	Lin .
5,181,212	1/1993	Moberg .
5,206,868	4/1993	Deacon .
5,274,650	12/1993	Amano .
5,278,852	1/1994	Wu et al. .
5,363,192	11/1994	Diels et al. .

5,420,875	5/1995	Sternklar	.... 372/27
5,590,148	12/1996	Szarmes	.... 372/105
5,671,232	9/1978	Lee et al.	.... 372/27

OTHER PUBLICATIONS

Jones et al; "Multiwatt–Level 213 nm Source Based on a Repetitively Q–Switched CW–Pumped ND:YAG Laser"; IEEE Jour. of Quantum Electronics;vol. QE–15,No.4,Apr. 1979.

Pixton; "Tripling yag frequency"; Laser Focus;pp. 66–70.

Primary Examiner—Leon Scott, Jr.
Attorney, Agent, or Firm—Thomas I. Rozsa; Tony D. Chen; Jerry Fong

[57] **ABSTRACT**

A tunable time plate device for providing a continually adjustable time delay between two linearly polarized laser pulses ω_1 and ω_2. The device comprises a time plate made of a parallel flat birefringence crystal having a principal axis of refractive index n_z parallel to its surface, and a principal axis of refractive index n_x having an angle ϕ to its surface normal. The time plate is rotatably mounted such that it is rotatable about its n_z principal axis for tuning a time delay between the two laser pulses as they travel through the time plate which is a function of an incident angle θ between its surface normal and the propagation direction of the laser pulses. The time delay therefore can be continually adjusted by rotating said time plate to change said incident angle θ.

20 Claims, 4 Drawing Sheets