

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

TACTION TECHNOLOGY, INC.,
Patent Owner.

IPR2022-00058
Patent 10,820,117 B2

Before JUSTIN T. ARBES, SCOTT B. HOWARD, and
SCOTT RAEVSKY, *Administrative Patent Judges*.

ARBES, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

Petitioner Apple Inc. filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–15 of U.S. Patent No. 10,820,117 B2 (Ex. 1001, “the ’117 patent”) pursuant to 35 U.S.C. § 311(a). Patent Owner Taction Technology, Inc. filed a Preliminary Response (Paper 8, “Prelim. Resp.”) pursuant to 35 U.S.C. § 313. Petitioner also filed an explanation for filing

multiple petitions ranking its Petition in this proceeding ahead of its petition in Case IPR2022-00060 (Paper 3). Patent Owner filed a response (Paper 9).

Pursuant to 35 U.S.C. § 314(a), the Director may not authorize an *inter partes* review unless the information in the petition and preliminary response “shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” *See* 37 C.F.R. § 42.4(a) (2021) (“The Board institutes the trial on behalf of the Director.”). For the reasons that follow, we do not institute an *inter partes* review.

B. Related Matters

The parties indicate that the ’117 patent is the subject of *Taction Technology, Inc. v. Apple Inc.*, No. 3:21-cv-00812 (S.D. Cal.) (“the district court case”). *See* Pet. 84; Paper 5, 2. Petitioner filed another petition challenging claims 16 and 17 of the ’117 patent in Case IPR2022-00060, and filed two other petitions challenging claims of a related patent in Cases IPR2022-00057 and IPR2022-00059.

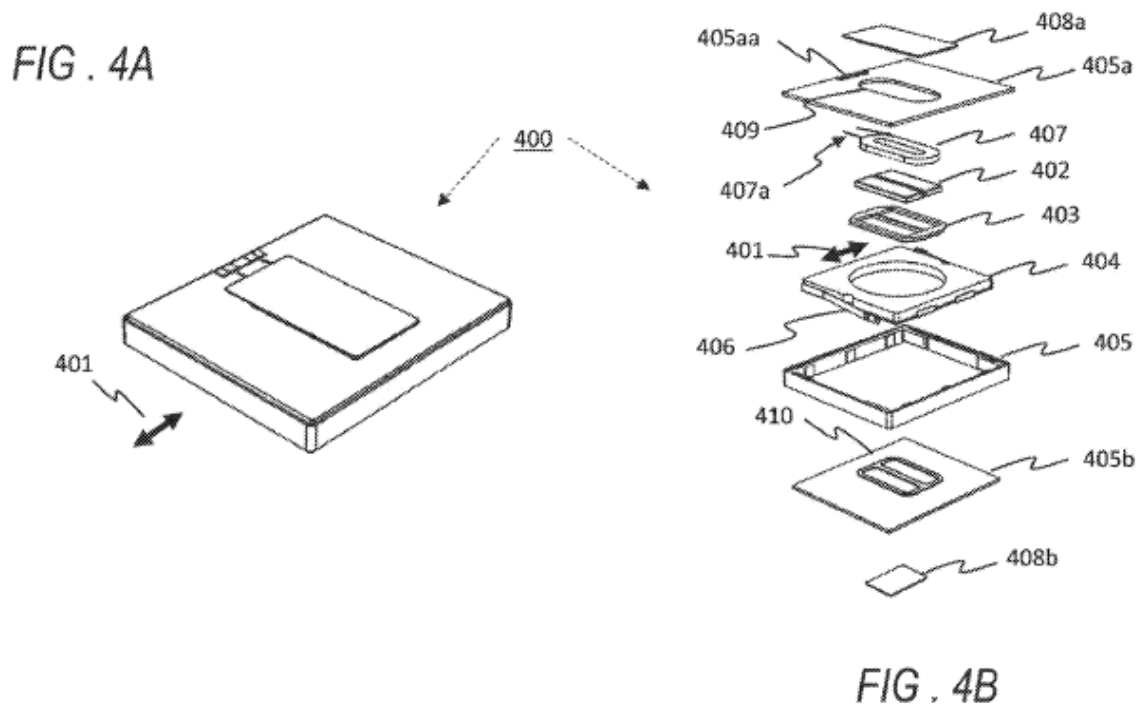
C. The ’117 Patent

The ’117 patent discloses a “vibration module” in, for example, a pair of headphones, for “applying vibrational tractions to a wearer’s skin.” Ex. 1001, code (57). The ’117 patent states that “[b]elow about 200 Hz, the lower the frequency of sound, the more it is perceived not only by vibration of the ear drum but also by touch receptors in the skin,” where “[t]he natural stimulus is both auditory and tactile, and a true reproduction of it is possible only when mechanical vibration of the skin accompanies the acoustic waves transmitted through the air to the ear drum.” *Id.* at col. 1, ll. 25–33.

Prior art tactile transducers to create such an effect used “axial shakers,” but were problematic because axial movement of the device would “plunge[] air into the listener’s ear canal,” generating unwanted acoustic noise. *Id.* at col. 1, ll. 34–56, Figs. 1, 2A. One prior art solution was to use a “low-profile, vibrating module which moves a mass in-plane” (rather than along the axis of the user’s ear), “effectively shear[ing] the skin, creating tactile sensation with little effect on the volume of air trapped between the ear cup and the ear drum.” *Id.* at col. 2, ll. 47–60. In-plane devices had various problems as well, such as being expensive and lacking the appropriate mechanical damping. *Id.* at col. 2, ll. 60–67. Another approach was to use “a relatively thin, flat arrangement of a coil and two magnets that produces planar motion.” *Id.* at col. 3, ll. 1–3. That approach had been used for haptic feedback in computer input devices, but had the drawback of “vulnerability of flexures to buckling when loaded by longitudinal compression.” *Id.* at col. 3, ll. 9–21.

The ’117 patent purports to overcome those problems with a vibration module that provides “damped electromagnetically actuated planar motion for audio-frequency vibrations.” *Id.* at col. 7, ll. 4–6. According to the ’117 patent, doing so “can advantageously speed a user’s reaction time by adding tactile sensations to audio provided by the headphone set” and “can also help to preserve the user’s hearing by lowering the user’s preferred acoustic listening level.” *Id.* at col. 8, ll. 61–67.

Figures 4A and 4B of the '117 patent are reproduced below.



Figures 4A and 4B depict, respectively, perspective and exploded views of damped planar electromagnetic vibration module 400. *Id.* at col. 8, ll. 6–9. “[V]ibration module 400 may be generally flat or planar so that it can easily be incorporated into the ear cup of a headphone, and provide a reciprocating force along axis 401 orthogonal to the thinnest dimension of the vibration module.” *Id.* at col. 8, ll. 9–14. The '117 patent discloses:

As shown in FIG. 4B, a pair of oppositely polarized magnets 402 can be held by a retainer 403 in a pocket or depression formed in mass 404, which may be suspended on flexures 406 within a frame or housing 405. Flexures 406 provide for movement of inertial mass 404 and magnets 402 along axis 401, which may be orthogonal to the thinnest dimension of the vibration module. Lateral forces can be imparted to magnets 402 by virtue of a Lorentz force generated by passing current through [a] coil 407, which is depicted in FIG. 4B as an elongated coil of conductive wire. Upper flux guide 408, which may be a piece of iron, or other suitable ferromagnetic material, adhered to or otherwise placed in close

proximity to coil 407, can guide the magnetic flux and act as a heat sink and means of retaining coil 407 in place within housing 405. For example, magnetic flux guide 408 can retain coil 407 in slot 409 formed in top plate 405a of housing 405 so that coil 407 is fixed with respect to frame 405. In some embodiments, a portion of the housing (e.g. top plate 405a in the embodiment depicted in FIG. 4) supporting the coil (e.g. coil 407) can be a printed circuit board with components to provide low-pass filtering of an audio signal and/or power amplification for driving the coil.

Id. at col. 8, ll. 16–37. Additionally, “movement of the mass 404 and magnets 402 may be damped by thin layer of viscous ferrofluid 410 retained in a gap between the magnets 402 and bottom plate 405b of housing 405.”

Id. at col. 8, ll. 38–41.

D. Illustrative Claim

Challenged claims 1 and 9 of the ’117 patent are independent. Claims 2–8 depend from claim 1, and claims 10–15 depend from claim 9. Claim 1 recites (with letter designations used in the Petition to refer to the various limitations):

1. An apparatus comprising:
 - [a] a housing;
 - [b] a plurality of conductive coils capable of carrying electrical current;
 - [c] a plurality of magnets arranged in operative proximity to the plurality of conductive coils;
 - [d] a moving portion comprising an inertial mass and the plurality of magnets;
 - [e] a suspension comprising a plurality of flexures that guides the moving portion in a planar motion with respect to the housing and the plurality of conductive coils;

[f] wherein vibration of the apparatus imparts vibrations to a user's skin;

[g] wherein vibration of the apparatus is damped by a viscous ferrofluid in physical contact with at least the moving portion;

[h] wherein the viscous ferrofluid reduces at least a resonance within a frequency range of 40–200 Hz in response to signals applied to the plurality of conductive coils;

[i] wherein said moving portion includes at least a pocket that provides space for at least a magnet;

[j] wherein each of said plurality of flexures is more resistant to motion transverse to a plane of the moving portion than it is to linear motion in the plane of the moving portion; and

[k] wherein said housing is generally cuboid in shape.

E. Evidence

Petitioner relies on the following prior art:

U.S. Patent No. 8,766,494 B2, filed Apr. 22, 2010, issued July 1, 2014 (Ex. 1005, “Park494”);

U.S. Patent No. 8,461,728 B2, issued June 11, 2013 (Ex. 1007, “Park728”);

U.S. Patent Application Publication No. 2009/0267423 A1, published Oct. 29, 2009 (Ex. 1006, “Kajiwara”); and

International Patent Application Publication No. WO 2011/013570 A1, published Feb. 3, 2011 (Ex. 1004, “Miyazaki”).¹

¹ We refer to “Miyazaki” as the English translation of the original reference. Petitioner provided a declaration attesting to the accuracy of the translation with Exhibit 1004. *See* 37 C.F.R. § 42.63(b).

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–15 of the ’117 patent are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	References/Basis
1–15	103	Miyazaki, Park494, Kajiwara
1–11, 13–15	103	Miyazaki, Park494, Park728
12	103	Miyazaki, Park494, Park728, Kajiwara

II. ANALYSIS

A. Legal Standards

A claim is unpatentable for obviousness if, to one of ordinary skill in the pertinent art, “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103(a) (2006)). The question of obviousness is resolved on the basis of underlying factual determinations, including “the scope and content of the prior art”; “differences between the prior art and the claims at issue”; and “the level of ordinary skill in the pertinent art.” *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Additionally, secondary considerations, such as “commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.” *Id.* When conducting an obviousness analysis, we consider a prior art reference “not only for what it expressly

teaches, but also for what it fairly suggests.” *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1049 (Fed. Cir. 2019) (citation omitted).

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. An obviousness determination requires finding “both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted); *see KSR*, 550 U.S. at 418 (for an obviousness analysis, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does”).

“Although the *KSR* test is flexible, the Board ‘must still be careful not to allow hindsight reconstruction of references . . . without any explanation as to *how* or *why* the references would be combined to produce the claimed invention.’” *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016) (citation omitted). Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); *accord In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that “conclusory statements” amount to an “insufficient articulation[] of motivation to combine”; “instead, the finding must be supported by a ‘reasoned explanation’” (citation omitted)); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner cannot employ

mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”).

B. Level of Ordinary Skill in the Art

Petitioner argues that at the time of the ’117 patent (September 2014), a person of ordinary skill in the art would have had

(i) a Bachelor’s degree (or higher degree) in an academic area emphasizing electrical engineering or mechanical engineering or a similar technical field; (ii) a working knowledge of computing devices and their associated hardware (including input/output devices) and software; and (iii) two to four years of experience designing and developing haptic interfaces and the associated technologies, including various damping techniques.

Pet. 2–4 (citing Ex. 1003 ¶¶ 70–73). Patent Owner responds that Petitioner’s proposed definition is “unreasonably high and not congruent with the technology of the ’117 patent,” and a person of ordinary skill in the art instead would have had

at least (1) a Bachelor’s degree in electrical engineering, mechanical engineering, physics, or a related course of study with at least two years of work experience in industry in the area of electromagnetic actuators or motors, or a related area of work or (2) a Master’s degree in electrical engineering, mechanical engineering, physics, or a related course of study, with at least one year of experience in industry in the area of electromagnetic actuators or motors.

Prelim. Resp. 19–21 (citing Ex. 2001 ¶¶ 66–69). Patent Owner argues that an ordinarily skilled artisan, however, “would . . . not have found the challenged claims obvious under either standard.” *Id.* at 21.

We are not particularly persuaded by either party’s evidence. The parties’ declarants offer conclusory opinions as to the level of ordinary skill

in the art for the '117 patent without identifying the specific evidence they relied upon in forming their opinion or showing their analysis of the facts. *See* Ex. 1003 ¶¶ 70–73; Ex. 2001 ¶¶ 66–69. Such testimony is entitled to little or no weight. 37 C.F.R. § 42.65(a).

That said, based on the record presented, we are persuaded by Patent Owner's argument that Petitioner's formulation is not commensurate with the technology of the '117 patent. Specifically, the claims of the '117 patent recite an “apparatus,” “apparatus for imparting vibrations,” or “apparatus for generating damped electromagnetically actuated planar motion.” We see nothing in the claims that would require “a working knowledge of computing devices and their associated hardware (including input/output devices) and software.” *See* Pet. 3–4. Instead, all that is required is a working knowledge of tactile transducers. *See* Ex. 1001, col. 1, ll. 20–21 (“The present invention relates to tactile transducers that produce bass frequency vibrations for perception by touch.”), col. 3, ll. 46–47 (“Therefore, there exists a need for novel audio-frequency tactile transducers and devices.”). This is also consistent with the prior art cited by Petitioner and its arguments.

Accordingly, we adopt Patent Owner's proposed definition of the level of ordinary skill in the art, except that we eliminate the term “at least” to eliminate vagueness as to the amount of practical experience. The qualifier expands the range indefinitely without an upper bound and thus precludes a meaningful indication of the level of ordinary skill in the art. We note, however, that our conclusions herein would be the same regardless of which party's definition is used.

C. Claim Interpretation

We interpret the challenged claims

using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b). Petitioner does not propose interpretations of any claim terms, but states that it “may assert” in the district court case that certain limitations in claims 1 and 9 are indefinite. Pet. 5–6. Patent Owner also does not propose interpretations of any claim terms. Prelim. Resp. 21–22. We conclude that no claim terms require interpretation to determine whether to institute an *inter partes* review in this proceeding. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“Because we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy,’ we need not construe [a particular claim limitation] where the construction is not ‘material to the . . . dispute.’” (citation omitted)).

D. Obviousness Ground Based on Miyazaki, Park494, and Kajiwara (Claims 1–15)

Petitioner contends that claims 1–15 are unpatentable over Miyazaki, Park494, and Kajiwara under 35 U.S.C. § 103(a), citing the testimony of Blake Hannaford, Ph.D., as support. Pet. 11–69 (citing Ex. 1003). Patent Owner responds, citing the testimony of Allison Okamura, Ph.D., as support. Prelim. Resp. 22–50 (citing Ex. 2001). We are not persuaded that Petitioner has established a reasonable likelihood of prevailing on this asserted ground.

1. Miyazaki

Miyazaki discloses a “vibrating motor provided with a movable portion that includes a permanent magnet and with a fixed portion that includes a coil.” Ex. 1004 ¶ 1. Figures 2 and 8 of Miyazaki are reproduced below.

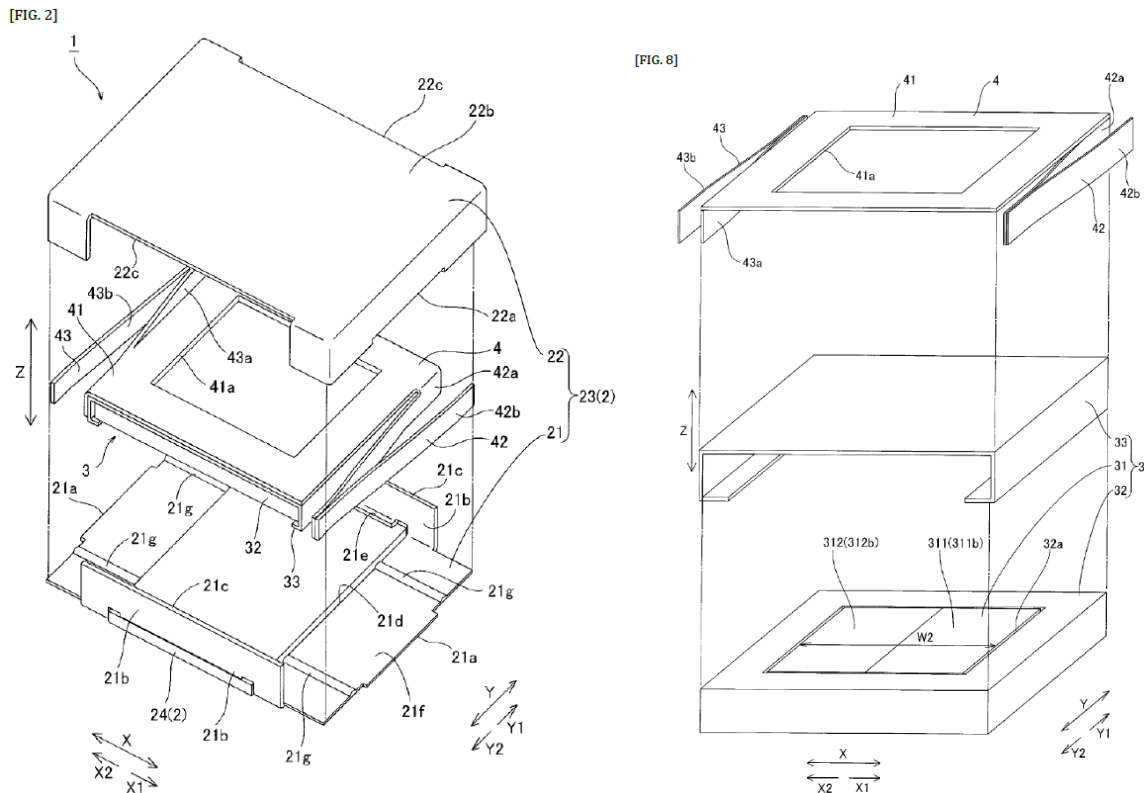


Figure 2 depicts an exploded perspective view of vibrating motor 1, and Figure 8 depicts a similar view “illustrating a movable portion and a spring member” of vibrating motor 1. *Id.* ¶¶ 10, 13, 23. Vibrating motor 1 comprises “a fixed portion 2, a movable portion 3 that vibrates relative to the fixed portion 2, and a spring member 4 that supports the movable portion 3 so as to enable vibration.” *Id.* ¶ 13. “[T]he fixed portion 2 includes a metal box-shaped case 23, made of a baseplate (lower case portion) 21 and an upper case portion 22, and a yoke-integrated coil portion 24 fixed to the baseplate 21.” *Id.* ¶ 14. “[T]he movable portion 3 is made of the permanent

160 surrounds stator 140 on the same planar surface. *Id.* at col. 3, ll. 21–26. When current flows in stator 140, vibrating unit 160 “may be smoothly vibrated if magnets (164a, 164b) are arranged in such a manner that a gravitational force is applied between any one of the magnets (164a) and the coil (140), and a repulsive force is applied between the other magnet (164b) and the coil (140).” *Id.* at col. 3, ll. 43–48. Elastic member 170 “elastically supports the vibrating unit (160) inside the housing” and transfers vibration generated by vibrating unit 160 to housing 110. *Id.* at col. 3, ll. 59–65.

Park494 discloses that

a magnetic fluid (180) may be coated on a bottom surface and an upper surface of the weight (161) respectively facing the pad (112) of the case (111) and the cover (116)[.] The magnetic fluid (180) contacts the pad (112) of the case (111) and the cover (116) to prevent the vibrating unit (160) from being inclined relative to the pad (112) and the cover (116). Furthermore, the magnetic fluid (180) serves as a damper for rapidly stopping the vibrating unit (160) when the vibrating unit (160) is to be stopped.

The magnetic fluid (180) is securely coupled to the magnetic body. To this end, the weight (161) is coupled with a support magnet (183), a periphery of which is coated with magnetic fluid (180). In order to insure a secure coupling of the support magnet (183), an external surface of the weight (161) is formed with a coupling groove (161a) insertedly coupled to the support magnet (183).

Id. at col. 4, ll. 20–35.

3. *Kajiwara*

Kajiwara discloses “an electromagnetic exciter that can be incorporated in thin mobile devices such as mobile phones.” Ex. 1006 ¶ 2.

The electromagnetic exciter comprises

a casing, a stator having an electromagnet and fixed in the casing, an oscillator having a permanent magnet, and an elastic support

member that positions the oscillator in horizontally-opposed relation to the stator at a distance between each other and that supports the oscillator oscillatably in a direction parallel to the stator. The elastic support member has a fixed portion fixed to the casing and a pair of arms extending from the fixed portion toward the stator along side surfaces of the oscillator to support the oscillator oscillatably. The oscillator is oscillated by an alternating magnetic field generated by application of an alternating voltage to the electromagnet of the stator.

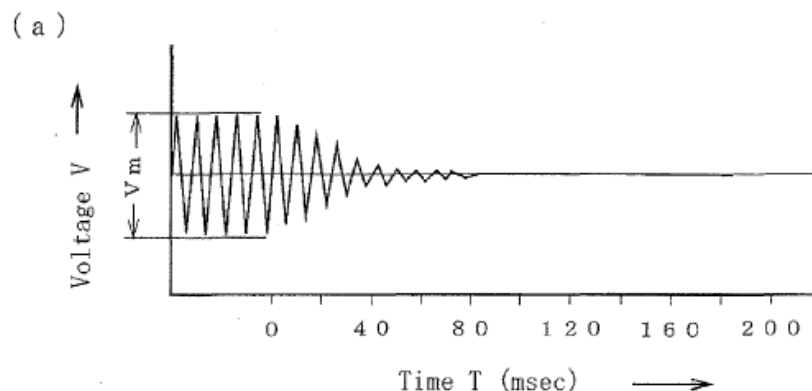
Id. ¶ 8. Electromagnetic exciter 1 includes elastic support members 4 with arms 4a and wedge-shaped deformable members 7 positioned between arms 4a and oscillator 20 to “damp vibration.” *Id.* ¶¶ 105–106, Figs. 17, 18.

“Any elastic material may be used to form the deformable members 7.

Examples of usable deformable members are vibration damping members of resin materials, such as silicone, urethane, fluorine resin and acrylic resins, and α gel and other vibration isolating materials.” *Id.* ¶ 105. Kajiwara states that when “there is no deformable member, when the supply of the driving signal is stopped, the oscillator 20, which has a large weight, vibrates freely by inertia,” but when “deformable members 7 are provided, an interfering effect occurs between the oscillator 20 and the elastic support member 4, and a damping action takes place.” *Id.* ¶ 106.

Figures 19(a) and (b) of Kajiwara are reproduced below.

[Fig. 19]



(b)

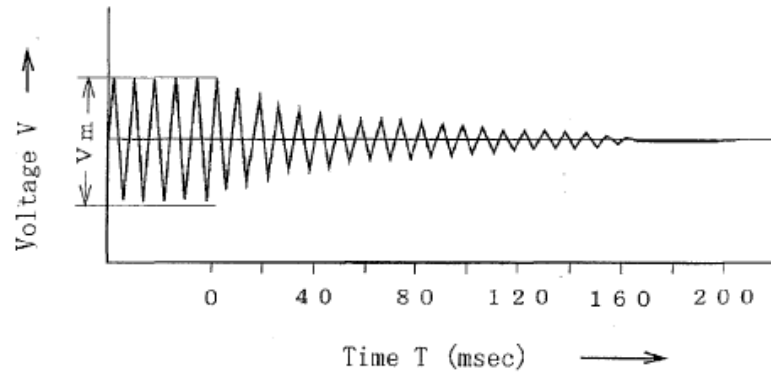


Figure 19(a) “is a graph showing the damped oscillation characteristics of an electromagnetic exciter provided with the deformable members” and Figure 19(b) “is a graph showing the damped oscillation characteristics of an electromagnetic exciter provided with no deformable members.” *Id.*

¶¶ 60–61. Figure 20 of Kajiwara is reproduced below.

[Fig. 20]

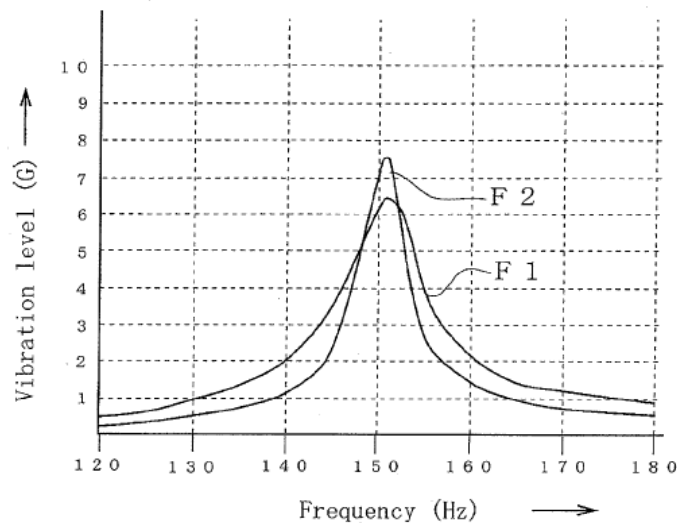


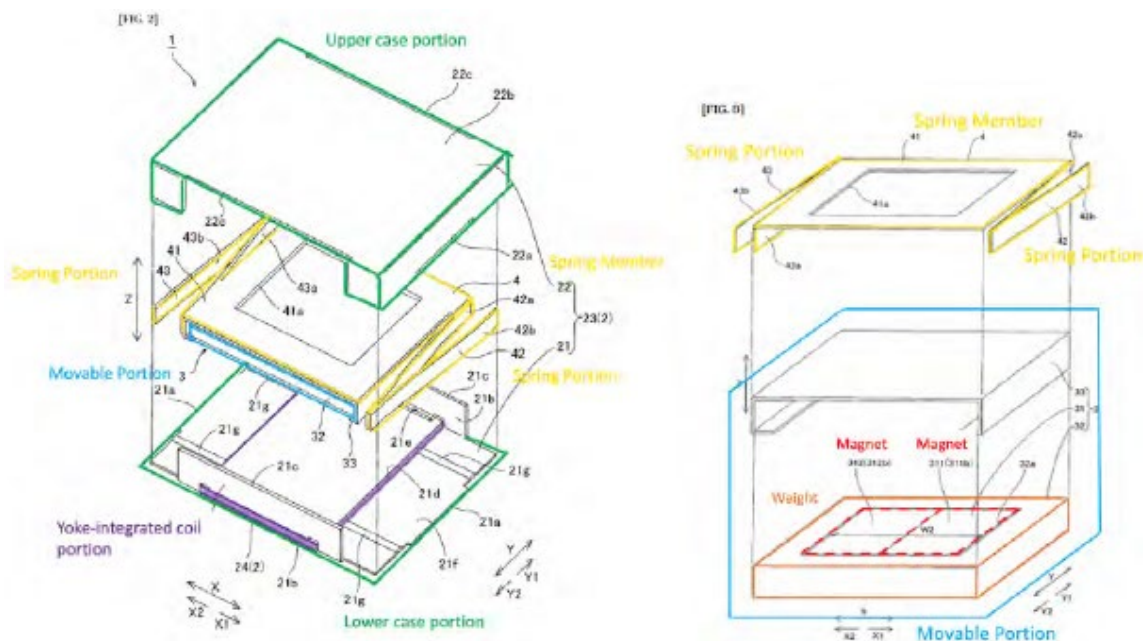
Figure 20 “shows the driving frequency characteristics of the electromagnetic exciter.” *Id.* ¶ 110. “The curve F1 shows the characteristics when the deformable members 7 are provided. The curve F2 shows the characteristics when the deformable members 7 are not provided.” *Id.*

“When the deformable members 7 are not provided, the resonance amplitude

is higher and the degree of sharpness Q is higher than those of the structure provided with the deformable members 7.” *Id.*

4. Claim 1

Petitioner argues that Miyazaki, Park494, and Kajiwara collectively teach all of the limitations of claim 1, and relies on Miyazaki as teaching the majority of the limitations. Pet. 11–47. Petitioner provides the following annotated versions of Figures 2 and 8 of Miyazaki. *Id.* at 12.



Annotated Figures 2 and 8 depict various structures in Miyazaki’s vibrating motor that Petitioner contends disclose components of the claim 1 apparatus, including a “housing” (case 23 shown in green), “plurality of conductive coils” (planar coils 25 and 26 shown in purple), “plurality of magnets” (first magnet 311 and second magnet 312 shown in red), “moving portion” (movable portion 3 shown in blue), “inertial mass” (weight 32 shown in orange), and “suspension” comprising a “plurality of flexures” (spring

member 4 comprising spring portions 42 and 43 shown in yellow). *Id.* at 12, 17–28.

Petitioner relies on Park494 and Kajiwara for two aspects of claim 1. First, limitation 1(g) recites that “vibration of the apparatus is damped by a viscous ferrofluid in physical contact with at least the moving portion.” Petitioner states that Miyazaki uses a “friction-based damping technique” using “rails for friction-based damping,” and Park494 uses magnetic fluid (which constitutes “viscous ferrofluid” according to Petitioner) for damping. *Id.* at 29–31. Petitioner argues that a person of ordinary skill in the art would have been motivated, based on the teachings of Park494, to “coat Miyazaki’s movable portion 3 with a magnetic fluid to damp the oscillations of the moving portion by rapidly stopping the vibrations of the moving unit when said moving portion is to be stopped.” *Id.* at 32–35.

Second, limitation 1(h) recites that “the viscous ferrofluid reduces at least a resonance within a frequency range of 40–200 Hz in response to signals applied to the plurality of conductive coils.” Petitioner argues that Miyazaki teaches that “movable portion 3 undergoes reciprocating motion by alternating linear movement.” *Id.* at 35 (quoting Ex. 1004 ¶ 33). According to Petitioner, a person of ordinary skill in the art “would have understood that Miyazaki teaches driving a moving portion at a predetermined frequency in response to a drive current (i.e., signal) that is applied to the coils.” *Id.* at 35–36 (citing Ex. 1003 ¶ 119).

Petitioner further argues that Kajiwara teaches that its linear vibration motor “operates within the frequency range of 120–180 Hz and has a resonance peak around 150 Hz.” *Id.* at 36 (citing Ex. 1006 ¶¶ 81, 121, Fig. 20). Petitioner also contends that Kajiwara teaches using a damping material (i.e., resin-based deformable members) that causes the vibration to

stop in less time than with the undamped version. *Id.* at 36–41 (citing Ex. 1006 ¶¶ 105–110, Figs. 19, 20; Ex. 1003 ¶¶ 52–55, 121–127).

According to Petitioner, “[b]ecause the reduction in resonance occurs at or around 150 Hz, this reduction in resonance occurs within the frequency range of 40–200Hz.” *Id.* at 40 (citing Ex. 1003 ¶¶ 125–126); *see also id.* at 40–41 (“Because Kajiwara teaches that the resonant frequency occurs around 150 Hz and that damping will directly result in the reduction of the amplitude at the resonance frequency, Kajiwara expressly discloses an example of a damping material that ‘reduces at least a [mechanical] resonance within a frequency range of 40–200 Hz.’” (quoting Ex. 1003 ¶ 127)).

Petitioner further asserts that a person of ordinary skill in the art “would have been motivated to implement the Miyazaki-Park494 vibrating motor such that it operated at least in a frequency range of 120–180 Hz, as taught by Kajiwara.” *Id.* at 41 (citing Ex. 1003 ¶¶ 128–132). In other words, Petitioner relies on Miyazaki for the underlying apparatus with a moving portion, Park494 for the recited “viscous ferrofluid” in contact with a moving portion, Kajiwara for the recited 40–200 Hz frequency range, and the combination of the three references for the full limitation 1(h). *Id.* at 29–32, 35–41. More specifically, Petitioner argues that because “Kajiwara discloses a frequency range for a vibrating motor for use in mobile devices,” and Miyazaki and Park494 disclose such devices but do not specify an operating frequency range, a person of ordinary skill in the art “would have been motivated to use the frequency range taught by Kajiwara in the Miyazaki-Park494 vibrating motor.” *Id.* at 42 (citing Ex. 1003 ¶ 129). Further, according to Petitioner, Kajiwara’s range of 120–180 Hz is within the known “optimal frequency range” of 100–300 Hz for “haptic actuators

used in mobile devices.” *Id.* (citing Ex. 1003 ¶¶ 64–68, 130). According to Petitioner, the overlap in ranges between the Miyazaki-Park494-Kajiwara combination of 120–180 Hz and the claimed range of 40–200 Hz creates a presumption of obviousness. *Id.* at 41 (citing *E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1006 (Fed. Cir. 2018)).

Patent Owner argues that it has overcome the presumption of obviousness associated with overlapping ranges. Prelim. Resp. 29–32. Specifically, Patent Owner argues that the ’117 patent teaches the criticality of the recited 40–200 Hz range. *Id.* at 31–32 (citing Ex. 1001, col. 9, ll. 25–44). Patent Owner argues that the Specification of the ’117 patent “notes the special concerns around the 40 Hz lower bound for reproducing the tactile response of an audio track” as well as the 200 Hz upper limit for perceiving sound via touch. *Id.* “By contrast, Kajiwara places no special emphasis on the frequency range of 120–180 Hz; it does not address why it was included in Fig. 20, nor how frequencies lower than 120 Hz might be reproduced.” *Id.* at 32. According to Patent Owner, “[i]n these circumstances, Kajiwara, alone or in combination with Miyazaki or Park494, is insufficient to render obvious the claimed results in the 40–200 Hz range.” *Id.* (citing Ex. 2001 ¶¶ 92–93).

In cases such as this where the claim recites an operative range, the United States Court of Appeals for the Federal Circuit “and its predecessor have recognized that ‘where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.’” *E.I. DuPont*, 904 F.3d at 1006 (quoting *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)). “A more specific application of this general principle is that ‘[a] *prima facie* case of obviousness typically exists when the ranges” recited in a claim “overlap

the ranges disclosed in the prior art.” *Id.* (quoting *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003)). As a result, “such overlap creates a presumption of obviousness.” *Id.*

However, “[t]here are several ways by which the patentee may rebut that presumption.” *Id.* One of the several ways identified by the Federal Circuit is by a patent owner showing that the claimed range is critical or special:

First, a modification of a process parameter may be patentable if it “produce[s] a new and unexpected result which is different in kind and not merely in degree from the results of the prior art.” *Aller*, 220 F.2d at 456. A claimed range that demonstrates such unexpected results is referred to as a “critical” range, and the patentee has the burden of proving criticality. *Id.*

Id.; see also *Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333, 1341–42 (Fed. Cir. 2020) (“One way in which the patentee may rebut the presumption of obviousness is by showing ‘that there is something special or critical about the claimed range.’” (quoting *E.I. DuPont*, 904 F.3d at 1006, 1008)); *E.I. DuPont*, 904 F.3d at 1006–1008 (placing the burden of production on the patent owner in an *inter partes* review).

In this case, Petitioner relies exclusively on overlapping ranges to show that Kajiwara teaches a “frequency range of 40–200 Hz.” *See* Pet. 41. If that was all the evidence in this case, i.e., absent rebuttal evidence from Patent Owner, that would have been sufficient to show a reasonable likelihood of obviousness of the recited “frequency range of 40–200 Hz.” *See E.I. DuPont*, 904 F.3d at 1006.

However, Patent Owner has come forward with sufficient evidence of the criticality of the recited 40–200 Hz range. *See* Prelim. Resp. 31–32 (citing Ex. 1001, col. 9, ll. 25–44). The ’117 patent discusses the criticality

of the range, with respect to both the lower 40 Hz limit and upper 200 Hz limit, to “reproduce the tactile component of a musical experience with previously unattainable high fidelity.” Ex. 1001, col. 9, ll. 25–44; *see also id.* at col. 1, ll. 25–27 (identifying 200 Hz as the highest frequency where sound is “perceived not only by vibration of the ear drum but also by touch receptors in the skin”). The ’117 patent discloses:

Below approximately 40 Hz, in sub-resonance frequencies 502, the output of vibration module 500 is constrained by the “travel limit” (e.g. travel limit 31 of FIG. 3A) because as voltage is increased, the mass (e.g. mass 304 of FIG. 3B) travels farther, and increasing the voltage too high results in the travel exceeding x_{max} and causes the mass to come into contact with the frame (e.g. housing 305 of FIG. 3B), producing an undesirable acoustic knocking sound. . . . The viscosity and volume of the damping fluid (e.g. viscous ferrofluid 410 of FIG. 4B) in vibration module 500 were adjusted to damp resonance that would be evident at 30-50 Hz, to achieve the relatively uniform, non-peaked, response evident in FIG. 5C between 40 and 200 Hz in range 503. The absence of resonant peak in the response makes it possible to reproduce the tactile component of a musical experience with previously unattainable high fidelity.

Id. at col. 9, ll. 25–44. By identifying that sounds below 200 Hz are perceived by both the ear and the skin and specifically noting the constraint of the travel limit at 40 Hz, the ’117 patent expressly teaches the criticality of the claimed range of 40–200 Hz. *See* Ex. 2001 ¶ 93 (Dr. Okamura testifying that “[a] person of ordinary skill in the art would have understood that the claimed 40–200 Hz range was specifically designed”).

Although the ’117 patent expressly teaches the criticality of the claimed range, neither Petitioner nor Dr. Hannaford addresses these teachings, instead relying solely on the fact that Kajiwara discloses a different, partially overlapping range with a particular resonant frequency.

See Pet. 41; Ex. 1003 ¶¶ 128–129. Accordingly, based on the record presented, Patent Owner’s evidence is sufficient to overcome the presumption of obviousness with respect to overlapping ranges.

Because Kajiwara does not teach or suggest the critical, claimed range of 40–200 Hz, Petitioner has not shown sufficiently that the combination of Miyazaki, Park494, and Kajiwara teaches or suggests limitation 1(h).² Accordingly, Petitioner has not shown a reasonable likelihood of prevailing on its assertion that claim 1 is unpatentable over Miyazaki, Park494, and Kajiwara.

5. *Claims 2–15*

Similar to limitation 1(h), claim 9 recites that “the viscous ferrofluid reduces at least a resonance within a frequency range of 40–200 Hz in response to signals applied to the plurality of conductive coils.” Petitioner relies on its earlier analysis regarding limitation 1(h). Pet. 59. Claims 2–8 depend from claim 1 and claims 10–15 depend from claim 9. Accordingly, Petitioner has not shown a reasonable likelihood of prevailing on its assertion that claims 2–15 are unpatentable over Miyazaki, Park494, and Kajiwara.

² Patent Owner makes a number of other arguments, including that Park494 does not teach “ferrofluid,” the frequency response of Kajiwara’s deformable members does not apply to ferrofluid or a device like the one described in Miyazaki, Petitioner has not shown a sufficient reason to combine the three references with a reasonable expectation of success, and the Petition should be denied under 35 U.S.C. §§ 314(a) and 325(d). Prelim. Resp. 22–29, 32–50, 60–68. In light of our decision to deny institution for the reasons discussed herein, we need not address these arguments.

*E. Obviousness Ground Based on Miyazaki, Park494, and Park728
(Claims 1–11 and 13–15)*

Petitioner contends that claims 1–11 and 13–15 are unpatentable over Miyazaki, Park494, and Park728 under 35 U.S.C. § 103(a). Pet. 69–81. We are not persuaded that Petitioner has established a reasonable likelihood of prevailing on this asserted ground.

1. Park728

Park728 discloses “a small-sized linear vibrator having a structure capable of generating a great vibratory force, outputting various types of vibrations in broadband and accurately coupling a magnet.” Ex. 1007, col. 1, ll. 13–17. Park728 states that “[t]he resonant frequency is related to the entire mass and strength of the system, such that the resonant frequency can be set up by changing mass and strength.” *Id.* at col. 4, ll. 63–65. Park728 further discloses that, for its disclosed linear vibrator, “the resonant frequency band is preferably determined within an 80~180 Hz band.” *Id.* at col. 4, ll. 66–67.

2. Analysis

Similar to its asserted ground based on the combination of Miyazaki, Park494, and Kajiwara, Petitioner relies on Miyazaki for the majority of the limitations of claim 1, relies on Park494 as teaching the “viscous ferrofluid” of limitation 1(g), and relies on Park728 (rather than Kajiwara) as teaching the “frequency range of 40–200 Hz” of limitation 1(h). Pet. 69–78.

With respect to limitation 1(h), Petitioner argues that “Park728 teaches that ‘the resonant frequency band [of its disclosed linear vibrator] is preferably determined within an 80~180 Hz band.’” *Id.* at 73 (quoting

Ex. 1007, col. 4, ll. 66–67). Petitioner also argues that Park728 teaches a resonant peak that occurs at around 175 Hz and the “optimal frequency range for haptic actuators” used in mobile devices was 100–300 Hz. *Id.* at 73–75 (citing Ex. 1007, col. 1, ll. 40–44, Fig. 5; Ex. 1003 ¶¶ 64–68, 172–174). According to Petitioner, Park728’s range of 80–180 Hz overlaps the 40–200 Hz range recited in claim 1 of the ’117 patent and that “overlap in ranges creates a presumption of obviousness.” *Id.* at 77–78 (citing *E.I. DuPont*, 904 F.3d at 1006).

Patent Owner makes the same argument discussed above regarding the overlap in ranges, asserting that “disclosure of an entirely different frequency range does not, in the specific context of this claim limitation and the motivations for it found in the ’117 patent specification, disclose [or] render obvious the claimed 40–200 Hz range.” Prelim. Resp. 56–57. We agree for the reasons explained above. *See supra* Section II.D.4. Because Park728 does not teach or suggest the critical, claimed range of 40–200 Hz, Petitioner has not shown sufficiently that the combination of Miyazaki, Park494, and Park728 teaches or suggests limitation 1(h).³ Accordingly, Petitioner has not shown a reasonable likelihood of prevailing on its assertion that claim 1 is unpatentable over Miyazaki, Park494, and Park728. For the same reason, Petitioner has not shown a reasonable

³ Again, Patent Owner makes a number of other arguments disputing the asserted ground, including that Park494 does not teach “ferrofluid,” Park728’s magnetic fluid does not provide any damping, the frequency response of Park728’s device does not apply to ferrofluid or a device like the one described in Miyazaki, Petitioner has not shown a sufficient reason to combine the three references with a reasonable expectation of success, and the Petition should be denied under 35 U.S.C. §§ 314(a) and 325(d). Prelim. Resp. 51–68. In light of our decision to deny institution for the reasons discussed herein, we need not address these arguments.

likelihood of prevailing on its assertion that claims 2–11 and 13–15 are unpatentable over Miyazaki, Park494, and Park728. *See* Pet. 78–81 (identical arguments for independent claims 1 and 9).

F. Obviousness Ground Based on Miyazaki, Park494, Park728, and Kajiwara (Claim 12)

Petitioner contends that claim 12 is unpatentable over Miyazaki, Park494, Park728, and Kajiwara under 35 U.S.C. § 103(a). Pet. 81–82. Claim 12 depends from claim 9, and Petitioner relies on Kajiwara as teaching the additional limitation of claim 12. *Id.* For the reasons explained above regarding parent claim 9, Petitioner has not shown a reasonable likelihood of prevailing on its assertion that claim 12 is unpatentable over Miyazaki, Park494, Park728, and Kajiwara. *See supra* Section II.E.2.

III. CONCLUSION

Based on the arguments and evidence presented by the parties, we conclude that Petitioner has not demonstrated a reasonable likelihood of prevailing with respect to at least one claim of the '117 patent challenged in the Petition. Therefore, we do not institute an *inter partes* review.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is denied and no *inter partes* review is instituted.

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