UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG ELECTRONICS, INC. and LG ELECTRONICS U.S.A., INC.,
Petitioner,

v.

TOSHIBA SAMSUNG STORAGE TECHNOLOGY KOREA CORPORATION,
Patent Owner.

Case IPR2015-01653
Patent RE43,106

PATENT OWNER'S NOTICE OF APPEAL

Pursuant to 35 U.S.C. § 142 and 37 C.F.R. § 90.2(a), Patent Owner Toshiba Samsung Storage Technology Korea Corporation hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision in this IPR dated February 2, 2017 and from all orders, decisions, rulings, and opinions underlying or supporting the Final Written Decision.

For the limited purpose of providing the Director with the information requested in 37 C.F.R. § 90.2(a)(3)(ii), issues on appeal may include but are not limited to the Board's determinations of unpatentability of claims and any finding or determination supporting or relating to such determinations of unpatentability including but not limited to claim construction issues, violation of due process, obviousness issues, Board findings that conflict with the evidence of record and are not supported by substantial evidence, as well as all other issues decided adversely to Patent Owner in any orders, decisions, rulings and/or opinions.

Patent Owner reserves the right to challenge any finding or determination supporting or relating to the issues listed above and to challenge any other issues decided adversely to Patent Owner by the USPTO Patent Trial and Appeal Board (PTAB) in this proceeding.

This document is being filed both electronically with the PTAB and by hand with the Office of the General Counsel. In addition, this document, along with the required fee, is being filed with the Clerk's Office for the United States Court of

Appeals for the Federal Circuit in accordance with Federal Circuit Rule 15.

Respectfully submitted,

Dated: Apr. 5, 2017

By: /Joseph A. Rhoa/

Joseph A. Rhoa
Reg. No. 37,515
Jonathan A. Roberts
Reg. No. 68,565
Attorneys for Patent Owner,
TOSHIBA SAMSUNG
STORAGE TECHNOLOGY
KOREA CORPORATION

NIXON & VANDERHYE P.C.
(Customer No.: 23117)
901 North Glebe Road
11th Floor
Arlington, VA 22203
Tel: (703) 816-4000
Fax: (703) 816-4100
Email: jar@nixonvan.com

CERTIFICATE OF SERVICE

I hereby certify that on Apr. 5, 2017, the foregoing PATENT OWNER'S NOTICE OF APPEAL was electronically filed with the USPTO. In addition, the original version of the foregoing PATENT OWNER'S NOTICE OF APPEAL was filed by hand on Apr. 5, 2017, with the Director of the United States Patent and Trademark Office, at the following address:

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel, 10B20
Madison Building East
600 Dulaney Street
Alexandria, VA 22314-5793

I further certify that the foregoing PATENT OWNER'S NOTICE OF APPEAL, and the filing fee, were filed on Apr. 5, 2017, with the Clerk's Office of the United States Court of Appeals for the Federal Circuit.

I further certify that a true and correct copy of the foregoing, PATENT OWNER'S NOTICE OF APPEAL, was served via First Class U.S. Mail and by electronic mail (in accordance with the parties' electronic service agreement) on Apr. 5, 2017, on the following email addresses for counsel of record for Petitioner:

btollefson@rfem.com
slieberman@rfem.com
mbattaglia@rothwellfigg.com
spanda@rfem.com
mjones@rfem.com

Rothwell Figg
607 14th Street, N.W. Suite 800
Washington, DC 20005

/Joseph A. Rhoa/
Joseph A. Rhoa

Trials@uspto.gov
Tel: 571-272-7822

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG ELECTRONICS, INC. and LG ELECTRONICS U.S.A., INC.,
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v.

TOSHIBA SAMSUNG STORAGE TECHNOLOGY KOREA CORPORATION,
Patent Owner.

Case IPR2015-01653
Patent RE43,106 E

Before KALYAN K. DESHPANDE, MICHAEL R. ZECHER, and TREVOR M. JEFFERSON, *Administrative Patent Judges.*

DESHPANDE, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Inter Partes Review
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

LG Electronics, Inc. and LG Electronics U.S.A., Inc. ("Petitioner") filed a Petition requesting an *inter partes* review of claims 7–19 of U.S. Patent No. RE43,106 E (Ex. 1001, "the '106 patent"). Paper 1 ("Pet.").

Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review of the '106 patent, on February 5, 2016, under 35 U.S.C. § 103(a), as to claims 7–19 on the basis that these claims would have been obvious over APA[1] and Katayama.[2] Paper 7 ("Dec.").

Patent Owner filed a Response (Paper 22, "PO Resp."), and Petitioner filed a Reply (Paper 26, "Pet. Reply"). A consolidated oral hearing was held on October 6, 2016, and the hearing transcript has been entered in the record. Paper 42 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Pursuant to our jurisdiction under 35 U.S.C. § 6, we conclude, for the reasons discussed below, Petitioner has shown by a preponderance of the evidence that claims 7–19 of the '106 patent are unpatentable under 35 U.S.C. § 103(a).

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[1] The '106 patent includes Admitted Prior Art ("APA") describing a conventional optical pickup apparatus and a thin-film type variable aperture. *See* Ex. 1001, 1:58–3:29, Figs. 1, 2. We consider APA as a relevant admission by Toshiba of the background knowledge of a person of ordinary skill in the art at the time of the invention of the '106 patent. For simplicity, we refer to APA and its disclosure generally in our analysis that follows.

[2] U.S. Patent No. 5,696,750, issued on December 9, 1997 (Ex. 1002) ("Katayama").

B. Related Proceedings

The parties indicate that the '106 patent is involved in the following district court cases: (1) *LG Electronics, Inc. v. Toshiba Samsung Storage Technology Korea Corp.*, Case No. 1:12-cv-01063 (LPS) (D. Del.); and (2) *Toshiba Samsung Storage Technology Korea Corp. v. LG Electronics, Inc.*, Case No. 1:15-cv-0691 (LPS) (D. Del.). Pet. 2; Paper 6, 1.

C. The '106 Patent

The '106 patent describes an optical pickup apparatus that can compatibly record information on, and read information from, a digital video disk (DVD) and a recordable compact disk (CD-R) using a holographic lens. Ex. 1001, 1:28–34. The optical pickup apparatus is set forth in Figure 3 of the '106 patent as follows:

FIG. 3

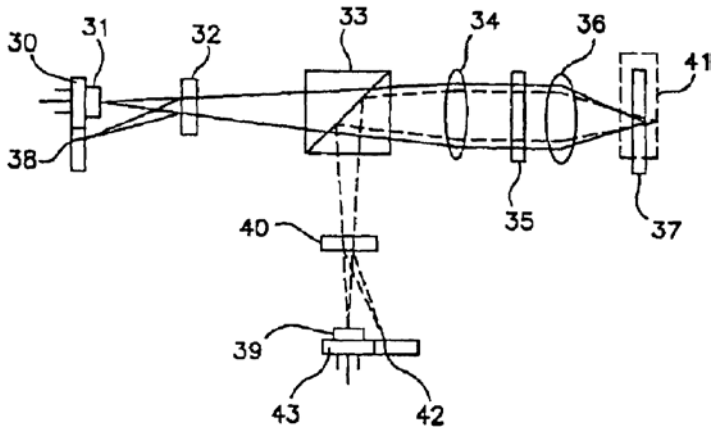

Figure 3 shows an optical system of an optical pickup according to one embodiment. *Id*. at 4:33–34. The optical pickup apparatus includes laser light sources 31 and 39 for emitting light beams having different wavelengths. *Id*. at 4:34–37. Laser light source 31 emits a wavelength of 650 nm, suitable for a DVD. *Id*. at 4:55–59. Laser light source 39 emits a

light beam having a 780 nm wavelength suitable for a CD-R. *Id*. at 4:61–67. Holographic beam splitters 32 and 40 alter the optical path of the light beams reflected from information recording surfaces, beam splitter 33 completely transmits or reflects the incident light beam according to wavelength, and collimating lens 34 collimates the incident light beam to be in a parallel form. *Id*. at 4:34–47. Holographic lens 35 diffracts the incident light beam according to its wavelength, and objective lens 36 focuses the light beams on the respective information recording surfaces of optical disks 37 and 41. *Id*.

Holographic lens 35 selectively diffracts the incident light beam in order to prevent the generation of spherical aberration with regard to the light beam's focus on the information recording surfaces of optical disks 37 and 41. *Id*. at 5:6–10. The relationship between holographic lens 35, objective lens 36, and optical disks 37 and 41 is illustrated in Figure 4A of the '106 patent as follows:

FIG. 4A

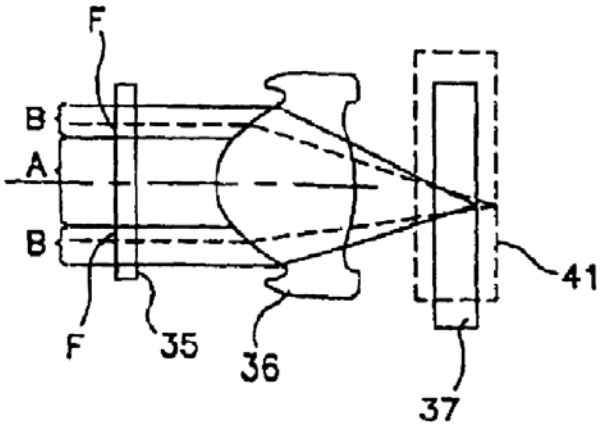

Figure 4A describes that objective lens 36 is partitioned into regions A and B. *Id*. at 5:13–14. Region A is closer to the optical axis of objective

lens 36 and has little effect on spherical aberration, whereas region B is farther from the optical axis of objective lens 36 and has a large effect on spherical aberration. *Id*. at 5:14–18. Objective lens 36 is most appropriate for an optical disk having a thin thickness, such as a DVD. *Id*. at 5:18–20. The light beam incident to region A passes through objective lens 36 without any diffraction by holographic ring lens 35 and is focused directly on the disk. *Id*. at 5:33–36. The light beam incident to region F is wavelength-selectively diffracted by holographic ring lens 35 and then proceeds to objective lens 36. *Id*. at 5:36–39.

D. Illustrative Claim

Petitioner challenges claims 7–19 of the '106 patent. Pet. 4–60. Claim 7 is the only independent claim at issue, and claims 8–19 directly or indirectly depend from independent claim 7. Claim 7 is illustrative of the claims at issue and is reproduced below:

> 7. An objective lens to form beam spots of different sizes using corresponding first and second light beams of respectively different wavelengths, the objective lens comprising:
>
> an inner region including an optical center of the objective lens which has an optical property optimized to focus the first light beam onto a first optical recording medium of a first thicknesses and to focus the second light beam onto a second optical recording medium of a second thickness other than the first thickness; and
>
> a diffractive region surrounding said inner region and comprising an optical property optimized so as to selectively diffract the first and second light beams as a function of wavelength so as to change a numerical aperture of the objective lens.

Ex. 1001, 8:18–8:31.

II. ANALYSIS

A. Claim Construction

We interpret claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard as the claim construction standard to be applied in an *inter partes* review proceeding). Under the broadest reasonable interpretation standard, claim terms are generally given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art, in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Patent Owner argues that "the broadest reasonable construction standard should not apply in *inter partes* review proceedings ("IPRs"). Instead, Patent argues that "the [Board] should construe claim terms in IPRs using the same *Phillips* standard used by district courts in litigations." PO Resp. 1 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc)). We are not persuaded by this argument. The U.S. Supreme Court was clear in articulating that the PTO's regulation that states that "[a] claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification" is a reasonable exercise of the rulemaking authority that Congress delegated to the PTO. *Cuozzo Speed Techs.*, 136 S. Ct. at 2142–46. Accordingly, we interpret the claims under their broadest reasonable interpretation, in light of the Specification.

1. "diffract"

Independent claim 7 recites the term "diffract." Patent Owner argues that the term "diffract" should be construed to mean "modulate waves in response to an obstacle, as an object, slit or grating, in the path of propagation, giving rise in light waves to a banded pattern or to a spectrum." PO Resp. 6–7 (citing Ex. 2001; Ex. 2002 ¶¶ 20–22; Ex. 2003, 9–11) (emphasis omitted). Patent Owner argues that the intrinsic record supports this construction, where the '106 patent specification "expressly contrasts 'diffracting' with totally transmitting and totally reflecting." *Id.* at 7 (citing Ex. 1001, 4:40–45, 5:1–9). Patent Owner additionally argues that this definition is the plain and ordinary meaning of "diffract" and is defined in the dictionary as such. *Id.* at 7–8 (citing Ex. 2001; Ex. 2002 ¶ 22). Petitioner does not propose an express definition for the term "diffract," but rather only construes the term "diffract" within the meaning of the limitation "selectively diffract the first and second light beams as a function of wavelength," which we discuss below.

We agree with Patent Owner that both the intrinsic and extrinsic evidence relied upon by Patent Owner supports its proposed construction. Accordingly we adopt Patent Owner's proposed construction of "diffract" to mean to "modulate waves in response to an obstacle, as an object, slit or grating, in the path of propagation, giving rise in light waves to a banded pattern or to a spectrum." *See* PO Resp. 6–8 (citing Ex. 2001; Ex. 2002 ¶ 22; Ex. 1001, 4:40–45, 5:1–9).

2. "selectively diffract the first and second light beams as a function of wavelength"

Independent claim 7 recites the limitation "selectively diffract the first and second light beams as a function of wavelength." Ex. 1001, 8:28–29. Petitioner argues that the broadest reasonable interpretation of this limitation is "diffract the first and second light beams according to their respective wavelengths." Pet. 13. Petitioner argues that this interpretation is consistent with its plain and ordinary meaning, and consistent with the '106 patent specification, "which does not provide an express definition for 'selectively diffract . . . as a function of wavelength.'" *Id.* (citing Ex. 1001, 4:43–45, 5:6–8, 5:66–6:3; Ex. 1012 ¶¶ 63–64).

Patent Owner agrees with Petitioner that this limitation should be construed to mean "diffract the first and second light beams according to their respective wavelength"; however, Patent Owner asserts this limitation requires that "both beams are diffracted by the diffractive region." PO Resp. 3 (citing Ex. 2002 ¶¶ 17–19). Patent Owner argues that the '106 patent specification includes some embodiments that require only one light beam to be diffracted and some embodiments that require both light beams to be diffracted. *Id.* at 3–6 (citing Ex. 1001, 4:18–20, 6:20–37, 6:53–63, Fig. 6; Ex. 2002 ¶¶ 18–19; Ex. 2003, 21–23). Patent Owner further argues that "[z]ero percent diffraction is no diffraction at all." Tr. 79:9–10. Patent Owner argues that, although claim 1 is directed towards the diffraction of only one light beam, claim 7 requires the diffraction of both light beams. PO Resp. 3.

Petitioner responds that Patent Owner's proposed construction is narrower than what is required by the claims, and Patent Owner selectively

characterizes the '106 patent specification, namely Figure 6, as requiring both light beams to be diffracted. Pet. Reply. 4–6 (citing Ex. 1001, 6:55–63, Fig. 6; Ex. 1021, 164:21–165:4). Petitioner argues that use of the term "selectively" with relation to the limitation "as a function of wavelength" means that diffraction is wavelength-dependent. *Id.* at 6–9. Petitioner argues that, according to its expert, Dr. Masud Mansuripur, "'[t]he diffractive elements described in the '106 patent are wavelength selective,' in which 'the fractional amount of diffraction (ranging anywhere from 0% to 100%) of an incident light beam into one or more of the various diffracted orders depends on the wavelength of the incident light beam." *Id.* at 6–7 (citing Ex. 1012 ¶ 53). As such, Petitioner argues that diffraction includes any diffraction ranging from 0% to 100%. *Id.* Petitioner argues that this construction is supported by the '106 patent specification, which illustrates in Figure 6 a zero-order transmissive efficiency (i.e. 0% diffraction) and the beams are diffracted into an order higher than the zeroth order beam when they are below the 1.0 on the vertical axis. *Id.* at 7–8 (citing Ex. 1001, 6:53–63, Fig. 6). Petitioner argues that claim 7 is not limited to diffraction into any particular order. *Id.* at 8–9 (citing Ex. 2001, 164:10–13). Specifically, Petitioner argues that Figure 6 describes that when "the surface groove depth d is 3.8 μm, the 650 nm wavelength light is transmitted via the holographic ring by 353 by 100% as shown in a solid line overlapped with the symbol '++', and the 780 nm wavelength light is transmitted via the holographic ring by 353 by 0%." *Id.* at 5 (quoting Ex. 1001, 6:55–63) (emphasis omitted).

We first review the intended purpose and goal of the '106 patent in order to give the claim terms meaning. "[T]he PTO applies to the verbiage

of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification." *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). The '106 patent specification explains that an optical pickup apparatus uses a single objective lens and two laser light diodes as light sources for a DVD, which is reproduced using a 635 nm wavelength, and a CD-R, which is recorded and reproduced using a 780 nm wavelength, because of the difference in the thickness of a DVD and CD-R. Ex. 1001, 1:62–67, 2:37–43. Petitioner's expert, Dr. Mansuripur, opines that "[i]n many cases, the objective lens was designed for spot-size corresponding to a DVD" and "[a]s such, it received the 650 nm laser beam . . . free from all forms of aberration." Ex. 1012 ¶ 47. When, on such an apparatus, a 780 nm wavelength is focused on a CD-R having a thickness of 1.2 mm, "spherical aberration is generated due to a difference in the thickness between the DVD [] and the CD-R []" because "the distance between the information recording surface of the CD-R [] and the objective lens [] is farther than that between the information recording surface of the DVD [] and the objective lens []." Ex. 1001, 2:37–48; *see also* Ex. 1012 ¶¶ 43, 44. Prior optical pickup apparatuses use a "finite optical system" in order to remove spherical aberration. *Id.* at 3:13–16. The '106 patent discloses an invention that utilizes a "holographic ring" to prevent the generation of spherical aberration. *Id.* at 5:6–10.

We determine, in light of the '106 patent claims and specification, that "selectively diffract the first and second light beams as a function of

wavelength," under the broadest reasonable interpretation, includes an interpretation that means selecting one light beam to diffract based on wavelength. As explained by Dr. Mansuripur, the objective lens is designed for the wavelength of one of the light beams so as to receive one light beam free from all forms of aberration, and then use a diffracting element for the other light beam to prevent the generation of aberrations. Ex. 1012 ¶¶ 47, 50. This construction encompasses the construction set forth by Petitioner, where Petitioner argues that the term "selectively" determines how much each light beam is diffracted, based on wavelength, and Dr. Mansuripur explains that the fractional amount of diffraction can range from 0% to 100%. Pet. Reply 6–9; Ex. 1012 ¶ 53. Our construction encompasses Petitioner's proposed construction because our construction allows a beam to pass without diffraction, which is the same as diffracting that light beam 0%.

In our view, this interpretation is required by the '106 patent claims. Independent claim 7 recites "selectively diffract the first and second light beams as a function of wavelength," and claim 8, which depends from claim 7, further limits claim 7 to require that the aperture "selectively diffracts the first light beam having a first wavelength" and "selectively allow the second light beam of a second wavelength to be focused on the second recording medium." Ex. 1001, 8:35–39. Accordingly, claim 8 requires that to "selectively diffract the first and second light beams," one beam is diffracted while the second beam is allowed to be focused directly on to the recording medium. Because dependent claim 8 further limits independent claim 7, independent claim 7 may be broadly, but reasonably interpreted to mean that one light beam is diffracted while allowing the second light beam to pass

without diffraction. That is, a person with ordinary skill in the art would have understood that claim 8 limits claim 7 such that one light is diffracted while allowing the second light to pass without diffraction.

We are not persuaded by Patent Owner's argument that claim 7 requires the diffraction of both light beams (PO Resp. 3) because further limiting claim 8 expressly requires that the second light beam is allowed selectively to be focused on the recording medium. As such, like claim 1, claim 7 only requires that one light beam is diffracted based on wavelength. As noted by Patent Owner, the '106 patent specification discloses an embodiment where only one light beam is diffracted (PO Resp. 3–6 (citing Ex. 1001, 4:18–20, 6:20–37, 6:53–63, Fig. 6; Ex. 2002 ¶¶ 18–19; Ex. 2003, 21–23)) and we determine that claim 7 does not include explicit or inherent limitations requiring that both beams are diffracted.[3]

[3] Patent Owner argues that Figure 6 of the '106 patent discloses an embodiment where both the first and second light beams are diffracted. PO Resp. 3–6. However, Figure 6 merely shows a graphical view of the "transmissive efficiency according to the groove depth of the holographic ring lens with regard to two wavelengths." Ex. 1001, 4:18–20. The '106 patent specification's only discussion of a holographic ring is one with a groove depth of 3.8 μm, where the 650 nm wavelength transmitted 100% and the 780 nm wavelength is transmitted 0%, resulting in 40% diffraction. *Id.* at 6:53–63. Patent Owner argues that "both beams are diffracted a majority of the time" (PO Resp. 3) in Figure 6, but Patent Owner does not provide any citation to the '106 patent specification that discloses an embodiment that utilizes a holographic ring that has a groove depth where both the first and second light beams would be diffracted. At the oral hearing, Patent Owner pointed to the discussion of Figure 6 in the '106 patent that discusses that the 650 nm wavelength light is "hardly" diffracted; however, Patent Owner did not advance the argument that the 650 nm wavelength is "hardly" diffracted in the briefing. Tr. 80:13–23 (citing Ex. 1001, 6:24–27); *see* PO Resp. 3–6. Therefore, we do not consider this

Our interpretation in this regard is further consistent with the '106 patent specification. The '106 patent specification explains that "holographic ring lens 35 selectively diffracts the incident light beam according to wavelength" in order to "prevent the generation of spherical aberration with regard to the light beams focused on the information recording surfaces of the optical disks," and "[b]y using the holographic ring lens 35, a working distance from the surface of the objective lens 36 to the information recording surfaces of the disks becomes shorter in the CD-R 41 rather than in the DVD 37." Ex. 1001, 5:6–10, 5:47–50 (emphasis omitted). The '106 patent specification further explains that "holographic ring lens 35 is constructed so that the light beam of 650 nm wavelength has transmissive efficiency close to 100%" and "the light beam of 780 nm wavelength has a zero-order transmissive efficiency 0% with respect to non-diffracted light beam." *Id.* at 6:11–15 (emphasis omitted). As such, we find that the '106 patent specification supports an interpretation of "selectively diffract the first and second light beams according to their respective wavelengths" to be selecting one light beam to diffract based on wavelength.

The '106 patent specification further provides an embodiment where the groove depth is 3.8 μm. Ex. 1001, 6:53–63, Fig. 6. The '106 patent explains that at 3.8 μm groove depth, the 650 nm wavelength light is transmitted via the holographic ring by 100% and the 780 nm wavelength is

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argument because it was not timely raised. For the reasons explained above, we are not persuaded by Patent Owner that a construction of "selectively diffract the first and second light beams as a function of wavelength" that requires the diffraction of both a first and second light beam is supported by the '106 patent specification.

transmitted via the holographic ring by 0%, thereby resulting in 40% diffraction efficiency. *Id.* That is, the '106 patent specification discloses that "[a]ll of the 650 nm wavelength light incident to the holographic ring lens . . . is transmitted and then proceeds to the objective lens," and "[t]he 780 nm wavelength light incident to the holographic ring lens [] is transmitted to the holographic ring lens [] as shown in Figure 4A, but is diffracted in region A and then proceeds to objective lens []." *Id.* at 6:64–66, 7:9–13.

Accordingly, applying the broadest reasonable interpretation standard, we interpret the limitation "selectively diffract the first and second light beams as a function of wavelength" to mean selecting one light beam to diffract based on wavelength.

B. Claims 7–19 – Obviousness over APA and Katayama

Petitioner contends that claims 7–19 are unpatentable under 35 U.S.C. § 103(a) as obvious over APA and Katayama. Pet. 22–59. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Mansuripur,[4] explaining how the prior art meets each of the claim limitations of claims 7–19. *Id.*; Ex. 1012. Petitioner also asserts that a person of ordinary skill in the art would have had a sufficient reason to combine or modify the teachings of APA and Katayama. *Id.*

1. APA (Ex. 1001)

The '106 patent discloses a conventional optical pickup apparatus that was available in the prior art. Ex. 1001, Fig. 1, 1:58–61. The conventional

[4] Petitioner supports its challenge with the Declaration of Dr. Mansuripur. Ex. 1012.

optical pickup apparatus is illustrated in Figure 1 of the ’106 patent as follows:

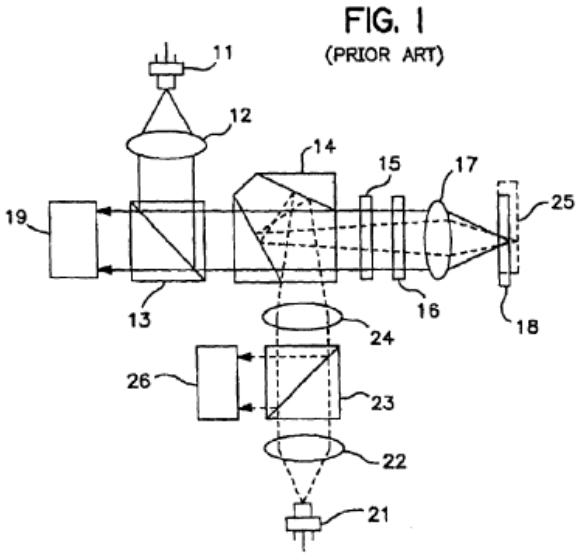

Figure 1 discloses an optical pickup apparatus that includes laser light sources 11 and 21, collimating lenses 12 and 22, objective lens 17, and optical media 18 and 25. *Id*. at 1:62–2:55. Laser light source 11 emits light, having a 635 nm wavelength, to collimating lens 12. *Id*. at 2:1–2. The collimated incident light beam is reflected by beam splitter 13 to interference filter prism 14. *Id*. at 2:3–7. Laser light source 21 emits light, having a 780 nm wavelength, to collimating lens 22. *Id*. at 2:8–13. The collimated incident light beam then goes to beam splitter 23, converging lens 24, and then to interference filter prism 14. *Id*. Interference filter prism 14 transmits completely both the light beam of 635 nm and 785 nm wavelengths. *Id*. at 2:15–18. As a result, the light beam from laser light source 11 is incident to quarter-wave plate 15 as a parallel beam by the collimating lens 12, whereas the light beam from laser light source 21 is incident to the quarter-wave plate 15 in the form of a divergent beam by converging lens 24 and interference filter prism 14. *Id*. at 2:18–24. The light transmitted through the quarter-

wave plate 15 passes through a variable aperture 16 having a thin film structure and then is incident to objective lens 17. *Id*. at 2:24–28.

Thin-film type variable aperture 16 is illustrated in Figure 2 of the '106 patent as follows:

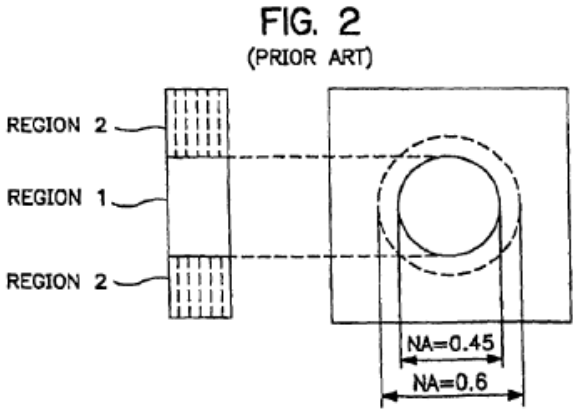

Figure 2 illustrates variable aperture 16 that is partitioned into two regions. *Id*. at 2:56–66. First region 1 transmits both light beams of 635 nm and 780 nm. *Id*. Second region 2 transmits completely the light beam of 635 nm, and reflects completely the light beam of 780 nm. *Id*.

2. Katayama (Ex. 1002)

Katayama discloses an optical head apparatus for different types of disks that have different thicknesses and/or densities. Ex. 1002, 1:7–9. The optical head apparatus is illustrated in Figure 28 of Katayama as follows:

Fig. 28

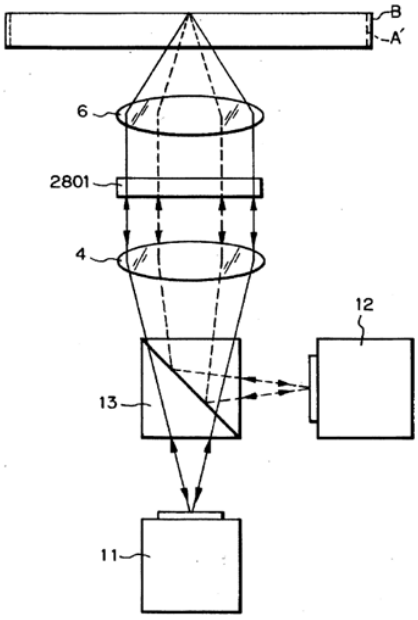

Figure 28 discloses an optical head apparatus that includes laser diodes 11 and 12, interference filter 13, collimator lens 4, aperture limiting element 2801,[5] objective lens 6, and disks A′ and B. Ex. 1002, 15:62–16:21. A 635 nm wavelength light beam is emitted from laser diode 11, and completely passes through interference filter 13 and is incident to collimator lens 4. *Id*. at 16:1–4. The collimated light beam passes through the entire aperture limiting element 2801 to reach objective lens 6, and is focused on disk A′. *Id*. at 16:4–8. A 785 nm wavelength light beam is emitted from laser diode 12, and is reflected completely by interference filter 13 and is incident to collimator lens 4. *Id*. at 16:18–21. The collimated light beam

[5] Aperture limiting element 2801 replaces the holographic optical element 5′ of Figure 5. Ex. 1002, 15:63–65. Figure 32 combines the holographic optical element 5" of Figure 8 and aperture limiting element 2801 of Figure 28 into aperture limiting holographic optical element 3201. *Id.* at 18:48–54.

passes only through a central portion of aperture limiting element 2801 to reach objective lens 6 to be focused on disk B. *Id*. at 16:22–25.

3. Analysis

Petitioner contends that claims 7–19 are unpatentable under 35 U.S.C. § 103(a) as obvious over APA and Katayama. Pet. 22–59. Petitioner provides a detailed analysis, supported by credible evidence, demonstrating by a preponderance of the evidence that claims 7–19 are obvious over APA and Katayama. *Id*.

For example, the preamble of claim 7 recites "an objective lens to form beam spots of different sizes using corresponding first and second light beams of respectively different wavelengths." Ex. 1001, 8:18–20. Petitioner contends that both APA and Katayama disclose this limitation. Petitioner specifically argues that APA discloses a conventional optical pickup apparatus that includes a single objective lens and two different wavelength light sources in order to form beam spots of different sizes for each recording medium (i.e., DVD and CD-R). Pet. 25–26 (citing Ex. 1001, 1:64–67, 2:28–31, 2:50–53, 2:56–3:12, Fig. 1; Ex. 1012 ¶¶ 70–77, 87). Petitioner additionally argues that Katayama discloses the use of an objective lens and two different light sources on DVDs or CDs, which require beam spots of different sizes due to disk density. *Id*. at 26–28 (citing Ex. 1002, 1:7–9, 1:45–59, 3:22–30, 18:43–44, Figs. 5, 8, 28, 32; Ex. 1012 ¶¶ 88–91).

Claim 7 further recites,

> an inner region including an optical center of the objective lens which has an optical property optimized to focus the first light beam onto a first optical recording medium of a first thicknesses and to focus the second light beam onto a second optical

> recording medium of a second thickness other than the first thickness.

Ex. 1001, 8:21–26. Petitioner contends that both APA and Katayama disclose this limitation. Petitioner specifically argues that APA discloses that objective lens 17 is optimized to focus (1) a first light beam on a first optical recording medium of a first thickness; and (2) a second light beam on a second optical recording medium of a second thickness. Pet. 28 (citing Ex. 1001, 2:28–31, 3:6–9, Fig. 1; Ex. 1012 ¶ 93). Petitioner argues that APA discloses that variable aperture 16, alone or combined with objective lens 17, has an inner region that includes an optical center to focus (1) the first light beam onto a first optical recording medium of a first thickness; and (2) a second light beam onto a second optical recording medium of a second thickness. *Id*. at 29 (citing Ex. 1012 ¶ 94).

Petitioner also argues that Katayama discloses an inner region that is configured to focus (1) a first beam onto a first medium; and (2) a second beam to focus onto a second medium. *Id*. at 29–30 (citing Ex. 1002, 17:13–30, 18:37–44, Figs. 28, 30A, 30B; Ex. 1012 ¶ 95). Petitioner argues that Katayama discloses an inner region that focuses two different light beams of different wavelengths, regardless of whether diffractive element 2801 is combined with objective lens 6, because inner region of diffractive-type variable aperture 3003 passes both wavelengths for focusing on their respective disks. *Id*. (citing Ex. 1002, 17:13–30; Ex. 1012 ¶ 95).

Claim 7 also recites "a diffractive region surrounding said inner region and comprising an optical property optimized so as to selectively diffract the first and second light beams as a function of wavelength so as to change a numerical aperture of the objective lens." Ex. 1001, 8:27–31.

Petitioner contends that, although APA fails to disclose this limitation because it uses a thin film element, Katayama discloses a diffractive-type aperture limiting element that is wavelength selective, and also discloses that the diffractive element can be formed directly on the surface of the objective lens. Pet. 30–31 (citing Ex. 1002, 18:31–44). Petitioner asserts that Katayama presents the diffractive-type variable aperture as interchangeable with a thin-film type aperture. *Id*. at 31–32 (citing Ex. 1002, 15:62–18:44; Ex. 1012 ¶¶ 80, 98). As discussed above in our claim construction section, we construe the limitation "selectively diffract the first and second light beams as a function of wavelength" to mean selecting one light beam to diffract based on wavelength, while the other light beam passes without diffraction. Petitioner argues that Katayama discloses grating element 3002, which is a diffracting element, and "grating 3002 completely passes the 635 nm wavelength light therethrough, while the grating 3002 almost completely diffracts the 785 nm wavelength light thereby." *Id.* at 38–39 (quoting Ex. 1002, 17:20–23).

Petitioner further articulates reasoning with rational underpinnings as to why a person of ordinary skill in the art at the time of the invention would have combined the teachings of APA and Katayama. *Id*. at 22–25 (citing Ex. 1012 ¶¶ 79–82). Petitioner asserts that the elements of the claims were well known and a person with ordinary skill in the art would have had a sufficient reason to combine them without change to their respective functions. *Id*. at 22–23. Accordingly, Petitioner argues that the combination of APA and Katayama is nothing more than the combination of known elements with each performing the same function it had been known to perform, and yields nothing more than predictable results. *Id*. Petitioner

further argues that Katayama expressly teaches that a thin film variable aperture and a diffractive-type variable aperture can be interchanged in an optical system to achieve the same results. *Id*. at 23–24 (citing Ex. 1002, 16:37–17:30; Ex. 1012 ¶¶ 80, 98). Petitioner argues that "it was also well known that a diffractive element could be either an individual element in the optical system or integrated onto the surface of the objective lens." *Id*. at 25 (citing Ex. 1002, 18:43–44). Petitioner concludes that it would have been obvious to insert the elements of Katayama, such as grating element 3002, into APA's conventional optical pickup apparatus, and such a combination would have yielded nothing more than predictable results. *See id*. at 23–24.

Petitioner has similarly provided a detailed analysis for claims 8–19. *See* Pet. 40–55. Notwithstanding Patent Owner's arguments, which we address below, we are persuaded by Petitioner's showing. We hold that Petitioner has demonstrated with credible and persuasive evidence that APA in combination with Katayama properly teaches all of the elements of claims 7–19, and that the combination would have been obvious for the reasons provided by Petitioner.

4. Patent Owner's Contentions

Patent Owner presents the following three arguments: (a) APA and Katayama were considered by the Examiner during the original prosecution of the '106 patent; and (b) the combination of APA and Katayama fails to teach or suggest that "selectively diffract the first and second light beams as a function of wavelength," as recited in claim 7; and (c) Petitioner's expert, Dr. Mansuripur, alleges that Katayama discloses that the numerical aperture for the second optical recording medium is already greater than for the first optical recording medium, as required by claim 13 and, therefore, "there

would have been no logical reason to have modified Katayama or APA/Katayama because this was already done." PO Resp. 10–18.

a. APA and Katayama Were Considered by the Examiner During the Original Prosecution of the '106 patent

Patent Owner argues APA and Katayama were considered during the original prosecution of the '106 patent. PO Resp. 10. Patent Owner argues that the Examiner twice allowed the challenged claims over APA and Katayama, and this should weigh in favor of patentability. *Id.* Petitioner responds that "the Office's prior consideration of the '106 patent is not pertinent to the present proceeding as the Board is not required to come to the same determination as the examiner." Pet. Reply. 20 (citing *Research in Motion Corp. v. Multimedia Ideas LLC*, Case IPR2013-00036, Paper 15, 6 (PTAB 2013)).

We agree with Petitioner. Patent Owner generally alleges that APA and Katayama were considered by the Examiner, but fails to provide any persuasive evidence or argument that the Examiner actually relied on or discussed APA or Katayama in allowing the challenged claims. For instance, Patent Owner does not direct us to, nor can we find, where the Examiner considers the particular combination of APA and Katayama in the extensive prosecution history. *See* Ex. 1013–19. Accordingly, we are not persuaded by Patent Owner because the Examiner did not discuss or rely on the teachings of APA or Katayama in determining whether the claims were allowable.

b. The Combination of APA and Katayama Fails to Teach or Suggest that "Selectively Diffract the First and Second Light Beams as a Function of Wavelength"

Patent Owner argues that claim 7 requires the limitation "selectively diffract the first and second light beams as a function of wavelength," which, according to Patent Owner, should be construed as requiring that the diffraction region diffracts both the first and second light beams. PO Resp. 10–11. Patent Owner, therefore, argues that Katayama discloses that an aperture limiting element is provided on an objective lens, but even if the objective lens includes an aperture limiting element "this would not diffract both beams." *Id.* at 11 (emphasis omitted). Patent Owner argues that Katayama explicitly discloses that grating element 3002 completely passes the 635 nm wavelength light and almost completely diffracts the 785 nm light. *Id.* at 11–12 (citing Ex. 1002, 16:54–60). As such, Patent Owner argues that Katayama diffracts only one light beam. *Id.* at 12–16.

We disagree with Patent Owner. As discussed above in our claim construction, we construe the limitation "selectively diffract the first and second light beams as a function of wavelength," under the broadest reasonable interpretation standard, to mean selecting one light beam to diffract based on wavelength. *See supra* Section II.A.2. Accordingly, this claim limitation is met if one of the light beams is diffracted. As also discussed above, Katayama discloses that "grating [element] 3002 completely passes the 635 nm wavelength light therethrough, while the grating 3002 almost completely diffracts the 785 nm wavelength light thereby." Pet. 38–39 (quoting Ex. 1002, 17:20–23); *see* Section II.B.3. Therefore, we agree with Petitioner that Katayama's disclosure of grating

element 3002 completely diffracting the 785 nm wavelength while letting the 635 nm wavelength pass through without diffraction teaches "selectively diffract the first and second light beams as a function of wavelength." As such, we are not persuaded by Patent Owner's argument.

c. Claim 13 - "There Would Have Been No Logical Reason to Have Modified Katayama or APA/Katayama Because This Was Already Done"

Patent Owner first argues that claim 13 "requires that the diffractive region diffracts both the first and second light beams" and "Katayama fails to disclose this claimed subject matter." PO Resp. 17–18 (emphasis omitted). We disagree with Patent Owner for the same reasons stated above in our discussion of claim 7. *See supra* Section II.B.4.b.

Patent Owner further contends that Petitioner's expert, Dr. Mansuripur, "alleges that in Katayama the numerical aperture for second optical recording medium is already greater than for the first optical recording medium." PO Resp. 18 (citing Ex. 1012 ¶ 122). Accordingly, Patent Owner argues that "if the numerical aperture for [the] second optical recording medium is *already greater* than for the first optical recording medium as alleged by petitioner, there would have been no logical reason to have modified Katayama or APA/Katayama because this was already done." *Id.*

Petitioner argues that Katayama discloses that the numerical aperture of the objective lens when reading the 635 nm wavelength for a DVD is 0.52 and the numerical aperture of the objective lens when reading the 785 nm wavelength for a CD-R is 0.45, and, therefore, teaches the numerical aperture of the objective lens is greater for the second optical recording medium than for the first optical recording medium. Pet. 48–49 (citing

Ex. 1002, 18:31–42; Ex. 1012 ¶¶ 121–122). Petitioner presents the same rationale to combine APA and Katayama discussed above with respect to claim 7, including that Katayama expressly teaches that a thin film variable aperture and a diffractive-type variable aperture can be interchanged in an optical system to achieve the same results. *Id*. at 23–24 (citing Ex. 1002, 16:37–17:30; Ex. 1012 ¶¶ 80, 98).

Petitioner responds to Patent Owner's argument that Dr. Mansuripur opines that the "numerical aperture for DVD at 635 nm (.52) is greater than the numerical aperture for CD-R at 785 nm (.45)" by asserting that "claim 13 is directed to the numerical aperture of the objective lens, not the numerical aperture of storage discs such as DVD or CD-R." Pet. Reply. 21–22. Petitioner, therefore, argues that Dr. Mansuripur's supporting testimony, particularly paragraph 122 of Exhibit 1012, does not undermine its position that a person with ordinary skill in the art would have "combined APA and Katayama to diffract first and second beams 'such that the numerical aperture of the objective lens is greater for the second optical recording medium than for the first optical recording medium.'" *Id.*

We are not persuaded by Patent Owner's argument. Claim 13 recites "the numerical aperture of the objective lens is greater for the second optical recording medium than for the first optical recording medium." Ex. 1001, 8:54–56. We agree with Petitioner that claim 13 requires that the numerical aperture of the objective lens is greater for the second recording medium than the first recording medium. Patent Owner mischaracterizes Petitioner's and Dr. Mansuripur's explanation of the required numerical aperture for a DVD and CD-R as "already done," whereas both Petitioner and Dr. Mansuripur explain that the numerical aperture of the objective lens is

greater for the second optical recording medium than the first optical recording medium. In other words, Patent Owner's argument that the numerical aperture of a DVD is already greater than that of a CD-R is misplaced because claim 13 requires that the diffractive region is optimized to diffract such that the numerical aperture of the *objective lens* is greater for the second recording medium than the first recording medium.

5. Conclusion

Petitioner has demonstrated by a preponderance of the evidence that claims 7–19 are unpatentable under 35 U.S.C. § 103(a) as obvious over APA and Katayama.

III. CONCLUSION

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 7–19 of the '106 patent would have been obvious over the combination of APA and Katayama.

IV. ORDER

Accordingly, it is hereby:

ORDERED that, based on the grounds under review, claims 7–19 of U.S. Patent No. RE43,106 E are held be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision of the Board under 35 U.S.C. § 318(a), the parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Brian Tollefson
Soumya Panda
Michael Battaglia
ROTHWELL, FIGG, ERNST & MANBECK, P.C.
btollefson@rothwellfigg.com
spanda@rothwellfigg.com
mbattaglia@rfem.com

For PATENT OWNER:

Joseph Rhoa
Jonathan Roberts
NIXON & VANDERHYE P.C.
jar@nixonvan.com
jr@nixonvan.com