

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner

v.

COREPHOTONICS LTD.,
Patent Owner

Case IPR2018-00030
U.S. Patent No. 9,857,568

**DECLARATION OF DUNCAN MOORE, Ph.D.
PURSUANT TO 37 C.F.R. §1.68**

Apple v. Corephotonics
IPR2019-00030

Table of Contents

I. Background.....	1
II. Summary of Opinions.....	1
III. Educational and Employment Background	4
IV. Level of Ordinary Skill in the Art (POSITA).....	6
V. Relevant Legal Standards for Anticipation and Obviousness.....	9
VI. Background.....	14
A. Overview of the '568 Patent.....	14
B. Multiple Element Lens Design.....	19
VII. Claim Construction	23
A. “Total Track Length (TTL)”	23
B. “Effective Focal Length”.....	34
VIII. Petition Grounds	34
A. Claims 1–5 of the '032 Patent are Not Rendered Obvious by Ogino	34
1. Ogino Does Not Disclose a Lens Assembly with $TTL / EFL < 1$	34
2. A POSITA Would Not Modify Ogino Example 6 to Disclose a Lens Assembly with $TTL / EFL < 1$	40
3. Ogino Does Not Disclose a Lens Assembly with $L11 / L1e < 4$	53
B. Claims 1–5 of the '032 Patent are Not Rendered Obvious by Ogino in Combination with Beich.....	55

I. Background

1. I have been retained as a technical expert by Patent Owner Corephotonics Ltd. (“Patent Owner” or “Corephotonics”) in this proceeding. Corephotonics has asked me to provide my expert opinions concerning certain technical aspects of imaging lenses and imaging lens design as they relate to the Petitioner Apple Inc.’s petitions for *inter partes* review of U.S. Patent 9,857,568 (“’568 patent”) in Case No. IPR2018-00030 (“’032 IPR”) and the accompanying Declaration of José Sasián. The statements in this declaration summarize my opinions on these matters based on my over 40 years of experience in the design and development of imaging lenses for optical systems, my education, knowledge, skills, and my review and analysis of the materials referenced herein.

2. I am being compensated for my work in this matter at the rate of \$425 per hour. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the substance of my testimony.

II. Summary of Opinions

3. In the preparation of this declaration, I have reviewed:

- The ’568 patent. Ex. 1001;
- Prosecution history of the ’568 patent. Ex. 1002;
- The Declaration of José Sasián. Ex. 1003;

- The curriculum vitae of José Sasián. Ex. 1004;
- U.S. Patent No. 9,128,267 (“Ogino”). Ex. 1005;
- Warren J. Smith, Modern Lens Design (1992). Ex. 1006;
- U.S. Patent No. 7,918,398 to Li et al. Ex. 1007;
- U.S. Patent No. 7,777,972 to Chen et al. (“Chen”). Ex. 1008;
- Max Born et al., PRINCIPLES OF OPTICS, 6th Ed. (1980). Ex. 1010;
- Prosecution history of the Ogino patent. Ex. 1011;
- Ex. 1012, identified as Jane Bareau et al., “The optics of miniature digital camera modules,” SPIE Proceedings (2006) (“Bareau”). Ex. 1012;
- U.S. Patent Publication No. 2013/0077183. Ex. 1017;
- Schaub, THE DESIGN OF PLASTIC OPTICAL SYSTEMS (2009). Ex. 1018.
- Bass et al., Handbook of Optics, vol. II, 2nd ed. (1995). Ex. 1019.
- William S. Beich & Nicholas Turner., “Polymer Optics: A Manufacturer’s Perspective on the Factors that Contribute to Successful Programs,” SPIE Proceedings Vol. 7788 (Aug. 12, 2010) (“Beich”). Ex. 1020.
- The Declaration of Ingrid Hsieh-Yee, Ph.D. Ex. 1022;
- U.S. Patent No. 8,395,851 (“Tang”). Ex. 2007;
- U.S. Patent Publication No. 2011/0249346. Ex. 2008;
- U.S. Patent Publication No. 2011/0279910, Ex. 2009;
- U.S. Patent Publication No. 2011/0261470. Ex. 2010;
- Transcript of the February 15, 2019 Deposition of Dr. José Sasián in the IPR2018-01140 and IPR2018-01146. Ex. 2011.

- Transcript of the July 2, 2019 Deposition of Dr. José Sasián in IPR2018-00030. Ex. 2012.
 - The Declaration of José Sasián in IPR018-01140, regarding U.S. Patent No. 9,402,032 (“’032 patent”) and U.S. Patent No. 9,568,712 (“’712 patent”). Ex. 2013;
 - Excerpts from Robert E. Fischer, Biljana Tadic-Galeb, Paul R. Yoder, OPTICAL SYSTEM DESIGN, 2nd Ed., 2008, Ex. 2014;
 - U.S. Patent 9,678,310 (“Iwasaki”), Ex. 2015;
 - U.S. Patent 8,248,715 (“Asami”), Ex. 2016;
 - U.S. Patent Publication 20110261471 (“Taniyama”), Ex. 2018;
 - Humpston et al., “Optical performance of bare image sensor die and sensors packaged at the wafer level and protected by a cover glass,” Proceedings of SPIE (2008), Ex. 2019;
 - Excerpts from Symmons & Schaub, FIELD GUIDE TO MOLDED OPTICS, SPIE (2016), Ex. 2020;
 - William S. Beich, “Injection Molded Polymer Optics in the 21st-Century,” SPIE Proceedings Vol. 5865 (2005), Ex. 2021;
 - Luxin Nie, “Patent Review of Miniature Camera Lenses and A Brief Comparison of Two Relative Design Patterns” (2017), Ex. 2022;
 - Excerpts from José Sasián, INTRODUCTION TO ABERRATIONS IN OPTICAL IMAGING SYSTEMS (2013), Ex. 2023; and
 - Kingslake & Johnson, LENS DESIGN FUNDAMENTALS, 2d ed., Ch. 4, (2010) Ex. 2024.
4. In forming the opinions set forth herein, I have considered:
- a. The documents listed above.

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.