

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

RESONANT SYSTEMS INC.,
d/b/a/ REVELHMI,
Patent Owner.

IPR2024-00697
Patent 8,093,767 B2

Before KARL D. EASTHOM, NORMAN H. BEAMER, and
BRIAN D. RANGE, *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge*.

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

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–5 of U.S. Patent No. 8,093,767 B2 (Ex. 1001, “the ’767 patent”). Paper 2 (“Pet.”). Resonant Systems, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”).

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless the information presented in the petition “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.” The following findings of fact and conclusions of law are not final, but are made for the sole purpose of determining whether Petitioner meets the threshold for initiating review. Any final decision shall be based on the full trial record, including any response timely filed by Patent Owner. Any arguments not raised by Patent Owner in a timely-filed response may be deemed waived.

For the reasons stated below, we determine that Petitioner has established a reasonable likelihood that it would prevail with respect to at least one claim. We hereby institute an *inter partes* review as to claims 1–5 of the ’767 patent based upon Petitioner’s asserted grounds of unpatentability.

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies itself as the real party in interest. Pet. 80. Patent Owner identifies itself as the real party in interest, as assignee of the ’767 patent. Paper 5, 1.

B. Related Matters

The parties identify the following pending matters as related to this proceeding: *Resonant Systems, Inc. d/b/a RevelHMI v. Apple, Inc.*, 7-23-cv-00077 (W.D. Tex.) (filed June 1, 2023) (“the District Court case”). Pet. 81; Paper 5 at 1. Patent Owner also identifies the companion Petition, IPR2024-00698, also filed by Petitioner. Paper 5 at 1.

C. The ’767 patent

The ’767 patent, titled “Linear-Resonant Vibration Module,” issued January 10, 2012, with claims 1–5. Ex. 1001, codes (45), (54), 11:6–12:33. The ’767 patent claims priority to a provisional application, No. 61/179,109, filed on May 18, 2009. The ’767 patent describes it is “related to vibration-generating devices and, in particular, to vibration modules that can be incorporated into a wide variety of different types of electromechanical devices and systems to produce vibrations of selected amplitudes and frequencies over a wide range amplitude/frequency space.” *Id.* at 1:11–16.

The ’767 patent describes that the most common prior-art method of producing vibrations in consumer appliances, toys, and other devices is an intentionally-unbalanced electric motor. *Id.* at 1:22–28. The patent describes four problems with this method: unbalanced forces (which can damage devices), inefficiency in producing forces (which drains batteries faster), elliptical, rather than linear, vibrations, and that “only a very limited portion of the total vibrational-force/frequency space is accessible to unbalanced electric motors.” *Id.* at 2:9–44.

In the ’767 patent, “vibrational forces are produced by linear oscillation of a weight or member, in turn produced by rapidly alternating the polarity of one or more driving electromagnets,” and “[f]eedback control

is used to maintain the vibrational frequency.” *Id.* at 3:9–15. Figure 6, reproduced below, is a block diagram of a linear-resonant vibration module (“LRVM”) of the ’767 patent:

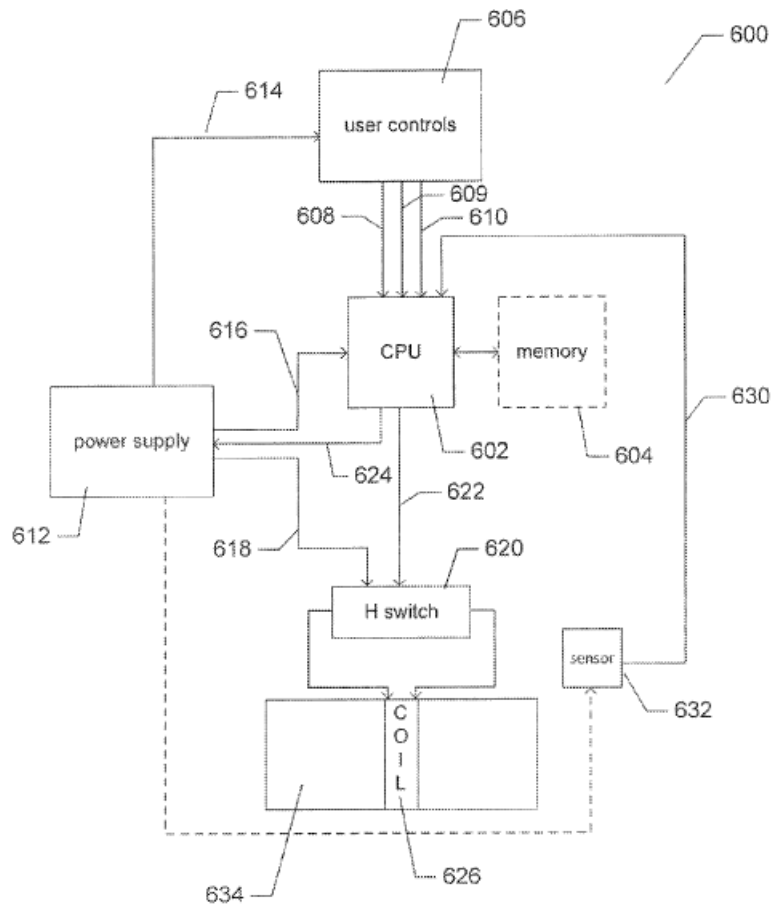


Figure 6 illustrates CPU 602, memory 604, user controls 616, input signals 608–610, power supply 612, H-bridge switch 620, sensors 632, coil 626, and linearly oscillating mass 634.

A side-view of one type of coil and oscillating mass is shown in Figure 10, reproduced below.

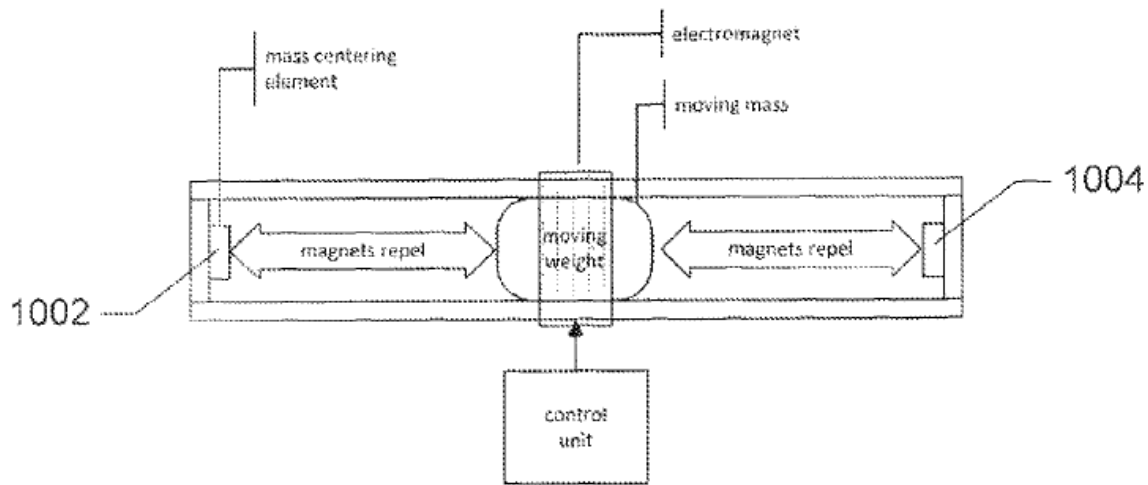


Figure 10 shows a LRVM, which illustrates end magnets 1002 and 1004 (which may instead be springs), a moving weight, an electromagnet, and a control unit. *Id.* at 8:45–51.

D. Illustrative Claims

Claim 1 is independent. The other challenged claims (claims 2–5) depend from claim 1. *See* Ex. 1001, 11:5–12:33.

Claim 1 (with identifiers of claim elements, *see, e.g.*, Pet. vii–viii, 18–31) is illustrative and is reproduced below.

[1.P] A linear resonant vibration module comprising:

[1.1] a housing;

[1.2] a moveable component;

[1.3] a power supply;

[1.4] a driving component that drives the moveable component in each of two opposite directions; and

[1.5.1] a control component that includes a microprocessor and that controls supply of power from the power supply to the driving component to cause the moveable component to linearly oscillate, the control component including, in addition to the microprocessor,

[1.5.2] a control program, stored in one of a separated electronic memory or within the processor, that is executed by the microprocessor to control operation of the linear resonant vibration module, and

[1.5.3] a switch that receives a directional signal d from the processor and that selects a corresponding direction of the two opposite directions in which the driving component drives the moveable component,

[1.6] the control component receiving output signals from sensors within the linear resonant vibration module during operation of the linear resonant vibration module and adjusting one or more operational control outputs of the control component according to the received output signals from the sensors in order that subsequent operation of linear resonant vibration module produces desired outputs from the one or more sensors corresponding to one or more operational control parameters.

Ex. 1001, 11:6–33.

E. Asserted Grounds of Unpatentability

Petitioner, supported by the declaration of Dr. Blake Hannaford (Ex. 1003), asserts the following grounds of unpatentability (Pet. 1):¹

Ground	Claim(s) Challenged	35 U.S.C. §	References/Basis
1A	1	103(a)	Shahoian ² , Cosper ³
1B	1–4	103(a)	Shahoian, Cosper, Rossi ⁴

¹ The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, took effect on March 16, 2013. The ’767 patent was filed before this date. *See* Ex. 1001, codes (22), (60). For the purposes of this Decision, pre-AIA statutes apply.

² US 6,982,969 B1, issued Jan. 3, 2006, Ex. 1004 (“Shahoian”).

³ US 2008/0246532 A1, published Oct. 9, 2008, Ex. 1009 (“Cosper”).

⁴ US 4,879,641, issued Nov. 7, 1989, Ex. 1020 (“Rossi”).

Ground	Claim(s) Challenged	35 U.S.C. §	References/Basis
1C	5	103(a)	Shahoian, Cospers, Rossi, Ramsay ⁵
2A	1	103(a)	Shahoian, Cospers, Ramsay, Aldrich ⁶
2B	1–5	103(a)	Shahoian, Cospers, Ramsay, Aldrich, Rossi

III. ANALYSIS

A. Legal Standard

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and “the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

In order to determine whether an invention would have been obvious at the time the invention was made, we consider the level of ordinary skill in

⁵ US 2008/0294984 A1, published Nov. 27, 2008, Ex. 1006 (“Ramsay”).

⁶ “Controller for Driving a Piezoelectric Actuator at Resonance,” NASA Tech Briefs, Apr. 2008, Ex. 1021 (“Aldrich”).

the pertinent art at the critical time. *Graham*, 383 U.S. at 17. The resolution of this question is important because it allows us to “maintain[] objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation omitted). Generally, it is easier to establish obviousness under a higher level of ordinary skill in the art. *Innovation Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d 1314, 1323 (Fed. Cir. 2011) (“A less sophisticated level of skill generally favors a determination of nonobviousness . . . while a higher level of skill favors the reverse.”).

Petitioner contends that a person of ordinary skill in the art (POSITA) would have had a degree in mechanical engineering, electrical engineering, physics, or a related technical field, and at least 2–3 years of experience related to the design or development of systems incorporating linear actuators; additional years of experience could substitute for the degree. Pet. 4 (citing Ex. 1003 ¶ 30–31). Patent Owner contends a POSITA would have had (1) a bachelor’s degree in electrical engineering, mechanical engineering, or a comparable field of study, and (2) at least two years of professional experience with electro-mechanical control systems, or other similarly relevant industry experience. Prelim. Resp. 3. Additional relevant industry experience may compensate for lack of formal education or vice

versa. *Id.* Patent Owner further contends this is similar to Petitioner’s POSITA contention. *Id.*

For purposes of this Decision, we adopt Petitioner’s proposal as reasonable and consistent with the ’767 patent specification and the prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art may reflect an appropriate level of skill in the art).

C. Claim Construction

In *inter partes* reviews, the Board interprets claim language using the district-court-type standard, as described in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 37 C.F.R. § 42.100(b). Under that standard, we generally give claim terms their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history. *See Phillips*, 415 F.3d at 1313–14. Although extrinsic evidence, when available, may also be useful when construing claim terms under this standard, extrinsic evidence should be considered in the context of the intrinsic evidence. *See id.* at 1317–19.

In considering claim construction, we take into account the August 23, 2024, Claim Construction Memorandum and Order issued by the U.S. District Court for the Western District of Texas, Midland/Odessa Division, in *Resonant Systems, Inc., et al. v. Apple, Inc.*, MO:23-CV-00077-ADA. Ex. 3001 (“Dist. Ct. Constr.”).

Petitioner argues that two terms recited in all claims, “driving component” and “control component,” should be construed under their plain and ordinary meaning. Pet. 5. But Petitioner also indicates that in the District Court case, Petitioner is arguing the terms should be construed under

35 U.S.C. § 112 ¶ 6 as “means-plus-function” terms. *Id.* Therefore, Petitioner argues Grounds 1A–1C based on plain and ordinary meaning but argues based on a means-plus-function construction for Grounds 2A and 2B. *Id.*

As to Grounds 2A and 2B (where Petitioner applies means-plus-function), Petitioner proposes the terms be construed as follows:

CLAIM TERM	PETITIONER’S IDENTIFIED CONSTRUCTION
driving component	one or more coils that receive alternating current as a structure that performs the recited function (citing Ex. 1001, columns 4, 5, 9, 10)
control component	a microprocessor and switch, as recited in claim 1, and the microprocessor is programmed with an algorithm (citing Ex. 1001, Figs 7A–7C, 6:25–8:3)

Pet. 6–8.

Patent Owner contends “the preamble of claim 1 is limiting based on Petitioner’s assertion in the District Court and based on the District Court’s order.” Prelim. Resp. 6. Patent Owner also contends “the District Court agreed with Patent Owner and ordered that the ‘control component’ term has its plain and ordinary meaning and is not subject to means-plus-function treatment.” *Id.* Patent Owner finally contends “there is no need for the Board to make claim construction determinations about Section 112, Paragraph 6 to decide institution.” *Id.*

As to the preamble, we agree, for purposes of this decision, that claim 1’s preamble is limiting. The parties agreed that this preamble is limiting in the District Court case. Dist. Ct. Const. 10.

As to the “driving component” recitation, the parties agreed to a construction in the District Court case. Dist. Ct. Constr. 11. For purposes of this Decision, we adopt the parties’ agreed construction. Pet. 6. The parties agreed the “driving component” term is a means-plus-function term. Dist. Ct. Constr. 11. The function is “drives the moveable component in each of two opposite directions.” *Id.* Corresponding structure includes “coils 420, 514, 626, 1202, 1204, 1302, 1304, 1412, 1414, 1510 (also shown in Figs. 16–17); electromagnets shown in Figs. 10–11; and equivalents thereof.” *Id.*

As to “control component,” the District Court held that the term is not a means-plus-function term because the claim defines the term structurally by requiring a “microprocessor,” “control program,” and “switch.” Dist. Ct. Constr. 17–22. For purposes of this Decision, we agree with the District Court that means-plus-function treatment does not apply to the “control component” recitation because structure in claim 1 defines the component. Given the context provided by claim 1 as a whole, a person having ordinary skill in the art would have understood the “control component” as identifying a specific structure (requiring a microprocessor, control program, and switch as claim 1 recites). *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (holding that the means-plus-function inquiry depends on “whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for a structure”).

With respect to other claim terms, Petitioner establishes a reasonable likelihood that it would prevail with respect to at least one claim based on the ordinary and customary meaning of these terms. Thus, no other claim terms require express construction for purposes of this Decision. *See, e.g.,*

Realtime Data, LLC v. Iancu, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

D. Discretion under 35 U.S.C. § 314(a)

Patent Owner contends that we should exercise our discretion to deny institution under 35 U.S.C. § 314(a) in light of the District Court case.

Prelim. Resp. 20–29. Patent Owner contends that the factors identified in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential), weigh in favor of exercising discretion to deny institution. *Id.*

On June 21, 2022, the Director of the U.S. Patent and Trademark Office (“USPTO”) issued a Memorandum titled “Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings With Parallel District Court Litigation” (“Memorandum”),⁷ which states, among other things, that “the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB.” Memorandum 3 (citing *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential as to § II.A)).

In a September 18, 2024 letter, Petitioner has stated that “[Petitioner] hereby stipulates that if the PTAB authorizes petitioner to enter this stipulation into evidence in IPR2024-00697 and institutes the proceeding,

⁷ The Memorandum is *available at* https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

[Petitioner] will not pursue in the above-captioned litigation the same invalidity grounds raised (or any grounds that could have been raised) in IPR2024-00697 for any claim of the patent.” Ex. 1048 (citing *Sotera*, IPR2020-01019, Paper 12). In view of this stipulation, we do not exercise discretion to deny institution.

E. Discretionary Denial For Multiple Petitions

Patent Owner also argues that we should deny institution in this proceeding pursuant to 35 U.S.C. § 314(a) if we grant institution in IPR2024-00698. Pet. 16. Patent Owner argues that this is not a “rare” circumstance where two petitions are needed. *Id.* at 17–22.

Petitioner asks that this Petition (IPR2024-00697) be prioritized ahead of IPR2024-00698. Petitioner’s Notice Ranking [Petitions], Paper 3, 2. Thus, even if Patent Owner were correct that we should only institute the petition for IPR2024-00697 or for IPR2024-00698 but not both, we would favor institution of IPR2024-00697. Thus, we do not deny institution of this proceeding based upon multiple petitions.

F. Overview of the Asserted Art

1. Shahoian (Exhibit 1004)

Shahoian relates “to the output and control of vibrations and similar force sensations from actuators in a force feedback interface device.” Ex. 1004, 1:18–22. Shahoian explains that:

Using an interface device, a user can interact with an environment displayed by a computer system to perform functions and tasks on the computer, such as playing a game, experiencing a simulation or virtual reality environment, using a computer aided design system, operating a graphical user interface (GUI), or otherwise influencing events or images depicted on the screen.

Id. at 1:23–29.

Shahoian further describes that many low-cost devices provide forces to a user by vibrating using an eccentric mass on the shaft of a motor, but this tends to “produce low-bandwidth vibrations that tend to all feel the same, regardless of the different events and signals used to command them.” *Id.* at 1:60–64. Shahoian’s device “provides an actuator for a haptic feedback device that can output high quality vibrotactile sensations. Both the frequency and amplitude of the vibrations can be controlled using bi-directional control, and features such as the elastic material and flexures contribute to a high quality and high bandwidth vibration force output.” *Id.* at 2:59–65.

Shahoian uses moving magnet actuators to product vibration, which can be linear or rotational. *Id.* at 2:3–5, 2:32–33. An embodiment of Shahoian is shown in the diagram of Figure 2, reproduced below.

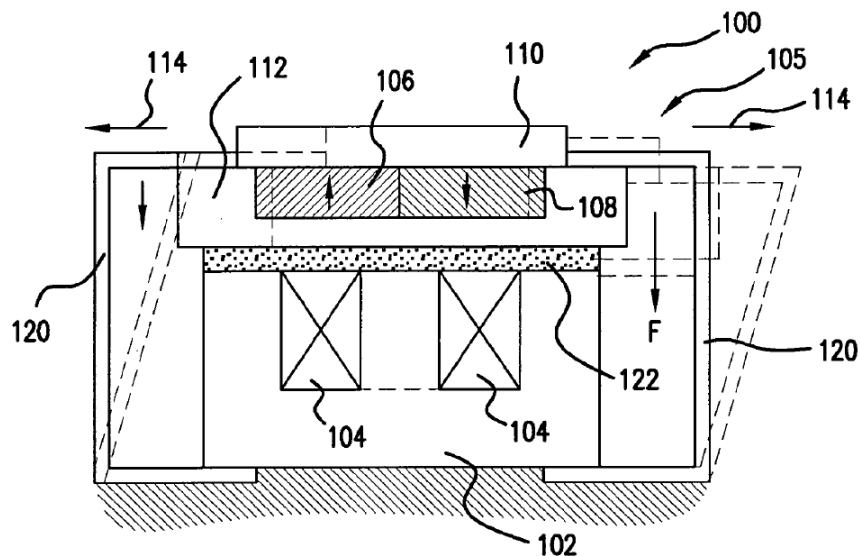


Figure 2 shows actuator 100, grounded metal core 102, wire coil 104, magnet head 105, which includes magnets 106 and 108, metal piece 110 (providing a flux return path), and plastic housing 112. *Id.* at 6:14–25.

“[A]ctuator 100 operates by producing a force on the magnet head 105 in the linear directions indicated by arrows 114 when a current is flowed through the coil 104.” *Id.* at 6:26–25. A controller can adjust the magnitude of vibration to a desired level within the allowed magnitude range, by adjusting the magnitude of the waveform. *Id.* at 7:38–41. The controller can also adjust the frequency of the drive waveform independently of the amplitude, to adjust the frequency of vibration. *Id.* at 7:41–49. The drive signal can be supplied by an “H-bridge circuit or other amplifier circuit.” *Id.* at 7:48–53.

2. *Cosper (Exhibit 1009)*

Cosper relates to “automatically driving and maintaining oscillation of an assembly system including a mass and a bias member (which may also be referred to as a spring or elastomeric member) at or near a resonant frequency of the assembly system.” Ex. 1009, code[57]. Cosper’s system includes “a controller operable to receive a signal from a sensor associated with a position or motion of the subassembly, and generate a drive signal for driving the subassembly in response to the received signal from the sensor.” *Id.* Cosper’s “controller may monitor the motion of the subassembly and adjust or modulate the driving force over time to maintain the subassembly at or near a resonant frequency.” *Id.*

Figure 1, reproduced below, is a schematic of Cosper’s system.

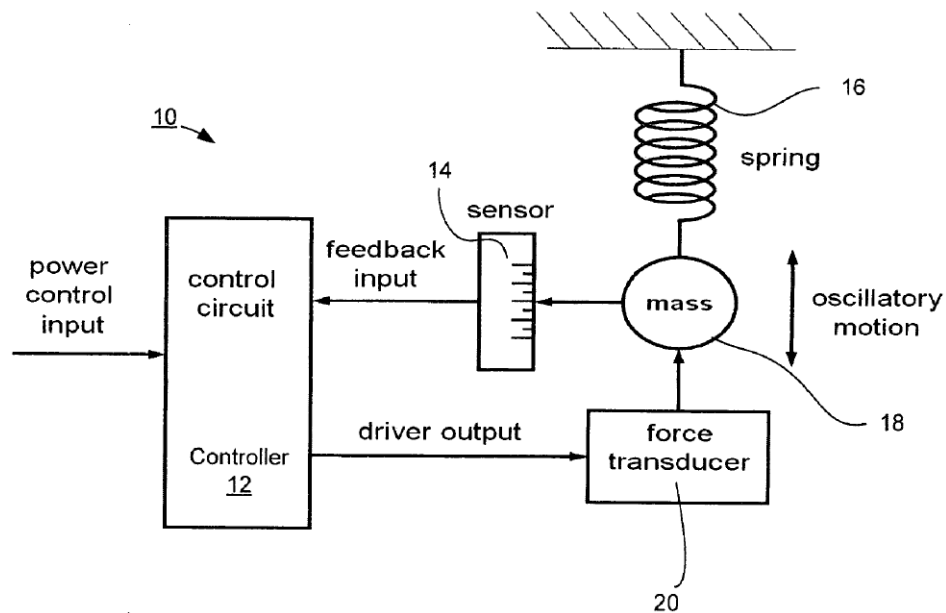


Figure 1 shows control system 10, with:

control logic (e.g., hardware, software, firmware, or combinations thereof included with a controller or control circuit 12), a sensor 14 for determining a parameter from the moveable subassembly (e.g., including a bias 16 and mass 18), a sensor input for inputting the parameter into the control logic of control circuit 12, and a control output from the control logic to drive the moveable subassembly at or near resonance via force transducer 20.

Id. ¶ 49.

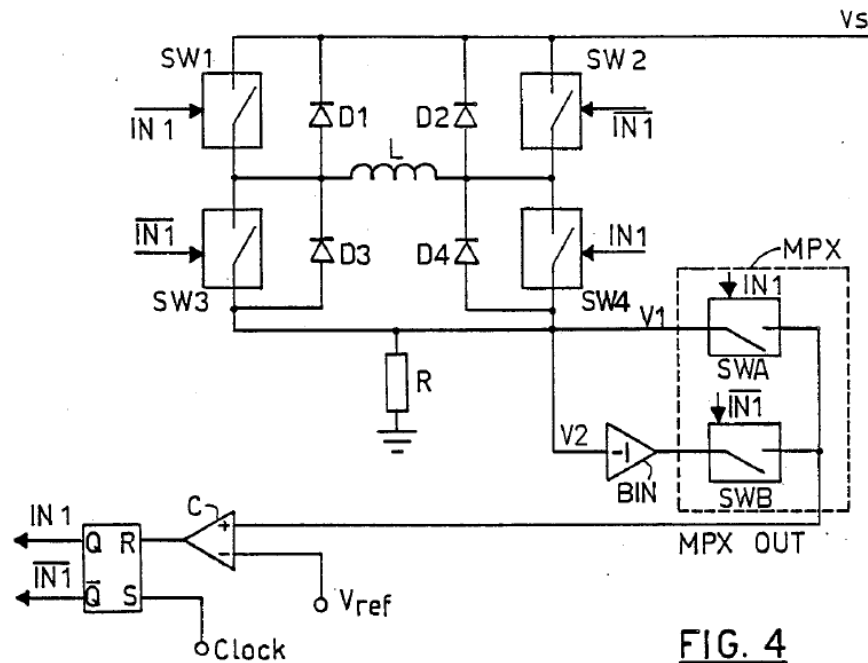
3. Rossi (*Exhibit 1020*)

Rossi “relates to circuits for a switching mode driving of a load and in particular to circuit arrangements for controlling the current being delivered to the load.” Ex. 1020, 1:8–11. Rossi describes that prior art apparatuses for controlling electric motors typically use “sensing resistances,” which “represent[] a remarkable cost factor of the apparatus [] because they must often possess well determined precision and temperature co-efficient characteristics and be exempt of any appreciable inductance.” *Id.* at 1:12–36.

Rossi’s circuit “determines the magnitude and direction of the current

being delivered to a load of an H-bridge stage by utilizing a single sensing resistor connected between a common virtual ground node of the driving bridge circuit and a real ground node.” *Id.* at 1:37–43.

A diagram of Rossi’s circuit is reproduced below:



Rossi’s Figure 4 depicts a circuit that utilizes “a single sensing resistor R connected between a single common virtual ground node (V_t) and a real ground node of the circuit.” *Id.* at 2:56–59.

4. Ramsay (Exhibit 1006)

Ramsay “relates to enabling a user to customize the haptic effects on an end user device.” Ex. 1006 ¶ 2. Ramsay explains that “haptic feedback can be used to supplement auditory and visual feedback to enhance how information is provided to the user.” *Id.* ¶ 14. However, unlike the ability to change “ring tones,” “a user typically does not have the option on the device itself to modify characteristics of haptic feedback.” *Id.*

Therefore, Ramsay discloses “allowing a user of an end user device to

modify parameters associated with haptic effects that can be played on the end user device.” *Id.* ¶ 5. Ramsay discloses “enabling a user of an end user device to access software adapted to design or modify haptic effects of the end user device,” or “enabling the user to open a haptic track file and enter or modify parameters associated with the haptic effects of the opened haptic track file.” *Id.* Ramsay discloses altering the speed of a motor with the use of an “eccentric rotating mass (ERM) actuator,” or modifying “amplitude values” with the use of a “linear resonant actuator (LRA).” *Id.* ¶ 26.

5. *Aldrich (Exhibit 1021)*

Aldrich describes a “digital control system based partly on an extremum-seeking control algorithm [which] tracks the changing resonance frequency of a piezoelectric actuator or an electrically similar electromechanical device that is driven by a sinusoidal excitation signal and is required to be maintained at or near resonance in the presence of uncertain, changing external loads and disturbances.” Ex. 1021, 41⁸.

Aldrich describes incrementing or decrementing an excitation frequency, determining if the change “results in an increase in the current/voltage ratio,” and then either making another increment, or reversing and decrementing, until the resonance peaks. *Id.* at 42.

G. *Unpatentability Grounds*

1. *Unpatentability over Shahoian and Cosper (Ground 1A)*

Petitioner asserts that claim 1 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Shahoian and Cosper, citing the Declaration of Dr. Hannaford for support. Pet. 1, 10–31 (citing Ex. 1003).

⁸ We refer to the page numbers in the original.

Patent Owner does not dispute Petitioner's assertions at this stage of the proceeding. *See generally* Prelim. Resp. We address Petitioner's assertions below.

a. *Combining Shahoian and Cosper*

Petitioner argues that Shahoian teaches a linear actuator module for a force feedback device that provides haptic feedback to a user as part of a "handheld game device or computer." Pet. 10–11 (citing, e.g., Ex. 1004, code [57], 2:1–3:2, 3:9–10, 3:21–5:39, 6:3–7:63; Ex. 1003 ¶¶ 72–80).

Petitioner argues that Cosper describes a feedback control system for maintaining resonant oscillation of a linear actuator. *Id.* at 12–13 (citing, e.g., Ex. 1009 ¶¶ 49–50; Ex. 1003 ¶¶ 81–82).

Petitioner argues that a person having ordinary skill in the art would have combined Shahoian's module to include multiple sensors in accordance with Cosper's teachings. Pet. 14. Petitioner argues that the sensor would allow adjusting a control signal to drive the actuator, "thereby facilitating vibration according to desired characteristics." *Id.*

Petitioner argues three reasons why a person having ordinary skill in the art would have combined Shahoian with Cosper's teachings. *Id.* at 15. First, Petitioner argues that a person having ordinary skill in the art would have looked to the teachings of Cosper to further Shahoian's goal of using a drive waveform to cause the actuator to produce a specific vibration output. *Id.* Second, Petitioner argues that the combined teachings would have achieved the benefit of monitoring real-time movement of the actuator with sensors thereby enhancing the ability to output vibration to particular parameters while making the output less susceptible to external influences. *Id.* Third, the combined teachings would allow user inputs to facilitate

device operation. *Id.* at 16–17.

Patent Owner does not, at present, dispute Petitioner’s rationale to combine the references’ teachings. Based on our review and consideration of the current record, we determine Petitioner has met its burden to show a reasonable likelihood it would prevail in demonstrating that a person of ordinary skill in the art would have combined the teachings of Shahoian and Cosper in the manner Petitioner argues (“the Shahoian-Cosper combination”).

b. *Claim 1*

Petitioner contends that the combined teachings of Shahoian and Cosper teach or suggest each limitation of claim 1. Pet. 19–30. We address each limitation below.

[1.P] A linear resonant vibration module comprising:

Petitioner argues that the Shahoian-Cosper combination includes a linear resonant vibration module. Pet. 18–20. Based on the current record, we find that Petitioner’s argument is sufficiently supported by evidence. Shahoian teaches, for example, “a linear moving magnet actuator for providing haptic feedback.” Ex. 1004, code [12], Fig. 2. Petitioner provides evidence that the combined system provides an actuator that “can be controlled to produce periodic motion in alternately opposite directions across a single axis at a resonant frequency.” Ex. 1003 ¶¶ 117–118.

[1.1] a housing;

Petitioner argues that the Shahoian-Cosper combination includes a housing. Pet. 20. Based on the current record, we find that Petitioner’s argument is sufficiently supported by evidence. Shahoian teaches a housing. *See, e.g.*, Ex. 1004, 2:51–52; Ex. 1003 ¶ 119.

[1.2] a moveable component;

Petitioner argues that the Shahoian-Cosper combination includes a moveable component. Pet. 20. In particular, Petitioner identifies Shahoian's "magnet head" as a moveable component. *Id.* Based on the current record, we find that Petitioner's argument is sufficiently supported by evidence. Shahoian teaches a moveable component. *See, e.g.,* Ex. 1004, 2:3–5, 6:14–35, 6:62–7:16; Ex. 1003 ¶ 120.

[1.3] a power supply;

Petitioner argues that the Shahoian-Cosper combination includes a power supply. Pet. 20–21. Based on the current record, we find that Petitioner's argument is sufficiently supported by evidence. Shahoian teaches "actuator interface 38" along with "power supply 40." Ex. 1004, 5:35–37, Fig. 1; Ex. 1003 ¶ 121.

[1.4] a driving component that drives the moveable component in each of two opposite directions;

As we explain in Section III(C), *supra*, for the present decision, we construe this term as means-plus-function. The function is "drives the moveable component in each of two opposite directions" and corresponding structure in the '767 patent includes "coils 420, 514, 626, 1202, 1204, 1302, 1304, 1412, 1414, 1510 (also shown in Figs. 16–17); electromagnets shown in Figs. 10–11; and equivalents thereof." *Id.*⁹

⁹ Although Petitioner identifies ground one as being a "plain and ordinary meaning ground" with respect to "control component" (Pet. 10), Petitioner explains that the Shahoian-Cosper combination also renders the "driving component" recitation obvious if the "driving component" is construed as a means-plus-function recitation. *Id.* at 7–8, 22.

Petitioner argues that Shahoian teaches a “wire coil” that drives the moveable component (Shahoian’s moveable “magnet head”) in each of two opposite directions. Pet. 21–22. Based on the current record, we find that Petitioner’s argument is sufficiently supported by evidence. Shahoian teaches, for example, that “[t]he actuator 100 operates by producing a force on the magnet head 105 in linear directions indicated by arrows 114 when a current is flowed through the coil 104.” Ex. 1004, 6:26–28; *see also id.*, Fig. 2, code [57], 2:15–17, 2:34–41, 6:14–25; Ex. 1003 ¶¶ 122–123. Petitioner sufficiently establishes that Shahoian’s wire coil “drives the moveable component in each of two opposite directions” with a structure at least equivalent to corresponding structure of the ’767 patent.

[1.5.1] a control component that includes a microprocessor and that controls supply of power from the power supply to the driving component to cause the moveable component to linearly oscillate, the control component including, in addition to the microprocessor,

As we explain in Section III(C), *supra*, for the present decision, we construe this team as having its plain and ordinary meaning and not as a means-plus-function limitation.

Petitioner argues that the Shahoian-Cosper combination includes a control component with a microprocessor programmed to execute a vibration control program (as modified in accordance with Cosper) and an H-bridge switch. Pet. 23–24. Petitioner argues that the control component controls power from the power supply to the driving component to cause the moveable component to linearly oscillate. *Id.* at 23.

Based on the current record, we find that Petitioner’s argument is sufficiently supported by evidence. Shahoian teaches a local microprocessor

and software instructions that control power in the recited manner. Ex. 1003 ¶¶ 108–115, 124–135; Ex. 1004, Fig. 1, 4:16–30, 4:56–61, 5:4–6.

[1.5.2] a control program, stored in one of a separated electronic memory or within the processor, that is executed by the microprocessor to control operation of the linear resonant vibration module,

Petitioner argues that the Shahoian-Cosper combination includes a control program stored in Shahoian's local memory 27 that is executed by Shahoian's local microprocessor to control operation of the linear resonant vibration module. Pet. 25–26. Based on the current record, we find that Petitioner's argument is sufficiently supported by evidence. Shahoian teaches microprocessor 26 having software instructions to handle/control input and output signals. Ex. 1003 ¶ 127–128; Ex. 1004 ¶¶ 4:10–24, 4:49–54. Cosper further describes controlling an output signal to maintain oscillation at a resonant frequency. Ex. 1009, code [57], ¶¶ 9–11, 50, 55, 57–58; Ex. 1003 ¶ 127.

[1.5.3] a switch that receives a directional signal d from the processor and that selects a corresponding direction of the two opposite directions in which the driving component drives the moveable component;

Petitioner argues that the combination's H-bridge circuit is a switch that receives a directional signal from Shahoian's local microprocessor and selects a corresponding direction in which Shahoian's wire coil drives the magnet head. Pet. 27–29. Petitioner argues that Shahoian describes that its microprocessor receives control signals from the microprocessor and also argues that such an arrangement would have been obvious. *Id.*

Based on the current record, we find that Petitioner's argument is sufficiently supported by evidence. Shahoian's H-bridge circuit receives a

directional signal d at each transistor 52, 54, 56, and 58 from the local microprocessor and selects a corresponding direction in which the wire coil drives the magnet head. Ex. 1004, 4:19–39, 4:46–53 (explaining that an H-bridge circuit is disclosed in a co-pending application incorporated by reference), 5:4–10; Ex. 1037, 13:24–14:18 (co-pending application further explaining the H-bridge circuit), Fig. 5A; Ex. 1003 ¶¶ 129–135.

[1.6] the control component receiving output signals from sensors within the linear resonant vibration module during operation of the linear resonant vibration module and adjusting one or more operational control outputs of the control component according to the received output signals from the sensors in order that subsequent operation of linear resonant vibration module produces desired outputs from the one or more sensors corresponding to one or more operational control parameters.

Petitioner argues that the microprocessor of the combination’s control component receives output from multiple sensors (sensors in accordance with Cosper). Pet. 30. Petitioner argues that the microprocessor adjusts outputs based on the signals corresponding to operational control parameters. *Id.* at 29–31. Based on the current record, we find that Petitioner’s argument is sufficiently supported by evidence. Cosper teaches multiple sensors that detect “position, velocity, acceleration, etc.” Ex. 1009 ¶ 50. The microprocessor uses the sensor inputs to control parameters such as amplitude or frequency. Ex. 1003 ¶¶ 136–137; Ex. 1009, code [57], ¶¶ 9–11, 50, 55, 57–58.

Based on our review and consideration of the current record, we determine Petitioner has met its burden to show a reasonable likelihood it would prevail in demonstrating that claim 1 would have been obvious over the combined teachings of Shahoian and Cosper.

2. *Unpatentability over Shahoian, Cosper, and Rossi
(Ground 1B)*

Petitioner asserts claims 1–4 are unpatentable under 35 U.S.C. § 103(a) as obvious over Shahoian in view of Cosper and Rossi. Pet. 1, 34–46 (citing Ex. 1003). Patent Owner does not dispute Petitioner’s assertions at this stage of the proceeding. *See generally* Prelim. Resp.

Petitioner accounts for the limitations recited in each of claims 2–4. Pet. 31–46. Petitioner shows sufficiently for purposes of this Decision that each element of claims 2–4 is disclosed by the combined teachings of Shahoian, Cosper, and Rossi. Petitioner also adequately establishes that a person having ordinary skill in the art would have reason to incorporate Rossi’s teachings regarding an H-bridge switch with the teachings of Shahoian and Cosper with a reasonable expectation of success. *Id.* at 31–37. Thus, we determine that Petitioner has sufficiently shown a reasonable likelihood of establishing claims 2–4 would have been obvious over Shahoian, Cosper, and Rossi. Furthermore, because Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the ’767 patent is unpatentable, we include this ground in the instituted *inter partes* review. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018); *PGS Geophysical v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018); 37 C.F.R. § 42.108(a).

3. *Unpatentability over Shahoian, Cosper, Rossi, and
Ramsay (Ground 1C)*

Petitioner asserts that claim 5 is unpatentable under 35 U.S.C. § 103(a) as obvious over Shahoian, Cosper, Rossi, and Ramsay. Pet. 1, 47–54 (citing Ex. 1003). Patent Owner does not dispute Petitioner’s assertions at this stage of the proceeding. *See generally* Prelim. Resp.

Petitioner accounts for each limitation of claim 5. Pet. 47–54. Petitioner shows sufficiently for purposes of this Decision that each element of claim 5 is disclosed by the combined teachings of Shahoian, Cosper, Rossi, and Ramsay. Petitioner also adequately establishes that a person having ordinary skill in the art would have combined user input/customization in accordance with Ramsay with the teachings of Shahoian, Cosper, and Rossi with a reasonable expectation of success. *Id.* at 49–52. Thus, we determine that Petitioner has sufficiently shown a reasonable likelihood of establishing claim 5 would have been obvious over Shahoian, Cosper, Rossi, and Ramsay. Furthermore, because Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the '767 patent is unpatentable, we include this ground in the instituted *inter partes* review. *See SAS*, 138 S. Ct. at 1354, 1359–60; 37 C.F.R. § 42.108(a).

4. *Unpatentability over Shahoian, Cosper, Ramsay, and Aldrich (Ground 2A)*

Petitioner asserts claim 1 is unpatentable under 35 U.S.C. § 103(a) as obvious over Shahoian, Cosper, Ramsay, and Aldrich. Pet. 1, 54–71 (citing Ex. 1003). Patent Owner does not dispute Petitioner's assertions for this ground. *See generally* Prelim. Resp.

Petitioner adds this ground as an alternative position in case “the Board applies the means-plus-function construction of ‘control component.’” *Id.* at 54. Based on the current record, however, we decline to construe claim 1's “control component” as a means-plus-function recitation. Moreover, as we explain in Section III(G)(1)(b), *supra*, Petitioner adequately establishes that claim 1 is unpatentable as obvious over Shahoian

and Cosper. As such, because Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the '767 patent is unpatentable (Ground 1A), we include this ground in the instituted *inter partes* review. *See SAS*, 138 S. Ct. at 1354, 1359–60; 37 C.F.R. § 42.108(a).

5. *Unpatentability over Shahoian, Cosper, Ramsay, Aldrich, and Rossi (Ground 2B)*

Petitioner asserts claims 1–5 are unpatentable under 35 U.S.C. § 103(a) as obvious over Shahoian, Cosper, Ramsay, Aldrich, and Rossi. Pet. 1, 73–78 (citing Ex. 1003). Patent Owner does not dispute Petitioner's assertions for this ground. *See generally* Prelim. Resp.

As with Ground 2A, Petitioner adds this ground as an alternative position in case “the Board applies the means-plus-function construction of ‘control component.’” *Id.* at 54. As we explain above, Petitioner adequately establishes that claims 1–5 are unpatentable as obvious over Shahoian, Cosper, Rossi, and Ramay. As such, because Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the '767 patent is unpatentable (Ground 1A), we include this ground in the instituted *inter partes* review. *See SAS*, 138 S. Ct. at 1354, 1359–60; 37 C.F.R. § 42.108(a).

IV. CONCLUSION

For the reasons above, we determine that the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail with respect to challenged claims 1–5 of the '767 patent. At this juncture in the proceeding, we have not made a final determination with respect to the patentability of the challenged claims, or with respect to claim construction.

V. ORDER

For the foregoing reasons, it is

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–5 of the '767 patent is hereby instituted with respect to all grounds of unpatentability set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial will commence on the entry date of this Decision.

IPR2024-00697
Patent 8,093,767 B2

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