

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FUJIFILM CORPORATION,
Petitioner,

v.

SONY CORPORATION,
Patent Owner.

Case IPR2017-01390
Patent 7,115,331 B2

Before JON B. TORNQUIST, JEFFREY W. ABRAHAM, and
ELIZABETH M. ROESEL, *Administrative Patent Judges*.

ABRAHAM, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318 and 37 C.F.R. § 42.73

I. INTRODUCTION

Fujifilm Corporation (“Petitioner”) filed a Petition seeking *inter partes* review of claims 1–18 (“challenged claims”) of U.S. Patent No. 7,115,331 B2 (Ex. 1001, “the ’331 patent”). Paper 1 (“Pet.”). Sony Corporation (“Patent Owner”) filed a Patent Owner Preliminary Response to the Petition. Paper 8 (“Prelim. Resp.”). On December 8, 2017, we instituted an *inter partes* review of all challenged claims, but not all grounds raised in the Petition. Paper 9 (“Inst. Dec.”).

After institution, Patent Owner filed a Patent Owner Response (Paper 14, “PO Resp.”). On April 27, 2018, we issued an order modifying our Institution Decision to include all grounds raised in the Petition. Paper 15. After receiving authorization from the Board, Patent Owner filed a Supplemental Patent Owner Response addressing the previously non-instituted grounds, (Paper 18, “Suppl. PO Resp.”)¹ and Petitioner filed a Reply (Paper 24).

An oral hearing was held on September 20, 2018, and a transcript of the hearing has been entered into the record of the proceeding. Paper 30 (“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. For the reasons that follow, we determine that Petitioner has not shown by a

¹ In the Supplemental Patent Owner Response, Patent Owner indicated Petitioner “agreed to drop” two grounds raised in the Petition. Suppl. PO Resp. 5 (referring to Grounds 7 and 8 in the Petition). Petitioner agrees. Tr. 4:8–10 (agreeing that Petitioner dropped Grounds 7 and 8 from the Petition). Because Petitioner has withdrawn Grounds 7 and 8 from the Petition, we do not address them in this Final Written Decision.

preponderance of the evidence that claims 1–18 of the '331 patent are unpatentable.

II. BACKGROUND

A. *Related Proceedings*

The parties indicate that the '331 patent is involved in *Certain Magnetic Tape Cartridges and Components Thereof* (ITC Investigation No. 337-TA-1036). Pet. 1; Paper 4, 1. Patent Owner further identifies the following litigation as related: *Sony Corporation v. Fujifilm Holdings Corporation*, Civil Action No. 1:16-cv-25210 (S.D. Fla.). Paper 4, 1.

B. *The '331 Patent*

The '331 patent, titled “Magnetic Recording Medium Having Narrow Pulse Width Characteristics,” issued on October 3, 2006. Ex. 1001, at [54], [45]. The '331 patent discloses a dual-layer magnetic recording media having a magnetic layer that “includes a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment material having a coercivity of at least about 2000 Oe, and an average particle size of less than about 100 nm, and a binder system therefor.” *Id.* at 2:65–3:4. As a result, the magnetic recording media “exhibit narrower pulsewidth characteristics and lowered remanence-thickness product.” *Id.* at 1:16–18.

The '331 patent explains that pulsewidth, “often abbreviated as ‘PW50,’” is one measure of magnetic media performance (*id.* at 2:36–37), and

is tested by recording a signal on a magnetic recording medium at a sufficiently low density that the transitions are isolated from one another; i.e., they do not interact or interfere with one another. The amplified, unequalized and unfiltered signal from the read head is displayed on an oscilloscope and the width along the time axis of the resulting positive and/or negative

pulses halfway from the baseline to their peaks is measured. This time interval is multiplied by the tape transport speed to obtain the pulsewidth, as a distance.

Id. at 3:39–48. According to the '331 patent, remanence-thickness product “is abbreviated Mr^*t , and means the product of the remanent magnetization after saturation in a strong magnetic field (10 kOe) multiplied by the thickness of the magnetic coating. This value is measured in memu/cm^2 .” *Id.* at 3:49–53.

The '331 patent discloses that the recording medium preferably has a PW50 of less than about 500 nm, and a Mr^*t of less than about $5.0 \text{ memu}/\text{cm}^2$. *Id.* at 3:4–8. The '331 patent describes the preparation of several examples, and Table 1 provides physical attributes and PW50 results for those examples. *Id.* at 10:1–11:10.

C. Challenged Claims

Petitioner challenges claims 1–18 of the '331 patent. Claims 1 and 16 are the only independent claims challenged. Claim 1 is representative, and is reproduced below:

1. A dual-layer magnetic recording medium comprising a non-magnetic substrate having a front side and a back side, a lower support layer formed over the front side and a magnetic upper recording layer formed over said lower support layer, the magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment having a coercivity of at least about 2300 Oe, the magnetic pigment particles having an average particle length of no more than about 80 nm, and a binder for the pigment, wherein said medium has a remanence-thickness product, Mr^*t , of less than or equal to about $2.84 \text{ memu}/\text{cm}^2$, an orientation ratio greater than about 2.0, and a PW50 of less than or equal to about 384 nm.

Ex. 1001, 11:14–27. Claim 16 is substantially similar to claim 1, but requires a coercivity of at least about 2500 Oe, a $M_r \cdot t$ of less than or equal to about 2.12 memu/cm^2 , and PW50 of less than or equal to about 366 nm. *Id.* at 12:25–38.

D. References

Aonuma, JP 2001-319315A, published Nov. 16, 2001 (“Aonuma,” Ex. 1002 (certified translation); Ex. 1018 (original)).

Mori et al., JP 2002-74641A, published Mar. 15, 2002 (“Mori,” Ex. 1003 (certified translation); Ex. 1022 (original)).

Sasaki et al., JP 2000-40217A, published Feb. 8, 2000 (“Sasaki,” Ex. 1004 (certified translation); Ex. 1019 (original)).

Magnetic Recording, Volume I: Technology (C. Denis Mee & Eric. D. Daniel eds., 1987) (“Mee,” Ex. 1005).

E. Reviewed Grounds of Patentability

Reference(s)	Statutory Basis	Claims Challenged
Mori	§ 102	1–11, 13, and 16–18
Sasaki	§ 102	1–11 and 13–18
Aonuma and Mori	§ 103	1–18
Sasaki and Mori	§ 103	1–11 and 13–18
Mori and Aonuma	§ 103	12, 14, and 15
Mori and Sasaki	§ 103	14 and 15
Mori and Mee	§ 103	1–11, 13, and 16–18
Sasaki and Mee	§ 103	1–11, 13–18

III. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2016); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Absent a special definition for a claim term being set forth in the specification, claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Furthermore, “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.” *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioner proposes a specific construction for the following terms: “volume concentration,” “magnetic metallic particulate pigment,” “orientation ratio,” “remanence-thickness product,” PW50,” “hard resin component,” and “soft resin component.” Pet. 13–16. For several terms, Petitioner simply repeats explicit definitions recited in the ’331 patent. *E.g.*, *id.* at 14–15 (offering proposed constructions for “orientation ratio,” “remanence-thickness product,” and “PW50”). Patent Owner responds that “[f]or all terms . . . the plain and ordinary meaning of the claim language as used in the context of the patent specification is applicable.” PO Resp. 8.

In our Institution Decision, we determined that no express construction for the noted terms or phrases was needed. Inst. Dec. 6. After

reviewing the arguments in the Patent Owner Response and Supplemental Response, and Petitioner's Reply, we determine it is necessary at this stage to construe the term "volume concentration."

i. The Parties' Arguments on "Volume Concentration"

Independent claims 1 and 16, the only independent claims of the '331 patent, both recite "[a] dual layer magnetic recording medium comprising . . . a magnetic upper recording layer formed over [a] lower support layer, the magnetic upper recording layer comprising a *volume concentration* of at least about 35% of a primary magnetic particulate pigment." Ex. 1001, 11:14–20, 12:25–31 (emphasis added).

Petitioner states that the Specification "mentions [volume concentration] briefly," but acknowledges that it does not expressly define the term. Pet. 13 (citing Ex. 1001, 2:66). Petitioner asserts "[e]xtrinsic evidence supports using the recipe of materials used to form the magnetic layer in order to measure volume concentration," citing paragraph 84 of the Wang Declaration (Ex. 1017). *Id.* In paragraph 84 of his Declaration, Dr. Wang cites to page 212 of Exhibit 1014,² which defines "Pigment Volume Concentration" as "the ratio of the volume (skeleton) of pigment to the volume of total solids." Ex. 1014, 212; Ex. 1017 ¶ 84. Dr. Wang relies on this definition to support his opinion that "one commonly used meaning of [volume concentration] focuses on the recipe used to form the magnetic layer." Ex. 1017 ¶ 84 (citing Ex. 1014, 212). Dr. Wang also states that the '331 Patent sets forth a recipe-based formulation for the composition of the magnetic layer. *Id.* Petitioner and Dr. Wang, therefore, contend that the

² H.F. Huisman & H.J.M. Pigmans, *Dispersion of Magnetic Pigments III, A Kneader Investigation*, J. DISPERSION SCI. AND TECH., 7(2), 187–213 (1986).

broadest reasonable interpretation of volume concentration includes “the volume of the primary magnetic metallic particulate pigment divided by the volume of all materials that form the magnetic layer.” Pet. 13 (citing Ex. 1017 ¶ 84).

Patent Owner argues that there is a difference between the volume fraction of magnetic particles in the formed magnetic layer itself (referred to as the “packing fraction”), and the volume fraction of the materials that make up the slurry used to form the magnetic layer (referred to as the “pigment volume concentration”). PO Resp. 29–30 (citing Ex. 2009³). According to Patent Owner, “[t]he pigment-volume concentration is the volume occupied by the particles as related to the nonvolatile components of a dispersion, while the packing fraction relates to the ratio of the magnetic volume to the overall volume of the coating.” *Id.* at 29 (citing Ex. 2009, 3.46–3.47). Thus, whereas the pigment volume concentration can be determined from the materials that make up the slurry, packing fraction is determined after the magnetic layer is formed by dividing the volume of the primary magnetic particles in the magnetic layer by the total volume of the finished magnetic layer. *See* Ex. 2001 (Declaration of Dr. Bain, Patent Owner’s Declarant) ¶ 123 (explaining the difference between pigment volume concentration and packing fraction).

According to Patent Owner, “[c]ritically, there is not a one-to-one correspondence between pigment volume concentration and packing fraction, and in some cases, attempting to increase packing fraction by increasing pigment volume concentration in the coating material can result

³ Magnetic Recording Technology (C. Denis Mee & Eric. D. Daniel eds., 2nd ed. 1996), Chapter 3.

in detrimental effects.” PO Resp. 30–31. Dr. Bain, Patent Owner’s Declarant, testifies that “when the packing fraction and the pigment-volume concentration disagree, it is because air filled voids exist within the tape layer,” and that “it is appropriate to consider these air-filled voids as additional non-magnetic material within the tape layer.” Ex. 2001 ¶ 123.

Patent Owner asserts that “[s]ince the ’331 patent refers to a ‘magnetic upper recording layer . . . comprising a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment,’ in this case we are concerned with the volume fraction that actually occurs in the tape.” PO Resp. 30. Patent Owner thus argues that the volume fraction of the materials that make up the slurry, or pigment volume fraction, is not relevant to the claims of the ’331 patent. *Id.*

In its Reply, Petitioner argues that the term “volume concentration” can refer to pigment volume concentration and packing fraction. Reply 2–4. Petitioner explains that (1) pigment volume concentration is a measurement taken before a magnetic layer is formed, uses the recipe of materials of the slurry used to prepare the magnetic layer, and does not consider voids in the magnetic layer, and (2) packing fraction is determined after a magnetic layer is formed by dividing the volume of the primary magnetic particles by the volume of the magnetic layer, and is inclusive of any voids in the magnetic layer. *Id.* Petitioner also acknowledges that the two measurements agree up to about 30% and then begin to diverge. *Id.* at 3 (citing Ex. 2009, Figure 3.28).

Petitioner, however, argues that Patent Owner improperly attempts to exclude pigment volume concentration from the meaning of “volume concentration,” as used in claim 1. *Id.* at 4. Rather than Patent Owner’s

narrow construction, Petitioner maintains its position that the broadest reasonable interpretation of volume concentration should at least include pigment volume concentration. *Id.* at 4–7.

Specifically, Petitioner contends the plain meaning of the phrase “volume concentration” should control, noting that “pigment volume concentration” “shares vocabulary” with claim 1, which recites “volume concentration.” *Id.* at 4. Petitioner also argues that Patent Owner’s narrow construction, which includes only packing fraction, is incorrect because it ignores the fact that the term “packing fraction” does not appear in the ’331 patent. *Id.* at 5. Additionally, Petitioner notes that the ’331 patent does not set forth instructions for making and testing a physical example necessary to determine packing fraction, but does provide a recipe for the slurry used to form the magnetic layer, which a person of ordinary skill in the art could use to determine pigment volume concentration. *Id.* at 5–6. This, according to Petitioner, is further evidence that the proper construction of volume concentration at least includes pigment volume concentration. *Id.*; Pet 12–13; *see also* Ex. 1017 ¶ 84 (Dr. Wang stating that the ’331 patent sets forth a recipe-based formulation for the composition of the magnetic layer, which supports his interpretation).

ii. Analysis

The parties appear to agree that the phrase “volume concentration,” on its own, can refer to the concentration of a particle in the magnetic layer itself (i.e., packing fraction, a final product-based value), or the concentration of a particle in the slurry used to make the magnetic layer (i.e., pigment volume concentration, a recipe-based value). Reply 2–3; PO Resp. 38 (arguing that “[t]he volume concentration of the slurry is not the type of

‘volume concentration’ recited in claim 1”); Ex. 2001 ¶ 122 (Dr. Bain stating that “Dr. Wang calculates the volume concentration of Mori based on a recipe describing the nonvolatile constituents in the coating slurry” and that “[w]hile this is a type of volume concentration, it is not the type of volume concentration claimed in the ’331 patent, which relates to the volume concentration that actually occurs in the magnetic layer of the tape.”); *see also* Ex. 1014, 212 (providing definitions for “Pigment Volume Concentration” and “Packing Factor”); Ex. 2009, 3.47 (discussing pigment volume concentration and packing fraction). There is also no dispute that the volume concentration of a particle in the magnetic layer (packing fraction) may be different from the volume concentration of a particle in the slurry used to create the magnetic layer (pigment volume concentration). Reply 3–4; PO Resp. 29–31. Dr. Bain explains that differences between the packing fraction and pigment volume concentration occur due to air-filled voids present within the tape layer. Ex. 2001 ¶ 123. Petitioner does not challenge this testimony, and acknowledges that pigment volume concentration does not consider voids in the magnetic layer, whereas packing fraction does. Reply 3 (citing Ex. 1014, 27).

Although the extrinsic evidence suggests that “volume concentration” can have either the recipe-based definition relied upon by Petitioner or the final product-based definition relied upon by Patent Owner, the intrinsic evidence shows that only one of these definitions is appropriate in the context of the ’331 patent.

We begin by looking at the language of claim 1.⁴ *Translogic*, 504 F.3d at 1257–1258; *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998) (“[T]he name of the game is the claim.”). Claim 1 recites a magnetic recording medium having “a magnetic upper recording layer formed over [a] lower support layer, the magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment.” Ex. 1001, 11:16–20. The language of the claim thus requires a finished product, a magnetic recording medium, having a formed magnetic layer with specific properties, namely a specific volume concentration of the metallic pigment in the magnetic layer. *Id.*; *see also* Tr. 36:12–14 (Patent Owner: “[T]he claims are about a tape. . . . It’s about what the tape looks like when it is finished.”).

The Specification likewise discusses the volume concentration of the metallic pigment in the context of the formed magnetic layer of a magnetic recording medium. For example, the ’331 patent states that “[t]he present invention relates to magnetic recording media such as magnetic tapes, and more specifically to the magnetic layer of the media which contains particulate metallic pigments that have . . . a high volume concentration.” Ex. 1001, 1:12–16. In the Summary of the Invention, the ’331 patent again describes a magnetic recording medium wherein the “magnetic upper layer is disposed over the lower support layer on the front side of the substrate and includes a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment material.” *Id.* at 2:60–3:1.

⁴ Claim 16 contains the same language as claim 1. Thus, although we refer and cite to only claim 1, the same analysis applies to claim 16.

Other references to volume concentration in the Specification of the '331 patent are similarly found in the context of the formed magnetic layer of a finished magnetic recording medium. *E.g.*, Ex. 1001, 3:9–15 (“Another aspect of the invention provides a dual-layer magnetic recording medium comprising . . . [an] upper magnetic layer including a volume concentration of at least about 40% of a primary magnetic metallic particulate pigment material”); 4:33–35 (“The pigment is present in the upper magnetic layer in a volume concentration of at least about 35%”).

Therefore, the words of the claim coupled with the Specification help define the term “volume concentration.” In the context of the '331 patent, “volume concentration” refers to the volume concentration of the magnetic particles *in the formed magnetic layer*.

Petitioner argues that “volume concentration” in claim 1 should include “pigment volume concentration” because both phrases contain the words “volume” and “concentration.” Reply 4. We disagree. Petitioner’s isolation of the phrase “volume concentration” ignores the other language in claim 1 and the Specification that refer to volume concentration in the context of the formed magnetic layer of a magnetic recording medium.

We are also unpersuaded by Petitioner’s argument that its interpretation is “guided by the intrinsic record, as the words ‘pigment’ and ‘volume concentration’ recited in the claims of the '331 Patent find support in the specification.” Reply 5. Petitioner’s own evidence shows that the term that has the interpretation advocated by Petitioner is the complete phrase “pigment volume concentration,” which has a specific meaning in the art, and not the isolated terms, “pigment” and “volume concentration.” Ex. 1014, 212. This undermines Petitioner’s attempt to support its proposed

construction based on the use of the words “pigment” and “volume concentration” separately in claim 1 and the Specification. It also undermines Petitioner’s argument that “packing fraction” is not the broadest reasonable construction because the phrase “packing fraction” does not appear in the Specification. Reply 5. As neither “packing fraction” nor “pigment volume concentration” appears in the ’331 patent, we construe “volume concentration” according to the plain meaning of the words of the claim when read in view of the Specification.

The Specification discusses “volume concentration” in the context of the formed magnetic layer of a finished magnetic recording medium. *E.g.*, Ex. 1001, 1:12–16, 2:60–3:1, 3:9–15, 4:33–35. Claim 1 likewise requires the magnetic layer of a finished magnetic recording medium to comprise a specific volume concentration of metallic particles. *Id.* at 11:12–16. By way of contrast, Petitioner would have us interpret claim 1 to include a magnetic layer *formed from a composition comprising* a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment. But that language is different from what actually appears in claim 1 and the Specification.

Petitioner also argues that Patent Owner’s construction is incorrect because a person of ordinary skill in the art would have to construct a physical example and then subject it to magnetic testing to determine packing fraction, and, according to Petitioner, instructions for such construction and testing are not disclosed in the ’331 patent. Reply 5–6. In support of its proposed construction, Petitioner argues that a person of ordinary skill in the art could determine pigment volume concentration simply by considering a recipe disclosed in a document. *Id.*

The '331 patent, however, does disclose information regarding the preparation of the magnetic layer of the magnetic recording media. *See, e.g.*, Ex. 1001, 4:20–6:52, 10:1–54. Additionally, evidence of record suggests a person of ordinary skill in the art would have known how to determine the packing fraction of metallic particles in the magnetic layer of a magnetic recording medium based on porosity measurements. *See* Ex. 1008, 41 (showing a table that includes a porosity value); Tr. 36:4–21 (discussing the porosity measurement in Ex. 1008). Further, Petitioner's argument is inconsistent with the '331 patent, which describes the ingredients of the magnetic layer and discloses ranges of amounts by weight (Ex. 1001, 3:22–12, 4:36–53, 5:3–6:52, 10:14–28), but does not disclose any specific recipes or formulations from which pigment volume concentration could be calculated. Moreover, although Dr. Wang testifies that the '331 patent sets forth a “recipe based formulation,” he does not cite to any specific recipe or otherwise explain how a person of ordinary skill in the art could have determined pigment volume concentration based on the information presented in the '331 patent. And Petitioner acknowledges that the '331 patent does not contain any additional information regarding calculating pigment volume concentration. Tr. 9:19–23.

iii. Conclusion

In view of the foregoing, we assign the plain and ordinary meaning to the phrase “volume concentration” in the context of the '331 patent. In the context of the claims and Specification, the plain and ordinary meaning of “volume concentration” refers to the volume concentration of metallic particulate pigment in the magnetic layer itself, i.e., a final product-based value as opposed to a recipe-based value.

B. Person Of Ordinary Skill in the Art

Petitioner defines a person of ordinary skill in the art as having at least one of the following qualifications:

(1) a bachelor's degree in materials science, physics, electrical engineering, mechanical engineering, chemistry, or a closely related field, and at least five years of experience in the field of magnetic recording, or (2) a Master's degree or higher in materials science, physics, electrical engineering, mechanical engineering, chemistry, or a closely related field, with an emphasis in magnetic recording, and at least three years of experience in the field of magnetic recording.

Pet. 12; Ex. 1017 ¶ 60. Although Patent Owner does not expressly define the appropriate level of skill in the art in the Patent Owner Response or its Supplemental Response, Patent Owner's declarant, Dr. Bain, presents a definition of a person of ordinary skill in the art in his declaration that is nearly identical to Petitioner's definition. Ex. 2001 ¶ 44. In view of this, for purposes of this Decision, we adopt Petitioner's definition of a person of ordinary skill in the art.

C. Prior Art References

i. Mori (Ex. 1003)

Mori is directed to providing "a particulate magnetic recording medium exhibiting a high [carrier to noise (C/N)] ratio in high-density magnetic recording (particularly when employing an MR head for reproduction) as well as good durability." Ex. 1003 ¶ 3. Mori discloses a dual-layer magnetic recording medium having a lower layer containing a non-magnetic powder and a magnetic layer containing a strongly magnetic powder. *Id.* ¶ 4. Mori further discloses embodiments of its invention, setting forth the "detailed contents" of the lower layer and magnetic layer in each. *Id.* ¶¶ 45–46.

Mori teaches that limiting the thickness of the magnetic upper layer and using a magnetic powder with a mean long axis length less than or equal to 0.1 μm and a saturation magnetization equal to or less than 120 $\text{A}\cdot\text{m}^2/\text{kg}$ can increase the C/N ratio. *Id.* ¶¶ 5–6. Mori further teaches using a coercivity equal to or greater than 167 kA/m (2,100 Oe) to maintain stable recording magnetization. *Id.* ¶ 8. Mori teaches that the “level of residual magnetization” of the magnetic layer preferably ranges from 5–50 $\text{mT}\cdot\mu\text{m}$ (*id.* ¶ 10) and the magnetic recording medium has a squareness in the tape running direction equal to or higher than 0.70 (*id.* ¶ 42).

ii. *Sasaki (Ex. 1004)*

Sasaki is directed to a “magnetic recording medium suitable for high-density recording.” Ex. 1004 ¶ 1. To achieve this, Sasaki teaches

providing a magnetic recording medium furnished with a lower layer on a support and an upper magnetic layer thereupon formed by dispersing ferromagnetic powder and nonmagnetic powder in binder, which magnetic recording medium uses an aforesaid upper magnetic layer wherein the thickness is no greater than 0.2 μm , the product of remanent flux density of said upper magnetic layer and the thickness of said upper magnetic layer is 0.005~0.045 $\text{T}\cdot\mu\text{m}$, the coercivity of said upper magnetic layer is 170~280 kA/m, the average particle size of the aforesaid magnetic powder is 0.01~0.12 μm , and the average particle size of the aforesaid nonmagnetic powder is no less than 1/10 the thickness of the aforesaid upper magnetic layer but no greater than 0.1 μm .

Id. ¶ 7. Sasaki discloses several examples, and lists the ingredients and procedures used to form each “embodiment” and “comparative” example.

Id. ¶¶ 26–40, Table 1. Sasaki also provides information regarding physical properties of the upper magnetic layer of each example, signal-to-noise ratio

(S/N) values for the magnetic tape formed using each example, and storage properties for each example. *Id.* ¶¶ 39–40, Tables 1 and 2.

iii. *Aonuma (Ex. 1002)*

Aonuma relates to a magnetic recording medium for recording computer data, and particularly a medium that can be used in a playback system that uses a magnetoresistive (MR) playback head. Ex. 1002 ¶ 1. Aonuma aims to provide a magnetic recording medium that has good electromagnetic conversion characteristics, durability, and storage stability, yields a high S/N ratio, achieves high-density recording, and is capable of rapid data transfer. *Id.* ¶¶ 9–10. Aonuma teaches that it is possible to manufacture the desired magnetic recording medium by “setting the thickness of the magnetic layer to a specific range relative to the prior art and specifying the remanent flux and [orientation ratio] of the magnetic layer of the magnetic recording medium.” *Id.* ¶ 10. In particular, Aonuma discloses

the average thickness of the magnetic layer is within the range of 0.15~0.25 μm , the remanent flux of the magnetic layer is within the range of 50~60mT* μm , the reduction in remanent flux of the magnetic layer after one week of storage at 60°C, 90% RH is less than 1%, and the OR (squareness ratio in the tape length direction/squareness ratio in the tape width direction) of the magnetic layer is 2.0 or greater.

Id. ¶ 11.

Aonuma discloses several examples, and lists the ingredients and procedures used to form each “embodiment” and “comparative” example. *Id.* ¶¶ 105–122, Tables 1 and 2. Aonuma also provides information regarding physical properties of the upper magnetic layer and overall magnetic tape for each example. *Id.* ¶¶ 118–122, Tables 1 and 2.

iv. Mee (Ex. 1005)

Mee is directed to “establishing the underlying technologies that are common to all forms of magnetic recording.” Ex. 1005, viii. Mee includes several chapters that address different aspects of magnetic recording, including the processes by which recording and reproduction take place, and materials, design, and fabrication of magnetic media. *Id.*

D. Claims 1–11, 13, and 16–18: Anticipation by Mori

Petitioner contends that claims 1–11, 13, and 16–18 are unpatentable under 35 U.S.C. § 102 as anticipated by Mori. Pet. 16–34. Petitioner relies on the Wang Declaration in support of its contentions. *Id.*

Claim 1 requires, *inter alia*, a “magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment.” Ex. 1001, 11:12–16.

Petitioner first argues that Mori discloses the volume concentration requirement of claim 1 because Mori teaches “[t]he filling rate by volume of the strongly magnetic alloy powder in the magnetic layer can be equal to or higher than 30%, preferably equal to or higher than 35 percent, and still more preferably equal to or higher than 38 percent.” Ex. 1003 ¶ 11; Pet. 18–19. Petitioner contends that a person of ordinary skill in the art would understand that “filling rate by volume of magnetic particles” corresponds to the “volume concentration” in claim 1. Pet. 19; Ex. 1017 ¶ 114; Ex. 1003

¶¶ 11, 49 (Table 1). Petitioner emphasizes Mori’s use of the phrase “in the magnetic layer” in this statement as evidence that volume filling rate refers to the volume concentration of magnetic particles in the magnetic layer itself, i.e., the packing fraction. Reply 9–10. Petitioner also argues that even if the volume fill rate in Mori refers to pigment volume concentration, Dr. Bain admitted during his deposition that Mori discloses a volume concentration of greater than about 35%, as recited in claim 1, based on Figure 3.28 of Ex. 2009. *Id.* at 10–11 (citing Ex. 1026, 71:3–15, 72:23–74:5).

Second, Petitioner argues that a person of ordinary skill in the art would have been able to calculate the volume concentration of the magnetic metal particles in the magnetic layer using the recipe for the magnetic layer disclosed in Mori, which sets forth the proportions of each ingredient used to make the magnetic layer. Pet. 19–21 (citing Ex. 1003 ¶ 46). Based on Mori’s recipe, Petitioner calculates that the volume concentration of metallic particle pigment in the magnetic layer is 59.5%. *Id.* at 21.

Patent Owner contends that Mori fails to disclose the volume concentration requirement in claim 1. First, Patent Owner asserts that Mori does not clearly identify what “volume filling rate” refers to, but argues that it describes the ingredients used to make up the magnetic layer prior to it being formed, not the volume concentration of the metallic particles in the magnetic layer itself. PO Resp. 37–38; Ex. 2001 ¶ 121. Patent Owner similarly challenges Petitioner’s calculation of the volume concentration from the recipe for the slurry used to make the tape described in Mori. According to Patent Owner, “[t]he volume concentration of the slurry is not the type of ‘volume concentration’ recited in claim 1, because it is not the

volume concentration in the magnetic layer of the tape.” PO Resp. 38–39 (citing Ex. 2001 ¶¶ 122–123).

We are not persuaded by Petitioner’s arguments that Mori discloses “a magnetic upper recording layer . . . comprising a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment” as required by claim 1. Petitioner directs us to Mori’s disclosure of a “filling rate by volume of magnetic particles” and “magnetic material volume fill rate.” Pet. 18 (citing Ex. 1003 ¶¶ 8, 11, Table 1). It is not clear, however, whether Mori’s “fill rate”/“filling rate” is the same parameter as “volume concentration” recited in claim 1. Dr. Wang states that a person of ordinary skill in the art would understand it refers to “volume concentration” as recited in claim 1, but offers nothing to support that statement. Ex. 1017 ¶ 114. Such conclusory statements are entitled to little or no weight. 37 C.F.R. § 42.65(a).

Further, the use of the language “in the magnetic layer,” without more information, is not sufficient evidence to establish that Mori discloses the “volume concentration” recited in claim 1. Patent Owner does not dispute that there is some magnetic alloy present “in the magnetic layer” of Mori. The relevant question, however, is how much and how Mori’s disclosed values were determined. Unlike the term “volume concentration,” for which the parties offered undisputed evidence regarding accepted meanings of the term in the art (i.e., packing fraction and pigment volume concentration), we have not been directed to similar evidence regarding the phrase “fill rate”/“filling rate” in Mori. Thus, although Mori states “[t]he filling rate by volume of the strongly magnetic alloy powder *in the magnetic layer* can be equal to or higher than 30%” (Ex. 1003 ¶ 11 (emphasis added)), Petitioner

has not offered sufficient evidence demonstrating that the term “filling rate” in Mori refers to a final product-based value. As a result, we find that this language in Mori does not establish, by a preponderance of evidence, that Mori discloses the “volume concentration” recited in claim 1.

Nor are we persuaded by Petitioner’s argument that even if the 39.5% material volume fill rates disclosed in Mori correspond to the pigment volume concentration, Dr. Bain admitted during his deposition that Mori discloses “a volume concentration of greater than about 35%,” as required by claim 1. Reply 10. At his deposition, counsel for Petitioner asked Dr. Bain several questions about Figure 3.28 in Ex. 2009, reproduced below.

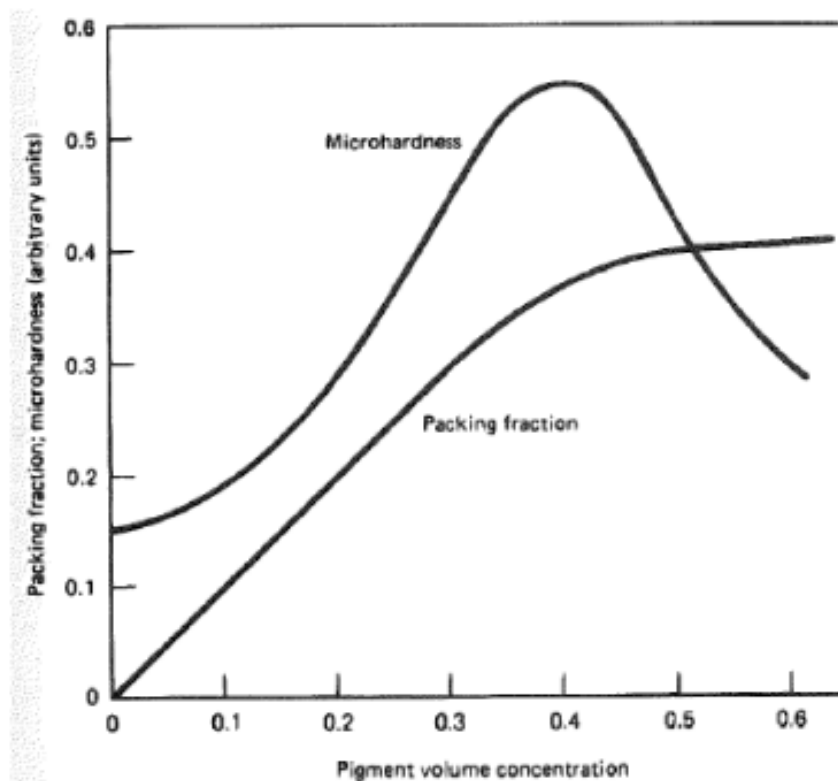


Figure 3.28 shows the “[s]chematic variation of packing fraction and microhardness with pigment-volume concentration of an as-dried coating.” Ex. 2009, 3.47. When asked what packing fraction corresponds to a pigment

volume concentration of 39.5% in Figure 3.28, Dr. Bain answered that it would be “approximately .4” or 40%. Ex. 1026, 73:9–22. Dr. Bain, however, qualified his answer, stating that his answer was limited to the specific data shown in Figure 3.28, and that he “wouldn’t jump from this figure to Mori without a lot of justification.” *Id.* at 73:23–74:21. According to Dr. Bain, Figure 3.28 is not a universal curve for all materials, and the point where the slope of the line breaks away from a one-to-one correspondence between packing fraction and pigment volume concentration is “very sensitive to the coating technology” used in a particular experiment. *Id.* at 73:9–74:21. As Petitioner has not provided evidence sufficient to demonstrate that Figure 3.28 of Exhibit 2009 is representative of the relationship between packing fraction and pigment volume concentration for all materials and all coating technologies, much less the specific materials and coating technologies used in Mori, we do not agree with Petitioner that Dr. Bain’s testimony amounts to an admission that Mori discloses the “volume concentration” limitation recited in claim 1.

Petitioner’s only remaining evidence that Mori discloses the “volume concentration” limitation in claim 1 is the volume concentration value it calculated based on the recipe recited in Mori. Pet. 19–21. This value, however, corresponds to the volume concentration of the magnetic particles in the slurry used to form the magnetic layer. For the reasons discussed above, Petitioner’s recipe-based calculations do not correspond to the “volume concentration” recited in claim 1.

For all of the foregoing reasons, we find that Petitioner has failed to demonstrate, by a preponderance of evidence, that Mori discloses “[a] dual layer magnetic recording medium comprising . . . a magnetic upper

recording layer formed over [a] lower support layer, the magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic particulate pigment,” as recited in independent claims 1 and 16. Ex. 1001, 11:14–20, 12:25–31. Claims 2–11, 13, 17, and 18 depend from claim 1 or claim 16, and, therefore, include the “volume concentration” limitation of claims 1 and 16. As a result, we find that Petitioner has failed to demonstrate that Mori discloses each limitation of claims 1–11, 13, and 16–18, and, therefore, has not demonstrated by a preponderance of evidence that Mori anticipates these claims.

E. Claims 1–11 and 13–18: Anticipation by Sasaki

Petitioner contends that claims 1–11 and 13–18 are unpatentable under 35 U.S.C. § 102 as anticipated by Sasaki. Pet. 34–47. Petitioner relies on the Wang Declaration in support of its contentions. *Id.*

As noted above, independent claims 1 and 16 require, *inter alia*, a “magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment.” Ex. 1001, 11:14–20, 12:25–31.

Petitioner argues Sasaki discloses a magnetic layer that includes ferromagnetic powders, and that the volume concentration of the ferromagnetic powders in Sasaki can be calculated from a recipe disclosed in paragraph 28 of Sasaki. Pet. 36–37. Based on Sasaki’s recipe, Petitioner calculates that the volume concentration of metallic particle pigment in the magnetic layer is 39.7%. *Id.* at 37.

Patent Owner challenges Petitioner’s calculation of the volume concentration from the recipe for the slurry used to make the tape described in Sasaki. PO Resp. 57–58. According to Patent Owner, “[t]he volume

concentration of the slurry is not the type of ‘volume concentration’ recited in claim 1, because it is not the volume concentration in the magnetic layer of the tape.” *Id.* (citing Ex. 2001 ¶¶ 227–228).

As discussed above with regard to Petitioner’s arguments based on Mori, Petitioner’s recipe-based volume concentration calculation corresponds to the volume concentration of the magnetic particles in the slurry used to form the magnetic layer. For the reasons discussed above, Petitioner’s calculated value does not correspond to the “volume concentration” recited in claims 1 and 16. Petitioner offers no other evidence demonstrating that Sasaki discloses the volume concentration limitation of claims 1 and 16.

For all of the foregoing reasons, we find that Petitioner has failed to demonstrate, by a preponderance of evidence, that Sasaki discloses “[a] dual layer magnetic recording medium comprising . . . a magnetic upper recording layer formed over [a] lower support layer, the magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic particulate pigment,” as recited in independent claims 1 and 16. Ex. 1001, 11:14–20, 12:25–31. Claims 2–11, 13–15, 17, and 18 depend from claim 1 or claim 16, and, therefore, include the “volume concentration” limitation of claims 1 and 16. As a result, we find that Petitioner has failed to demonstrate that Sasaki discloses each limitation of claims 1–11 and 13–18, and, therefore, has not demonstrated by a preponderance of evidence that Sasaki anticipates these claims.

F. Claims 1–18: Obvious in view of Aonuma and Mori

Petitioner argues that claims 1–18 are unpatentable under 35 U.S.C. § 103 as obvious in view of Aonuma and Mori. Pet. 47–62. Petitioner relies

on the Wang Declaration in support of its contentions. *Id.*

As noted above, independent claims 1 and 16 require, *inter alia*, a “magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic metallic particulate pigment.”

Ex. 1001, 11:14–20, 12:25–31.

Petitioner argues Aonuma discloses a magnetic layer that includes a ferromagnetic powder containing iron, cobalt, aluminum, yttrium, and magnesium, and that the volume concentration of the ferromagnetic powder in Aonuma can be calculated from a recipe disclosed in Aonuma. Pet. 48–50. Based on Aonuma’s recipe, Petitioner calculates that the volume concentration of the metallic particle pigment in the magnetic layer is 35.1%. *Id.* Petitioner contends this volume concentration applies to all of Aonuma’s examples. *Id.* at 51.

Patent Owner argues that Aonuma fails to expressly disclose the volume concentration recited in claim 1, i.e., the volume concentration in the magnetic layer of the tape itself. PO Resp. 48.

As discussed above with regard to Petitioner’s arguments based on Mori and Sasaki, Petitioner’s recipe-based volume concentration calculation corresponds to the volume concentration of the magnetic particles in the slurry used to form the magnetic layer. For the reasons discussed above, Petitioner’s calculated value does not correspond to the “volume concentration” recited in claims 1 and 16. Petitioner offers no other evidence demonstrating that Aonuma discloses the volume concentration limitation of claims 1 and 16.

For all of the foregoing reasons, we find that Petitioner has failed to demonstrate, by a preponderance of evidence, that the combined teachings

of Aonuma and Mori disclose or suggest “[a] dual layer magnetic recording medium comprising . . . a magnetic upper recording layer formed over [a] lower support layer, the magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic particulate pigment,” as recited in independent claims 1 and 16. Ex. 1001, 11:14–20, 12:25–31. Claims 2–15, 17, and 18 depend from claim 1 or claim 16, and, therefore, include the “volume concentration” limitation of claims 1 and 16. As a result, we find that Petitioner has failed to demonstrate that Aonuma and Mori disclose or suggest each limitation of claims 1–18, and, therefore, has not demonstrated by a preponderance of evidence that claims 1–18 are unpatentable as obvious over Aonuma and Mori.

G. Remaining Grounds Based on Aonuma, Mori, Sasaki, and Mee

Petitioner contends that the subject matter of claims 1–18 would have been unpatentable under 35 U.S.C. § 103 as obvious in view of one or more of Aonuma, Mori, Sasaki, and Mee. Pet. 62–63 (claims 1–11 and 13–18 obvious over Sasaki and Mori), 63–65 (claims 12, 14, and 15 obvious over Mori and Aonuma), 65 (claims 14 and 15 obvious over Mori and Sasaki), 68–69 (claims 1–11, 13, and 16–18 obvious over Mori and Mee), 69–70 (claims 1–11 and 13–18 obvious over Sasaki and Mee).

For all of these grounds, Petitioner relies on the same arguments presented above, namely that Aonuma, Mori, or Sasaki discloses “[a] dual layer magnetic recording medium comprising . . . a magnetic upper recording layer formed over [a] lower support layer, the magnetic upper recording layer comprising a volume concentration of at least about 35% of a primary magnetic particulate pigment.” Ex. 1001, 11:14–20, 12:25–31; *see, e.g.*, Reply 23–26. For the same reasons discussed above, we find that

Petitioner has failed to demonstrate, by a preponderance of evidence, that Mori, Sasaki, or Aonuma discloses this limitation of the claims. Petitioner does not present any evidence or arguments in its additional obviousness grounds to remedy the deficiencies discussed above. In particular, Petitioner does not argue that Mee discloses the volume concentration limitation in claims 1 and 16. Reply 25–26.

Accordingly, we find that Petitioner has failed to demonstrate, by a preponderance of evidence, that claims 1–18 would have been unpatentable under 35 U.S.C. § 103 as obvious in view of one or more of Aonuma, Mori, Sasaki, and Mee.

IV. CONCLUSION

For all of the foregoing reasons, we conclude that Petitioner has not demonstrated, by a preponderance of evidence, that claims 1–18 of the '331 patent are unpatentable under 35 U.S.C. §§ 102 or 103 in view of one or more of Mori, Sasaki, Aonuma, and Mee.

V. ORDER

For the reasons given, it is hereby

ORDERED that Petitioner has not shown by a preponderance of the evidence that claims 1–18 of the '331 patent are unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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