

NOTE: This disposition is nonprecedential.

**United States Court of Appeals
for the Federal Circuit**

COREPHOTONICS, LTD.,
Appellant

v.

APPLE INC.,
Appellee

**ANDREW HIRSHFELD, PERFORMING THE
FUNCTIONS AND DUTIES OF THE UNDER
SECRETARY OF COMMERCE FOR
INTELLECTUAL PROPERTY AND DIRECTOR OF
THE UNITED STATES PATENT AND TRADEMARK
OFFICE,**
Intervenor

2020-1961

Appeal from the United States Patent and Trademark
Office, Patent Trial and Appeal Board in No. IPR2019-
00030.

Decided: October 25, 2021

MARC AARON FENSTER, Russ August & Kabat, Los An-
geles, CA, argued for appellant. Also represented by NEIL

RUBIN, JAMES S. TSUEI.

ANGELA OLIVER, Haynes and Boone, LLP, Washington, DC, argued for appellee. Also represented by ANDREW S. EHMKE, DEBRA JANECE MCCOMAS, Dallas, TX; DAVID W. O'BRIEN, Austin, TX; MICHAEL SCOTT PARSONS, Plano, TX.

ROBERT MCBRIDE, Office of the Solicitor, United States Patent and Trademark Office, Alexandria, VA, for intervenor. Also represented by THOMAS W. KRAUSE, MONICA BARNES LATEEF, FARHEENA YASMEEN RASHEED.

Before TARANTO, HUGHES, and STOLL, *Circuit Judges*.

TARANTO, *Circuit Judge*.

This case is closely related to *Corephotonics Ltd. v. Apple Inc.*, No. 20-1424 (Fed. Cir.), which involves Corephotonics Ltd.'s U.S. Patent No. 9,402,032 and which we decide today in an opinion (*20-1424 Decision*) on which we rely here. The present case involves Corephotonics's U.S. Patent No. 9,857,568, which issued from a second-generation continuation-in-part of the application that became the '032 patent, and which describes (as its title states) a "miniature telephoto lens assembly" for use in cell phones. Apple Inc. petitioned the Patent and Trademark Office (PTO) for an inter partes review of the '568 patent, contending that all five claims are unpatentable because their subject matter would have been obvious based on (1) U.S. Patent No. 9,128,267 (Ogino) or (2) a combination of Ogino and a paper by William S. Beich and Nicholas Turner—*Polymer Optics: A Manufacturer's Perspective on the Factors That Contribute to Successful Programs*, SPIE Proceedings Vol. 7788, Polymer Optics Design, Fabrication, and Materials (August 12, 2010) (Beich). The primary issue here is common to this matter and the matter resolved in our *20-1424 Decision*: whether Figure 6 of Ogino describes a lens assembly that has a total track length (TTL)

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less than the effective focal length (EFL). The secondary issue here, unique to this matter, is whether a relevant artisan would have been motivated to select a specific rule taught in Beich and implement it in the Ogino lens assembly.

The PTO's Patent Trial and Appeal Board determined that all five claims of the '568 patent are unpatentable under 35 U.S.C § 103 for obviousness: claims 1–4 based on Ogino alone, and claims 1–5 based on Ogino in combination with Beich. *Apple Inc. v. Corephotonics Ltd.*, IPR2019-00030, 2020 WL 1696140 (P.T.A.B. Apr. 6, 2020) (*Board Decision*). Corephotonics timely appealed that decision, properly invoking our jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

Besides raising challenges to the merits of the Board's decision, Corephotonics presented a challenge under the Appointments Clause of the Constitution, Art. II, § 2. After the Supreme Court resolved a similar constitutional challenge in *United States v. Arthrex, Inc.*, 141 S. Ct. 1970 (2021), we remanded this matter, while retaining jurisdiction, to give the Acting Director of the PTO the opportunity to consider reviewing the Board decision (an opportunity Corephotonics indicated it wanted). The Acting Director has now declined to review the Board decision, and Corephotonics has informed us that it does not challenge the Acting Director's denial of review, but seeks only our review of the Board's decision. We proceed to address Corephotonics's challenges to the merits of that decision. We affirm.

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The '568 patent describes a camera-lens assembly with a plurality of lenses ("lens element[s]") of varying thicknesses and refractive power arranged in line along an optical axis running from an object side (*i.e.*, the side with the

object to be photographed) to an image side (*i.e.*, the side where the image of the object is formed). '568 patent, col. 1, lines 49–62. Past the last lens element, on the image side of the assembly, is an “optional glass window” and an “image plane” with an “image sensor” for “image formation.” *Id.*, col. 3, lines 37–42.

The '568 patent purports to improve on previous lens assemblies by reducing the ratio of the assembly's TTL to its EFL. *Id.*, col. 1, lines 33–45. The lens assembly's TTL is the distance “on an optical axis between the object-side surface of the first lens element and the electronic sensor” where the image captured by the lens is ultimately projected. *Id.*, col. 2, lines 1–8. The TTL affects the physical width (thickness) of the camera, while the EFL “determines how well the camera performs at capturing images of small or distant objects, as opposed to closer objects.” J.A. 2246 ¶ 38 (Declaration of Corephotonics expert, Dr. Duncan Moore). Increasing the EFL allows a lens to magnify and increase the resolution of objects at greater distances, while simultaneously narrowing the camera lens's field of view. J.A. 2246 ¶ 38 (Dr. Moore Declaration). Thus, reducing the TTL/EFL ratio results in a thin lens with the capability of capturing far-away objects in great detail. All five claims in the '568 patent require that the ratio of TTL to EFL be smaller than 1. *See* '568 patent, col. 8, lines 29–66.

The '568 patent also describes the F-number of the lens assembly, which is the ratio of the focal length of a lens to its aperture diameter. A smaller F-number means that the lens is exposed to more light and has a greater illumination. J.A. 2248 ¶ 40 (Dr. Moore Declaration). All embodiments in the '568 patent teach an F-number of less than 3.2. '568 patent, col. 2, lines 8–9.

Finally, the '568 patent includes tables providing information about each embodiment of the lens assembly and the characteristics of each lens element, including their

radii, thicknesses, and the distances between them along the optical axis. *Id.*, col. 3, lines 44–48; *see also id.*, col. 5, line 66, through col. 6, line 4; *id.*, col. 7, lines 23–28. Relevant to this appeal, Table 1 sets forth the thickness of each lens element in one particular embodiment (Figure 1A) of the lens assembly, expressing the thickness of lens element 1 as “L11,” with the first “1” referring to the lens element number and the second “1” referring to the location on the lens (*the center*) where the thickness is measured. *See id.*, col. 4, lines 13–25; *see also id.*, Fig. 1A. The same Figure 1A also shows a distance marked “L1e”—which is the “width . . . of a flat *circumferential edge* (or surface) of [the first] lens element 102.” *Id.*, col. 4, lines 28–29 (emphasis added). The ratio of L11 to L1e compares the thickness of the first lens element at its center to the width of its edge; the parties on appeal refer to this ratio as the center-to-edge thickness ratio.

The ’568 patent explains that when “ $TTL/EFL < 1.0$ and $F\# < 3.2$ ” there can be a “large ratio” (greater than 4.0) of L11 to L1e. *Id.*, col. 2, lines 30–33. Such a large L11/L1e ratio affects “negatively the manufacturability of the lens and its quality,” the patent observes. *Id.*, col. 2, lines 36–38. But, the patent continues, “the present inventors have succeeded in designing the first lens element to have a L11/L1e ratio smaller than 4, smaller than 3.5, smaller than 3.2, smaller than 3.1 . . . and even smaller than 3.0,” resulting in improved manufacturability and quality of the lens assembly. *Id.*, col. 2, lines 38–45. There are five claims in the ’568 patent, each of which corresponds to a different L11/L1e ratio. *See id.*, col. 8, lines 29–66.

Claim 1, the only independent claim in the ’568 patent, recites:

1. A lens assembly, comprising: a plurality of refractive lens elements arranged along an optical axis with a first lens element on an object side, wherein at least one surface of at least one of the

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