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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : F21V 7/00		A3	(11) International Publication Number: WO 94/03759
			(43) International Publication Date: 17 February 1994 (17.02.94)
(21) International Application Number: PCT/US93/07124		(74) Agents: HOOVER, George, W. et al.; Blakely, Sokoloff, Taylor & Zafman, 12400 Wilshire Boulevard, 7th Floor, Los Angeles, CA 90025 (US).	
(22) International Filing Date: 29 July 1993 (29.07.93)			
(30) Priority data: 07/924,198 3 August 1992 (03.08.92) US		(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
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(54) Title: TOROIDAL REFLECTORS FOR OPTICAL SYSTEM

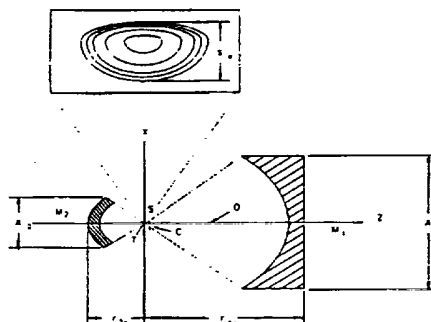


Figure-4a Schematic of XZ-plane of the present invention.

- S - point source
- r_s - size of the source
- T - target
- M₁ - primary reflector
- M₂ - secondary reflector
- C - connecting optical element
- O - optical axis of the system
- r₁ - radius of curvature of the primary reflector in the XZ-plane
- r₂ - radius of curvature of the primary reflector in the YZ-plane
- r₃ - radius of curvature of the secondary reflector in the XZ-plane
- r₄ - radius of curvature of the secondary reflector in the YZ-plane
- A₁ - diameter of primary reflector
- A₂ - diameter of secondary reflector
- r₀ - off-axis distance of the source and target measured from the optical axis.

(57) Abstract

An electromagnetic radiation source (S) such as an arc lamp, is located at a point displaced from the optical axis (o) of a concave toroidal reflecting surface. The concave primary reflector (M1) focuses the radiation from the source at an off-axis image point that is displaced from the optical axis. The use of a toroidal reflecting surface enhances the collection efficiency into a small target (T), such as an optical fiber, relative to a spherical reflecting surface by substantially reducing aberrations caused by the off-axis geometry. A second concave reflector (M2) is placed opposite to the first reflector to enhance the total flux collected by a small target.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/07124**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) : F21V 7/00

US CL : 362/32, 293, 297, 346; 359/858

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. : 362/32, 293, 297, 310, 346; 359/858, 861

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.
Y	US,A, 4,757,431 (Cross et al) 12 July 1988, cols. 2, 3, and 5.	1-50
A	US,A, 4,947,305 (Gunter, Jr.) 07 August 1990, col. 3.	1-50
A	US,A, 4,921,338 (Macken et al) 01 May 1990, col. 2.	1-50
A	US,A, 4,706,168 (Weisner) 10 November 1987, col. 2.	13-50

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

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Date of the actual completion of the international search
15 November 1993

Date of mailing of the international search report

JAN 31 1994

Name and mailing address of the ISA/US
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/07124

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A, 4,241,390 (Markle et al) 23 December 1980, cols. 1 and 7.	1-50
A	US,A, 4,151,582 (Grunberger) 24 April 1979, entire document.	1-50
A	US,A, 2,628,533 (Oetjen) 17 February 1953, entire document.	1-50
Y	SU,A, 1,254,405 (Kuvshinov) 30 August 1986, abstract.	1-50
A	Journal of the Optical Society of America, (Block Associates, Inc.) Volume 55, No.2, dated February 1965, "Configuration for a Large Light Collector".	1-50