



US007321475B2

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

(10) **Patent No.:** **US 7,321,475 B2**
(45) **Date of Patent:** ***Jan. 22, 2008**

- (54) **IMAGE PICK-UP LENS SYSTEM**
- (75) Inventors: **Zhuo Wang**, Beijing (CN); **Min-Qiang Wang**, Beijing (CN); **Ying-Bai Yan**, Beijing (CN); **Guo-Fan Jin**, Beijing (CN); **Ji-Yong Zeng**, Beijing (CN)
- (73) Assignees: **Tsing Hua University**, Beijing (CN); **Hon Hai Precision Industry Co., Ltd.**, Tu-Cheng, Taipei Hsien (TW)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 48 days.

6,104,545 A *	8/2000	Tsuchida	359/654
6,297,915 B1	10/2001	Kaneko et al.	359/718
6,449,105 B1	9/2002	Dou	359/793
6,885,508 B2 *	4/2005	Yamaguchi et al.	359/717
6,970,306 B2 *	11/2005	Matsuo	359/716
7,027,234 B2 *	4/2006	Kim et al.	359/717
7,038,861 B2 *	5/2006	Ninomiya et al.	359/719
7,075,728 B2 *	7/2006	Yamaguchi et al.	359/676
7,196,855 B2 *	3/2007	Yamaguchi	359/785
7,196,856 B2 *	3/2007	Nakamura	359/785
2003/0117723 A1 *	6/2003	Shinohara	359/794
2003/0197953 A1 *	10/2003	Yamaguchi et al.	359/717
2004/0036983 A1	2/2004	Ninomiya et al.	359/719
2005/0280904 A1 *	12/2005	Wang et al.	359/717

This patent is subject to a terminal disclaimer.

FOREIGN PATENT DOCUMENTS

CN	1461959	12/2003
EP	1271215 A1	1/2003
EP	1357414 A1	10/2003

(21) Appl. No.: **10/954,726**

(22) Filed: **Sep. 30, 2004**

(65) **Prior Publication Data**
US 2005/0254147 A1 Nov. 17, 2005

(30) **Foreign Application Priority Data**
May 15, 2004 (CN) 2004 1 0027254

(51) **Int. Cl.**
G02B 9/04 (2006.01)
G02B 13/18 (2006.01)

(52) **U.S. Cl.** 359/793; 359/717; 359/738
(58) **Field of Classification Search** 359/793-795, 359/738-740
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

5,940,219 A	8/1999	Yamada	359/642
-------------	--------	--------	---------

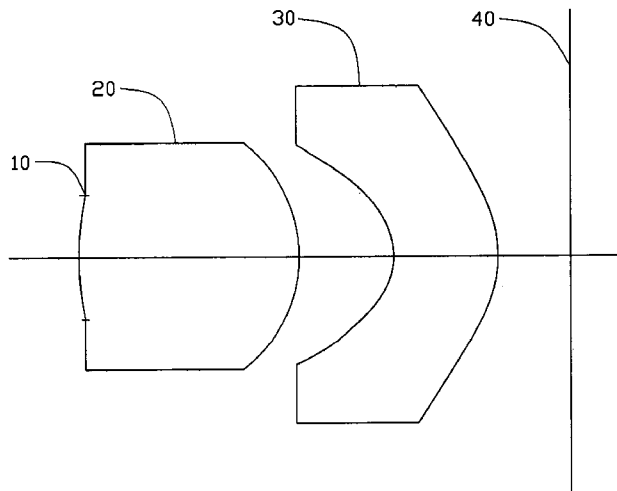
* cited by examiner

Primary Examiner—Jordan M. Schwartz
(74) *Attorney, Agent, or Firm*—Jeffrey T. Knapp

(57) **ABSTRACT**

An image pick-up lens system includes an aperture stop (10), a biconvex first lens (20), and a meniscus-shaped second lens (30) having a concave surface on a side of an object. The aperture stop, the first lens and the second lens are aligned in that order from the object side to an image side. Each of the lenses has at least one aspheric surface, and the following conditions are satisfied: (1) $0.5 < f_1/f < 0.9$, and (2) $1 < T/f < 1.62$, wherein f_1 is a focal length of the first lens, f is a focal length of the system, and T is a length from the aperture stop to an image pick-up surface of the image side.

6 Claims, 16 Drawing Sheets



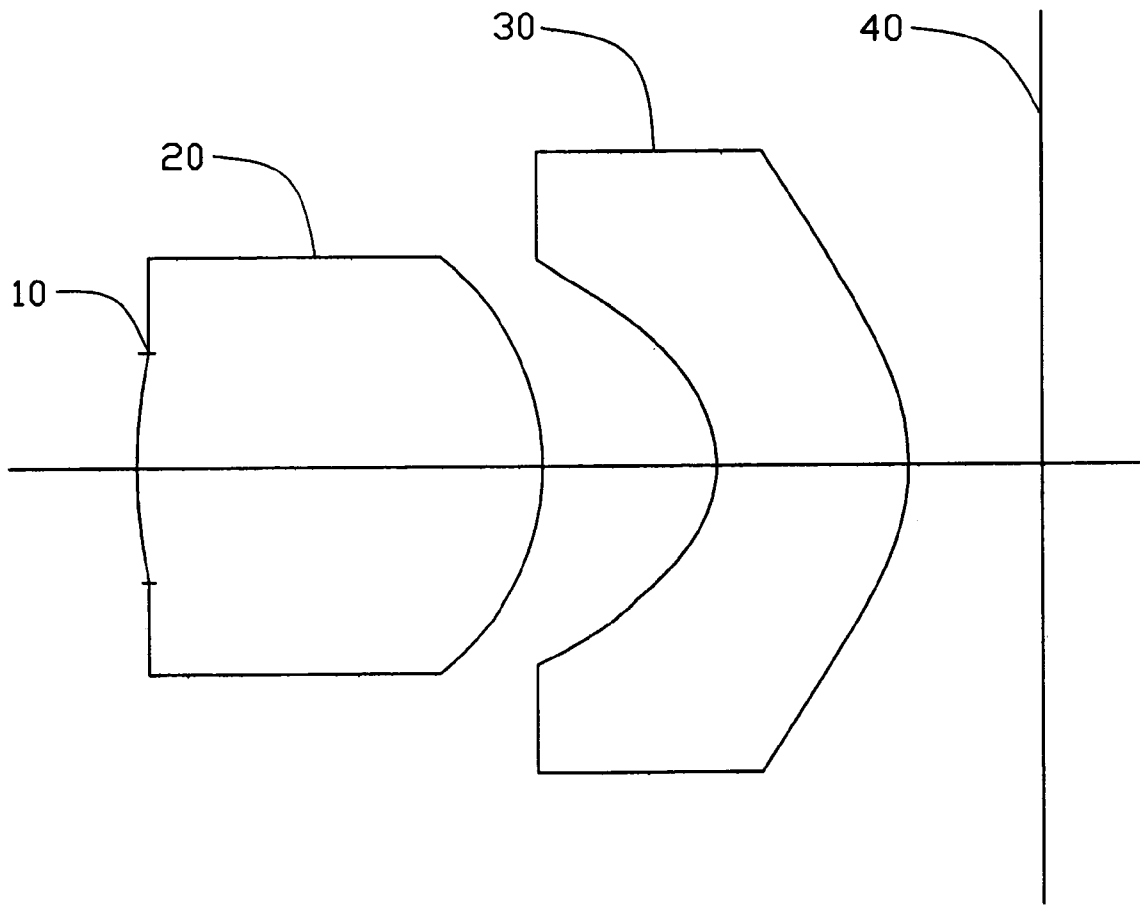


FIG. 1

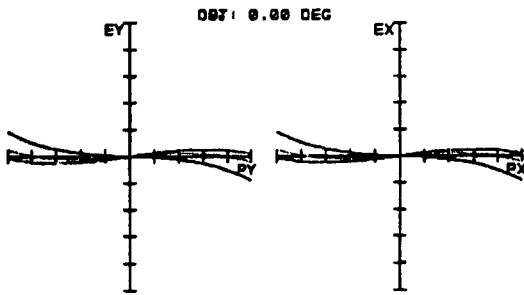


FIG. 2A

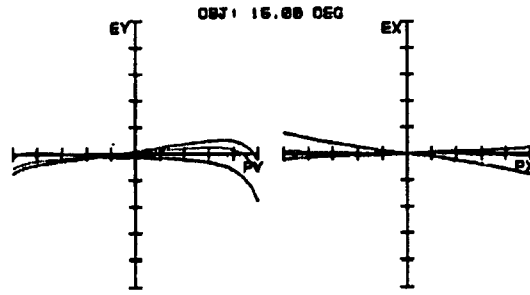


FIG. 2B

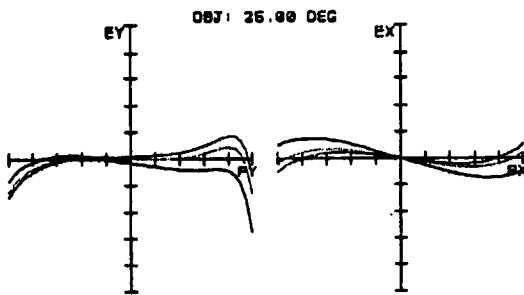


FIG. 2C

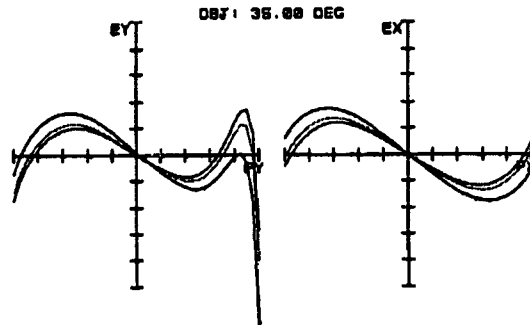


FIG. 2D

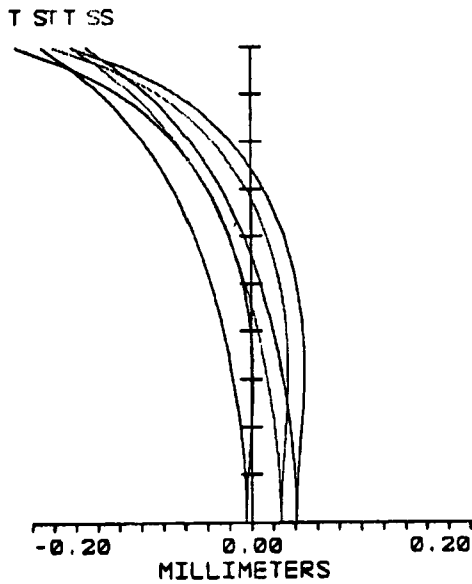


FIG. 3A

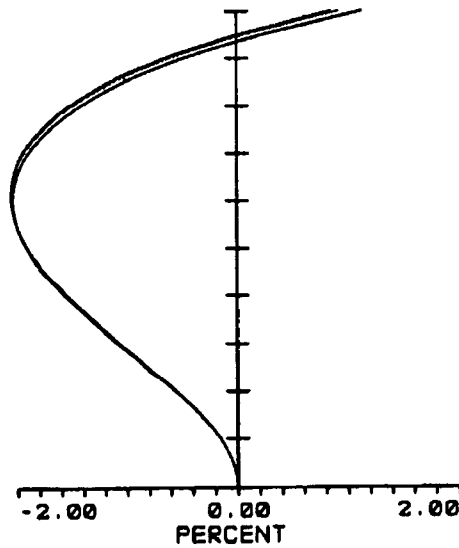


FIG. 3B

PUPIL RADIUS: 0.5640 MILLIMETERS

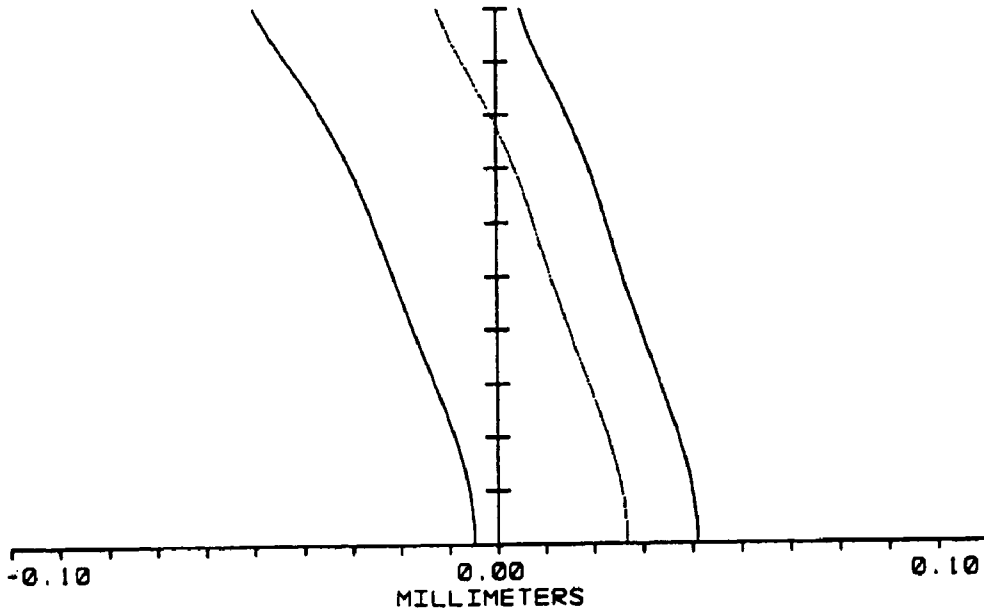


FIG. 4

MAXIMUM FIELD: 35.0000 DEG

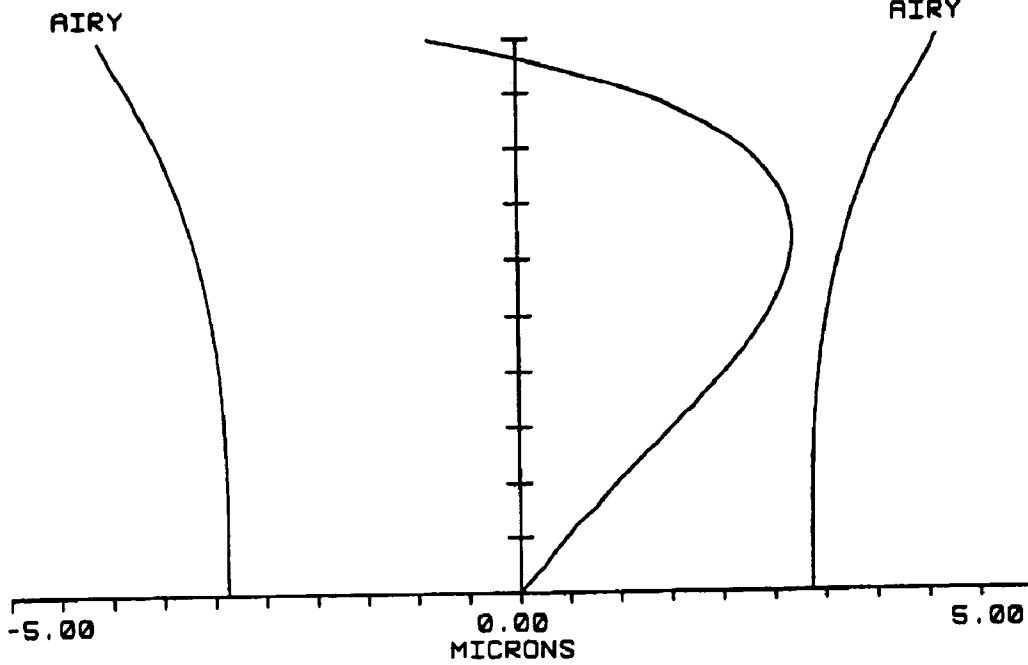


FIG. 5

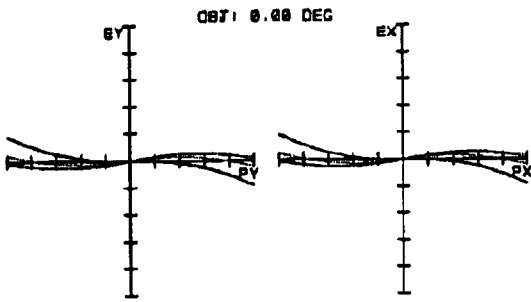


FIG. 6A

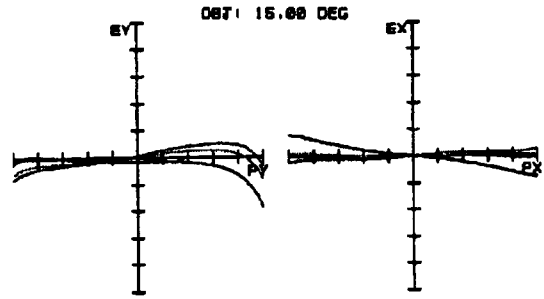


FIG. 6B

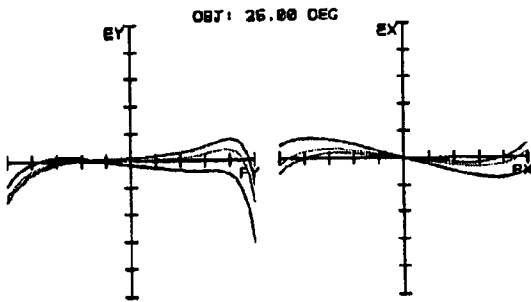


FIG. 6C

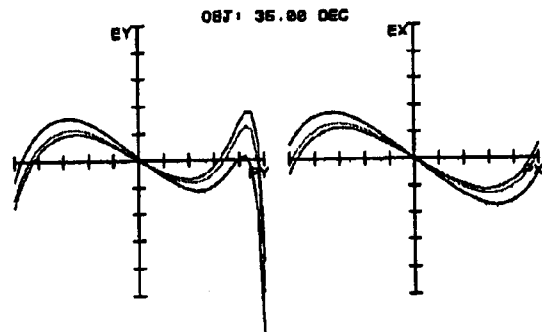


FIG. 6D

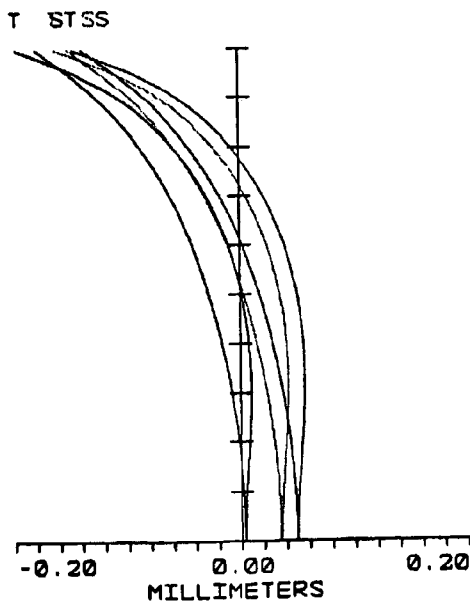


FIG. 7A

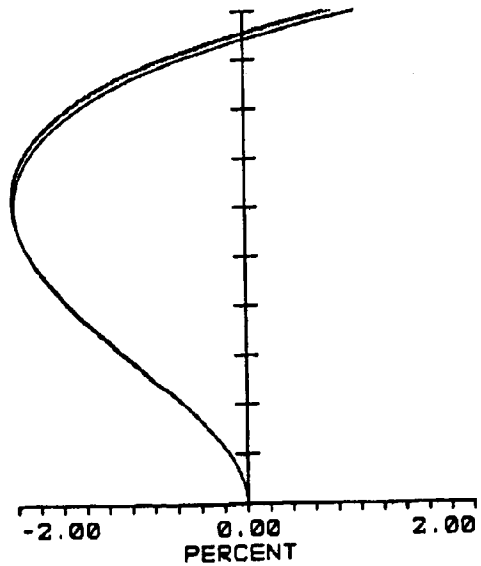


FIG. 7B

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.