

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CATERPILLAR INC.,
Petitioner,

v.

WIRTGEN AMERICA, INC.,
Patent Owner.

IPR2022-01278
Patent 8,424,972 B2

Before BARRY L. GROSSMAN, JAMES J. MAYBERRY, and
RICHARD H. MARSCHALL, *Administrative Patent Judges*.

MARSCHALL, *Administrative Patent Judge*.

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

Caterpillar Inc. challenges claims 1–10, 25, 27, 30, 31, 33, 34, and 36–40 of U.S. Patent No. 8,424,972 B2 (Ex. 1001, the “’972 patent”), which is assigned to Wirtgen America, Inc. We have jurisdiction under 35 U.S.C. § 6, and we issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 (2022). For the reasons set forth below, we determine that Petitioner has shown that claims 1–10, 25, 27, 30, 31, 33, 34, and 36–40 are unpatentable.

INTRODUCTION

A. Background and Summary

Caterpillar Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of the challenged claims. Paper 1 (“Pet.”). Wirtgen, Inc. (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 11 (“Prelim. Resp.”). Pursuant to 35 U.S.C. § 314, we instituted an *inter partes* review as to all challenged claims and all grounds raised in the Petition. Paper 12 (“Institution Decision” or “Inst. Dec.”).

After institution, Patent Owner filed a Response (Paper 18, “PO Resp.”), Petitioner filed a Reply (Paper 21, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 26, “PO Sur-reply”). An oral hearing was held on October 30, 2023, and a transcript is included in the record. Paper 34 (“Tr.”).

B. Real Parties-in-Interest

Caterpillar identifies itself as well as its subsidiaries Caterpillar Paving Products, Inc. and Caterpillar Prodotti Stradali S.r.L. as real parties-in-interest. Pet. 83. Wirtgen identifies itself and Wirtgen GmbH as real parties-in-interest. Paper 9, 2.

C. Related Matters

Petitioner and Patent Owner identify the following district court proceeding as a related matter: *Wirtgen Am., Inc. v. Caterpillar, Inc.*, Case No. 17-770-RGA (D. Del.) (the “district court litigation”). Pet. 86; Paper 9, 2.

Petitioner and Patent Owner also identify the following pending *inter partes* review proceeding as a related matter: IPR2022-01310 challenging additional claims of the ’972 patent. Pet. 83; Paper 9, 2; *see* IPR2022-01310. We also note that IPR2022-01264 and IPR2022-01277 between the same parties contain similar claims and challenges.

D. The ’972 Patent

The ’972 patent, titled “Road Milling Machine and Method for Positioning the Machine Frame Parallel to the Ground,” issued April 23, 2013, from an application filed December 21, 2007. Ex. 1001, codes (22), (45), (54). The ’972 patent ultimately claims priority to a German application filed December 22, 2006. *Id.*, code (30).

The ’972 patent relates to “a self-propelled road milling machine, especially a cold milling machine, as well as a method for positioning the machine frame parallel to the ground.” Ex. 1001, 1:7–10. The ’972 patent explains that there are several known problems with known road milling machines where the machine frame does not extend parallel to the ground. The ’972 patent explains that “if the machine frame does not extend parallel to the ground, the stripping means will not rest on the ground with sufficient exactness behind the milling roller to allow for a residue-free stripping process to be performed on the surface under treatment.” *Id.* at 1:33–38. The ’972 patent further states that “if the machine frame is not arranged

lifting columns 12, 13. *Id.* at 6:66–7:3. Lifting columns 12, 13 allow machine frame 4 to be moved to a predetermined inclined position with respect to the ground or traffic surface 8. Ex. 1001, 7:5–8. Machine frame 4 supports milling roll 6, and arranged behind milling roll 6 is height-adjustable stripping means 14 which, in operation, has stripping plate 15 that engages milling track 17 formed by milling roll 6. *Id.* at 7:16–21. Driver's stand 5 is arranged above milling roller 6 and provides a control panel for the vehicle operator that includes control means 23 for controlling the milling depth of the milling roller 6. *Id.* at 7:22–26. Position sensors measure the displacements of side plates 10, beam 20, or stripping plate 15 with respect to machine frame 4 or relative to each other. *Id.* at 7:39–43.

Figure 3 of the '972 patent is reproduced below.

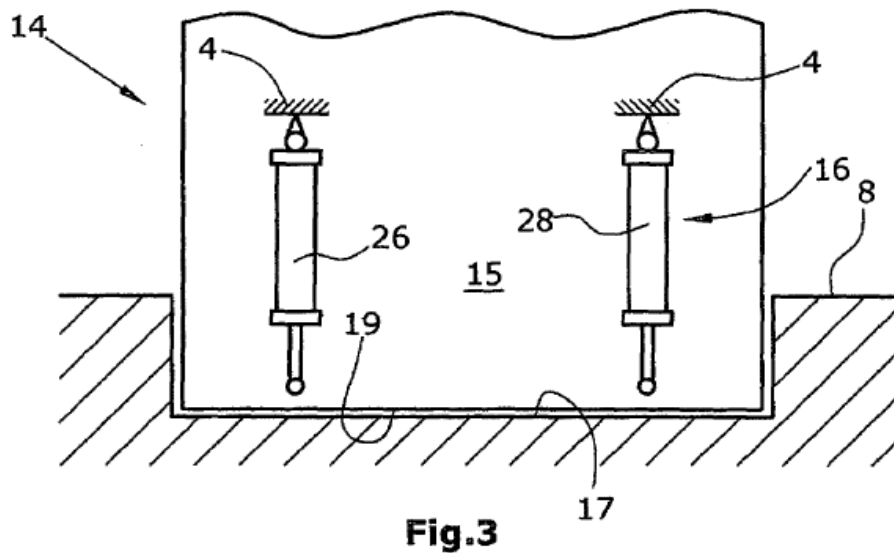


Figure 3 depicts an embodiment of the claimed invention wherein hydraulic pistons or cylinders 26, 28 lift and lower stripping plate 15 of stripping means 14. *Id.* at 7:61–64. The depicted hydraulic cylinders have an integrated position sensing system that generate a position signal and

have one end connected to machine frame 4 and the other to stripping plate 15. Ex. 1001, 7:63–8:3. The '972 patent explains that “control means 23 can calculate the current milling depth at the level of the milling roller axis from the position sensing signals received” and that “control means 23 can automatically control the lifted condition of the front and/or rear lifting column 13 . . . to establish parallelism between the machine frame 4 and the ground.” *Id.* at 9:21–30.

E. Challenged Claims

Among the challenged claims, claims 1, 31, and 38 are independent claims. Independent claim 1 is illustrative and is reproduced below.

1. A self-propelled road milling machine, comprising:
 - [1a] a machine frame;
 - [1b] at least two front ground engaging supports, and at least one rear ground engaging support, with reference to a direction of travel;
 - [1c] front and rear lifting columns supporting the frame from the ground engaging supports;
 - [1d] a milling roller supported from the frame for treatment of a ground surface;
 - [1e] first and second height adjustable side plates arranged on opposite sides of the milling roller;
 - [1f] a height adjustable stripping plate arranged behind the milling roller and operable to be lowered, during operation, into a milling track generated by the milling roller;
 - [1g] at least one ground engaging sensor; and,
 - [1h] a controller operably associated with the at least one ground engaging sensor, the controller being configured to automatically control a lifting condition of at least one of the lifting columns to establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel.

Ex. 1001, 11:63–12:17 (bracketed nomenclature added).

F. Prior Art and Asserted Ground

Petitioner asserts that the challenged claims are unpatentable on the following ground:

Claims Challenged	35 U.S.C. § ¹	Basis
1–10, 25, 27, 30, 31, 33, 34, 36–40	103(a)	OMM, ² Sehr, ³ Samuelson ⁴

Pet. 6.

Petitioner relies on the declaration testimony of Dr. William Singhose. *See* Ex. 1006. Patent Owner relies on the declaration of Dr. John Lumkes. *See* Ex. 2020.

The following subsections provide brief descriptions of the asserted prior art references.⁵

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 296–07 (2011), took effect on September 16, 2011. The changes to 35 U.S.C. §§ 102 and 103 in the AIA do not apply to any patent application filed before March 16, 2013. Because neither part disputes that the application for the patent at issue in this proceeding has an effective filing date before March 16, 2013, we refer to the pre-AIA version of the statute.

² Caterpillar, “PM-465 Cold Planer, Operation & Maintenance Manual” (Ex. 1002, “OMM”). The parties somewhat confusingly refer to OMM and “PM-465” interchangeably because OMM (the reference as a whole) describes the PM-465 model of milling machine. *See, e.g.*, Pet. 1 (defining the reference as “*OMM*”), 5 (referring to “PM-465 *OMM*”), 7 (“The PM-465 *OMM* describes the PM-465 road-milling machine. *See OMM*, 2. The PM-465 has . . .”). We will generally refer to the reference as OMM to remain consistent with the Petition, but the parties’ (and any of our own) references to what the PM-465 machine includes should be read as what OMM teaches or suggests, not as a distinct prior art reference.

³ US 5,309,407, issued May 3, 1994 (Ex. 1037, “Sehr”).

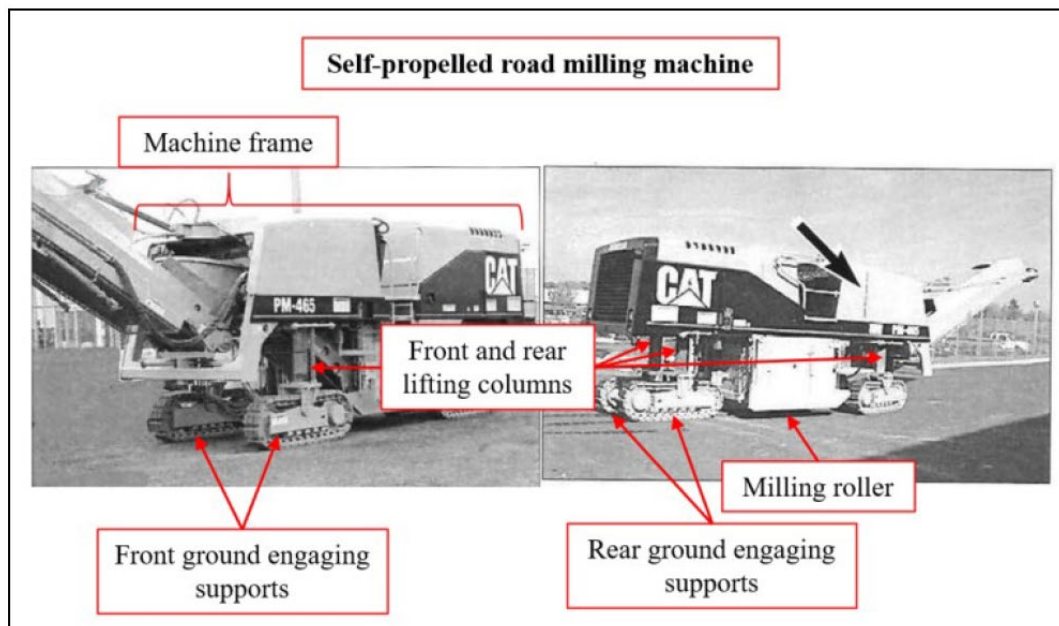
⁴ US 6,450,048 B1, issued Sept. 17, 2002 (Ex. 1004, “Samuelson”).

⁵ The Petition also refers to Zarniko (US 4,943,119) to bolster Petitioner’s motivation to combine arguments. *See* Pet. 28–29. We found Petitioner’s

1. *OMM (Ex. 1002)*

OMM is an operation and maintenance manual for the PM-465 cold planer that is used for cold milling pavement. Ex. 1002, Title, 2.⁶

We reproduce below Petitioner's annotated versions of the images depicted on pages 2 and 40 of OMM.



arguments based on Zarniko unconvincing in our Institution Decision but noted that other evidence supported Petitioner's motivation arguments. See Inst. Dec. 26. Petitioner withdrew its reliance on Zarniko in its Reply. See Pet. Reply 13 n.3; PO Sur-reply 21 n.5 (acknowledging Petitioner's withdrawal of Zarniko argument). We will not address the parties' arguments based on Zarniko in this Decision, and we do not rely on any of the Zarniko-based arguments in any of our findings.

⁶ When referencing OMM, we use the pagination of the manual, rather than the exhibit, as this approach is consistent with how Petitioner references the manual. When discussing prior art references, Petitioner typically italicizes the name of the reference. When we quote the Petition, we do not italicize the name.

The images on pages 4 and 42 of OMM are annotated by Petitioner to denote uncontested components of the milling machine. Pet. 8; *see also* Prelim. Resp. 9–11. In particular, Petitioner adds the title, “Self-propelled road milling machine” placed inside a red rectangle. *Id.* Petitioner also denotes the “machine frame,” “milling roller,” “front and rear lifting columns,” “front ground engaging supports,” and “rear ground engaging support,” by placing these terms in red rectangles and using a lead arrow that extends from a rectangle to its respective component. *Id.* OMM’s machine also includes Caterpillar’s “Grade and Slope Electronic Control System,” which includes, an “Electronic Control Module,” “grade/slope controllers on the left and/or right side of the operator's console, the grade/slope controllers at ground level in front and/or behind the mandrel, a contacting or a non[-]contacting sensor on each side of the machine, [and] a slope sensor at the center of the machine.” Ex. 1002, 32. According to OMM, the contacting sensor can include a grade slope wheel as depicted in the image on page 49 of OMM, reproduced below.



The image on page 49, on the left-hand side of the page, includes a black arrow denoting a grade slope wheel adjacent to the side plate of machine. Ex. 1002, 49. OMM explains that “[t]he grade slope wheel sends signals to the controller as the ground elevation varies.” *Id.* According to OMM, “[i]f the machine uses the non-contacting method of measuring the grade, a sonic sensor is attached. The sonic grade sensor uses sound waves to monitor the distance from a fixed point on the machine to a grade reference point (such as: finished surface, curb, gutter, or stringline).” *Id.* OMM notes that “[t]he sensors should be positioned on the centerline of the rotor to achieve an accurate cut. The further away from the center of the rotor, the less accurate the reading on the readout and the potential for less accurate cuts.” *Id.* at 48.

2. *Samuelson (Ex. 1004)*

Samuelson, titled “Hydraulic Cylinder Monitoring Apparatus,” issued September 17, 2002. Ex. 1004, codes (54), (45). Samuelson relates to “a hydraulic cylinder monitoring apparatus for a welded construction-type hydraulic cylinder.” *Id.* at 1:15–17. Samuelson discloses that hydraulic cylinders are used in various industries including “mobile equipment.” *Id.* at 1:35–40. Samuelson recognizes the importance of protecting the position measuring structure, e.g. transducer, of the cylinders, while being able to interchange “dumb” cylinders without transducers to “smart” cylinders. *Id.* at 1:45–60. Figures 5 and 6 of Samuelson are reproduced below.

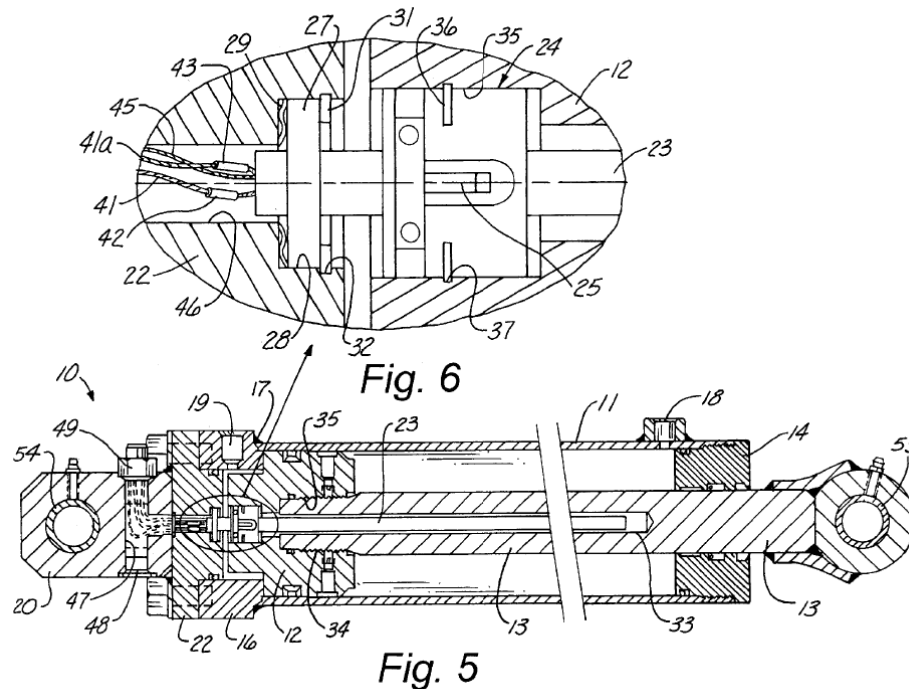


Figure 5 is a cross sectional view of a hydraulic cylinder having a monitoring apparatus disposed therein, and Figure 6 is an enlarged view of the circled portion shown in Figure 5. Ex. 1004, 2:53–57. Samuelson discloses that in operation, hydraulic cylinder 10 is connected at ends 53 and 54 to two objects that need to be selectively controlled by being separated and then moved back together while the relative spacing is monitored by the transducer structure 23 and 24. *Id.* at 4:17–21.

Samuelson explains that in Figure 5, a controller, not shown, is sensing the position of piston 12 with respect to cap 22 through reference supply and/or ground return wires 41 and 41a, which have fixed resistors. *Id.* at 4:22–26. Similarly, output wire 45 is connected to the controller. *Id.* at 4:27–28. According to Samuelson, when pressurized hydraulic oil is directed into port 19, cylinder 12 moves to the right and follower 24 will move with it, which will change the resistance. *Id.* at 4:29–33.

“Consequently, the position of the piston (12) and/or rod (13) can readily be monitored as the piston (12) and rod (13) move from one position to another within the cylinder (11).” *Id.* at 4:41–44. Samuelson notes that “[b]ecause the fixed resistors (42) and (43) are disposed within the steel confines of the supplemental cap (22) and its flange (20), there is very little chance that they can be damaged during the use of the device.” *Id.* at 4:48–51.

3. *Sehr (Ex. 1037)*

Sehr, titled “Ultrasonic Control Unit for a Traveling Cutter,” issued May 3, 1994. Ex. 1037, codes (54), (45). Sehr “relates to an ultrasonic control unit for a travelling cutter.” *Id.* at 1:5–6. We reproduce Sehr’s Figure 1, below.

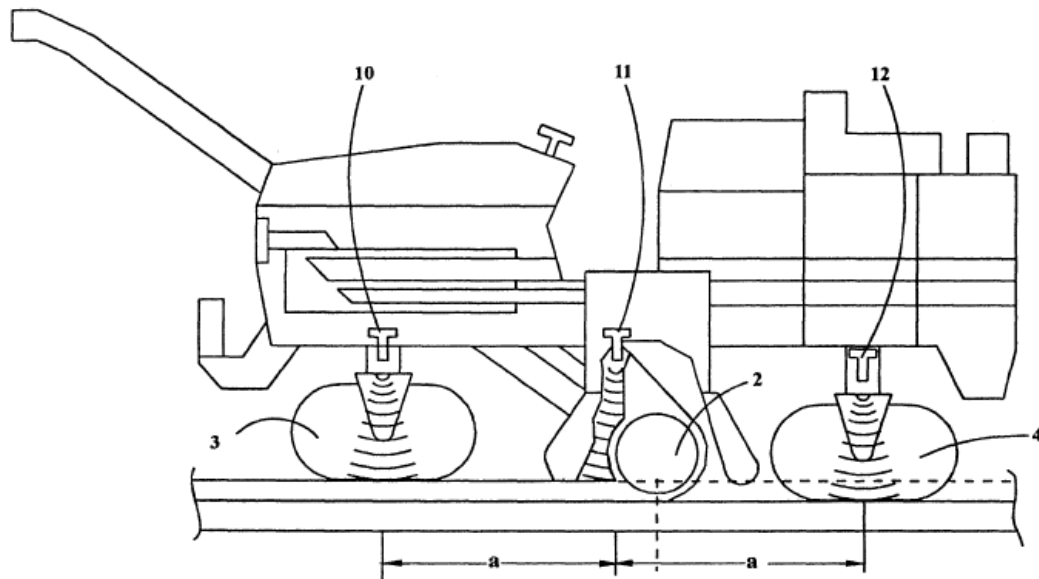


Fig.1

Figure 1 depicts “a road grooving machine” with “cutter drum 2, which is rotatably supported on the road grooving machine, as well as front and rear travelling gears 3, 4” and “at least three ultrasonic sensors 10, 11, 12, which are arranged one behind the other essentially in the direction of movement of the road grooving machine 1.” *Id.* at 2:7–10, 2:24–27. The

ultrasonic sensors in Sehr sample a “reference plane” with their “sound cones,” and the sampled plane “is normally a marginal strip of a road whose surfacing has to be removed by cutting down to a predetermined depth.” *Id.* at 2:27–31. Sehr further discloses that the control unit “compensates substantially for the waviness of the reference plane, and it facilitates the work of the operator of the road grooving machine by holding the road grooving machine in a parallel position.” *Id.* at 3:53–60.

ANALYSIS

A. Legal Standards

To prevail in its challenges, Petitioner must prove unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d). “In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burdens of proof in an *inter partes* review).

Petitioner relies on obviousness in its challenges. Pet. 6. A claim is unpatentable as obvious under 35 U.S.C. § 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, also known as objective indicia of nonobviousness.⁷ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

An obviousness analysis must include a reason, based upon some rational underpinning, why a person of ordinary skill would have been motivated to modify the prior art to achieve the claimed invention. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner . . . must . . . articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” (citing *KSR*, 550 U.S. at 418)). The requirement of a reason to combine is a safeguard against hindsight bias, which is characterized by the “temptation to read into the prior art the teachings of the invention in issue.” *KSR*, 550 U.S. at 421 (quoting *Graham*, 383 U.S. at 36).

B. Level of Ordinary Skill in the Art

The level of skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). “This reference point prevents . . . factfinders from using their own insight or, worse yet, hindsight, to gauge obviousness.” *Id.* Factors pertinent to a determination of the level of ordinary skill in the art include: (1) educational level of the inventor; (2) type of problems

⁷ The parties do not address any objective indicia of nonobviousness in this proceeding.

encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of workers active in the field. *Env't Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–697 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case. *Id.* Moreover, these factors are not exhaustive but are merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). In determining a level of ordinary skill, we also may look to the prior art, which may reflect an appropriate skill level. *Okajima*, 261 F.3d at 1355.

Petitioner asserts that a person of ordinary skill in the art would have had “at least a four-year degree in mechanical engineering or a closely related field and at least two years of experience designing, developing, servicing or operating heavy machinery, including their components and control systems.” Pet. 6 (citing Ex. 1006 ¶ 23). Petitioner also states that “[a]dditional education could substitute for professional experience, and significant work experience—such as working with, servicing, or operating heavy machinery in the field—could substitute for formal education.” *Id.*

“Patent Owner does not dispute the Petition’s definition” of the level of ordinary skill. PO Resp. 12.

Based on the prior art, the sophistication of the technology at issue, and Dr. Singhose’s declaration testimony, we adopt Petitioner’s undisputed definition of the level of ordinary skill. *See* Ex. 1006 ¶ 23; *see, e.g.,*

Exs. 1002, 1003 (providing information on the PM-465 Cold Planer);
Ex. 1004; Ex. 1005; Ex. 1037.

C. Claim Construction

We construe each claim “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).” 37 C.F.R. § 42.100(b). Under this standard, claim terms are generally given their ordinary and customary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc) (“We have frequently stated that the words of a claim ‘are generally given their ordinary and customary meaning.’” (citations omitted)).

Petitioner contends that “[t]he prior art renders all challenged claims unpatentable under the plain and ordinary meaning of the claims.” Pet. 6.⁸ “Patent Owner does not believe that any claim terms need specific construction to resolve the prior art grounds raised in the Petition.” PO Resp. 12.

We determine that we need not expressly construe any claim terms to resolve the parties’ disputes on the record before us. *See 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.*

⁸ Petitioner “notes that the parties exchanged preliminary claim constructions in the parallel litigation,” and provides the construction for two terms from that litigation, “controller” and “ground engaging sensor,” but argues that “[t]hose constructions are irrelevant to the outcome here and the Board thus need not address them.” Pet. 6–7.

Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999)). To the extent that the scope of any particular claim term requires discussion, however, we provide it in our assessment of the challenges, which we turn to next. For example, although not apparent in the Petition and Patent Owner's Response, the parties have at least an implicit claim construction dispute over the scope of limitation 1[h], which we discuss in the context of that limitation below.

D. Obviousness Based on OMM, Sehr, and Samuelson

Petitioner contends that the combination of OMM, Sehr, and Samuelson teaches or suggests each limitation of claims 1–10, 25, 27, 30, 31, 33, 34, and 36–40. Pet. 6–82. Petitioner provides various reasons in support of the motivation to combine the references and points to specific aspects of the references as teaching each of the claim limitations. *See id.*

Patent Owner argues that (1) Petitioner fails to establish a motivation to combine the references as proposed (*id.* at 29–46); (2) Petitioner fails to establish that its proposed combination would “automatically . . . establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel” (referred to as “parallel-to-surface,” “PTS,” or “parallel-to-ground”) as required by each of the challenged claims (PO Resp. 13–28); (3) the proposed combination would not meet the additional limitations in dependent claims 3–10 (*id.* at 46–48); and (4) the proposed combination would not meet the additional limitations of dependent claim 27 (*id.* at 48–53). We address the parties' positions as to each argument below. We begin by addressing the motivation to combine issue, and then address whether Petitioner establishes that the combination teaches or suggests the limitations in the challenged claims.

1. *Petitioner’s proposed combination of OMM, Sehr, and Samuelson*

We first present Petitioner’s reasoning for combining the teachings of OMM, Sehr, and Samuelson to arrive at the subject matter of the challenged claims. We then present Patent Owner’s counter arguments, and our discussion of the parties’ arguments.

a) *Petitioner’s Arguments*

Petitioner contends that OMM, Sehr, and Samuelson are analogous art, as all three references are in the same field of endeavor and reasonably pertinent to the problem that the ’972 patent attempts to solve. Pet. 20–22 (citing Ex. 1002, 2, 32, 48–49, 52; Ex. 1004, 1:35–63, 2:28–31, 4:17–47; Ex. 1006 ¶¶ 62–63; Ex. 1037, code (57), 1:60–63, 2:44–54); *cf. In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (“References . . . qualify as prior art for an obviousness determination only when analogous to the claimed invention.”). Patent Owner does not dispute that OMM, Sehr, and Samuelson are analogous art.

Petitioner contends that a person of ordinary skill in the art (“POSITA”) “would have understood that OMM’s Electronic Control Module (‘ECM’)—an electronic controller—was designed to receive and process signals from a variety of sensors all at once, and that the ECM would be able to receive and process the position signals generated from a sensor-integrated cylinder like Samuelson’s.” Pet. 21 (citing Ex. 1002, 32; Ex. 1006 ¶ 63). Petitioner further contends that a POSITA “would have been motivated to implement sensor-integrated cylinders like Samuelson’s on the PM-465 machine and use them to monitor and change the positions of components attached to those cylinders, to keep the machine frame parallel

to the ground, as taught by Sehr.” *Id.* at 21–22 (citing Ex. 1002, 32; Ex. 1006 ¶ 63).

Petitioner argues that it would have been motivated to incorporate Sehr’s “sensor-driven parallel orientation adjustments, which provides for parallelism in the direction of travel, into the machine described by OMM.” Pet. 22 (citing Ex. 1006 ¶¶ 64–65). Petitioner notes that PM-465 already has a “grade-and-slope system [with] controllers that receive signals from multiple sensors, and this information is used to control the drum’s milling depth by adjusting the ‘heights of the legs.’” *Id.* (citing Ex. 1002, 32, 48–49). Petitioner contends that Sehr discloses a similar system that relies on sensor data “for the vertical adjustment of the front as well as of the rear traveling gear height adjustment means.” Pet 22 (citing Ex. 1037, 3:48–52). Petitioner further argues that because both systems use systems to adjust the orientation of their respective machines by changing the height of the lifting columns that “[a] POSITA would have understood that incorporating Sehr’s orientation adjustments would require nothing more than the use of additional sensors.” *Id.* at 22–23 (citing Ex. 1006 ¶ 64). Petitioner asserts that this modification would have a reasonable expectation of success because the state of the art recognizes “[t]hose skilled in the art can readily write software for implementing’ sensors in road-milling machines.” *Id.* (citing Ex. 1050, 4:19–24).

Petitioner argues that there are several benefits that a POSITA would recognize from this modification. Pet. 23. First, Petitioner contends that Sehr’s system permits more accurate adjustment of the cutting depth. *Id.* (citing Ex. 1037, 1:60–63; Ex. 1006 ¶ 65). Second, Petitioner argues that Sehr’s system avoids cutting depth faults and can compensate for a wavy

reference plane while assisting the operators work by holding the machine in a parallel position. *Id.* (citing Ex. 1037, 3:53–61). According to Petitioner, a “POSITA would have recognized that these benefits would apply to and improve OMM, thus further motivating a POSITA to modify OMM with Sehr’s parallel adjustment mechanism.” *Id.*

Next, Petitioner turns to a further modification of OMM and Sehr with Samuelson. Petitioner contends that a person having ordinary skill in the art “would have been motivated to implement Sehr’s parallel adjustment system in OMM by using sensor-integrated cylinders like Samuelson’s in the PM-465’s legs.” Pet. 24–34 (citing Ex. 1006 ¶¶ 66–80). Petitioner asserts that the prior art already shows how to use sensors on the front and rear legs of a road-milling machine to maintain parallelism from left to right and front to back, with the front to back parallelism satisfying the parallel to surface limitation of the challenged claims. *Id.* (citing Exs. 1052–1054 (discussing the Roadtec RX-500 road milling machine)).

Petitioner presents several benefits that would inspire a POSITA to make the proposed modification. First, Petitioner contends Sehr’s PTS orientation avoids cutting depth faults caused by undesirable inclination angles and allows the system to compensate for waviness of the reference plane. Pet. 25 (citing Ex. 1037, 3:53–61). Second, the parallel-to-ground orientation promotes machine stability and improves the operator’s comfort. *Id.* (citing Ex. 1006 ¶ 68; Ex. 1037, 3:53–61).

As to the stability, Petitioner contends road-milling machines can become unstable if the elevation differs too much or they encounter uneven terrain. Pet. 25–26 (citing Ex. 1057 (explaining controlling the legs of milling machines can prevent instability); Ex. 1058 (explaining improper

control can be “detrimental to stability of the machines”); Ex. 1059 (recognizing stability benefits in keeping a large machine parallel to the ground)). Petitioner contends that one of ordinary skill in the art would be familiar with the prior art and would be motivated to keep the machine parallel to improve stability. *Id.* at 26–27 (citing Ex. 1006 ¶¶ 70–71). Petitioner also asserts that a POSITA would recognize the advantage of being able to temporarily leave and return to a parallel-to-ground inclination by using sensor-integrated cylinders like Samuelson’s that know the extension position of each leg that corresponds to the parallel-to-ground inclination. *Id.* at 27–28 (citing Ex. 1006 ¶¶ 71–72).

Petitioner contends that OMM recognizes that the PM-465’s leg sensors can be compromised by dust and debris and require cleaning. Pet. 31–32 (citing Ex. 1002 ¶¶ 109, 112; Ex. 1005, 1:23–45; Ex. 1006 ¶ 77). Petitioner argues that OMM’s disclosures would motivate a POSITA to replace PM-465’s existing leg cylinders with the cylinders of Samuelson to measure the legs’ elevation. *Id.* (citing Ex. 1006 ¶ 77). Petitioner contends that this modification would improve the sensing capabilities of the PM-465 machine and allow the modified machine “to measure, with precision, the exact amount of each leg’s extension,” thereby enabling the controller to adjust the machine “parallel to the ground.” *Id.* at 31–32.

Petitioner also contends that Samuelson expressly discloses additional motivating factors, such as improvements in controller technology over time that “became cost effective and it became easier to use sensors on hydraulic cylinders in mobile construction equipment.” Pet. 32 (citing Ex. 1004, 1:19–49; Ex. 1006 ¶ 78); *see also id.* at 32 (“A [person having ordinary skill in the art] would have known to consider the technological advances in the

art and to look for ways to improve the PM-465 machine’s design by implementing those advances (e.g., by using sensor-integrated hydraulic cylinders on the machine).”).

In addition to the motivations discussed above, Petitioner contends that a POSITA would have had a reasonable expectation of success in performing the proposed modifications. *See* Pet. 30–34. For example, Petitioner contends PM-465 was “primed to receive” the sensor-integrated cylinder of Samuelson because PM-465 already uses hydraulic cylinders inside all four legs, PM-465 uses numerous sensors including service height sensors to determine the extension of the machine’s legs, and sensors at the right rear corner to sense the elevation of the rear legs. *Id.* at 30–32 (citing Ex. 1002, 32, 66, 108, 109, 112; Ex. 1003, 39–40; Ex. 1006 ¶¶ 75–77). Further, Petitioner notes that Samuelson discloses its invention is “designed for the equipment rather than modifying the equipment design to accept the cylinder” and that Samuelson’s design is in a state where it can be integrated easily with PM-465’s controllers. *Id.* at 33 (citing Ex. 1003, 1:54–63, 4:17–62; Ex. 1006 ¶ 79).

b) Patent Owner’s Arguments

Patent Owner raises several arguments against Petitioner’s motivation to combine rationales. *See* PO Resp. 29–46. Patent Owner argues that the proposed combination fails to provide “all the advantages taught by Sehr.” *Id.* at 30. According to Patent Owner, Sehr reduces waviness by controlling milling depth control rather than automatically establishing PTS⁹ because

⁹ Petitioner generally refers to “parallel-to-ground” and Patent Owner generally refers to PTS (parallel-to-surface) when addressing the limitation “automatically . . . establish a parallel orientation of the machine frame

Sehr’s ultrasonic sensors function as grade control sensors. *Id.* at 31 (citing Ex. 2020 ¶¶ 69, 72). Patent Owner contends that Sehr’s sensors improve upon systems such as OMM by performing grade averaging (measuring the height of the reference plane such as the ground relative to the machine frame at several points) and throwing out clearly erroneous readings before averaging the readings. *Id.* at 33–34 (citing Ex. 2020 ¶¶ 73, 124–125). Patent Owner contends that the proposed combination cannot grade average because the leg sensors do not measure milling depth. *Id.* at 34–35 (citing Ex. 2009, 62:11–21; Ex. 2020 ¶¶ 126–132).

Next, Patent Owner argues that the “way Sehr accomplishes PTS does not apply to the proposed combination.” PO Resp. 36. Patent Owner contends that Sehr can detect longitudinal orientation from any two sensors, while the leg sensors in the proposed combination by themselves cannot. *Id.* at 36–37 (citing Ex. 2020 ¶¶ 132–134, 149).

Patent Owner further contends that the “Petition’s motivations regarding stability, operator comfort, milling on inclines, and temporarily leaving and returning to parallel are inherent advantages of longitudinal orientation control, which would not be provided by the proposed combination.” *Id.* at 37–38 (citing Pet. 25–28). According to Patent Owner, because Sehr’s system already provided the advantages, there would be no motivation to create a new design to achieve them and “the Petition does not

relative to the ground surface in the direction of travel.” *See* Pet. 1–2, 22; PO Resp. 1–3. Both refer to the same thing—i.e., establishing a parallel relationship from front to back, or in the “longitudinal” direction of the milling machine. *See* Pet. 1–2; PO Resp. 1, 4.

explain how the proposed combination could achieve this functionality.” *Id.* at 38.

As to Petitioner’s argument that PM-465 was already primed to receive Samuelson’s design, Patent Owner argues that the contention lacks support because the Petition does not discuss the modifications necessary to arrive at the claimed inventions and the PM-465 controller was not capable of accepting additional inputs required for additional sensors. PO Resp. 39. In Patent Owner’s view, the Petition does not provide any detail as to the “control scheme” Petitioner alleges it would have implemented on the PM-465’s controller. *Id.* at 39–41 (citing Ex. 1050, Abstract, 2:66–9:31, Figs. 2, 3a–g; Ex. 2020 ¶ 150). Patent Owner also argues that U.S. Patent No. 6,152,648 to Gfroerer (Exhibit 1050), upon which Petitioner relies, states that a person having ordinary skill in the art could write software to implement Gfroerer’s flowchart, not program any result. *Id.* at 39–40.

Patent Owner also faults Petitioner’s argument that a POSITA would have sought more robust leg sensors than those existing in the PM-465 merely because the sensors may require cleaning. PO Resp. 41 (citing Ex. 1002, 112; Ex. 2007, 75:19–77:16). Patent Owner contends that the Petition fails to explain how eliminating the need for cleaning renders the sensors more robust and fails to show that Samuelson’s leg sensors are more robust than PM-465’s proximity sensors. *Id.* (citing Ex. 2020 ¶ 145).

As to Petitioner’s reliance on the RX-500’s calibration process to establish a parallel orientation, Patent Owner argues that it does not aid Petitioner because RX-500’s leg sensors were not used in the manner Petitioner proposes. PO Resp. 41–42 (citing Pet. 24–25; Ex. 2011, 16:10–14, 33:20–34:2; Ex. 1053, 17–18). According to Patent Owner, “[i]nitial

calibration says nothing about subsequent control.” *Id.* at 42 (citing Ex. 2020 ¶ 95).

Finally, Patent Owner argues that the “Petition provides no evidence that the proposed sensor-integrated cylinder replacements were more affordable than the existing PM-465 solutions.” PO Resp. 43. Patent Owner further contends that the Petition also fails to “provide any evidence that a POSITA would have retrofitted the PM-465 with the proposed sensor-integrated cylinder replacements” beyond “Dr. Singhose’s conclusory testimony.” *Id.* Patent Owner relies on Dr. Singhose’s declaration and deposition testimony, and contends that he only alleged that “a POSITA ‘could’ implement sensor-integrated cylinders on a PM-465,” not that he knew it had been done or that a POSITA “would” have been motivated to do so. *Id.* at 43–44 (citing Ex. 1006 ¶ 64; Ex. 2008, 23:1–24:4, 76:11–79:10). Patent Owner also asserts that Petitioner’s cost effectiveness motivation argument lacks merit because Samuelson describes the lower cost of its PLCs, not its sensor-integrated cylinders, and Dr. Singhose did not perform a cost analysis. *See id.* at 44–45 (citing Ex. 1004, 1:35–49; Ex. 1006 ¶¶ 60, 78, 90; Ex. 2009, 55:3–59:11; Ex. 2020 ¶¶ 146–147).

c) Petitioner’s Reply and Patent Owner’s Sur-reply

Petitioner contends that the evidence of record confirms that a POSITA would have made its combination, which “adds sensor-integrated cylinders like Samuelson’s to the legs of the OMM PM-465 machine, and then uses those sensor-integrated cylinders to keep the machine frame parallel front-to-back, just as Sehr describes.” Pet. Reply 9. Petitioner relies in part on Samuelson itself as expressly providing a motivation to combine

when it touts the advantages of (1) having sensors inside its leg cylinders to protect them from damage; (2) PLCs were becoming more common due to lower cost, which enabled more automatic functions that would improve operator interfaces; (3) sensor-integrated cylinders were provided to upgrade older equipment; and (4) “Samuelson’s sensor-integrated cylinders are easy to service and maintain.” *Id.* at 10 (citing Ex. 1004, 1:35–40, 1:45–49, 1:58–63, 4:48–52, 4:58–5:1; Ex. 1006 ¶¶ 60, 61, 77–80).

As to Patent Owner’s arguments that the combination fails to incorporate all of Sehr’s advantages, Petitioner argues that it does not propose “incorporating Sehr’s sensor design into the PM-465. Bodily incorporation is not required to show obviousness.” Pet. Reply 11 (citing PO Resp. 29–38). According to Petitioner, it merely relies on Sehr’s teaching that holding the machine in PTS front-to-back has benefits and provides a motivation “to keep the milling machine’s frame parallel front-to-back during both milling and non-milling operations.” *Id.* at 11–12.¹⁰

As to the Roadtec RX-500 “state-of-the-art evidence,” Petitioner contends that it “proves that it was actually known to use leg sensors on a road-milling machine to keep the machine frame parallel front-to-back” and shows that a POSITA would know how to move the legs to achieve the claimed parallelism. *See* Pet. Reply 14 (citing Ex. 1006 ¶¶ 66–68; Ex. 1071, 64:23–66:9, 98:24–99:24). Petitioner asserts that Patent Owner’s own

¹⁰ Petitioner also argues that potential problems with Sehr’s ultrasonic sensors due to the presence of leaves and dust would further motivate a POSITA to seek out Samuelson’s sensor approach, while Patent Owner contends that these arguments, based on deposition testimony, do not appear in the Petition and should be ignored. *See* Pet. Reply 13; PO Sur-reply 23–25. We do not consider this aspect of Petitioner’s argument in our analysis.

expert undermines Patent Owner’s argument that the RX-500’s initial calibration says nothing about subsequent control, because Dr. Lumkes testified that “when a road-milling machine is set to scratch (i.e., when the machine frame is parallel to the ground side-to-side and front-to-back), the calibration values ‘are stored for . . . potential future use’ and can be used during ‘different operations’ to ‘get back’ to the scratch position.” *Id.* at 15 (citing Ex. 1071, 24:3–26:12); *see also id.* at 15–16 (citing Ex. 2009, 52:2–54:21) (Dr. Singhose allegedly agreeing with Dr. Lumkes on this point). In Petitioner’s view, its combination includes a machine that can access stored PTS values that, at least when “traveling on relatively flat ground,” holds the machine frame in the claimed PTS position, which meets the claim requirements even if occasional road imperfections cause the machine to be non-parallel to the ground. *Id.* at 16.

Patent Owner replies that Petitioner’s analysis relies on improper hindsight and uses the ’972 as a roadmap for its combination. *See* PO Sur-reply 17–18. Patent Owner contends that Petitioner must do more than show generic motivations to use Samuelson’s sensors or Sehr’s parallelism and fails to show a motivation to make the specific combination Petitioner proposes. *See id.* at 17–19. Patent Owner further asserts that Samuelson’s advantages would apply to any application of its sensor-integrated cylinders on any mobile machine. *See id.* at 18–20.

Patent Owner addresses the Sehr-based motivations, and contends that “[n]either Sehr nor OMM would have motivated a POSITA to implement sensor-integrated cylinders in all four legs of OMM’s PM-465 to automatically establish PTS during non-milling operations” because Sehr’s benefits only apply “during milling.” PO Sur-reply 20. Patent Owner also

contends that Sehr's alleged benefit of promoting machine stability and operator comfort lacks support in Sehr, which refers to facilitating the work of the operator by holding the machine in a parallel position. *Id.* at 20–21 (citing Pet. 25; Ex. 1037, 3:54–60). Patent Owner asserts that a POSITA would not have been motivated to implement Petitioner's comprehensive modifications when the "PM-465's obstacle jump feature would achieve the same result" and Sehr already provides a "straightforward solution." *Id.* at 21 (citing Pet. Reply 15–18). Patent Owner makes a similar argument against Petitioner's motivation to incorporate Samuelson's sensor-integrated sensors in all four legs of the PM-465 merely because it would avoid some cleaning of the sensors. *Id.* at 21–22 (citing Pet. 31–32; Ex. 1002, 112). Finally, Patent Owner argues that Petitioner fails to explain how to modify Sehr's control scheme to achieve PTS using Samuelson's sensors, and "[c]onsequently, the Petition cannot explain why a POSITA would have done so." *Id.* at 22–23.

d) Discussion

Based on our review of the complete record, we find that Petitioner has demonstrated, by a preponderance of the evidence, that a person having ordinary skill in the art would have been motivated to modify the teachings of OMM with Samuelson's teaching of sensor-integrated cylinders and Sehr's teaching to keep the machine frame parallel to the ground from front-to-back. *See* Pet. 25–34.

As to the motivation to modify OMM with Samuelson's teaching, Petitioner persuasively explains why a POSITA would be motivated to replace the sensors in the PM-465 machine shown in OMM with Samuelson's sensors. First, OMM itself supports the modification by

recognizing that the PM-465’s leg sensors can be compromised by dust and debris and require cleaning, with a switch to Samuelson’s sensor-integrated cylinders minimizing this issue. *See* Pet. 31–32 (citing Ex. 1002, 109, 112; Ex. 1005, 1:23–45; Ex. 1006 ¶ 77). Petitioner persuades us that such a change would allow the modified machine “to measure, with precision, the exact amount of each leg’s extension,” thereby enabling the controller to adjust the machine “parallel to the ground.” *Id.* Patent Owner argues that one of ordinary skill in the art would not have sought more robust leg sensors merely to avoid cleaning. PO Resp. 41 (citing Ex. 1002, 112; Ex. 2007, 75:19–77:16; Ex. 2020 ¶ 145). We find Petitioner more credibly argues that enclosing the sensors within the cylinder as Samuelson teaches provides a meaningful benefit because it lessens the chance of dust causing issues with exposed sensors and reduces the need to clean the exposed sensors to avoid those issues. *See* Pet. 31–32; Ex. 1006 ¶ 77. This motivation alone supports the use of Samuelson’s sensors over existing sensor’s in the PM-465 or Sehr’s ultrasonic sensors. *See* Ex. 1006 ¶ 77 (noting less maintenance required for Samuelson’s sensors compared to those in the PM-465 or Sehr).

Second, even ignoring OMM’s statements regarding the need for cleaning to avoid dust accumulation, Samuelson itself supports the combination by explicitly discussing advantages of its placing its sensors inside cylinders, including “protecting them from damage and environmental degradation.” Ex. 1004, 1:45–49. As Samuelson notes, by fixing the sensors within steel “there is very little chance that they can be damaged during the use of the device.” *Id.* at 4:48–52; *see also* Pet. 20 (citing Ex. 1004, 1:45–49, 4:48–52); Pet. Reply 10 (citing Ex. 1004, 1:45–49, 4:48–

52). In addition to the references themselves, Petitioner supports its motivation assertions with credible and persuasive expert testimony that cites the references for support. *See* Ex. 1006 ¶¶ 60, 61, 73, 77–80.

Patent Owner does not appear to dispute this aspect of Samuelson’s teaching, and instead argues that a mere “generic motivation to implement Samuelson’s position-sensing cylinders in OMM’s PM-465 . . . is not enough.” PO Sur-reply 18. We agree that a motivation to use Samuelson’s sensors, standing alone, does not supply a motivation to meet all of the requirements of the independent claims, including the parallel-to-the-ground aspect of the claims, but Petitioner does not rely on Samuelson’s sensors alone for those motivations, it relies on Sehr in combination with Samuelson. *See* Pet. 20–34.

As to the motivation to use a controller to position the machine frame parallel to the ground from front-to-back as required by the claims and taught by Sehr, Petitioner persuasively argues that Sehr’s teachings would motivate one of ordinary skill in the art to incorporate this feature into the combination. Sehr itself directly supports Petitioner’s motivation arguments by explicitly disclosing the advantages of its approach, such as more accurate adjustments of cutting depth and the ability to compensate for the waviness of a reference plane. Ex. 1037, 1:60–63, 3:53–61; Pet. 23 (citing Ex. 1037, 1:60–63, 3:53–61; Ex. 1006 ¶ 65), 25 (citing Ex. 1037, 3:53–61; Ex. 1006 ¶ 68); Pet. Reply 11 (citing Ex. 1037, 3:53–61; Ex. 1006 ¶¶ 57, 65, 68, 109, 112). Patent Owner argues that these benefits are only realized during milling, and if we agree with Petitioner that the challenged claims do not require positioning the machine parallel to the ground during milling (we do agree with Petitioner on this point, for the reasons provided in the next

section below), then Sehr's benefits would be lost on Petitioner's proposed combination, which does not provide a milling machine capable of achieving PTS during milling. *See* PO Sur-reply 20. We disagree, because if the milling operations benefit from the claimed parallelism, including during the initial milling operation, it makes sense that maintaining the machine in the claimed parallel position just prior to milling, with the machine just above the milling surface, would be beneficial. *See* Pet. Reply 11–12 (citing Ex. 1037, 3:53–61; Ex. 1006 ¶¶ 57, 65, 68, 109, 112; Ex. 2009, 18:20–23:5, 26:4–27:21, 42:16–45:2) (arguing that avoiding non-parallel “nose up” and “nose down” orientations has benefits that would apply “during both milling and non-milling operations”). We find Petitioner's argument and supporting testimony persuasive on this point.

Nevertheless, even if Sehr teaches benefits of parallelism that apply *only* during milling operations, it also teaches advantages of keeping the machine, and therefore the operator, parallel to the ground in the direction of travel as required by the claims. For example, Sehr states that it “facilitates the work of the operator of the road grooving machine by holding the road grooving machine in a parallel position.” Ex. 1037, 3:53–61. Dr. Singhose interprets that phrase to mean that a POSITA would have known that “the parallel-to-ground orientation promotes machine stability and operator comfort.” Ex. 1006 ¶ 68; Pet. 25 (citing Ex. 1006 ¶ 68).

Petitioner also argues, independent of Sehr's teaching, that a POSITA would have been aware of potential stability problems with milling machines and that would have motivated a POSITA “to solve this problem by using sensor-integrated cylinders like Samuelson's in all four of the road-milling machine's legs so that the extension/retraction of each leg can be

measured, and the machine can be stabilized by keeping the legs at elevations where the machine frame is parallel to the ground (from front to back).” Pet. 25–26 (citing Ex. 1057 ¶¶ 22–25 (recognizing that controlling the legs on a milling machine can prevent instability); Ex. 1058, 2:4–12, 3:1–9 (explaining that failing to properly control the legs on milling machines can be “detrimental to the stability of these machines”); Ex. 1059, 2 (recognizing stability benefits of keeping a large piece of mobile machinery parallel “relative to the crawlers”)). Dr. Singhose’s testimony similarly touts the ability of keeping the machine parallel to the ground from front to back as promoting the stability of the milling machine. *See* Ex. 1006 ¶ 69. Patent Owner suggests that Sehr’s statements are too “vague” and the modifications too “comprehensive” to justify moving away from Samuelson or Sehr’s existing designs and that a POSITA may have been motivated to use Samuelson’s sensors in less than all four legs. *See* PO Sur-reply 20–22. These arguments merely suggest the possibility that a less comprehensive design may have achieved similar goals when compared to Petitioner’s proposal, without undermining Petitioner’s showing that its proposed combination would achieve notable stability and operator comfort benefits by monitoring leg extension in all four legs, even when not milling.

As to the reasonable expectation of success issue, we find that Petitioner provides additional persuasive arguments and evidence when asserting that OMM was primed for the modifications based on Samuelson’s sensors and Sehr’s parallelism teachings. *See* Pet. 21, 29–34. As Petitioner notes, OMM discloses an electronic control module, i.e., a controller, that receives and processes signals from a number of sensors, and would be able to process signals from Samuelson’s sensors. *See id.* at 21; Ex. 1002, 32;

Ex. 1006 ¶ 63. In addition, once Samuelson’s sensors are present in all four legs, “a POSITA would have known that, after the operator performs the pre-milling calibration function where the rotor is brought to the ground and the sensors are calibrated, the machine can begin operation and the controller can compare the values from all four leg sensors to the calibration values and continually position the machine frame at the desired parallel-to-ground orientation, maximizing the stability and milling efficiency of the machine.” Pet. 29; Ex. 1006 ¶ 74. The PM-465 machine was already primed for Petitioner’s proposed design not only due to its existing electronic controller, but also the presence of hydraulic cylinders on all four legs and a service height sensor that indicates when the legs reach a service height. Ex. 1002, 32, 66, 108, 112; Pet. 30–31; Ex. 1006 ¶¶ 75–76.

Although not required to find in Petitioner’s favor on these issues, we also note that Petitioner persuasively shows that machines already known in the art employed leg sensors and a system to achieve parallelism from front to back as claimed. *See* Pet. 24–25 (citing Ex. 1006 ¶ 66; Exs. 1052–1054). We find Petitioner’s argument and supporting expert testimony on these issues persuasive and credible. *See also id.* at 29–34; Pet. Reply 20–25; Ex. 1006 ¶¶ 74–80.

Patent Owner argues that Petitioner does not provide enough details, such as a control scheme, to show that its proposed combination would achieve the claimed PTS orientation, undermining its motivation and reasonable expectation of success arguments.¹¹ *See* PO Resp. 24–28, 39–41;

¹¹ Patent Owner’s arguments here overlap with its argument that the proposed combination fails to meet the claim limitation at all, which we address in the next section. We ultimately find that the combination teaches

PO Sur-reply 22–23. We do not find these arguments persuasive because Petitioner was not required to specify every detail of its proposed combination, including the specific control scheme or algorithm used to monitor the sensors and keep the machine parallel to the ground, to support its challenge when such details are within the knowledge of one of ordinary skill in the art. *See* Pet. Reply 22–25. As noted by Petitioner, the ’972 patent itself does not provide the specificity Patent Owner alleges Petitioner must provide, and Petitioner’s proposed combination need only contain the same level of detail as the ’972 patent. *See id.* at 22–24. We view the lack of details in the ’972 patent as further evidence that one of ordinary skill in the art would know how to program a controller to achieve the claimed parallelism by monitoring the sensor readings on all four cylinders of the machine. *See* Ex. 1071, 64:23–66:20, 67:8–68:18 (Patent Owner’s expert testifying that even without a detailed algorithm or code, a POSITA could write the code to create a machine that would function to achieve parallelism). We do not find Patent Owner’s arguments on these issues sufficiently persuasive to undermine Petitioner’s arguments and credible expert testimony of Dr. Singhose supporting its position. *See* Ex. 1006 ¶¶ 74–80.¹²

this aspect of the claims, which largely addresses Patent Owner’s argument as to lack of motivation to make the modifications due a failure to meet the claim limitation.

¹² We credit this testimony, in part, because it is consistent with Petitioner’s proposed level of ordinary skill, which we adopted above and which includes “at least two years of experience designing, developing, servicing or operating heavy machinery, *including their* components and *control systems*.” Pet. 6.

We have considered Patent Owner’s remaining arguments, but find those arguments insufficient to undermine Petitioner’s arguments in support of its motivation to combine. *See* PO Resp. 30–38, 41–45. For example, Patent Owner alleges that the “proposed combination does not provide all of the advantages taught by Sehr,” but Patent Owner cites no authority for the proposition that “all” of the advantages in a prior art reference must be used in a proposed combination, or that a prior art reference must explicitly disclose any advantages to support a proposed combination. *See* PO Resp. 30–37. In addition, Petitioner was not required to bodily incorporate Sehr’s methods of achieving PTS, using its ultrasonic sensors, into the proposed combination as long as the proposed combination could achieve PTS.

Patent Owner also argues that Petitioner’s reliance on improved stability as a reason to implement Sehr’s PTS functionality lack merit because the improved stability merely stems from the benefits of controlling longitudinal orientation and Petitioner shows no reason to depart from Sehr’s solution. *See* PO Resp. 37–38. This argument lacks merit because Patent Owner fails to explain or support its implicit position that a challenger must use and bodily incorporate a solution found in the existing art rather than picking and choosing which functionality to incorporate into a proposed design. *See id.* Nothing precludes Petitioner from relying on Samuelson’s sensor-integrated cylinders and eschewing Sehr’s ultrasonic sensors in its design, and limiting the use of Sehr’s teaching’s goal of implementing the PTS functionality. *See* Pet. Reply 11.

Patent Owner contends that Petitioner cannot rely on the RX-500 as evidence that controlling leg extension to maintain parallelism because those sensors were designed for manual milling and “calibration says nothing

about subsequent control.” PO Resp. 41–43. We do not view Petitioner’s reliance on the RX-550 as necessary to our decision, but it does support Petitioner’s position. Contrary to Patent Owner’s position, the RX-550 calibrates the ground position (when the legs are extended to a position where the rotor meets the ground) and stores a leg extension position corresponding to a parallel-to-ground position, and with the press of a button that parallel position can be recalled and the legs moved to that position. *See* Pet. 24–25; Pet. Reply 14–15. That system shows that a controller can be configured to achieve the claimed parallel-to-ground position, undermining Patent Owner’s arguments that one of ordinary skill in the art would not know how to do it and would have no motivation to do so.¹³

Based on the foregoing, we find that Petitioner proves, by a preponderance of the evidence, that one of ordinary skill in the art would have been motivated to combine OMM, Sehr, and Samuelson in the manner Petitioner proposes.

¹³ Patent Owner further asserts that Petitioner fails to establish that Samuelson’s sensor-integrated cylinders were more affordable than the existing PM-465 solutions. *See* PO Resp. 43–45. We do not rely on this aspect of Petitioner’s arguments to find a sufficient motivation to use Samuelson’s sensors, but we do find it persuasive. Petitioner does not argue that Samuelson’s sensors are cheaper, and instead persuasively argues that “controller technology” became more cost effective, which in turn made it easier to incorporate Samuelson’s more advanced approach. *See* Pet. 32 (citing Ex. 1004, 1:19–49; Ex. 1006 ¶ 78).

2. *“automatically . . . establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel”*

a) *The Parties’ Positions*

Each of independent claims 1 and 38 requires a controller configured to “automatically . . . establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel” while independent method claim 31 similarly requires automatically controlling a lifting condition to “automatically establish a parallel orientation of the machine frame to the ground surface in the direction of travel.” Ex. 1001, claims 1, 31, 38. We treat these limitations as a group as the parties do, and generally refer to the limitation found in claim 1 for ease of reference.

As noted above in the motivation to combine analysis, Petitioner contends that OMM discloses an electronic controller that was designed to receive and process signals from a variety of sensors, including at least one ground engaging sensor. Pet. 47 (citing Ex. 1002, 32). Petitioner argues that Sehr discloses a control system that uses information from sensors to adjust the elevation of a milling machine’s legs, such that the milling machine remains parallel to the ground, satisfying this aspect of the independent claims. *Id.* at 47–48 (citing Ex. 1006 ¶ 109; Ex. 1037, 2:23–67); *see also id.* at 48–51 (repeating motivation to combine and reasonable likelihood of success arguments when addressing this limitation); Ex. 1006 ¶¶ 110–116.

Patent Owner argues that Petitioner’s proposed combination “does not ‘automatically . . . establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel,’ as required by the challenged claims.” PO Resp. 13. Patent Owner contends that the “Petition

incorrectly presumes that signals from sensor-integrated leg cylinders alone are sufficient” and fails to recognize that Samuelson’s “sensor-integrated leg cylinders do not detect changes in the height of the machine frame relative to the reference surface being used by the grade control system.” *Id.* at 13–14. Patent Owner also asserts that “automated grade control, which must be used in combination with the information derived from the leg sensor signals to automatically establish PTS.” *Id.* at 13.

As part of its argument, Patent Owner reviews the approach taken by the ’972 patent and asserts that “automatically establishing PTS ‘can be performed by the control means only when the control means performs a readjustment of the milling depth or performs a setting of a predefinable milling depth.’” PO Resp. 19 (citing Ex. 1001, 3:10–14, 10:48–52, 13:15–19 (claim 13)). Patent Owner further contends that “automatically establishing PTS require[s] the controller to account for milling depth,” which requires “at least one additional sensor that provides milling depth information” and that Petitioner’s proposed combination lacks this information. *Id.* at 20–21 (citing Ex. 2020 ¶¶ 49–55, 133–134).¹⁴

Patent Owner also argues that the “Petition does not explain how a POSITA would have modified the PM-465’s controller to accommodate four sensor-integrated leg cylinders and to process their signals to achieve the desired service-height indications and automatically establish PTS.” PO Resp. 24. According to Patent Owner, Petitioner’s proposed combination

¹⁴ Patent Owner also disputes Petitioner’s assertion that the cylinders in its proposed combination can detect compression of its cylinders when the machine hits an obstacle and account for that when milling. *See* PO Resp. 21–24; Pet. 26. We do not rely on Petitioner’s compression-related arguments, and need not resolve this dispute.

would have required hardware modifications to the PM-465 controller because that controller “was only capable of receiving signals from at most two leg proximity switches at a time.” *Id.* at 25–28 (citing Ex. 1003, 7, 38–39, Fig. 7; Ex. 2020 ¶¶ 108–109). Patent Owner further alleges that the “Petition’s vague proposed software modifications would not have worked because the PM-465 controller was incapable of adjusting the rear legs to establish PTS.” *Id.* at 28 (citing Ex. 1003, 8–9; Ex. 2007, 36:3–38:3; Ex. 2020 ¶¶ 110–111).

In its Reply, Petitioner argues that Patent Owner improperly assumes an impermissibly narrow scope of the limitation. *See* Pet. Reply 1–9. Petitioner contends that the ’972 patent does not preclude and instead allows for the claimed “PTS feature to be satisfied at any time during the operation of the machine (while milling or otherwise).” *Id.* at 2. Petitioner refers to a number of milling machine operations that do not involve milling, including driving to and from a location to be milled, performing a calibration that sets the milling parameters, driving backward to mill adjacent strips, and raising the milling drum over obstacles. *Id.* (citing Ex. 1071, 14:13–16:10, 27:2–33:2, 34:1–36:1, 38:5–39:19). According to Petitioner, the claim limitation does not require the PTS feature during milling operations. *See id.* Petitioner further contends that the claim limitation only requires the claimed parallelism on *just one side* of the machine, because machines that encounter a cross slope “will have different elevations relative to the unmilled road surface.” *Id.* at 3 (citing Ex. 1071, 47:19–53:20). Petitioner also asserts that neither the claims nor the ’972 patent specify a degree of parallelism and provide no dimensions or distance values that define the amount of parallelism required by the claims. *Id.* at 4.

With this approach to claim scope in mind, Petitioner argues that Patent Owner improperly stated that it did not believe claim construction was necessary and then proceeded to assume throughout its Response “that the PTS feature claimed in the ’972 patent must apply *while the machine is milling*, and that the machine in [Petitioner’s] prior-art combination is not PTS during milling.” Pet. Reply 5 (citing PO Resp. 2–5, 13–16, 19–20, 35–36). Petitioner contends that Patent Owner never proposed this narrow construction in the district court litigation between the parties, and instead broadly applied the claims to cover “PTS scenarios of infringement that occurred while machines were not milling.” *Id.* at 5–6 (citing Ex. 1074, 30–59). According to Petitioner, Patent Owner accuses machines of infringing when using PTS during an “obstacle jump feature,” even though Patent Owner’s own expert admits that no milling occurs when using that feature. *See id.* at 6 (citing Ex. 1071, 34:1–36:1, 38:5–39:15). Petitioner also contends that the claim limitation lacks any support for Patent Owner’s narrow reading, and that unchallenged claim 13, which depends from claim 1, shows that Patent Owner “knew how to draft claim limitations where the PTS operation occurred only during milling.” *Id.* at 7. Petitioner also contends that the specification refers to the PTS operation without referring to milling in several instances, refuting any argument that the specification mandates Patent Owner’s construction of the limitation. *Id.* at 8–9 (citing Ex. 1001, 2:25–28, 3:33–38).

Petitioner also disputes Patent Owner’s assertion that it failed to show how Samuelson’s cylinders would have worked in the proposed combination. Pet. Reply 20–21. Petitioner points back to the Petition and the references, and argues that OMM was designed to work with many

different types of sensors and already received voltage signals like the signals Samuelson's sensors produce. *Id.* at 21. According to Petitioner, Patent Owner incorrectly states that the PM-465 controller could not handle additional sensors, and Dr. Lumkes admitted that the connector pins had plenty of room to accommodate the additional sensors used in the proposed combinations. *Id.* at 22 (citing Ex. 1003, 30–31; Ex. 1072, 138:17–144:19; Ex. 1072, 74:11–79:13). As we noted above, Petitioner also describes the lack of actual computer code or an algorithm as insignificant given the level of skill in the art and the limited teachings in the '972 patent. *Id.* at 23–24. As to Patent Owner's argument that the PM-465 only moved the front legs and would not know how to move the rear legs as required to meet the PTS requirement, Petitioner argues that the PM-465 already had a service height sensor on the rear legs for this purpose and that a POSITA would have known that adding Samuelson's sensor-integrated cylinders "would allow for the extension/retraction of each leg to be measured." *Id.* at 24–25 (citing Ex. 1006 ¶¶ 76, 113, 115).

In its Sur-reply, Patent Owner argues that Petitioner fails to provide adequate information as to how to program the controller to achieve PTS using the sensors in the combination and fails to explain how the RX-500's calibration procedure automatically establishes PTS. PO Sur-reply 1–5. Patent Owner also repeats its assertion that Petitioner fails to explain how to establish PTS without accounting for milling depth and using only leg sensor data, which stems from an incorrect assumption that Sehr's PTS system can be applied to the proposed combination. *Id.* at 5–10. Patent Owner also faults Petitioner for failing to describe the modifications necessary "to provide a milling machine operable to both automatically

control milling depth (the principal operation of the PM-465) and automatically establish PTS.” *Id.* at 10. As to Petitioner’s reliance on non-milling operations, Patent Owner contends that those operations “all require the operator to manually command extension of the legs to raise the machine.” *Id.* at 11 (citing Pet. 27–28; Pet. Reply 18; Ex. 1002, 48, 57). Patent Owner acknowledges that it took a different approach to claim scope in the district court litigation, but contends that it did so to preserve arguments based on Petitioner’s alleged claim scope. *Id.* at 12.

Patent Owner also argues that the limitation requires automatically establishing PTS while milling because the specification shows that “the invention” is directed to this functionality and that “[a]ll the problems solved by the invention occur during milling.” PO Sur-reply 12. Patent Owner asserts that all of the embodiments are discussed in the context of milling and that Petitioner fails to identify embodiments discussed in the context of non-milling operations. *Id.*; *see also id.* at 12–15 (expanding on these same arguments). Patent Owner also contends that Petitioner’s non-milling arguments cannot render the challenged method claims 31, 33, 34, 36, and 37 obvious because those claims are “require ‘[a] method of milling a ground surface’ that includes automatically establishing PTS.” *Id.* at 15–16.

b) Discussion

We begin by addressing whether the claims require a controller configured to “automatically . . . establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel” *during a milling operation* as Patent Owner contends. Based on our review of the arguments and evidence, Petitioner has the better position on this

issue, and we decline to read the limitation as requiring automatically establishing a parallel orientation during milling.

First, and most importantly, the claim limitation itself never alludes to a milling operation or suggests that the parallel orientation must occur during milling. *See* Ex. 1001, claims 1, 31, 38. Patent Owner makes no attempt to argue that the claim language in the limitation supports its position. *See* PO Sur-reply 12–16.

Second, unchallenged dependent claim 13, which depends from claim 1, squarely addresses this issue by expressly requiring a controller configured to automatically establish the parallel orientation “only when the controller performs a readjustment of the milling depth of the milling roller or a setting of a predefinable milling depth.” *Id.* at claim 13. Even if claim differentiation does not *require* reading claim 1 in the manner Petitioner proposes, the language of claim 13 at least shows that Patent Owner knew how to require establishing the parallel orientation during milling when it wanted to, and the absence of any attempt to do so in the independent claims strongly counsels against Patent Owner’s narrower reading of the limitation. Notably, Patent Owner does not even address claim 13 or Petitioner’s argument as to claim 13 in its Sur-reply, but in its Response Patent Owner relies on claim 13 as part of its argument as to what the ’972 patent teaches. *See* PO Sur-reply 12–16; PO Resp. 19–20.

Patent Owner makes a number of new claim construction arguments in its Sur-reply without any attempt to justify the failure to include them in the Patent Owner Response. *See* PO Sur-reply 11–15. Under these circumstances, we do not consider the new arguments. *See* Paper 13, 9 (“Patent Owner is cautioned that any arguments not raised in the response

may be deemed waived.”). This approach seems especially appropriate here where Patent Owner does not dispute that (1) it never raised the arguments in its Sur-reply in the Response; and (2) it knew, based on Petitioner’s contentions in the district court litigation, that Petitioner read the limitation more broadly than Patent Owner. Patent Owner may not have been required to employ the same broad construction here that it used when alleging infringement in the district court litigation, but it certainly should have supported its narrow construction in its Patent Owner Response rather than wait to raise its claim construction arguments in its Sur-reply. Such an approach unfairly deprives Petitioner of the opportunity to respond to the new arguments in its briefing and deprives the Board of Petitioner’s input.¹⁵

With this view of the claim scope, we turn to the parties’ arguments and find that Petitioner proves by a preponderance of the evidence that its proposed combination teaches the limitation requiring a controller configured to “automatically . . . establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel” as required by the independent claims. For the reasons discussed above, we find that Petitioner proves that one of ordinary skill in the art would have been motivated to automatically establish the claimed parallel orientation provided by Sehr. We also find that in Petitioner’s proposed combination,

¹⁵ Even if we considered the merits of Patent Owner’s arguments, they fail to give proper weight to the claim language and claim 13. *See* PO Sur-reply 12–15. We also do not view the specification and method claim language as clear-cut as Patent Owner proposes. Merely because portions of the ’972 patent discuss the automatically establishing the parallel orientation adjacent to a discussion of milling does not, by itself, establish that the parallel orientation *must* be established *during* the milling operation. *See id.*

the limitation is satisfied for the reasons provided by Petitioner. *See* Pet. 47–48 (citing Ex. 1006 ¶ 109; Ex. 1037, 2:23–67). Sehr teaches the PTS functionality consistent with the claim language, and once that functionality is incorporated into the proposed combination with OMM and Samuelson’s sensor-integrated cylinders, the limitation would be satisfied. *See id.*

We agree with Petitioner that Patent Owner’s arguments in the Response are based on the improper reliance on the assumption that its narrow construction applied to the limitation, and Patent Owner appears to repeat that approach in the Sur-reply. *See* Pet. Reply 5; PO Sur-reply 1–11. Based on the manner in which Patent Owner briefed the issue, it remains unclear if any of its argument and evidence apply in the event that the limitation covers establishing a parallel orientation during non-milling operations, such as driving a milling machine to and from a work site. Patent Owner’s primary argument—that a POSITA would need to know the milling depth to achieve the claimed parallel orientation—appears to be based on Patent Owner’s incorrect construction, and Patent Owner provides no alternative approach using Petitioner’s construction. *See* PO Resp. 13–21; PO Sur-reply 1–11. We briefly address several of Patent Owner’s arguments, to the extent they still apply to the broader reading of the claim.

As to Patent Owner’s argument that Petitioner provides insufficient explanation of the hardware and software needed to implement its proposed combination, we disagree for largely the same reasons we disagree with the very similar arguments Patent Owner made in the context of the motivation to combine dispute. *See* PO Resp. 24–28. Petitioner provides persuasive argument and evidence that one of ordinary skill in the art would have been able to construct the machine in the proposed combination, including adding

Samuelson’s sensor-integrated cylinders and Sehr’s parallelism teachings. *See* Pet. Reply 20–25. As Petitioner points out, OMM was designed to work with many different types of sensors, and already received voltage signals like the signals Samuelson’s sensors produce. *Id.* at 21. We also agree with Petitioner that Patent Owner misstates the capabilities of the PM-465 controller when it argues that it could not handle additional sensors required for the proposed combination—the controller had enough open pin locations to handle the additional sensors. *See id.* at 22 (citing Ex. 1003, 30–31; Ex. 1072, 138:17–144:19; Ex. 1072, 74:11–79:13). No “hardware” modifications would be necessary to accommodate the additional sensors. We also again agree with Petitioner that it need not supply the actual computer code or an algorithm for the controller given the level of skill in the art and the lack of specifics provided by the ’972 patent when describing its controller. *Id.* at 23–24.

Similarly, we find Patent Owner’s argument that one of ordinary skill in the art would not know how to monitor and move the rear legs in the proposed combination unpersuasive. *See* PO Resp. 28 (citing Ex. 1003, 8–9; Ex. 2007, 36:3–38:3; Ex. 2020 ¶¶ 110–111); PO Sur-reply 10–11. We agree with Petitioner that a POSITA would have known that adding Samuelson’s sensor-integrated cylinders “would allow for the extension/retraction of each leg to be measured.” *Id.* at 24–25 (citing Ex. 1006 ¶¶ 76, 113, 115). In its Sur-reply, Patent Owner argues that its argument is that “the Petition never suggests making such a modification as required to provide a milling machine *operable to both automatically control milling depth* (the principal operation of the PM-465) *and automatically establish PTS.*” PO Sur-reply 10 (emphasis added). This argument shows that Patent Owner’s argument

based on the rear legs is based on Patent Owner's erroneous claim construction position, and we find it unpersuasive for that additional reason.¹⁶

Based on the foregoing, we find that Petitioner proves by a preponderance of the evidence that its combination of OMM, Sehr, and Samuelson teaches or suggests a controller configured to “automatically . . . establish a parallel orientation of the machine frame relative to the ground surface in the direction of travel.”

3. *Claims 1, 2, 25, 30, 31, 33, 34, and 36–40*

Petitioner argues that the combination of OMM, Sehr, and Samuelson teaches or suggests all of the limitations of claims 1, 2, 25, 30, 31, 33, 34, and 36–40. Pet. 34–52, 69–82. Petitioner points to the aspects of the proposed combination that teach or suggest each claim limitation, and cites to its expert testimony for support. *See id.*

Aside from the arguments already addressed above, Patent Owner does not address Petitioner's arguments and evidence as to these claims or argue that the proposed combination does not disclose any of these limitations. *See* PO Resp. 13–46. We find Petitioner's arguments and evidence as to claims 1, 2, 25, 30, 31, 33, 34, and 36–40 persuasive, and

¹⁶ Patent Owner also argues that Petitioner relies on “non-milling maneuvers [that] require manual control of the lifting condition” such that they fail to “automatically” establish PTS. PO Sur-reply 11. This argument, like Patent Owner's claim construction argument, does not appear in the Patent Owner Response in this form and comes too late in the Sur-reply. In addition, the only “manual” maneuver referenced by Patent Owner appears to be the ability to jump over an obstacle. *See id.* Patent Owner's argument does not address other non-milling maneuvers Petitioner relies on, such as driving to and from a worksite.

adopt Petitioner’s argument and evidence as our own.¹⁷ *See* Pet. 34–52, 69–82.

In summary, we find Petitioner proves by a preponderance of the evidence that one of ordinary skill in the art would have been motivated to combine OMM, Sehr, and Samuelson in the manner Petitioner proposes and that the resulting combination teaches or suggests all of the limitations of claims 1, 2, 25, 30, 31, 33, 34, and 36–40. As a result, we determine that Petitioner proves by a preponderance of the evidence that the combination of OMM, Sehr, and Samuelson renders claims 1, 2, 25, 30, 31, 33, 34, and 36–40 obvious.

4. *Dependent Claims 3–10*

Claim 3 depends from claim 1 and further requires “first and second ground engaging sensors displaced relative to each other in the direction of travel,” the sensors “generating first and second distance signals,” and “the controller is configured to detect a longitudinal inclination of the frame in the direction of travel from the first and second distance signals.” *See* Ex. 1001, claim 3. Claims 4–10 depend from claim 3. *See id.* at claims 4–10.

¹⁷ Aside from adopting Petitioner’s arguments and evidence as our own, we do not set forth separate formal findings as to Petitioner’s undisputed assertions. *See In re NuVasive, Inc.*, 841 F.3d 966, 974 (Fed. Cir. 2016) (“Although the Board did not make findings as to whether any of the other claim limitations (such as fusion apertures or anti-migration teeth) are disclosed in the prior art, it did not have to: NuVasive did not present arguments about those limitations to the Board. . . . The Board, having found the only disputed limitations together in one reference, was not required to address undisputed matters.”); Paper 13, 9 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”).

Petitioner argues that the proposed combination includes Samuelson’s sensor-integrated cylinders, which meet the “ground engaging sensor” limitations, with each front leg displaced relative to a corresponding rear leg in the direction of travel. *See* Pet. 52–53 (citing Ex. 1006 ¶¶ 120–121). Petitioner also contends that the sensor signals indicate the distance from the frame to the ground at each location. *See id.* at 53–54 (citing Ex. 1006 ¶ 122). As to the controller, Petitioner argues one motivation for implementing the claimed parallelism is operation comfort, and an operator can store values indicative of a certain longitudinal inclination based on a distance each leg extends. *See id.* at 54–55 (citing Ex. 1006 ¶¶ 124–126). The operator can recall that orientation when desired for operator comfort, with an emphasis on keeping the machine horizontal to improve stability. *See id.* at 55 (citing Ex. 1006 ¶ 125).

Patent Owner focuses on the “controller” aspect of claim 3 and argues that “Petitioner is wrong for the same reasons they are wrong that the proposed combination includes a controller configured to automatically establish PTS.” PO Resp. 47 (incorporating by reference Patent Owner’s previous arguments). Patent Owner repeats its argument that leg sensor signals alone are insufficient, and that the controller needs “information regarding milling depth to detect longitudinal orientation.” *Id.* Patent Owner also argues that “leg sensor signals alone are insufficient to establish PTS even when the machine is not milling.” PO Resp. 47 (citing Ex. 2020 ¶¶ 129, 160–161, 195–199). According to Patent Owner “[b]ecause the proposed combination relies solely on leg-sensor signals, any parallel orientation initiated by equally extending the legs only persists so long as the ground remains level and no obstacles are encountered,” and inclines,

declines, and obstacles will result in a machine that is no longer parallel. *Id.* at 47–48 (citing Ex. 2020 ¶¶ 129, 160–161).

In its Reply, Petitioner argues that Patent Owner’s “argument hinges on the false assumption that the claims require the PTS feature always be active,” but the “claims do not recite this.” Pet. Reply 25 (incorporating previous arguments to that effect). Petitioner also asserts that it would not “make sense since the machine cannot be ‘parallel’ to a nonlinear surface (e.g., a road that transitions to an incline).” *Id.* (citing Ex. 1071, 68:19–71:16).

In its Sur-reply, Patent Owner argues that Petitioner improperly relies on “happenstance” when asserting that the proposed combination meets the controller limitation requirements. *See* PO Sur-reply 16. Patent Owner takes issue with Petitioner’s hypothetical in the Petition involving an operator storing and recalling leg positions at desired inclinations because the “controller measures only leg extensions and does not detect a longitudinal inclination” and the controller does not “automatically establish PTS.” *Id.* Patent Owner also argues that “Petitioner’s own caveats to its hypothetical demonstrate that the controller lacks the required configuration” because “all the operations described result from the operator’s actions,” which “indicates that the controller is configured to detect only leg positions, not longitudinal inclination relative to the ground surface.” *Id.* at 17. Patent Owner also contends that “the operator’s restoration of stored leg positions only returns the frame to the desired longitudinal inclination if the machine has returned to level ground” “because the controller cannot detect the longitudinal orientation of the

frame relative to the ground surface from only the front and rear leg sensors.” *Id.*

We find Petitioner’s arguments and evidence as to the controller limitation more persuasive. Petitioner notes the motivation to establish an orientation parallel to the ground and for the operator to store the orientation corresponding to a comfortable position. *See* Pet. 54–55 (citing Ex. 1006 ¶¶ 124–126). Claim 3 requires a controller “configured to detect a longitudinal inclination of the frame” and that inclination may be any inclination, including the parallel orientation of the frame that Petitioner’s proposed the combination seeks to achieve, which can be stored and retrieved (i.e., detected) as Petitioner points out. *See id.*

Patent Owner raises two arguments in its Response that fail to undermine Petitioner’s argument and evidence. First, Patent Owner relies on its arguments that the controller needs “information regarding milling depth to detect longitudinal orientation” and that “leg sensor signals alone are insufficient to establish PTS even when the machine is not milling.” PO Resp. 47. These arguments are based on Patent Owner’s incorrect claim construction, and we do not find them persuasive for that reason.

Second, Patent Owner argues that “any parallel orientation initiated by equally extending the legs only persists so long as the ground remains level and no obstacles are encountered,” but, as Petitioner notes, this “argument hinges on the false assumption that the claims require the PTS feature always be active,” but the “claims do not recite this.” *Id.* at 47–48; Pet. Reply 25. The fact that the PTS feature in the controller may only be useful, in Petitioner’s proposed combination, when operating on level ground does aid Patent Owner because the claims do not require employing the PTS

feature during other specific conditions, such as inclines, declines, or over objects. In addition, Patent Owner does not offer any argument or evidence in support of a narrower construction that might support its position. *See* PO Resp. 47–48; *see Chef America, Inc. v. Lamb-Weston, Inc.*, 358 F. 3d 1371, 1374 (Fed. Cir. 2004) (“Thus, in accord with our settled practice we construe the claim as written, not as the patentees wish they had written it.”).

Patent Owner raises a number of different and new arguments in its Sur-reply that take issue with the Petition’s use of a hypothetical. PO Sur-reply 16–17. These arguments could have and should have been included in the Response, and Patent Owner therefore forfeited those arguments. The arguments also fail to undermine Petitioner’s assertion that the machine in its proposed combination would operate as required by claim 3, at least when on level ground and when storing readings with a longitudinal inclination corresponding to the parallel position. *See id.*

Patent Owner does not dispute that Petitioner’s proposed combination discloses the remaining limitations of claim 3, or the limitations of claims 4–10. We find Petitioner’s arguments and evidence as to the undisputed limitations of claims 3–10 persuasive, and adopt Petitioner’s argument and evidence as our own. *See* Pet. 52–69. Based on the foregoing, we determine that Petitioner proves by a preponderance of the evidence that the combination of OMM, Sehr, and Samuelson renders claims 3–10 obvious.

5. *Dependent Claim 27*

Claim 27 depends from claim 1 and further requires that “the controller is configured to set a zero level of a measuring signal corresponding to a position of the at least one ground engaging sensor.” Ex. 1001, claim 27. Petitioner argues that “OMM discloses that its

controller is configured to set a zero level of a measuring signal (‘zero cut calibration function’).” Pet. 70–71 (citing Ex. 1002, 34–35). Petitioner further asserts that “this zero level of a measuring signal would correspond to a position of at least one of the PM-465’s legs containing the sensor-integrated cylinders like Samuelson’s” and that it would have been obvious to store the values from the sensors. *Id.* at 71 (citing Ex. 1006 ¶ 179).

Patent Owner argues that the “Petition is wrong that the zero cut level of a grade sensor corresponds to any one measurement provided by a sensor-integrated leg cylinder” because “the zero cut level of a grade sensor corresponds to an infinite number of leg positions.” PO Resp. 49 (citing Ex. 2020 ¶¶ 195–199). Patent Owner relies on photographs that “show at least three different leg extension measurements for each sensor-integrated leg cylinder of a Wirtgen W200i corresponding to a milling depth of zero.” *Id.* at 49–52. According to Patent Owner, “[t]his demonstrates that the extension/retraction of the leg does not ‘correspond’ to a ‘zero cut value’ of the grade sensor as alleged by the Petition.” *Id.* at 52 (citing Ex. 2020 ¶ 199).

In its Reply, Petitioner argues that Patent Owner accuses Petitioner’s “set-to-scratch” calibration feature as meeting this claim limitation, and Petitioner relies on the same well known feature in OMM in the context of claim 1 when explaining how leg sensor data are used and stored during that procedure. *See* Pet. Reply 26 (citing Pet. 24–26, 45–51, 70–71; Ex. 1074, 67; Ex. 1075, 67–68). Petitioner contends that in the context of claim 27, it explained that it would have been obvious to store those values from the leg sensors. *Id.* (citing Pet. 71). Petitioner disagrees with Patent Owner’s arguments because, while it may be possible for multiple values to

correspond to the zero level, nothing in the claim precludes this. *See id.* Patent Owner does not respond to Petitioner's Reply arguments as to claim 27 in its Sur-reply.

We find Petitioner's argument and evidence as to claim 27 persuasive. Claim 27 only requires a controller "configured to set a zero level of a measuring signal corresponding to a position of the at least one ground engaging sensor." Storing the values corresponding to calibration settings when performing the set-to-scratch procedure meets this limitation. Contrary to Patent Owner's assumption, the claim does not require a single value that corresponds to those values, and presumably different leg position values may correspond to the set-to-scratch calibration position depending on the ground location underneath the machine frame.

Based on the foregoing, we determine that Petitioner proves by a preponderance of the evidence that the combination of OMM, Sehr, and Samuelson renders claim 27 obvious.

CONCLUSION

After considering all the evidence and arguments presently before us, we determine Petitioner has demonstrated, by a preponderance of the evidence, that the challenged claims are unpatentable.¹⁸

In summary:

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–10, 25, 27, 30, 31, 33, 34, 36–40	103(a)	OMM, Sehr, Samuelson	1–10, 25, 27, 30, 31, 33, 34, 36–40	

ORDER

Accordingly, it is:

ORDERED that Petitioner has proven by a preponderance of the evidence that claims 1–10, 25, 27, 30, 31, 33, 34, and 36–40 of U.S. Patent No. 8,424,972 B2 are unpatentable;

FURTHER ORDERED that, pursuant to 35 U.S.C. § 318(b), upon expiration of the time for appeal of this decision, or the termination of any

¹⁸ 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).

such appeal, a certificate shall issue canceling claims 1–10, 25, 27, 30, 31, 33, 34, and 36–40 of U.S. Patent No. 8,424,972 B2; and

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

IPR2022-01278
Patent 8,424,972 B2

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