

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner,

v.

ARSUS, LLC,
Patent Owner.

IPR2022-01216
Patent 11,077,877 B1

Before HYUN J. JUNG, RICHARD H. MARSCHALL, and
JASON W. MELVIN, *Administrative Patent Judges*.

JUNG, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

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 Tesla, Inc. (“Petitioner”) has shown by a preponderance of the evidence that claims 1–21 of U.S. Patent No. 11,077,877 B1 (Ex. 1001, “the ’877 patent”) are unpatentable.

A. *Background and Summary*

Petitioner filed a Petition (Paper 1, “Pet.”) requesting institution of an *inter partes* review of claims 1–21 of the ’877 patent. Arsus, LLC (“Patent Owner”) filed a Preliminary Response (Paper 5). Pursuant to 35 U.S.C. § 314, we instituted an *inter partes* review of all challenged claims of the ’877 patent on all presented grounds. Paper 9 (“Inst. Dec.”).

After institution, Patent Owner filed a Response (Paper 14, “PO Resp.”), to which Petitioner filed a Reply (Paper 17, “Pet. Reply”), and Patent Owner thereafter filed a Sur-reply (Paper 18, “PO Sur-reply”). An oral hearing in this proceeding was held on September 28, 2023; a transcript of the hearing is included in the record. Paper 23.

B. *Real Parties in Interest*

Petitioner identifies only itself as a real party in interest, and Patent Owner only identifies itself as a real party in interest. Pet. 71; Paper 4, 1.

C. *Related Matters*

The parties identify *Arsus, LLC v. Tesla, Inc.*, 6:22-cv-00476 (W.D. Tex.) as a related matter. Pet. 71; Paper 4, 1. A related patent was challenged in IPR2020-00948.

D. *The ’877 Patent (Ex. 1001)*

The ’877 patent issued on August 3, 2021 from an application filed on April 15, 2019, which is the latest continuation application of several

previously filed continuation and continuation-in-part applications. Ex. 1001, codes (22), (45), (63). The earliest filing date among those applications is August 31, 2011, and the '877 patent claims priority to provisional applications filed on August 31, 2010 and September 22, 2010. *Id.* at codes (60), (63).

The '877 patent “relates to steering control devices . . . for use in preventing steering to the point of vehicle rollover.” Ex. 1001, 1:29–31. Figure 1 of the '877 patent is reproduced below.

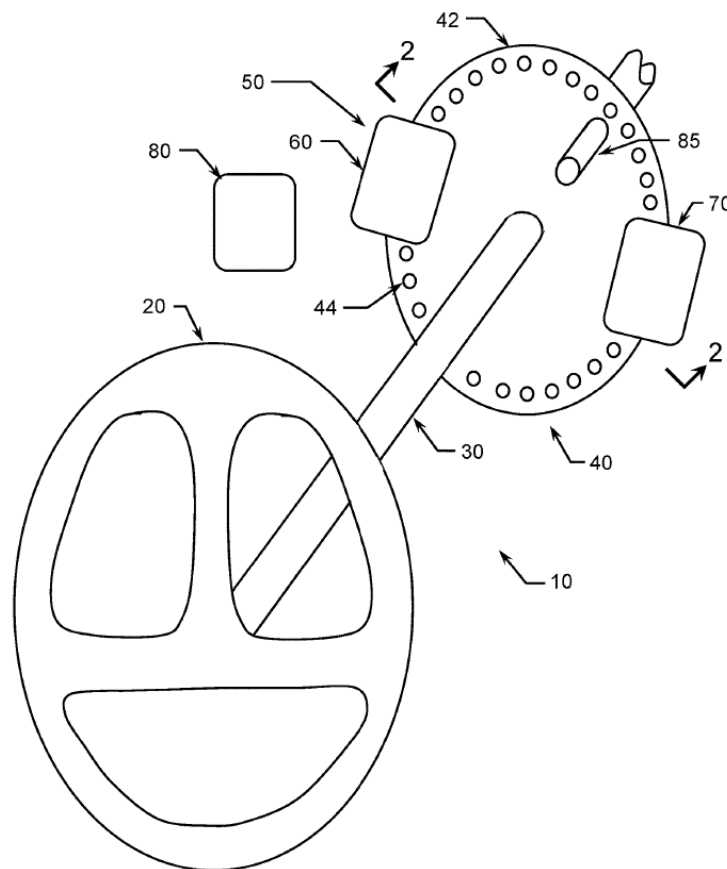


Figure 1

Figure 1 shows “a trimetric view” of an embodiment of the steering control device. Ex. 1001, 3:32–33. Adaptive steering range limiting device (“ASRLD”) 10 includes steering column 30 with steering wheel 20 connected at one end of steering column 30 and steering column position

detection device (“SCPDD”) 40 also connected to steering column 30. *Id.* at 5:15–21, 5:58–61. Steering wheel 20 can be a conventional steering wheel of a passenger vehicle, and steering column 30 can be a conventional steering column that transmits torque from steering wheel 20 to a rack and pinion or other vehicle wheel control device. *Id.* at 5:24–29.

SCPDD 40 has magnetic targets 44 spaced substantially equally around the periphery of disc 42. Ex. 1001, 5:29–33. Sensor 85 can detect when magnetic target 44 is near to provide a rotational position of SCPDD 40. *Id.* at 5:53–57.

Brake assemblies 50 include left-hand unidirectional brake assembly 60 and right-hand unidirectional brake assembly 70. Ex. 1001, 2:35–39, 5:33–36. The unidirectional brake assemblies 60, 70 each include extendable and retractable rollers 64, 74. *Id.* at 5:36–39, 5:44–46, Figs. 3A, 3B, 4A, 4B. Brake assemblies 50 are placed near SCPDD 40 so that disc 42 can rotate past rollers 64, 74. *Id.* at 2:35–39, 5:61–63. Brake assemblies 50 are also connected to a structural member of the vehicle to remain stationary relative to SCPDD 40. *Id.* at 6:2–6.

Electronic control unit 80 electronically receives speed, position, and other sensor inputs and transmits actuation signals based on those inputs. Ex. 1001, 5:48–53. Electronic control unit 80 is connected to sensor 85 and brake assemblies 50. *Id.* at 5:63–65.

When the vehicle is below a predetermined speed, such as 10 miles per hour, brake assemblies are not actuated, and steering wheel 20 can be rotated through its full range of motion. Ex. 1001, 6:17–22. When the vehicle moves at or above the predetermined speed and SCPDD 40 is at or above a predetermined rotational limit, electronic control unit 80 determines a steering prevention threshold has been reached and actuates one of the

unidirectional brake assemblies 60, 70 to prevent further rotation of steering wheel 20. *Id.* at 6:27–38. ASRLD 10, thus, prevents steering wheel 20 from being turned to a point that would cause vehicle rollover. *Id.* at 7:7–13.

E. Illustrative Claim

The '877 patent includes 21 claims, all of which Petitioner challenges. Of the challenged claims, claims 1, 8, and 15 are independent, and reproduced below is claim 1.

1. A rollover prevention apparatus having a mode that allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle at any rollover capable speed of said vehicle regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle, wherein said apparatus transitions from said mode in response to a predetermined application of rotational load to said steering wheel.

Ex. 1001, 10:6–15.

Independent claims 8 and 15 also recite a “rollover prevention apparatus.” Ex. 1001, 10:41–48, 11:5–12. Claim 8 further recites “a mode that allows a vehicle to be steered within a non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered to a point of vehicle roll.” *Id.* at 10:41–44.

Claim 15 does not recite a mode, and the recited apparatus

allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents the turning of a steering wheel of said vehicle from being rotated to a point of causing a rolling wheel of said vehicle being turned to an angular position of vehicle roll at any rollover capable speed of said vehicle.

Ex. 1001, 11:5–11.

F. Asserted Prior Art and Proffered Testimonial Evidence

Petitioner identifies the following references as prior art in the asserted grounds of unpatentability:

Name	Reference	Exhibit
Inagaki	US 5,022,480, issued June 11, 1991	1008
Nishikawa	US 6,053,270, issued Apr. 25, 2000	1007
Schramm	US 8,634,989 B1, issued Jan. 21, 2014	1004
Husain	US 2005/0082107 A1, published Apr. 21, 2005	1006
Dechamp	WO 2007/031817 A1, published Mar. 22, 2007	1005

Pet. 1–2. Petitioner contends that all of the above-listed references are prior art under § 102(a)(1). *Id.* at 2. Petitioner also contends that, “even if the ’877 patent was entitled to an earlier priority date in 2010 (which it is not), Grounds 2–4 would still apply because each of the relevant references published years beforehand.” *Id.*

Petitioner also provides a Declaration of Scott Andrews (Ex. 1003) and a Supplemental Declaration of Scott Andrews (Ex. 1029). Patent Owner provides a Declaration of Michael R. Schramm (Ex. 2022) and a Declaration of Edward L. Gussin (Ex. 2023). Deposition transcripts for Mr. Andrews (Ex. 2021), Mr. Schramm (Ex. 1031), and Mr. Gussin (Ex. 1030) were filed.

G. Asserted Grounds

Petitioner asserts that claims 1–21 are unpatentable on the following grounds:

Claims Challenged	35 U.S.C. §	References/Basis
1–21	102	Schramm
1–21	103	Dechamp, Husain
1–21	103	Dechamp, Nishikawa
15, 16, 19–21	102	Inagaki
15, 16, 19–21	103	Inagaki

Pet. 1.

II. ANALYSIS

A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent [claim] it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). This burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail in an *inter partes* review, the petitioner must support its challenges by a preponderance of the evidence. 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2021).

Petitioner contends that the challenged claims of the ’877 patent are unpatentable under §§ 102 and 103. Pet. 1. A claim is anticipated under § 102 “only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987).

A claim is unpatentable under § 103 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 skill in the art; and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also “determine whether there was an

apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

B. Level of Ordinary Skill in the Art

Petitioner asserts that one of ordinary skill in the art “would have had at least a Bachelor’s of Science in mechanical engineering, electrical engineering, or a related technical field pertinent to automotive control or safety systems, along with two or more years of experience working with automotive control or safety systems.” Pet. 14 (citing Ex. 1003 ¶ 21). We preliminarily adopted Petitioner’s level of ordinary skill. Inst. Dec. 10. Patent Owner does not propose a level of ordinary skill and does not dispute Petitioner’s proposal. *See generally* PO Resp.

In determining 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) (citation and internal quotation marks omitted).

In view of the full record, we see no reason to disturb our preliminary determination regarding the level of ordinary skill in the art. Inst. Dec. 10. Thus, we maintain and reaffirm that one of ordinary skill in the art “would have had at least a Bachelor’s of Science in mechanical engineering, electrical engineering, or a related technical field pertinent to automotive control or safety systems, along with two or more years of experience working with automotive control or safety systems.” Pet. 14 (citing Ex. 1003 ¶ 21).

C. Claim Construction

In an *inter partes* review, the claims are construed

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) (2021); *see Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Petitioner argues that the “mode” of independent claims 1 and 8 and “apparatus” of independent claim 15 are nonce words followed by functional recitations with insufficient structure. Pet. 14, 19. Petitioner contends that claims 1, 8, and 15 should thus be given means-plus-function interpretations. *Id.* Petitioner also argues what the asserted functions and corresponding structures for these claims are with support from the record. *Id.* at 15–21.

“Petitioner submits that Grounds 1–2 render Claims 1 and 8 (and their dependent claims) unpatentable under this § 112(f) construction,” and “if these claims are not limited to above-cited corresponding structure and equivalents thereof, then Grounds 1–3 will render Claims 1 and 8 unpatentable.” Pet. 19. Similarly, “Petitioner submits that Grounds 1–2 render Claim 15 (and its dependent claims) unpatentable under this § 112(f) construction,” and “if Claim 15 is not limited to above-cited corresponding structure and equivalents thereof, Petitioner submits that Grounds 1–4 will apply.” *Id.* at 21.

1. Patent Owner’s Response

Patent Owner responds that prosecution history (PO Resp. 11–12 (citing Ex. 2019; Ex. 2020; Ex. 2022 ¶ 4)), deposition testimony (*id.* at 12–

13 (citing Ex. 2021, 69:21–25; Ex. 2023 ¶¶ 12–14)), the language of the claims (*id.* at 13–14), and the applicable law (*id.* at 17–21 (citing Inst. Dec. 11, 24; Ex. 2021, 70:1–9)) confirm that the challenged claims are not means-plus-function claims.

Patent Owner argues that “rollover prevention apparatus” is structural, not a nonce phrase, and the claims recite enough other structure to avoid means-plus-function construction. PO Resp. 14–16 (citing Ex. 2015; Ex. 2021, 77:10–23). Patent Owner also argues that a claim issued from a grandparent of the ’877 patent was previously determined not to be a means-plus-function claim and the claims in this proceeding recite more structure. *Id.* at 16–17 (citing Ex. 2010). Patent Owner further argues that Petitioner has the burden and that the Office’s prior determination during prosecution that the challenged claims are not means-plus-function claims should be credited and given deference. *Id.* at 21–22.

2. *Petitioner’s Reply*

Petitioner replies that a District Court order similarly determined that the claims are means-plus-function claims (Pet. Reply 17–18 (citing Ex. 1013, 5–7)), that Patent Owner does not point to any alleged errors in Petitioner’s declaration testimony cited in the Institution Decision (*id.* at 18 (citing Inst. Dec. 11–13)), and that, during prosecution, the Examiner never withdrew his official notice that the claims invoke § 112(f) interpretation (*id.* at 18–19 (citing PO Resp. 11–12; Ex. 1002, 393–394, 470–472, 490)).

Petitioner also replies that Patent Owner mischaracterizes the cited deposition testimony. Pet. Reply 19–20 (citing Inst. Dec. 11; PO Resp. 12–13; Ex. 1003 ¶¶ 51–54; Ex. 1029 ¶¶ 6–10; Ex. 2021, 69:21–25, 84:5–85:3). Petitioner further replies that Patent Owner’s identified structures are “ordinary vehicle components [that] are merely acted upon, but they do not

actually perform the recited function.” *Id.* at 21 (citing Ex. 1003 ¶¶ 51–53; Ex. 2021, 84:5–85:3). In Petitioner’s view, the “claims never recite the specific structure that actually performs the ‘allows . . . but prevents . . . ’ function” and Patent Owner argues that any rollover apparatus is within the scope of the claim, far beyond the ’877 patent’s few examples. *Id.* at 21 (citing PO Resp. 16; Ex. 1003 ¶¶ 51–54; Ex. 1029 ¶ 10; Ex. 1031, 70:8–71:5).

Petitioner additionally replies that Patent Owner attempts to substitute improperly “mode” with “way or manner,” but the “virtual claim amendment” does not change the result. Pet. Reply 21–22 (citing PO Resp. 19–21; Ex. 1029 ¶ 11). According to Petitioner, the claims “would recite a vague placeholder term followed by a purely functional recitation, without any description of the exact structure that actually performs the ‘allows . . . but prevents . . . ’ function.” *Id.* at 22 (citing Ex. 1029 ¶ 12). Petitioner also contends that the “virtual amendment” is “divorced from the [S]pecification, which never uses the term ‘way or manner’ in the same context as ‘mode.’” *Id.*

3. *Patent Owner’s Sur-reply*

Patent Owner replies that the claims do not recite nonce words or phrases and recite sufficient structure to avoid means-plus-function interpretation. PO Sur-reply 3 (quoting claims 1, 8, and 15 with asserted structural elements in bold). Patent Owner also argues that Petitioner does not deny that the claims allow steering up to a maximal non-rollover steering range or up to but not beyond the threshold of roll. *Id.* at 3–4. Patent Owner further argues that the dependent claims recite sufficient structure by their dependency. *Id.* at 4.

Patent Owner also replies that Petitioner does not dispute its testimonial evidence that the claims are not means-plus-function claims. PO Sur-reply 4 (citing Ex. 2023 ¶¶ 12–14). According to Patent Owner, Petitioner errs in arguing that the Office did not consider the issue. *Id.* (citing Ex. 2019; Ex. 2020; Ex. 2022 ¶ 4). Patent Owner also argues that Petitioner does not overcome admissions made by its declarant. *Id.* at 5–6 (citing Ex. 1029 ¶¶ 9–12; Ex. 2021, 69:21–25, 70:1–9, 78:17–79:4).

Patent Owner further argues that no case or statute has determined that “mode that allows” is means-plus-function language or a nonce phrase and that there is a presumption that means-plus-function interpretation does not apply because “means for” is absent from the claims. PO Sur-reply 7 (citing Pet. Reply; Ex. 2011, 11). Patent Owner additionally argues that a single word can preclude such interpretation. *Id.* Patent Owner asserts that Petitioner ignores that a claim in a patent that issued from the grandparent application was determined not to be a means-plus-function claim. *Id.* at 7–8 (citing Ex. 2010).

4. No Need to Determine Whether the Claims Invoke § 112(f)

Based on the full record and for the reasons discussed below, Petitioner shows that Dechamp and Husain would have rendered obvious the challenged claims under both means-plus-function interpretations and interpretations in which the claims are not limited to the asserted corresponding structures and their equivalents. *See also* Pet. 19, 21.

We, therefore, see no need to determine whether the claims invoke § 112(f) interpretation to resolve the parties’ disputes. *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)).

In our Institution Decision, we preliminarily adopted Petitioner’s asserted means-plus-function interpretations. Inst. Dec. 11–13. Patent Owner disputes that the claims should be given means-plus-function interpretations but does not present arguments that Petitioner incorrectly identifies the function or corresponding structure. *See, e.g.*, PO Resp. 11–22. For our analysis below, we maintain and apply the same functions and corresponding structures that we preliminarily adopted.

In particular, for our analysis below in which the claims are given a means-plus-function interpretation, like Petitioner, we treat the phrase “mode that allows” recited by claims 1 and 8 as equivalent to using the means-plus-function language “means for,” and the “apparatus” recited by claim 15 as insufficient for avoiding interpretation under § 112(f). *See* Pet. 14–15, 20.

For claim 1, we apply Petitioner’s function:

allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle at any rollover capable speed of said vehicle regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle.

Pet. 15–16 (citing Ex. 1003 ¶ 51); Ex. 1001, 10:7–12. We also apply Petitioner’s corresponding structure for the asserted function, specifically the first embodiment of the ’877 patent (“Corresponding Structure #1”).

Pet. 17–18 (citing Ex. 1001, 2:35–39, 2:48–52, 2:57–3:18, 5:15–21, 5:29–57, 5:63–65, 6:17–7:38, 7:45–54, Figs. 1–4B).

For independent claim 8, we apply Petitioner’s function (“allows a vehicle to be steered within a non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered to a point of vehicle roll regardless of the source of a oversteer rotational load applied to a steering wheel of said vehicle”) and Corresponding Structure #1. Pet. 16 (citing Ex. 1003 ¶ 51), 17–19; Ex. 1001, 10:42–46.

For independent claim 15, we apply Petitioner’s function:

allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents the turning of a steering wheel of said vehicle from being rotated to a point of causing a rolling wheel of said vehicle being turned to an angular position of vehicle roll at any rollover capable speed of said vehicle regardless of the source of an oversteer rotational load applied to said steering wheel of said vehicle,

and Corresponding Structure #1. Pet. 20–21 (citing Ex. 1003 ¶¶ 53, 54); Ex. 1001, 11:5–12.

The parties provide no other proposed interpretations. *See generally* Pet.; PO Resp. Based on the full record, we determine that no other claim term requires express interpretation. *Realtime Data*, 912 F.3d at 1375.

D. Asserted Obviousness Based on Dechamp and Husain

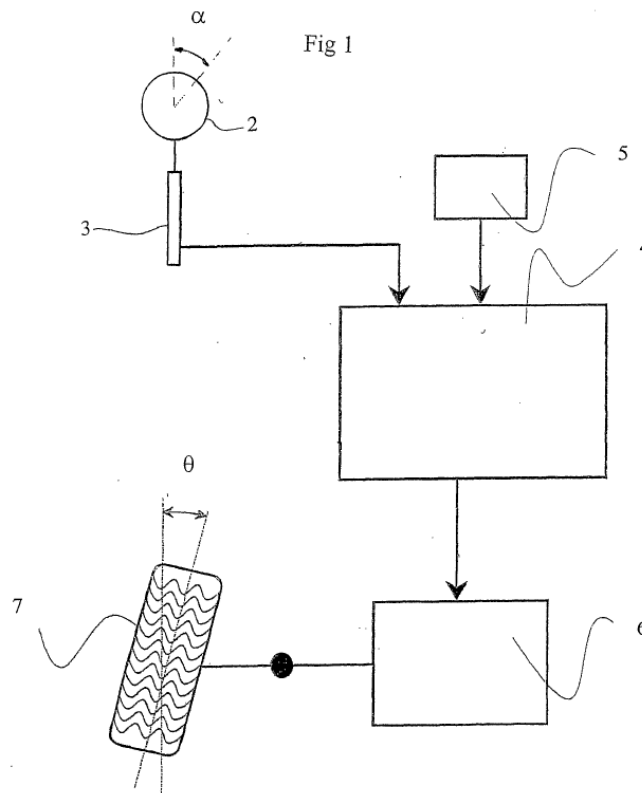
1. Dechamp (Ex. 1005)

Dechamp “relates to a method of determining a steering ratio in a steer-by-wire system for a vehicle.” Ex. 1005, Abstr. Dechamp explains that, in a steer-by-wire system, a driver moves a control member to fix a setpoint direction for the vehicle, and position sensors send a signal based on the movement of that control member. *Id.* at 1:21–26.¹ The signal is

¹ Like the parties, we cite to Dechamp’s page numbers, not the exhibit page numbers at the bottom center of the page.

processed and sent to an actuator to change the orientation of wheels on a vehicle. *Id.* at 1:26–29. Dechamp also explains that the steering can be parameterized so that “the steering angle of the steerable wheel[] is a function of the angle of the control member and of the speed of the vehicle.” *Id.* at 2:8–10.

Dechamp’s method includes “determining a maximum allowable steering angle θ of the steerable wheel based on said detected speed and a predetermined maximum transverse acceleration criterion.” Ex. 1005, 3:16–20. In one implementation, Dechamp determines a maximum steering angle based on “a rollover transverse acceleration criterion,” and, in another, steering is limited to a range in which the vehicle can be safely moved. *Id.* at 4:4–8, 4:28–35, 7:31–8:17. Figure 1 of Dechamp is reproduced below.



“Figure 1 is a block diagram of a steer-by-wire steering system.” Ex. 1005, 5:32. The system includes control member 2, which can be a

steering wheel and can be turned to angle α . *Id.* at 6:3–8. Position sensor 3 detects the angular displacement and sends a signal to CPU 4. *Id.* at 6:10–12. CPU 4 also receives a signal from speed sensor 5. *Id.* at 6:17–19. CPU 4 sends a signal based on sensed angle α and speed to actuator 6 that is mechanically linked to steerable wheels 7. *Id.* at 6:21–23. Steering angle θ depends on angle α and speed, and the ratio of angle α to steering angle θ defines a reduction ratio. *Id.* at 6:32–7:3.

2. Husain (Ex. 1006)

Husain “relates to a steer-by-wire system that includes a driver interface system comprising a steering wheel” and particularly to one “wherein the steering wheel is rotatable by an operator between limits that are dependent upon the ability of the road wheels to respond.” Ex. 1006 ¶ 1. Figure 1 of Husain is reproduced below.

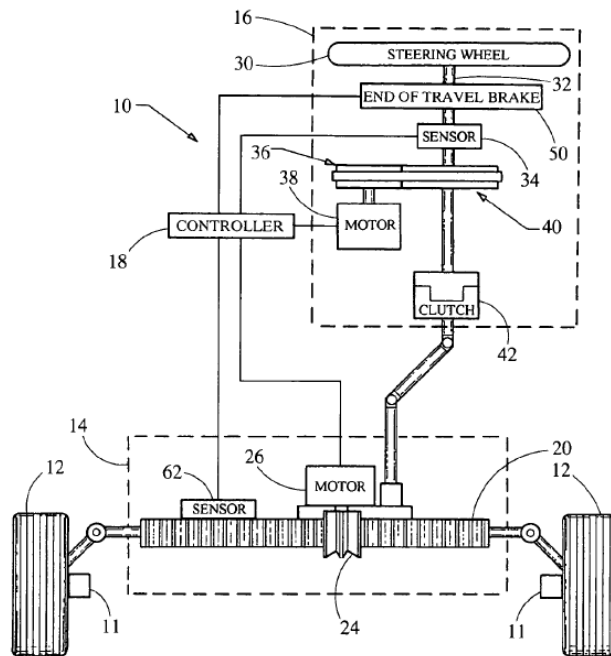


Fig. 1

Figure 1 shows a driver interface system. Ex. 1006 ¶ 9. Steer-by-wire system 10 includes steering wheel 30 on steering column 32 and sensor 34

that detect the rotation of steering column 32. *Id.* ¶ 13. Sensor 34 provides an input signal to controller 18. *Id.* Controller 18 sends a signal to electric motor 26 that drives pinion gear 24. *Id.* ¶ 12. Pinion gear 24 engages teeth of rack 20, and rack 20 can thereby be displaced laterally to alter the orientation of road wheels 12. *Id.*

System 10 also includes end of travel brake 50 that can lock steering column 32 and prevent rotating steering wheel 30. Ex. 1006 ¶ 17. Controller 18 can receive an input from sensor 62 that detects the position of pinion gear 24 and can actuate end of travel brake 50. *Id.* ¶ 18. Also, controller 18 can calculate the lateral displacement of rack 20 based on sensor 62 and determine if road wheels 12 have engaged stops 11 or if rack 20 cannot move because of a vehicle-mounted stop, curb, or other obstacle. *Id.* ¶¶ 19, 20. By actuating end of travel brake 50, system 10 can alert the driver when the road wheels 30 engage a stop or some other obstacle. *Id.* ¶ 21.

3. *Claim 1*

a) “*A rollover prevention apparatus . . .*”

Petitioner argues that, if the preamble is limiting, the proposed combination of Dechamp and Husain teaches such an apparatus. Pet. 39 (citing Ex. 1003 ¶ 109; Ex. 1005, 6:1–30; Ex. 1006 ¶¶ 17–20); Ex. 1001, 10:6; *see also* Pet. viii (labeling the preamble “[1.1]”).

The relied-upon portion of Dechamp describes in relation to DeChamp’s Figure 1 a steering system that includes control member 2 that can be a steering wheel, position sensor 3 that can be an angle counter, CPU 4, speed sensor 5, actuator 6, and steerable wheels 7. Ex. 1005, 6:1–30. A cited portion of Husain describes “electromechanical end-of-travel

brake 50 adapted to lock steering column 32,” thereby locking steering wheel 30. Ex. 1006 ¶ 17.

We also credit Petitioner’s declarant testimony that one of ordinary skill in the art would have understood that these components are an “apparatus” because “they work in tandem toward a common goal—steering a vehicle while preventing a rollover.” Ex. 1003 ¶ 109. Patent Owner does not provide a responsive argument regarding the preamble of claim 1. *See generally* PO Resp.

Based on the full record before us, Petitioner persuades us, and we find, that Petitioner’s proposed combination of Dechamp and Husain teaches or suggests, to the extent the preamble is limiting, a “rollover prevention apparatus.”

b) “. . . having a mode that allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle . . . ”

Petitioner argues that “mode” is a “generic nonce term.” Pet. 42 (citing Ex. 1003 ¶¶ 51, 117). Petitioner contends that its proposed combination provides an identical function with a structure equivalent to Corresponding Structure #1. Pet. 44–45 (citing Ex. 1003 ¶¶ 119–120; Ex. 1006 ¶¶ 17–20).

(1) Asserted Identical Function

Petitioner’s asserted function in claim 1 is

allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle at any rollover capable speed of said vehicle regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle.

Pet. 15–16 (citing Ex. 1003 ¶ 51); Ex. 1001, 10:7–12.

Petitioner argues that Dechamp teaches a maximum steerable angle for wheels based on speed and transverse rollover acceleration. Pet. 39–40 (citing Ex. 1003 ¶¶ 94, 111; Ex. 1005, 3:22–23, 4:28–35, 5:8–12); *see also* Pet. viii (labeling the limitation “[1.2]”). Regarding “at any rollover capable speed of said vehicle,” Petitioner argues that Dechamp describes providing its technique for any rollover capable speed. *Id.* at 41 (citing Ex. 1003 ¶¶ 94, 112; Ex. 1005, 3:16–20, 3:22–23); Ex. 1001, 10:10.

As for “regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle,” Petitioner contends that, consistent with arguments made during prosecution of the ’877 patent, the “source” does not require or exclude any particular source and the “source” can be a human driver. Pet. 41 (citing Ex. 1003 ¶ 114); Ex. 1001, 10:11–12. Petitioner also contends that dependent claim 2 recites that the source is a human driver and that both Dechamp and Husain teach a human driver being the source of a load applied to a steering wheel. *Id.* at 41–42 (citing Ex. 1003 ¶ 115; Ex. 1005, 1:21–29, 2:4–6, 3:33–35, 6:7–8, 7:1–17; Ex. 1006 ¶¶ 5–7, 13, 21). Based on the ’877 patent’s description, Petitioner further contends that Dechamp teaches the required “oversteer.” *Id.* at 42 (citing Ex. 1001, 1:47–48, 1:53, 1:58, 3:14–18; Ex. 1003 ¶ 116; Ex. 1005, 4:28–35, 5:8–12).

Petitioner relies on portions of Dechamp that describe “[t]he point of the invention is to define for any vehicle speed a maximal angle for the steerable wheel” (Ex. 1005, 3:22–23) and that one implementation “for determining $\theta_{\max}$ the transverse acceleration criterion is less than the transverse rollover acceleration” to “enhanc[e] the operational safety of the vehicle” because “the driver is limited to being able to steer his vehicle within the range of safe movements of the vehicle” (*id.* at 4:28–35).

Petitioner relies on another portion that describes that a transverse acceleration criterion may be defined “as a fraction of the transversal rollover acceleration (i.e. 80%, 90%, 100%, or 120% of the rollover transverse acceleration).” *Id.* at 5:8–12.

For “at any rollover capable speed of said vehicle,” Petitioner cites portions of Dechamp that describe that its method includes “detecting the speed of said vehicle” and “determining a maximum allowable steering angle θ of the steering wheel based on said detected speed and a predetermined maximum transverse acceleration criterion” (Ex. 1005, 3:16–20) and that “the point of the invention is to define for any vehicle speed a maximal angle for the steerable wheel” (*id.* at 3:22–23).

For “regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle,” the cited portions of Dechamp describe that “a steer-by-wire steering system comprises a control member (steering wheel, lever, or joystick) on which a driver can act” (Ex. 1005, 1:21–22), “the driver is limited to being able to steer his vehicle” (*id.* at 3:33–35), and “control member 2 may be oriented at an angle α by the driver of the vehicle” (*id.* at 6:7–8).

The cited portions of Husain describe “alert[ing] the driver that the road wheel stop has been engaged that is not dependent upon a predetermined angular displacement of the steering wheel” (Ex. 1006 ¶ 5), “alert[ing] the driver in a manner similar to mechanical system with which the driver is familiar” (*id.* ¶ 6), “a steering wheel mounted on a steering column and rotatable by a driver” (*id.* ¶ 7), “a driver rotat[ing] steering wheel 30 to input a steering command” (*id.* ¶ 13), and “alert[ing] the driver as to steering limits” (*id.* ¶ 21).

We credit Petitioner's testimonial evidence regarding Dechamp's steering ratio R and minimal steering ratio $R_{\min}$ because the cited portions of Dechamp support it. Ex. 1003 ¶ 94; Ex. 1005, 3:8–4:2, 4:28–35, 7:31–8:17. We also credit the testimony regarding “allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle” because the cited portions of Dechamp also support it. Ex. 1003 ¶ 111; Ex. 1005, 3:22–23, 4:28–35, 5:8–12.

We further credit Petitioner's supporting testimonial evidence regarding “at any rollover capable speed of said vehicle” because the cited portions of Dechamp support it. Ex. 1003 ¶¶ 94, 112; Ex. 1005, 3:16–20, 3:22–23. We additionally credit Petitioner's supporting testimonial evidence pertaining to “regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle” because the cited portions of the record support it. Ex. 1002, 559–560, 609; Ex. 1003 ¶¶ 114, 115; Ex. 1005, 1:21–29, 2:4–6, 3:33–35, 6:7–8, 7:1–17, 7:19–23; Ex. 1006 ¶¶ 5–7, 13, 21.

Patent Owner does not dispute Petitioner's asserted function, if the claims were given means-plus-function interpretations, or whether the asserted references teach or suggest the function. *See generally* PO Resp. Based on the full record before us, Petitioner persuades us, and we determine, that the proposed combination of Dechamp and Husain teaches or suggests an identical function, specifically the function of

allow[ing] a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevent[ing] said vehicle from being steered beyond a rollover threshold of said vehicle at any rollover capable speed of said vehicle regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle.

(2) Asserted Equivalent Structure

Petitioner's asserted corresponding structure is Corresponding Structure #1, the first embodiment of the '877 patent, that includes steering column 30 with steering wheel 20 connected at one end and SCPDD 40 connected at the other end, left-hand unidirectional brake assembly 60, and right-hand unidirectional brake assembly 70. Pet. 17–18; Ex. 1001, 2:35–39, 2:48–52, 2:57–3:18, 5:15–21, 5:29–57, 5:63–65, 6:17–7:38, 7:45–54, Figs. 1–4B.

Petitioner contends that Dechamp teaches steering wheel 2 that would be engaged by Husain's steering column brake when it reaches a maximum angle and disengaged when below that angle. Pet. 42–43 (citing Ex. 1005, 3:22–4:2; Ex. 1006 ¶¶ 17–20).

Petitioner cites to a portion of Dechamp that describes “[t]he point of the invention is to define for any vehicle speed a maximal angle for the steerable wheel” and “the method of the invention makes it possible to ensure that when the steering control member is oriented at full travel the steerable wheel angle stays within an angular area defined as a function of a transverse acceleration area.” Ex. 1005, 3:22–29. Dechamp goes on to describe turning the steering wheel provides a command angle α that is converted into a steering angle θ to form a ratio that is compared with a minimal steering ratio $R_{\min}$ that takes into account transverse acceleration. *Id.* at 3:31–4:2.

The relied-upon portions of Husain describe “electromechanical end-of-travel brake 50 adapted to lock steering column 32 and prevent rotation of steering wheel 30,” that “[d]uring vehicle operation, controller 18 actuates brake 50 under selected circumstances to prevent rotation of steering wheel

30,” and that “the brake is actuated to provide an end-of-travel stop to lock the steering wheel.” Ex. 1006 ¶¶ 17, 18, 20.

We credit Petitioner’s testimonial evidence the proposed combination provides a structure that is not substantially different from Corresponding Structure #1, the first embodiment of the ’877 patent, because Dechamp and Husain support it. Ex. 1003 ¶¶ 119–120. Patent Owner does not provide a response disputing that Petitioner’s proposed combination has an identical structure. *See generally* PO Resp.

Based on the full record before us, Petitioner persuades us, and we find, that the proposed combination teaches or suggests a structure equivalent to the first embodiment of the ’877 patent. Below, we analyze whether one of ordinary skill in the art would have made the proposed modification of Dechamp in view of Husain.

In view of the above, Petitioner persuades us, and we agree with Petitioner’s declarant, that the proposed combination performs the identical function in the same way by applying a braking force on a steering column to achieve the same result of rollover prevention. Ex. 1003 ¶ 120.

(3) Under Patent Owner’s View

Patent Owner argues that the claims recite enough structure to avoid means-plus-function interpretations. *See, e.g.*, PO Resp. 14–16. Petitioner argues that its proposed combination has a “mode” under two alternative mappings that each satisfy the limitation. Pet. 42 (citing Ex. 1003 ¶¶ 51, 117).

Petitioner contends that its proposed combination of Dechamp and Husain would have been understood to have a brake engaged mode and a brake disengaged mode, and in both asserted modes, Dechamp’s vehicle is steered within a maximal non-rollover steerable range and prevented from

being steered beyond a rollover threshold, as claimed. Pet. 42–43 (citing Ex. 1003 ¶ 118; Ex. 1005, 3:22–4:2, 3:31–4:11, 4:28–35, 5:8–12, 6:1–33, 7:19–8:17; Ex. 1006 ¶¶ 17–20).

Petitioner cites portions of Dechamp that describe a method where $R_{\min}$ is determined by “a rollover transverse acceleration criterion” (Ex. 1005, 3:31–4:11), a method where “the transverse acceleration criterion is less than the transverse rollover acceleration” to “enhanc[e] the operational safety of the vehicle” because “the driver is limited to being able to steer his vehicle within the range of safe movements of the vehicle” (*id.* at 4:28–35). Petitioner also cites portions of Dechamp that describe a transverse acceleration criterion defined “as a fraction of the transversal rollover acceleration” (*id.* at 5:8–12), the components of a steering system shown in Figure 1 (*id.* at 6:1–30), “the steering angle θ depend[ing] on the angle α and on the speed of the vehicle” (*id.* at 6:32–33), and $R_{\min}$ depending on the speed of the vehicle and “mak[ing] it possible to take into account the transverse rollover acceleration” and “limit[ing] the driver to being able to steer his vehicle within the range of safe movements of the vehicle” with reference to Figure 2 (*id.* at 7:19–8:17).

The relied-upon portions of Husain describe “electromechanical end-of-travel brake 50 adapted to lock steering column 32 and prevent rotation of steering wheel 30,” “[d]uring vehicle operation, controller 18 actuates brake 50 under selected circumstances to prevent rotation of steering wheel 30,” and “the brake is actuated to provide an end-of-travel stop to lock the steering wheel.” Ex. 1006 ¶¶ 17, 18, 20.

We credit Petitioner’s declarant testimony that one of ordinary skill in the art would have understood that the proposed combination of Dechamp and Husain has two modes—a brake engaged mode and a brake disengaged

mode—so that the vehicle is steered within a safe steerable range and prevented from being steered beyond a rollover threshold. Ex. 1003 ¶ 118. The full record supports that testimony. Ex. 1005, 3:22–4:11, 4:28–35, 5:8–12, 6:1–33, 7:19–8:17; Ex. 1006 ¶¶ 17–20.

Under an alternative mapping, Petitioner argues that, when Dechamp’s steering wheel 2 is turned in one direction, steering wheel 2 sends a command angle that causes the CPU to send a signal to actuator 6 so that steerable wheels 7 go to angle θ that is speed dependent and prevents rollover. Pet. 43–44 (citing Ex. 1005, 3:31–4:11, 4:28–35, 5:8–12, 6:1–33, Fig. 1). Petitioner also argues that a similar operation occurs when steering wheel 2 is turned in the other direction. *Id.* at 44. Petitioner asserts that Patent Owner’s infringement contentions support Petitioner’s alternative mapping of mode to the contended modes in opposite directions of the steering wheel. *Id.* at 44 (citing Ex. 1001, 10:6–15; Ex. 1009, 10:33–43).

Petitioner cites to the same portions of Dechamp that describe components of a steering system for determining $R_{\min}$ by “a rollover transverse acceleration criterion” that “is less than the transverse rollover acceleration” and may be “a fraction of the transversal rollover acceleration” so as to “enhanc[e] the operational safety of the vehicle” and limit steering to “within the range of safe movements of the vehicle.” Ex. 1005, 3:31–4:11, 4:28–35, 5:8–12, 6:1–33, Fig. 1.

Patent Owner does not provide a response disputing that Petitioner’s proposed combination has modes for brake engaged and brake disengaged or modes for turning to the right and turning to the left. *See generally* PO Resp.

Based on the full record, Petitioner persuades us, and we find, that Petitioner’s proposed combination teaches or suggests “a mode,” in which

Husain's brake 50 engages Dechamp's steering wheel 2 when a maximum steering angle is reached, and another "mode," in which brake 50 is not engaged with steering wheel 2. Petitioner also persuades us, and we find, based on the full record that the proposed combination alternatively teaches or suggests "a mode" for each of the two steering directions.

If claim 1 does not invoke means-plus-function interpretation, for the reasons above, Petitioner shows that its proposed combination of Dechamp and Husain has a "mode" (one of a brake-engaged mode, a brake-disengaged mode, a right-turning mode, or left-turning mode) that

allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle at any rollover capable speed of said vehicle regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle.

Ex. 1001, 10:7–12.

(4) "Within a Maximal Non-Rollover Steering Range"

(a) Patent Owner's Response

Patent Owner responds that "DeChamp, in one implementation, doesn't allow a vehicle to be steered anywhere near to the point of rollover; and, in another implementation, doesn't prevent a vehicle from being steered **beyond** the point of rollover." PO Resp. 40. Patent Owner also responds that, unlike the challenged claims, "DeChamp's two implementations each permit steering a vehicle **beyond** the threshold of roll." *Id.* at 42 (citing Ex. 2023 ¶ 38); *see also id.* at 43–44 (arguing similarly). Patent Owner further responds that Dechamp teaches steering beyond rollover threshold. *Id.* at 43 (quoting Ex. 1005, 5:1–6, 8:19–24). According to Patent Owner, a second implementation of Dechamp "prevents a vehicle from reaching the

point of rollover” and “**keep[s] the vehicle far below the threshold of roll,**” contrary to the challenged claims. *Id.* at 44 (citing Ex. 1005, 8:10–17; Ex. 2023 ¶¶ 41–42), 45 (arguing similarly) (citing Ex. 2021, 142:23–143:24).

(b) Reply Arguments

Petitioner replies that Dechamp teaches “defin[ing] for any vehicle speed a maximal angle for the steerable wheel” that would be “less than or equal to the vehicle’s ‘transverse rollover acceleration,’” thereby meeting the limitation. Pet. Reply 1–2 (citing Pet. 39–40; Ex. 1005, 3:22–23, 4:28–35, 5:8–12). Petitioner also argues that Patent Owner’s “up to” argument is not based on a claim limitation and Dechamp teaches steering up to transverse rollover acceleration. *Id.* at 2–3 (citing Pet. 40; PO Resp. 40; Ex. 1001, 10:7–8, 10:42–43, 11:6–7; Ex. 1005, 5:8–12; Ex. 1029 ¶¶ 17–24). Petitioner further argues that the ’877 patent describes crude accuracy and Patent Owner, thus, cannot require more accuracy from Dechamp. *Id.* at 3 (citing Ex. 1021, 132:13–21; Ex. 1029 ¶¶ 22–23; Ex. 1030, 23:3–24:10). Petitioner additionally argues that Dechamp makes clear that it limits steering range. *Id.* at 3–4 (citing Pet. 39–40; PO Resp. 42; Ex. 1003 ¶¶ 94, 97; Ex. 1005, 4:28–35; Ex. 1029 ¶¶ 25–26; Ex. 1030, 57:8–58:18).

Patent Owner replies that Petitioner does not deny that Dechamp allows a vehicle to be steered beyond a roll threshold. PO Sur-reply 20–21 (citing Ex. 1005, 5:1–6, 8:19–24; Ex. 2023 ¶ 36), 25 (citing Ex. 2023 ¶ 41). Patent Owner also argues that Dechamp keeps a vehicle far below roll threshold, unlike the claims. *Id.* at 21–22 (citing Ex. 1005, 8:10–17; Ex. 2023 ¶¶ 39–42). Patent Owner further argues that Dechamp’s calculation of transverse rollover criterion would not reproducibly steer a

vehicle up to, but not beyond, a roll threshold. *Id.* at 22–23 (citing Ex. 1005, Abstr.; Ex. 1029; Ex. 2023 ¶ 35).

(c) Petitioner Shows the Limitation

Claim 1 recites “a mode that allows a vehicle to be steered within a maximal non-rollover steering range . . . but prevents said vehicle from being steered beyond a rollover threshold.” Ex. 1001, 10:6–9. As discussed above, Petitioner persuades us, and we find, that Dechamp teaches a maximum steerable angle based on transverse acceleration criterion that may be defined as “90%” or “100%” of the rollover transverse acceleration. Pet. 39–40; Ex. 1003 ¶¶ 94, 111; Ex. 1005, 5:8–12.

Even if we were to adopt Patent Owner’s view, Petitioner relies on portions of Dechamp that we find describe “defin[ing] for any vehicle speed a maximal angle for the steerable wheel” and that “maximal angle for the steering wheel” can be defined by determining $\theta_{\max}$ so that “the transverse acceleration criterion is less than the transverse rollover acceleration.” Ex. 1005, 3:22–23, 4:28–35. Contrary to Patent Owner’s position, Petitioner also relies on a portion of Dechamp that we find teaches “defin[ing] the transverse acceleration criterion as a fraction of the transversal rollover acceleration (i.e. 80%, 90%, 100%, or 120% of the rollover transverse acceleration).” *Id.* at 5:8–12.

Because we find that Dechamp teaches a “maximal angle for the steering wheel” based on a criterion that can be “100%” of the rollover transverse acceleration, we determine that Dechamp teaches or suggests allowing a vehicle to be steered near the point of rollover but prevented from being steered beyond that point. *See also* PO Resp. 44 (arguing that Dechamp describes an implementation that “prevents a vehicle from reaching the point of rollover”).

Moreover, Patent Owner does not propose an interpretation for any claim term, such as the above-quoted limitation of claim 1. *See generally* PO Resp. Patent Owner’s argument about steering “near to the point of rollover” implies a narrower interpretation of “allows a vehicle to be steered within a maximal non-rollover steering range . . . but prevents said vehicle from being steered beyond a rollover threshold.” *See id.* at 40–45. To support such an argument, Patent Owner should, but did not, provide analysis and evidence for a narrower claim scope. *See generally id.*

As Patent Owner points out, Dechamp does describe setting the transverse acceleration criterion to be greater than transversal rollover acceleration (PO Resp. 40, 42, 43–44; Ex. 1005, 5:1–6, 8:19–24); however, Petitioner does not rely on those portions of Dechamp. *See* Pet. 39–40 (Ex. 1003 ¶¶ 94, 111; Ex. 1005, 3:22–23, 4:28–35, 5:8–12).

(5) *Unworkable Formula*

(a) *Patent Owner’s Response*

Patent Owner also responds that “DeChamp’s formulas are the central feature disclosed in DeChamp, and are unworkable.” PO Resp. 40 (citing Ex. 2023 ¶¶ 29–36); *see also id.* at 44–45 (arguing “DeChamp only teaches an unworkable, unpredictable formula for expressing a relationship between *alpha* and *theta*”), 56 (arguing, as “**Reason Nine**” that Dechamp’s formula are unworkable), 58 (reiterating the argument). According to Patent Owner, Dechamp fails to disclose the “variables characteristic of, and unique to, a given vehicle” or what weight to give to such variables that can change over short time periods, and, thus, the formulas are unworkable. *Id.* at 40–41 (citing Ex. 2023 ¶¶ 33–35). Patent Owner argues that “**DeChamp’s formulas cannot reproducibly steer any vehicle up to, but not beyond a threshold of roll** under all circumstances,” and “[i]t is therefore irrelevant

that a [person of ordinary skill in the art] could calculate A_y [transverse acceleration criterion] for some, or any, set of variables.” *Id.* at 42.

Patent Owner also argues that “nowhere does DeChamp teach that the reason for such steering limitation can be ascribed to anything but the particular driving parameters of the moment in combination with the particular steering ratio applied” and that “[t]he variable steering ratio isn’t a method of limiting the overall steering range of motion.” PO Resp. 42 (citing Ex. 2023 ¶ 37). In Patent Owner’s view, “steering beyond a vehicle’s threshold of roll may happen unpredictably, in part because of the unpredictability of variations in the value of A_y .” PO Resp. 42–43 (citing Ex. 2023 ¶ 38).

(b) Reply Arguments

Petitioner replies that Dechamp is presumed enabled and Patent Owner has not met its burden of submitting evidence and argument that Dechamp is not enabled. Pet. Reply 4–5, 8 (citing PO Resp. 56). Petitioner argues that Patent Owner waived its opportunity to explain why undue experimentation would be required and the record shows that one of ordinary skill in the art would have been able to determine a vehicle’s transverse rollover acceleration. *Id.* at 5 (citing Ex. 1001, 4:37–41, 7:39–49; Ex. 1005, 5:8–12; Ex. 1029 ¶¶ 27–34). Petitioner also argues that the claims do not require rollover prevention under all circumstances. *Id.* at 5–6 (citing PO Resp. 41–42; Ex. 1005, 8:6–9; Ex. 1030, 63:17–65:20). According to Petitioner, the ’877 patent provides little detail about the factors that influence vehicle rollover. *Id.* at 6 (citing Ex. 1001, 4:37–41, 7:39–49).

Patent Owner replies that Petitioner does not deny the Dechamp may unpredictably allow a vehicle to be steered beyond roll threshold because of the unpredictable variations in Dechamp’s transverse acceleration criterion.

PO Sur-reply 21. Patent Owner also argues that Petitioner does not deny that Dechamp is unworkable because of the unspecified variables in Dechamp's transverse acceleration criterion and Dechamp merely changes how much the rolling wheel changes relative to the steering wheel input. *Id.* at 22 (citing Ex. 2023 ¶ 35). Patent Owner further argues that Dechamp provides no teaching about the variables and that Petitioner speculates on what the variables might be. *Id.* at 22–23 (citing Ex. 1005, Abstr.; Ex. 1029). According to Patent Owner, using variables such as vehicle mass and height precludes accurate calculation of the transverse rollover criterion. *Id.* at 23.

(c) Dechamp is Enabled

Petitioner asserts an obviousness challenge based on Dechamp and Husain. *See* Pet. 36–47. While a reference must enable someone to practice the invention in order to anticipate under § 102, a non-enabling reference may qualify as prior art for the purpose of determining obviousness under § 103. *See Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1380–81 (Fed. Cir. 2021).

Patent Owner points to an asserted lack of disclosure regarding the variables for calculating Dechamp's transverse acceleration criterion. PO Resp. 40, 44–45, 56, 58. Dechamp, however, states that “transverse acceleration criterion” is “associated with the architecture of the vehicle (especially the mass, height and length of the vehicle)” and “may possibly be weighted by a load of the vehicle.” Ex. 1005, 8:4–8. Dechamp also provides a graph of minimum reduction ratio as a function of vehicle speed. *Id.* at 5:34–35, 7:19–9:2, Fig. 2. Given Petitioner's undisputed level of ordinary skill in the art, we find that these disclosures would be sufficient for

calculating Dechamp's transverse acceleration criterion. Pet. 14; Ex. 1005, 5:34–35, 7:19–9:2, Fig. 2. We, thus, find that Dechamp is enabled.

Even if we could only presume that Dechamp is enabled, Patent Owner provides no argument or evidence, other than an asserted lack of disclosure, for overcoming that presumption. *See* PO Resp. 40, 44–45, 56, 58. Additionally, as we previously indicated to provide notice to Patent Owner, the Specification of the '877 patent describes that “[m]any factors are involved in a vehicle rollover” and that such vehicle rollover can occur “when a vehicle steering wheel is turned too sharply for the vehicle speed,” but the '877 patent does not indicate how to calculate when vehicle rollover will occur or how far a steering wheel can be turned before it is considered to be “too sharply.” *See* Inst. Dec. 27–28; Ex. 1001, 1:44–45, 2:1–3.

Because the '877 patent does not describe how to calculate when vehicle rollover will occur, such calculation must be within ordinary skill in the art; otherwise, the '877 patent itself would not be enabled. *See* Ex. 1001, 1:44–45, 2:1–3. Based on the full record, we find that the '877 patent indicates it is a matter of ordinary skill in the art to determine rollover thresholds, because there is no argument or evidence to the contrary in the record. *See* Ex. 1001, 1:44–45, 2:1–3.

Thus, because the '877 patent indicates determining rollover threshold is a matter of ordinary skill in the art, the full record indicates that calculating Dechamp's “transverse rollover acceleration criterion” would have been within ordinary skill in the art, and Dechamp, therefore, is enabled in the same manner that the '877 patent is enabled.

- c) “... wherein said apparatus transitions from said mode in response to a predetermined application of rotational load to said steering wheel”

For the wherein clause quoted above, Petitioner argues that the proposed combination of Dechamp and Husain transitions between a brake-engaged mode and brake-disengaged mode under Petitioner’s first mapping. Pet. 45–46 (citing Ex. 1003 ¶¶ 65, 114, 121; Ex. 1005, 3:22–4:2; Ex. 1006 ¶¶ 17–21); Ex. 1001, 10:12–15; *see also* Pet. viii (labeling the limitation “[1.3]”).

The cited portion of Dechamp describes that its method “ensure[s] that when the steering control member is oriented at full travel the steerable wheel angle stays within an angular area defined as a function of a transverse acceleration area.” Ex. 1005, 3:27–29. A cited portion of Husain describes that “when the driver attempts to steer the vehicle in an opposite direction from the direction in which the stop is engaged, the electromechanical brake is readily released to free the steering wheel.” Ex. 1006 ¶ 21. We credit Petitioner’s testimonial evidence because the cited portions of the record support it. Ex. 1002, 559–560, 609; Ex. 1003 ¶¶ 65, 114, 121; Ex. 1005, 3:22–4:2, 7:19–23; Ex. 1006 ¶¶ 17–21.

Petitioner also argues that, under its alternative mapping, the proposed combination transitions between a right-hand turning mode and a left-hand turning mode. Pet. 46–47 (citing Ex. 1005, 1:21–29, 2:24–29, 4:33–35, 6:7–8, 7:19–23).

The cited portions of Dechamp describe that “the driver is limited to being able to steer his vehicle within the range of safe movements of the vehicle” (Ex. 1005, 4:28–35) and “the driver can turn the steering wheel to the maximum angle $\theta_{\max}$ that the steerable wheel can adopt for a given

speed” (*id.* at 7:19–23). We credit Petitioner’s supporting testimonial evidence because the cited portions of the record support it. Ex. 1002, 559–560, 609; Ex. 1003 ¶¶ 65, 114; Ex. 1005, 7:19–23.

Patent Owner does not provide a response for “wherein said apparatus transitions from said mode in response to a predetermined application of rotational load to said steering wheel.” *See generally* PO Resp. Based on the full record, Petitioner persuades us, and we find, that the proposed combination teaches or suggests “wherein said apparatus transitions from said mode in response to a predetermined application of rotational load to said steering wheel.”

d) Asserted Reason for Combining Dechamp and Husain

Petitioner argues that one of ordinary skill in the art would have been motivated to implement Husain’s end of travel brake in Dechamp because of Dechamp’s fixed angular travel for a steering wheel. Pet. 36 (citing Ex. 1003 ¶¶ 99–108; Ex. 1005, 3:22–4:2; Ex. 1006 ¶¶ 17–20). Petitioner also argues that Husain expressly identifies benefits for using its end of travel brake, such as providing a resistive torque that simulates feel and ready release when turning the steering wheel in the other direction. *Id.* at 36–37 (citing Ex. 1003 ¶¶ 102, 103; Ex. 1006 ¶¶ 17, 20, 21). Petitioner further argues that providing tactile feedback would have also motivated the ordinarily skilled artisan to combine Dechamp and Husain. *Id.* at 37 (citing Ex. 1003 ¶ 104).

Petitioner additionally argues that one of ordinary skill in the art would have been motivated to make the proposed combination, because Husain’s brake can be used for other purposes, such as preventing the steering wheel from moving when a curb or some other obstacle prevents the road wheels from moving. Pet. 38 (citing Ex. 1003 ¶ 105; Ex. 1006 ¶¶ 7,

21). According to Petitioner, one of ordinary skill in the art would have had a reasonable expectation of success in making the combination. *Id.* at 38–39 (citing Ex. 1003 ¶¶ 26–40, 106–107).

(1) Patent Owner’s Responsive Arguments, the Parties’ Reply Arguments, and Analysis of Those Arguments

Patent Owner responds that one of ordinary skill in the art would not have made the proposed combination. PO Resp. 47–48 (citing Ex. 2023 ¶¶ 29–50). Patent Owner argues that “Husain and DeChamp have nothing to do with each other.” *Id.* at 53 (citing Ex. 2023 ¶¶ 44, 46, 51, 52).

Petitioner, however, argues that both Dechamp and Husain relate to steer-by-wire steering systems. Pet. 32 (citing Ex. 1003 ¶¶ 92–97; Ex. 1005, 1:6–7, 4:4–11, 4:28–35), 35 (citing Ex. 1006 ¶ 17). The full record supports Petitioner because the references themselves expressly state that they both relate to steer-by-wire steering systems. Ex. 1005, 1:5–6 (“The present invention relates to a method of controlling a steer-by-wire steering system.”); Ex. 1006 ¶ 1 (“This invention relates to a steer-by-wire system that includes a driver interface system comprising a steering wheel.”); *see also* Ex. 1003 ¶ 106 (opining about “the overlapping ‘steer-by-wire’ systems of Dechamp and Husain”).

Patent Owner also argues that, even if the combination were made, it would not have rendered obvious the challenged claims. PO Resp. 53 (“**Reason One**”); PO Sur-reply 20 (arguing that Petitioner’s declarant tacitly admits that the proposed combination would not have rendered obvious the claims) (citing Ex. 1029 ¶¶ 17–34). Patent Owner contends that “Husain doesn’t disclose the threshold of roll, or any system/method that permits steering up to, but not beyond the threshold of roll.” PO Resp. 53 (citing Ex. 2023 ¶ 43). Petitioner replies that it relies on the combination of

Dechamp and Husain. Pet. Reply 7 (citing PO Resp. 53; Ex. 1003 ¶¶ 101–107).

In its proposed combination, Petitioner relies on Dechamp, not Husain, for teaching or suggesting “allow[ing] a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle.” See Pet. 39–40.

Patent Owner also responds that “Husain’s braking system, even if added to DeChamp’s system, wouldn’t affect how either of DeChamp’s two implementations work.” PO Resp. 53 (“**Reason Two**”) (citing Ex. 2023 ¶ 42). Petitioner replies that “Husain’s brake satisfies DeChamp’s instruction to provide a steering wheel with ‘a fixed angular travel’” and so Dechamp’s rollover prevention technique does not need to change. Pet. Reply 7 (citing Pet. 36; PO Resp. 53; Ex. 1003 ¶¶ 101–103). Patent Owner replies that Petitioner does not deny that Husain’s brake can engage or disengage at any steering wheel angle or rolling wheel angle when the rolling wheels hit a barrier, as admitted by Petitioner’s declarant. PO Sur-reply 24–25 (citing Ex. 1029; Ex. 2021, 116:2–3, 116:8–10, 118:25–119:5, 121:8–13; Ex. 2023 ¶¶ 41–50).

Petitioner argues that one of ordinary skill in the art “would have been motivated to implement Dechamp’s steering system . . . [to] employ[] Husain’s suggested improvement for a selectively engageable end-of-travel brake on the steering column.” Pet. 36 (citing Ex. 1003 ¶¶ 99–108; Ex. 1006 ¶¶ 17–20). As shown in the quote above, the proposed modification affects Dechamp by adding Husain’s brakes. See *id.*

Even if we accepted Patent Owner’s position that adding Husain’s brakes would not affect how Dechamp works, the full record indicates that

the scope of the challenged claims, if not given a means-plus-function interpretation, is broad enough to encompass Dechamp alone because such an interpretation would not require a brake. *See, e.g.*, Ex. 1001, 10:6–10 (reciting, in claim 1, an apparatus that “allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle”). Claim 1 only requires an apparatus that allows a vehicle to be steered within a non-rollover steering range but not beyond a rollover threshold and does not further require a brake in the apparatus. *See id.*

Patent Owner further responds Husain discloses an embodiment already described in Dechamp but that embodiment is not relied on for the proposed combination. PO Resp. 53–54 (“**Reason Three**”) (citing Ex. 2021, 116:19–117:12). Petitioner replies that Patent Owner confirms what the Petitioner is arguing. Pet. Reply 7 (citing Pet. 35–36; PO Resp. 53–54). This responsive argument acknowledges that it does not address the challenge presented.

Patent Owner next responds that “DeChamp doesn’t disclose such an automatic steering wheel column brake, or any need for such a brake.” PO Resp. 54 (“**Reason Four**”). Petitioner replies that an express need for a brake is not required for obviousness and “DeChamp specifically calls for a solution to fix the angular travel of the steering wheel, a goal accomplished via Husain’s end-of-travel brake.” Pet. Reply 7–8 (citing Pet. 36; Ex. 1005, 3:22–4:2). This responsive argument also fails to address the challenge presented because Petitioner points to benefits described by Husain, not Dechamp, that would have prompted one of ordinary skill in the art to make the proposed combination. *See* Pet. 36–38.

Patent Owner also responds that “DeChamp’s formulas have the driver steering the vehicle, under all circumstances, which makes Husain’s second concept, of automatically applying a brake when the wheels run into some barrier, inconsistent with DeChamp’s methods/systems.” PO Resp. 54 (“**Reason Five**”). In Patent Owner’s view, such automatic braking “takes steering away from the driver.” *Id.* (citing Ex. 2023 ¶¶ 43, 46, 47). Petitioner replies that “Husain’s brake is a feedback mechanism to alert the user when the road wheels ‘engage a vehicle-mounted [end-of-travel] stop, a curb, or other obstacle.’” Pet. Reply 8 (citing Pet. 37; Ex. 1003 ¶¶ 101–102; Ex. 1006 ¶ 19).

As summarized above, Petitioner’s proposed modification is to use Husain’s brake in Dechamp so that, when wheels 7 of Dechamp reach a limit, Husain’s brake would prevent further rotation of steering wheel 2. *See* Pet. 36–40. In other words, the driver can still steer but within limits. *See id.* The full record shows that steering within limits is not inconsistent with Dechamp and does not take steering away from the driver. Ex. 1003 ¶ 102 (opining that Husain “[i]s designed to be ‘readily released to free the steering wheel’ when the steering wheel is turned in the opposite direction”); Ex. 1006 ¶ 21 (“It is pointed out that, when the driver attempts to steer the vehicle in an opposite direction from the direction in which the stop is engaged, the electromechanical brake is readily released to free the steering wheel.”).

Patent Owner additionally responds that “Husain’s brakes engages/disengages, unrelated to whether the vehicle is below, at, or above the point of vehicle rollover.” PO Resp. 54–55 (“**Reason Six**”) (citing Ex. 2023 ¶ 49). Patent Owner also argues that Husain’s brakes do not engage based on whether the vehicle is below, at, or beyond rollover

threshold and, thus, unrelated to Dechamp, as admitted by Petitioner's declarant. *Id.* at 55 (“**Reason Seven**”) (citing Ex. 2021, 116:2–3, 118:25–119:5, 121:8–13; Ex. 2023 ¶ 50). Patent Owner contends that Husain's brakes engage when an obstacle blocks the vehicle's wheels. *Id.* (citing Ex. 1006 ¶ 7; Ex. 2023 ¶ 46). According to Patent Owner, the proposed combination would not have rendered obvious the challenged claims because “adding Husain's automatic brake has nothing to do with whether a vehicle is below, at, or above the threshold of rollover.” *Id.* at 56.

Petitioner replies that “Patent Owner misses the mark in arguing that Husain's braking scenarios are ‘unrelated to whether the vehicle is below, at, or above the point of vehicle rollover’” and that the Petition relies on Dechamp and Husain. Pet. Reply 8 (citing Pet. 36–39; PO Resp. 54–56).

The challenged claims only require an apparatus that allows a vehicle to be steered within a non-rollover steering range but not beyond a rollover threshold. *See, e.g.*, Ex. 1001, 10:6–10 (reciting, in claim 1, an apparatus that “allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered beyond a rollover threshold of said vehicle”). The claims do not further require a brake to engage or disengage in a manner related to vehicle rollover. *See id.*

e) Patent Owner's Remaining Arguments

(1) Dechamp

Patent Owner responds that Dechamp was cited during prosecution, considered by the Examiner, and the claims were allowed over Dechamp. PO Resp. 24–25 (citing Ex. 1001; Ex. 1005; Ex. 2018 (excerpts from an Office Action and an Information Disclosure Statement showing that Dechamp was considered); Ex. 2022 ¶¶ 1–3); *see also* PO Sur-reply 13–14

(arguing similarly) (citing Ex. 2017; Ex. 2018; Ex. 2022 ¶¶ 1–3). According to Patent Owner, the '877 patent is entitled to a presumption of validity, and the Board should not have instituted this proceeding in view of that presumption of validity. PO Resp. 25–26, 29–30 (citing Ex. 2011, 47:5–11; Ex. 2018), 38 (citing Inst. Dec. 7–8), 39–40 (citing Inst. Dec. 7–8; Ex. 1001; Ex. 2018), 57. Patent Owner also argues that Petitioner's declarant failed to consider that Dechamp was considered during prosecution and his testimony is contrary to MPEP § 609.06. *Id.* at 26–29 (citing Ex. 2021, 85:15–86:11, 88:19–91:19); *see also* PO Sur-reply 13 (citing Ex. 2021, 88:19–91:19).

Petitioner replies, and we agree, that Patent Owner erroneously asserts that a higher burden applies to this proceeding, because “[t]he Board owes no deference to the Examiner” and such deference would thwart the purpose of this proceeding. Pet. Reply 1 (citing Pet. 68–69; Inst. Dec. 7–8; PO Resp. 24–26; Ex. 1031, 36:6–39:3). Petitioner also replies, and we agree, that the combination of Dechamp and Husain was never considered during prosecution. *Id.* at 8 (citing PO Resp. 56).

Patent Owner also responds that Dechamp alone would not have rendered obvious any of the challenged claims. PO Resp. 38–39 (citing Ex. 2021, 94:5–95:14), 56 (arguing neither Dechamp alone nor Husain alone would have rendered obvious the challenged claims) (citing Ex. 2021, 94:5–95:14); PO Sur-reply 19–20 (citing Ex. 2021, 94:5–95:14).

Petitioner, however, challenges the claims based on Dechamp modified by Husain, not Dechamp alone, and this responsive argument does not address the challenge presented. *See* Pet. 1, 32–51; *see also* PO Resp. 45–46 (recognizing that Dechamp and Husain are asserted to argue that the challenged claims would have been rendered obvious); PO Sur-

reply 19 (acknowledging that review was instituted for Dechamp and Husain).

(2) Dechamp and Husain

Because Dechamp does not allow steering up to the point of rollover and Dechamp's formulas are unworkable, Patent Owner responds that Dechamp and Husain would not have rendered obvious the claims. PO Resp. 45. Patent Owner also argues that the claims were allowed over Dechamp alone, and so Petitioner's counsel had to suggest Husain to Petitioner's declarant, who did not mention Husain in his declaration for the related IPR2020-00948. *Id.* at 45–46 (citing Ex. 2004; Ex. 2021, 9:6–15). Patent Owner further argues that Petitioner ignores its nine reasons why one of ordinary skill in the art would not have combined Dechamp and Husain. *Id.* at 46–48 (citing Ex. 2023 ¶¶ 29–50).

For the reasons above, Petitioner shows that Dechamp teaches steering up to the point of rollover, Dechamp is enabled, and one of ordinary skill in the art would have combined Dechamp and Husain. The fact that Petitioner's counsel suggested Husain does not affect the testimony analyzing the proposed combination. Also, because the challenged claims in this proceeding and the related proceeding are different, we see no issue with including Husain in the present proceeding, but not the earlier one.

(3) Petitioner's Declarant

Patent Owner responds that Petitioner's declarant, Mr. Andrews, made admissions that contradict his first declaration and that those statements are admissible under Federal Rules of Evidence Rules 801(d)(2)(C) and 801(d)(2)(D). PO Resp. 3–4 (citing Ex. 1003). Patent Owner argues that no weight should be given to the declaration because deposition testimony impeaches it, Mr. Andrews failed to disclose that he

used his declaration from IPR2020-00948, deposition testimony established that Mr. Andrews ignored or misread the file history, deposition testimony shows that he was told to rely on Husain and Nishikawa, deposition testimony is so contrary to the declaration that the declaration must have been drafted by somebody else, and Mr. Andrews admitted that he was paid for his declaration and, thus, cannot be independent. *Id.* at 4–5 (citing Ex. 1003).

Patent Owner also responds that Mr. Andrews did not state he was a person of ordinary skill in the art in IPR2020-00948 but does so in this proceeding. PO Resp. 5 (citing Ex. 1003 ¶ 21; Ex. 2004 ¶ 5), 7–8 (citing Ex. 1003 ¶¶ 1, 21; Ex. 2021, 17:18–21:10). Patent Owner argues that Mr. Andrews admitted he had done nothing that would make him a person of ordinary skill in the art in this proceeding. *Id.* at 5–7 (quoting Ex. 2021, 44:15–47:14). Patent Owner further argues that Mr. Andrews admitted that no patent or other publication with his name has been cited against any of the patents claiming a rollover prevention apparatus and that he last worked in the automotive industry in 2001. *Id.* at 8 (citing Ex. 2021, 12:13–13:14, 86:23–87:9).

Patent Owner also responds that Mr. Andrews fails to disclose that he considered his prior declaration from IPR2020-00948 and its Decision to Institute in writing the declaration for this proceeding. PO Resp. 8 (citing Ex. 1003 ¶¶ 22–25; Ex. 2004; Ex. 2010; Ex. 2021, 41:16–24). According to Patent Owner, the consideration of the prior declaration was concealed because that declaration said nothing about Husain, Nishikawa, or Inagaki and because his declaration in this proceeding alleges that he is a person of ordinary skill in the art. *Id.* at 8–9 (Ex. 1003; Ex. 1006; Ex. 2004).

Patent Owner further responds that the Office considered both Dechamp and Inagaki, contrary to what Mr. Andrews states. PO Resp. 9 (citing Ex. 2017; Ex. 2018; Ex. 2021, 88:19–94:4; Ex. 2022). Patent Owner also contends that Husain and Nishikawa were not raised as relevant prior art in IPR2020-00948 and that Mr. Andrews admits Petitioner’s counsel suggested considering Husain and Nishikawa. *Id.* at 9–10 (citing Ex. 2021, 88:19–94:4). A reasonable inference, Patent Owner argues, is that Mr. Andrews knew these references were irrelevant in both the prior and present proceedings. *Id.* at 10.

Patent Owner further contends that Mr. Andrews made many admissions during deposition that were contrary to his declaration, and those admissions raise an inference that he signed a declaration that someone else drafted. PO Resp. 10–11. Patent Owner additionally contends that Mr. Andrews is not independent because he admitted he was paid for his declaration. *Id.* at 11 (citing Ex. 1003 ¶¶ 2; Ex. 2021, 23:3–24:9).

Petitioner replies that the full context of Mr. Andrews’s testimony undermines Patent Owner’s allegations. Pet. Reply 22, 24–26 (citing PO Resp. 4, 5, 8–9, 10–11; Ex. 1003 ¶¶ 2–3; Ex. 2021, 16:2–8, 21:4–23:2, 24:2–9, 41:16–42:1, 45:22–24, 53:12–54:20, 93:4–24, 114:11–21, 114:18–21, 115:5–22, 116:9–10, 151:2–8). Petitioner also argues that Mr. Andrews is the only one to have proposed a level of ordinary skill in the art in this proceeding and to have testified that he is a person of ordinary skill in the art in both the prior and present proceedings. *Id.* at 23 (citing Ex. 1003 ¶¶ 5–14, 21; Ex. 2021, 41:2–5, 45:5–8, 45:16–46:5, 49:3–25, 51:3–9).

Petitioner contends that Patent Owner’s declarant is not a person of ordinary skill in the art under the only proffered level of skill because there

is no evidence of experience in the field of automotive control or safety systems. Pet. Reply 23–24 (citing Ex. 1032; Ex. 1033; Ex. 2023 ¶¶ 2–9).

The parties’ cited portions of the deposition transcript for Mr. Andrews do not provide a reason for us to give his declaration lesser or no weight. *See* Ex. 2021, 12:13–13:14, 16:2–8, 17:18–24:9, 41:16–42:1, 44:15–47:14, 53:12–54:20, 86:23–87:9, 88:19–94:4, 114:11–21, 114:18–21, 115:5–22, 116:9–10, 151:2–8.

Turning to whether Mr. Andrews is a person of ordinary skill in the art, for the reasons above, we adopted Petitioner’s proposal that one of ordinary skill in the art “would have had at least a Bachelor’s of Science in mechanical engineering, electrical engineering, or a related technical field pertinent to automotive control or safety systems, along with two or more years of experience working with automotive control or safety systems.” Pet. 14 (citing Ex. 1003 ¶ 21). Patent Owner does not dispute Petitioner’s proposal. *See generally* PO Resp.

According to Mr. Andrews, he has a Bachelor of Science degree in Electrical Engineering and, prior to 2010, had years of experience in automotive control or safety systems. *See, e.g.*, Ex. 1003 ¶¶ 6–10. Comparing the undisputed level of ordinary skill with the declarant’s credentials, we are satisfied that Petitioner’s declarant qualifies as a person of ordinary skill in the art under the only definition proposed. Whether he was or was not an ordinarily skilled artisan in another proceeding does not affect whether he is such an artisan in this proceeding because the full record of this proceeding indicates he is. We, thus, see no reason to alter the weight we give to his declaration.

(4) Estoppel

The parties dispute whether estoppel should be applied based on the adverse judgment entered in IPR2020-00948. Pet. 13–14; PO Resp. 2–3; Pet. Reply 26–27; PO Sur-reply 12–13. Based on the full record, we see no reason to apply estoppel.

f) Objective Indicia of Nonobviousness

Patent Owner does not present any arguments or evidence regarding any objective indicia of nonobviousness for any of the challenged claims. *See generally* PO Resp.

g) Petitioner Shows by a Preponderance of the Evidence that Claim 1 is Unpatentable

“Once all relevant facts are found, the ultimate legal determination [of obviousness] involves weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan.”

Arctic Cat Inc. v. Bombardier Recreational Prods. Inc., 876 F.3d 1350, 1361 (Fed. Cir. 2017) (quoting *In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1068–69 (Fed. Cir. 2012)).

Above, based on full record before us, we provide our factual findings regarding (1) the level of ordinary skill in the art, (2) the scope and content of the prior art, (3) any differences between the claimed subject matter and the prior art, and (4) objective evidence of nonobviousness.

In particular, we find that (1) Petitioner’s proposed level of ordinary skill in the art is consistent with the prior art of record, (2) Dechamp and Husain teach or suggest all the limitations of claim 1, (3) one of ordinary skill in the art would have combined Dechamp and Husain with a reasonable expectation of success, and (4) no objective evidence of nonobviousness presented in relation to any of claims 1–21. Weighing these underlying

factual determinations, a preponderance of the evidence persuades us that claim 1 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

4. *Dependent Claim 2*

Claim 2 depends from claim 1 and recites “wherein said source of an oversteer rotational load applied to a steering wheel of said vehicle comprises a human applying an oversteer rotational load to said steering wheel.” Ex. 1001, 10:16–19. Petitioner refers to its argument for claim 1. Pet. 47 (citing Ex. 1003 ¶ 122). Patent Owner does not provide a separate argument for claim 2. *See generally* PO Resp.

For the same reasons stated above for the limitation “regardless of the source of an oversteer rotational load applied to a steering wheel of said vehicle” recited by claim 1, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 2. Ex. 1003 ¶¶ 114–116, 122; Ex. 1005, 1:21–29, 2:4–6, 3:33–35, 4:28–35, 5:8–12, 6:7–8, 7:1–17; Ex. 1006 ¶¶ 5–7, 13, 21.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 2 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

5. *Dependent Claim 3*

Claim 3 depends from claim 1 and recites “wherein said predetermined application of rotational load to said steering wheel comprises a non-oversteer rotational load applied to said steering wheel.” Ex. 1001, 10:20–23. Petitioner argues that each of its mappings for the wherein clause of claim 1 involves a predetermined rotational load and one of ordinary skill

in the art would have understood that changing rotational direction would not induce rollover. Pet. 47 (citing Ex. 1003 ¶ 123).

We credit Petitioner’s testimonial evidence that one of ordinary skill in the art “would have understood, changing the direction of rotation (***predetermined rotational load***) does not overturn the steering wheel in a manner that would induce a rollover and, thus, ***comprises a non-oversteer rotational load.***” Ex. 1003 ¶ 123. The record supports the testimony. Ex. 1005, 3:27–29; Ex. 1006 ¶ 21. Patent Owner does not provide a separate argument for claim 3. *See generally* PO Resp.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 3 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

6. *Dependent Claim 4*

Claim 4 depends from claim 1 and recites

wherein said source of an oversteer rotational load applied to a steering wheel of said vehicle comprises a human applying an oversteer rotational load to said steering wheel, and wherein said predetermined application of rotational load to said steering wheel comprises a non-oversteer rotational load applied to said steering wheel.

Ex. 1001, 10:24–30. Petitioner refers to its arguments for claims 2 and 3. Pet. 47 (citing Ex. 1003 ¶¶ 124, 125).

Patent Owner does not provide a separate argument for claim 4. *See generally* PO Resp. For the reasons discussed above for claims 2 and 3, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 4. Ex. 1003 ¶¶ 124, 125.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 4 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

7. Dependent Claim 5

Claim 5 depends from claim 1 and recites “wherein if said vehicle is steered beyond a rollover threshold of said vehicle, said vehicle rolls.”

Ex. 1001, 10:31–33. Petitioner argues that the limitations of claim 5 would have been understood from Dechamp. Pet. 47–48 (citing Ex. 1003 ¶¶ 26–28, 126; Ex. 1005, 4:28–35, 5:8–12).

Petitioner cites to portions of Dechamp that describe “the driver is limited to being able to steer his vehicle within the range of safe movements of the vehicle” (Ex. 1005, 4:28–35) and that a transverse acceleration criterion may be defined “as a fraction of the transversal rollover acceleration (i.e. 80%, 90%, 100%, or 120% of the rollover transverse acceleration)” (*id.* at 5:8–12). We also credit Petitioner’s testimonial evidence because the cited portions of the record support it. Ex. 1003 ¶¶ 26–28, 126.

Patent Owner does not provide a separate argument for claim 5. *See generally* PO Resp. Based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 5.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 5 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

8. Dependent Claim 6

Claim 6 depends from claim 1 and recites “wherein said apparatus includes an electronic control unit adapted to send an actuation signal to an

actuator when a sensed driving parameter exceeds a predetermined magnitude.” Ex. 1001, 10:34–37. Petitioner argues that Dechamp teaches sensing vehicle speed and CPU 4 sends an actuation signal to actuator 6 based on sensed vehicle speed. Pet. 48 (citing Ex. 1003 ¶¶ 127–130; Ex. 1005, 6:17–19, 6:21–23, 7:10–9:2).

The cited portions of Dechamp describe CPU 4 “receives a signal representative of the speed of the vehicle . . . from a speed sensor 5” and “generates an output signal that is sent to an actuator 6 mechanically linked to the steerable wheels 7 of the vehicle” so as to provide “a variable reduction ratio . . . to have very direct steering at low speed or at intermediate speed, and a little direct steering at high speed.” Ex. 1005, 6:17–19, 6:21–23, 7:10–17. We credit Petitioner’s declarant testimony because Dechamp supports it. Ex. 1003 ¶¶ 127–130; Ex. 1005, 6:17–19, 6:21–23, 7:10–9:2.

Patent Owner does not provide a separate argument for claim 6. *See generally* PO Resp. Based on the full record, Petitioner persuades us, and we find, that Dechamp teaches or suggests the limitations of claim 6.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 6 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

9. Dependent Claim 7

Claim 7 depends from claim 1 and recites “wherein said apparatus is automatically actuated in response to the speed of said vehicle.” Ex. 1001, 10:38–40. Petitioner refers to its argument for claim 6. Pet. 48 (citing Ex. 1003 ¶ 131).

Patent Owner does not provide a separate argument for claim 7. *See generally* PO Resp. For the reasons discussed above for claim 6, based on

the full record, Petitioner persuades us, and we find, that Dechamp also teaches or suggests the limitations of claim 7. Ex. 1003 ¶ 131.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 7 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

10. Independent Claim 8

a) “A rollover prevention apparatus”

For the preamble of claim 8, Petitioner refers to its arguments for the preamble of claim 1. Pet. 48 (citing Ex. 1003 ¶ 132); *see also id.* at ix (labeling the preamble “[8.1]”). Patent Owner does not provide a responsive argument regarding the preamble of claim 8. *See generally* PO Resp.

Based on the full record before us, for the reasons discussed for the preamble of claim 1, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests, to the extent the preamble is limiting, a “rollover prevention apparatus.” Ex. 1003 ¶¶ 109, 132; Ex. 1005, 6:1–30; Ex. 1006 ¶¶ 17–20.

b) “having a mode that allows a vehicle to be steered within a non-rollover steering range of motion of said vehicle but prevents said vehicle from being steered to a point of vehicle roll regardless of the source of a oversteer rotational load applied to a steering wheel of said vehicle,”

For the limitations quoted above, Petitioner refers to its arguments for similar limitations in claim 1. Pet. 49 (citing Ex. 1003 ¶ 133); *see also id.* at ix (labeling the limitation “[8.2]”). Patent Owner provides the same responsive arguments for claims 1 and 8 regarding the above-quoted limitation. *See* PO Resp. 2–11, 24–30, 38–48, 52–56.

Based on the full record, for the same reasons discussed above for claim 1, Petitioner persuades us, and we find, that Dechamp and Husain

teach or suggest the limitations quoted above under either a means-plus-function interpretation or an interpretation that does not invoke § 112(f). Ex. 1003 ¶ 133.

- c) “*wherein said apparatus transitions from said mode in response to a predetermined application of rotational load to said steering wheel.*”

For the wherein clause quoted above, Petitioner refers to its arguments for a similar wherein clause in claim 1. Pet. 49 (citing Ex. 1003 ¶ 134); *see also id.* at ix (labeling the limitation “[8.3]”). Patent Owner does not provide a responsive argument for the above-quoted limitation. *See generally* PO Resp.

Based on the full record, for the same reasons discussed above for claim 1, Petitioner persuades us, and we find, that Dechamp and Husain teach or suggest the limitations quoted above under either a means-plus-function interpretation or an interpretation that does not invoke § 112(f). Ex. 1003 ¶ 134.

- d) *Petitioner Shows by a Preponderance of the Evidence that Claim 8 is Unpatentable*

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 8 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

11. Dependent Claim 9

Claim 9 depends from independent claim 8 and recites “wherein said source of an oversteer rotational load applied to a steering wheel of said vehicle comprises a human applying an oversteer rotational load to said steering wheel.” Ex. 1001, 10:49–52. Petitioner refers to its argument for claim 2. Pet. 49 (citing Ex. 1003 ¶ 135). Patent Owner does not provide a separate argument for claim 9. *See generally* PO Resp.

For the same reasons stated above claim 2, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 9.

Ex. 1003 ¶¶ 114–116, 135; Ex. 1005, 1:21–29, 2:4–6, 3:33–35, 4:28–35, 5:8–12, 6:7–8, 7:1–17; Ex. 1006 ¶¶ 5–7, 13, 21.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 9 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

12. Dependent Claim 10

Claim 10 depends from independent claim 8 and recites “wherein said predetermined application of rotational load to said steering wheel comprises a non-oversteer rotational load applied to said steering wheel.” Ex. 1001, 10:53–56. Petitioner refers to its argument for claim 3. Pet. 49 (citing Ex. 1003 ¶ 136). Patent Owner does not provide a separate argument for claim 10. *See generally* PO Resp.

For the same reasons stated above for claim 3, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 10. Ex. 1003 ¶ 136.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 10 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

13. Dependent Claim 11

Claim 11 depends from independent claim 8 and recites

wherein said source of an oversteer rotational load applied to a steering wheel of said vehicle comprises a human applying an oversteer rotational load to said steering wheel, and wherein said predetermined application of rotational load to said steering

wheel comprises a non-oversteer rotational load applied to said steering wheel.

Ex. 1001, 10:57–63. Petitioner refers to its arguments for claims 2–4.

Pet. 49 (citing Ex. 1003 ¶¶ 137, 138). Patent Owner does not provide a separate argument for claim 11. *See generally* PO Resp.

For the same reasons stated above for claims 2–4, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 11.

Ex. 1003 ¶¶ 137, 138.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 11 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

14. Dependent Claim 12

Claim 12 depends from independent claim 8 and recites “wherein said steering point of vehicle roll varies according to the speed of said vehicle.”

Ex. 1001, 10:64–65. Petitioner argues that one of ordinary skill in the art would have understood that Dechamp teaches the limitations of claim 12.

Pet. 49–50 (citing Ex. 1003 ¶ 139; Ex. 1005, Abstr., 3:12–20, 4:4–11, 4:28–35, 7:1–17).

Petitioner cites portions of Dechamp that describe that its method includes “detecting the speed of said vehicle” and “determining a maximum allowable steering angle θ of the steering wheel based on said detected speed and a predetermined maximum transverse acceleration criterion” (Ex. 1005, 3:16–20) and that “for a given speed the method . . . defines a maximum steerable wheel angle $\theta_{\max}$ ” (*id.* at 4:4–11). Another cited portion describes that “the reduction ratio may vary depending on the speed” and “a variable reduction ratio . . . mak[es] it possible to have very direct steering at low

speed or at intermediate speed, and a little direct steering at high speed.” *Id.* at 7:5–7, 7:10–12.

We credit Petitioner’s testimonial evidence because the cited portions of the record support it. Ex. 1003 ¶ 139; Ex. 1005, Abstr., 3:12–20, 4:4–11, 4:28–35, 7:1–17; Ex. 1015; Ex. 1017 ¶ 45; Ex. 1020 ¶¶ 2, 178; Ex. 1021 ¶ 42; Ex. 1022, Abstr. Patent Owner does not provide a responsive argument specifically for claim 12. *See generally* PO Resp.

Based on the full record, Petitioner persuades us, and we find, that Dechamp teaches or suggests the limitations of claim 12. Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 12 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

15. Dependent Claim 13

Claim 13 depends from independent claim 8 and recites “wherein if said vehicle is steered beyond a point of vehicle roll, said vehicle rolls.” Ex. 1001, 10:66–67. Petitioner refers to its argument for claim 5. Pet. 50 (citing Ex. 1003 ¶ 140). Patent Owner does not provide a separate argument for claim 13. *See generally* PO Resp.

For the same reasons stated above for claim 5, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 13. Ex. 1003 ¶ 140.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 13 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

16. Dependent Claim 14

Claim 14 depends from independent claim 8 and recites “wherein said apparatus includes an electronic control unit adapted to send an actuation signal to an actuator when a sensed driving parameter exceeds a predetermined magnitude.” Ex. 1001, 11:1–4. Petitioner refers to its arguments for claim 6. Pet. 50 (citing Ex. 1003 ¶ 141). Patent Owner does not provide a separate argument for claim 14. *See generally* PO Resp.

For the same reasons stated above for claim 6, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 14. Ex. 1003 ¶ 141.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 14 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

17. Independent Claim 15

Claim 15 recites:

A rollover prevention apparatus that allows a vehicle to be steered within a maximal non-rollover steering range of motion of said vehicle but prevents the turning of a steering wheel of said vehicle from being rotated to a point of causing a rolling wheel of said vehicle being turned to an angular position of vehicle roll at any rollover capable speed of said vehicle regardless of the source of an oversteer rotational load applied to said steering wheel of said vehicle.

Ex. 1001, 11:5–12.

Petitioner argues that the combination of Dechamp and Husain teaches the asserted function and the corresponding structure for the reasons asserted for claim 1 that includes, according to Petitioner, similar and overlapping functional claim language. Pet. 50 (citing Ex. 1003 ¶¶ 142–

144). Petitioner contends that claim 15 more narrowly recites a steering wheel instead of a vehicle but that difference is not dispositive because Dechamp teaches the functional language of claim 15. *Id.* at 50–51 (citing Ex. 1003 ¶ 143; Ex. 1005, 3:22–4:11, 4:28–35, 5:8–12). Patent Owner provides the same responsive arguments for claims 1 and 15. *See* PO Resp. 2–11, 24–30, 38–48, 52–56.

Based on the full record, for the reasons discussed for the preamble of claim 1, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests, to the extent the preamble is limiting, a “rollover prevention apparatus.” Ex. 1005, 6:1–30; Ex. 1006 ¶¶ 17–20. Also, based on the full record, for the same reasons discussed above for claim 1, Petitioner persuades us, and we find, that Dechamp and Husain teach or suggest the body of claim 15 under either a means-plus-function interpretation or an interpretation that does not invoke § 112(f). Ex. 1003 ¶¶ 142–144.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 15 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

18. Dependent Claim 16

Claim 16 depends from independent claim 15 and recites “wherein said source of an oversteer rotational load applied to a steering wheel of said vehicle comprises a human applying an oversteer rotational load to said steering wheel.” Ex. 1001, 11:13–16. Petitioner refers to its argument for claim 2. Pet. 51 (citing Ex. 1003 ¶ 145). Patent Owner does not provide a separate argument for claim 16. *See generally* PO Resp.

For the same reasons stated above for claim 2, based on the full record, Petitioner persuades us, and we find, that the proposed combination

of Dechamp and Husain teaches or suggests the limitations of claim 16. Ex. 1003 ¶¶ 114–116, 145; Ex. 1005, 1:21–29, 2:4–6, 3:33–35, 4:28–35, 5:8–12, 6:7–8, 7:1–17; Ex. 1006 ¶¶ 5–7, 13, 21.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 16 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

19. Dependent Claim 17

Claim 17 depends from independent claim 15 and recites “wherein said predetermined application of rotational load to said steering wheel comprises a non-oversteer rotational load applied to said steering wheel.” Ex. 1001, 11:17–20. Petitioner refers to its argument for claim 3. Pet. 51 (citing Ex. 1003 ¶ 146). Patent Owner does not provide a separate argument for claim 17. *See generally* PO Resp.

For the same reasons stated above for claim 3, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 17. Ex. 1003 ¶ 146.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 17 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

20. Dependent Claim 18

Claim 18 depends from independent claim 15 and recites wherein said source of an oversteer rotational load applied to a steering wheel of said vehicle comprises a human applying an oversteer rotational load to said steering wheel, and wherein said predetermined application of rotational load to said steering wheel comprises a non-oversteer rotational load applied to said steering wheel.

Ex. 1001, 12:1–7. Petitioner refers to its arguments for claims 2–4. Pet. 51 (citing Ex. 1003 ¶¶ 147, 148). Patent Owner does not provide a separate argument for claim 18. *See generally* PO Resp.

For the same reasons stated above for claims 2–4, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 18.

Ex. 1003 ¶¶ 147, 148.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 18 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

21. Dependent Claim 19

Claim 19 depends from independent claim 15 and recites “wherein said steering point where said steering wheel causes a rolling wheel of said vehicle to be turned to an angular position of vehicle roll varies according to the speed of said vehicle.” Ex. 1001, 12:8–11. Petitioner refers to its argument for claim 12. Pet. 51 (citing Ex. 1003 ¶ 149). Patent Owner does not provide a separate argument for claim 19. *See generally* PO Resp.

For the same reasons stated above for claim 12, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 19.

Ex. 1003 ¶ 149.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 19 of the '877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

22. Dependent Claim 20

Claim 20 depends from independent claim 15 and recites “wherein if said rolling wheel of vehicle is turned beyond an angular position point of

vehicle roll, said vehicle rolls.” Ex. 1001, 12:12–14. Petitioner refers to its argument for claim 5. Pet. 51 (citing Ex. 1003 ¶ 150). Patent Owner does not provide a separate argument for claim 20. *See generally* PO Resp.

For the same reasons stated above for claim 5, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 20. Ex. 1003 ¶ 150.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 20 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

23. Dependent Claim 21

Claim 21 depends from independent claim 15 and recites “wherein said apparatus includes an electronic control unit adapted to send an actuation signal to an actuator when a sensed driving parameter exceeds a predetermined magnitude.” Ex. 1001, 12:15–18. Petitioner refers to its argument for claim 6. Pet. 51 (citing Ex. 1003 ¶ 151). Patent Owner does not provide a separate argument for claim 21. *See generally* PO Resp.

For the same reasons stated above for claim 6, based on the full record, Petitioner persuades us, and we find, that the proposed combination of Dechamp and Husain teaches or suggests the limitations of claim 21. Ex. 1003 ¶ 141.

Weighing the underlying factual determinations, a preponderance of the evidence persuades us that claim 21 of the ’877 patent is unpatentable over Dechamp and Husain. *Arctic Cat*, 876 F.3d at 1361.

E. Remaining Challenges

Having determined that all of the challenged claims are unpatentable over Dechamp and Husain, we need not reach Petitioner’s argument that

those same claims are also (1) anticipated by Schramm, (2) rendered obvious in view of Dechamp and Nishikawa, and (3) anticipated by or rendered obvious in view of Inagaki. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”). Accordingly, we do not reach the other grounds.

III. CONCLUSION²

In summary:

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–21	102	Schramm ³		
1–21	103	Dechamp, Husain	1–21	
1–21	103	Dechamp, Nishikawa ⁴		
15, 16, 19–21	102	Inagaki ⁵		
15, 16, 19–21	103	Inagaki ⁶		
Overall Outcome			1–21	

² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding, 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. §§ 42.8(a)(3), (b)(2).

³ As explained in Section II.E, we do not reach this ground.

⁴ As explained in Section II.E, we do not reach this ground.

⁵ As explained in Section II.E, we do not reach this ground.

⁶ As explained in Section II.E, we do not reach this ground.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–21 of U.S. Patent No. 11,077,877 B1 have been shown, by a preponderance of the evidence, to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, the 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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