

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CATERPILLAR INC.,
Petitioner,

v.

WIRTGEN AMERICA, INC.,
Patent Owner.

IPR2022-01277
Patent 9,879,391 B2

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

GROSSMAN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Granting-in-Part Patent Owner's and Petitioner's
Motions to Seal
35 U.S.C. § 318(a)

I.INTRODUCTION

A. Background and Summary

Caterpillar Inc. (“Petitioner” or “Caterpillar”) filed a Petition for *inter partes* review of claims 1–20 of U.S. Patent No. 9,879,391 B2 (Ex. 1001, “the ’391 patent”). Paper 2 (“Pet.”).¹ Wirtgen America, Inc. (“Patent Owner” or “Wirtgen”) timely filed a Preliminary Response to the Petition. Paper 8 (“Prelim. Resp.”).

We concluded that Petitioner satisfied the burden, under 35 U.S.C. § 314(a), to show that there was a reasonable likelihood that Petitioner would prevail with respect to at least one of the challenged claims. Accordingly, on behalf of the Director (37 C.F.R. § 42.4(a)), and in accordance with *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1353 (2018), we instituted an *inter partes* review of all the challenged claims, on all the asserted grounds. Paper 9 (“Dec. Inst.”).

Patent Owner submitted a Response to the Decision to Institute. Paper 14 (“Patent Owner Response” or “PO Resp.”). Petitioner submitted a Reply. Paper 18 (“Reply”). Patent Owner submitted a Sur-reply. Paper 20 (“Sur-reply”).²

A joint hearing was held with the related cases (*see* Section I.C of this Decision) on October 30, 2023. *See* Paper 29 (“Transcript” or “Tr.”).

We have jurisdiction under 35 U.S.C. § 6. We enter this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner has the burden of proving unpatentability of a claim by a preponderance of the evidence. 35 U.S.C. § 316(e).

¹ We refer to the public version of the Petition. Petitioner filed a confidential version of the Petition under seal as Paper 1.

² We refer to the public version of the Sur-reply. Patent Owner filed a confidential version of the Sur-reply under seal as Paper 22.

Based on the findings and conclusions below, we determine that Petitioner has established by a preponderance of the evidence that claims 1–20 are unpatentable.

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. 81. Wirtgen identifies itself and Wirtgen GmbH as real parties-in-interest. Paper 6, 2.

C. Related Matters

Petitioner and Patent Owner each identify the following district court proceeding as a related matter: *Wirtgen Am., Inc. v. Caterpillar, Inc.*, Case No. 17-770-RGA (D. Del.). Pet. 81; Paper 6, 2.

Petitioner and Patent Owner also each identify the following pending *inter partes* review proceeding as a related matter: IPR2022-01264 (the “’264 IPR”) challenging claims in Patent 9,879,390 (the ’390 patent”). The ’391 patent in the proceeding before us is a continuation of the ’390 patent challenged in the ’264 IPR. *See* Ex. 1001, code (60) (stating that the application that matured into the ’391 patent is a “Continuation of application No. 15/376,023,” which matured into the ’391 patent). *See* Ex. 3001 code (21)

The ’264 IPR and the proceeding before us are further related in that both proceedings involve the same parties, the same declarants offering testimonial evidence, and rely on the same two references as an asserted basis of unpatentability. *Compare* Section I.F of this Decision and Section I.F in the Final Decision issued in the ’264 IPR).

Additionally, we note that pending IPR2022-01278 and IPR2022-01310 also are related to the proceeding before us and to IPR2022-01264, as summarized in

the chart below. Citations to the common references identified in the chart are provided in the substantive analysis of patentability in this Decision.

	IPR2022-01264	IPR2022-01277	IPR2022-01278	IPR2022-01310
Challenged Patent–Title	9,879,390 “Road Milling Machine and Method for Measuring the Milling Depth,”	9,879,391 “Road Milling Machine and Method for Measuring the Milling Depth”	8,424,972 “Road Milling Machine and Method for Positioning the Machine Frame Parallel to the Ground”	8,424,972 “Road Milling Machine and Method for Positioning the Machine Frame Parallel to the Ground”
Challenged Claims–Grounds	1–6, 8–17, 19–22–OMM and Samuelson 7, 8–OMM, Samuelson, Zarniko	1–20– OMM and Samuelson	1–10, 25, 27, 30–31, 33, 34, 36–40–OMM, Sehr, Samuelson	1, 15, 16, 22, 23, 26–OMM, Sehr, Samuelson 1, 12–OMM, Sehr, Matsuda
Petitioner	Caterpillar Inc.	Caterpillar Inc.	Caterpillar Inc.	Caterpillar Inc.
Patent Owner	Wirtgen America, Inc.	Wirtgen America, Inc.	Wirtgen America, Inc.	Wirtgen America, Inc.

D. The ’391 Patent

We make the following findings of fact concerning the ’391 patent.

The ’391 patent discloses “a self-propelled road milling machine, especially a cold milling machine, as well as [] methods for measuring the milling depth.” Ex. 1001, 1:21–23. The ’391 patent explains that “a problem with known road milling machines [is] that the milling depth can not be controlled accurately enough” so that measuring “an adjustment of side plates, for example, with respect

to the machine frame is not sufficiently accurate.” *Id.* at 1:47–58. The ’391 patent purports to address this problem, in one embodiment, by using side plates having a plurality of sensors “spaced apart in the travelling direction.” *Id.* at 3:34–36.

Figure 1 of the ’391 patent is reproduced below.

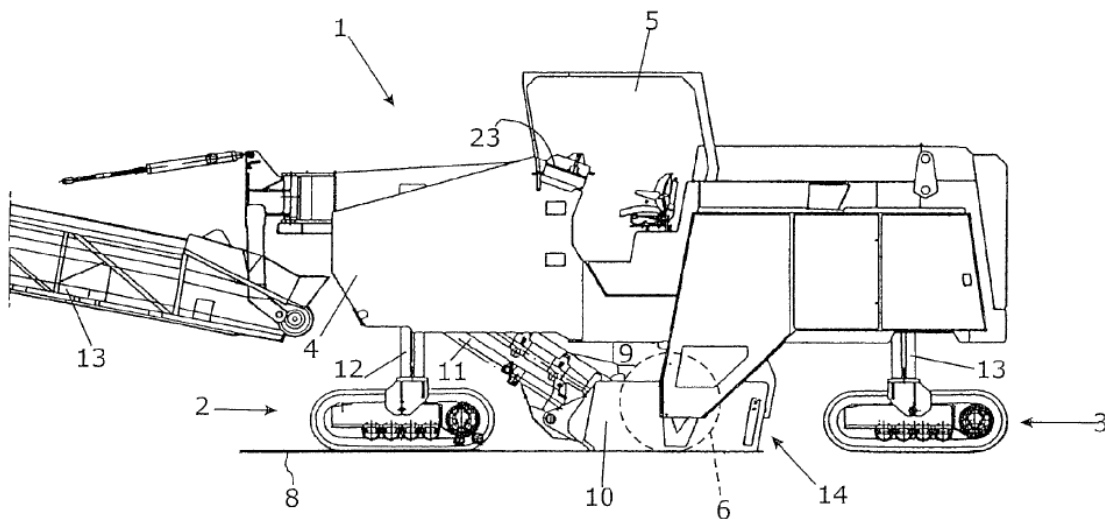


Fig.1

Figure 1 “shows a cold milling machine.” Ex. 1001, 3:57. The milling machine includes a machine frame 4 supported by a track assembly having two front chain tracks 2 and at least one rear chain track 3. Chain tracks 2, 3 are connected with machine frame 4 through lifting columns respective 12, 13. *Id.* at 4:9–13. Using lifting columns 12, 13, machine frame 4 can be moved to a predetermined inclined position with respect to the ground or traffic surface 8. *Id.* at 4:15–18. Machine frame 4 supports milling roll 6. *Id.* at 4:18. 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 4:25–28.

Side plates 10 are arranged on either side near the front end of milling roll 6. *Id.* at 4:36–37. Stripping means 14 are provided with measuring means 16 that

allow determination of the current milling depth at the level of the stripping means 14 or the calculation of the milling depth at the level of the rotational axis of the milling roll. Ex. 1001, 4:37–41.

The '391 patent explains that measuring means 16, preferably formed by “position sensing means” measure the displacements of “sensor means” positioned on side plates 10, beam 20, or stripping plate 15 with respect to machine frame 4 or relative to each other. *Id.* at 4:49–53.

Figure 7a of the '391 patent, reproduced below, illustrates an embodiment of position sensing means of the side plates.

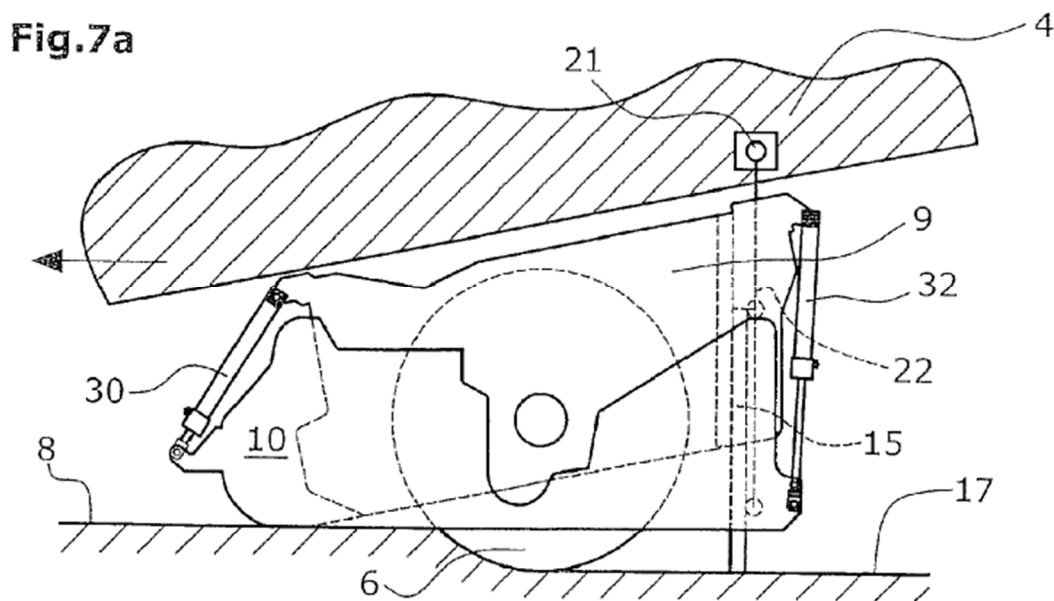


Figure 7a is a “schematic illustration of the measurement error occurring at the stripping plate of the stripping means in the absence of parallelism between the machine frame and the ground or traffic surface.” Ex. 1001, 4:1–4. Figure 7a evidences the extent to which side plates 10 are pivotable with respect to machine frame 4. *Id.* at 6:18–20. Piston/cylinder units 30, 32 are provided with position

sensing systems, and their measuring signals may be used to determine the distance of side plates 10 from machine frame 4. *Id.* at 6:20–24. The ’391 patent explains:

Should two measuring means be used, one in front of the side plates 10 and one behind the same, seen in the travelling direction, it is also possible to determine the longitudinal inclination of the machine frame 4 with respect to the ground or traffic surface 8 or to also determine the transverse inclination of the machine frame 4 by a comparison of the measured values for both side plates 10 on both sides of the milling roll 6.

Id. at 5:43–50.

E. Illustrative Claim

Among the challenged claims, claims 1, 8, and 16 are independent claims. Independent claim 1 is directed to a “self-propelled road milling machine.” Ex. 1001, 6:53–7:7. Independent claim 8 is directed to a “method of controlling a milling machine.” *Id.* at 7:38–51. Independent claim 16 is directed to a “method of measuring a milling depth of a milling machine.” *Id.* at 8:15–38.

Independent claim 1 is illustrative and is reproduced below.

1. A self-propelled road milling machine, comprising:
 - a machine frame;
 - at least two front ground engaging supports, and at least one rear ground engaging support;
 - front and rear lifting columns supporting the frame from the ground engaging supports, each of the front and rear lifting columns comprising a position sensor configured to detect a lifted condition for a respective lifting column;
 - a milling roller supported from the frame for treatment of a ground surface;
 - 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; and
 - first and second height adjustable side plates arranged on opposite sides of the milling roller, at least one of the side plates comprising a plurality of position sensors spaced apart in a traveling direction of

the milling machine, wherein each side plate position sensor generates position signals representing changes in position for a respective side plate.

Id. at 6:53–7:7.

To further illustrate the close relationship between the '391 patent in the proceeding before us and the '390 patent in related IPR2022-01264³, the following chart compares claim 1 from each patent, with differences shown in a red font.

Pat. No. 9,879,391 IPR2022-01277	Pat. No. 9,879,390 IPR2022-01264
1. A self-propelled road milling machine, comprising: a machine frame; at least two front ground engaging supports, and at least one rear ground engaging support; front and rear lifting columns supporting the frame from the ground engaging supports, each of the front and rear lifting columns comprising a position sensor configured to detect a lifted condition for a respective lifting column; a milling roller supported from the frame for treatment of a ground surface; a height adjustable stripping plate arranged behind the milling roller and operable to be lowered, during	1. A self-propelled road milling machine, comprising: a machine frame; at least two front ground engaging supports, and at least one rear ground engaging support; front and rear lifting columns supporting the frame from the ground engaging supports; a milling roller supported from the frame for treatment of a ground surface; a height adjustable stripping plate arranged behind the milling roller and operable to be lowered, during

³ The '390 patent is Ex. 3001 in this proceeding. A Final Decision was entered determining claims 1–22 of the '390 patent unpatentable. IPR2022-01264, Paper 31 (PTAB Jan. 22, 2024).

operation, into a milling track generated by the milling roller; and first and second height adjustable side plates arranged on opposite sides of the milling roller, at least one of the side plates comprising a plurality of position sensors spaced apart in a traveling direction of the milling machine, wherein each side plate position sensor generates position signals representing changes in position for a respective side plate.	operation, into a milling track generated by the milling roller; first and second height adjustable side plates arranged on opposite sides of the milling roller; and a plurality of position sensors, each of the first and second side plates including at least two of the position sensors spaced apart in a traveling direction of the milling machine, wherein each position sensor generates position signals representing changes in position for a respective side plate.
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As shown in the claim comparison above, claim 1 of the '391 patent recites that “a plurality of position sensors” are on “at least one of the side plates,” whereas the '390 patent recites that “at least two position sensors” are on “each of the first and second side plates.”

Claim 1 of the '391 patent also includes the additional claim limitation that “each of the front and rear lifting columns” comprise “a position sensor configured to detect a lifted condition for a respective lifting column,” which is not in claim 1 of the '390 patent. Claim 8 of the '390 patent, dependent from claim 1, however, includes a substantially similar limitation. *See* Ex. 3001, 7:32–35 (“The self-propelled road milling machine of claim 1, wherein each of the lifting columns includes an integrated position sensor configured to directly detect a lifted condition of its associated lifting column”).

F. Prior Art and Asserted Ground

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

Claims Challenged	35 U.S.C. § ⁴	Basis
1–20	103(a)	OMM ⁵ and Samuelson ⁶

Petitioner relies on the declaration testimony of William Singhose, Ph.D. *See* Ex. 1006. Patent Owner relies on the declaration testimony from Christopher Rahn, Ph.D., in response. *See* Ex. 2003.

II.ANALYSIS

A. Legal Standards

Section 103 forbids issuance of a patent when “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when available,

⁴ 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 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.

⁵ Caterpillar’s PM-465 Cold Planer, Operation & Maintenance Manual (Ex. 1002 hereinafter “OMM” for consistency with the Petition).

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

evidence such as commercial success, long felt but unsolved needs, and failure of others.⁷ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *see KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.”). The Court in *Graham* explained that these factual inquiries promote “uniformity and definiteness,” for “[w]hat is obvious is not a question upon which there is likely to be uniformity of thought in every given factual context.” 383 U.S. at 18.

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 417. To support this conclusion, however, it is not enough to show merely that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.*

In determining whether there would have been a motivation to combine prior art references to arrive at the claimed invention, it is insufficient to simply conclude the combination would have been obvious without identifying any reason *why* a person of skill in the art would have made the combination. *Metalcraft of Mayville, Inc. v. Toro Co.*, 848 F.3d 1358, 1366 (Fed. Cir. 2017).

⁷ The parties do not direct us to any objective evidence of non-obviousness.

Moreover, in determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 164 (Fed. Cir. 1985) (“It is elementary that the claimed invention must be considered as a whole in deciding the question of obviousness.”); *see also Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537 (Fed. Cir. 1983) (“[T]he question under 35 U.S.C. § 103 is not whether the differences *themselves* would have been obvious. Consideration of differences, like each of the findings set forth in *Graham*, is but an aid in reaching the ultimate determination of whether the claimed invention as a whole would have been obvious.”).

As a factfinder, we also must be aware “of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421.

Applying these general principles, we consider the evidence and arguments of the parties.

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.*

“The *Graham* analysis includes a factual determination of the level of ordinary skill in the art. Without that information, a . . . court cannot properly assess obviousness because the critical question is whether a claimed invention would have been obvious at the time it was made to one with ordinary skill in the

art.” *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986); *see also Ruiz v. A.B. Chance*, 234 F.3d 654, 666 (Fed. Cir. 2000) (“The determination of the level of skill in the art is an integral part of the *Graham* analysis.”).

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 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. *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (citing *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007) (quoting *Env’t Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696 (Fed. Cir. 1983)). These factors are not exhaustive but merely are a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo*, 501 F.3d at 1256. 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. “The patent’s purpose also can be informative.” *Best Med. Int’l*, 46 F.4th at 1353 (citing *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1362–63 (Fed. Cir. 2006)).

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. 5 (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.* Petitioner does not state the basis for these conclusions.

Dr. Singhose repeats Petitioner’s conclusions without any additional facts, data, or analysis to support his “opinion.” *See* 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”).

“Patent Owner does not dispute the Petition’s definition.” PO Resp. 25.

For purposes of this Decision, based on the prior art, the sophistication of the technology disclosed in the ’391 patent, and giving little weight to Dr. Singhose’s opinion, we adopt Petitioner’s definition of the level of ordinary skill.

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 asserts that “all challenged claims [are] unpatentable under their plain and ordinary meaning,” and that “no terms need construction here.” Pet. 5.

“Patent Owner does not believe that any claim terms need construction to resolve the prior art grounds raised in the Petition.” PO Resp. 25.

We do not perceive the need to construe any claim limitation. Claims must be construed “only to the extent necessary to resolve the controversy.”

AstraZeneca AB v. Mylan Pharms. Inc., 19 F.4th 1325, 1345 (Fed. Cir. 2021) (quoting *Vivid Techs., Inc. v. American Science & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor*

Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“Because we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy,’ we need not construe the claim preambles here where the construction is not ‘material to the [obviousness] dispute.’” (citations omitted)).

We now turn to the merits of Petitioner’s asserted Ground of unpatentability.

D. Patentability of Claims 1–20

Based on OMM and Samuelson

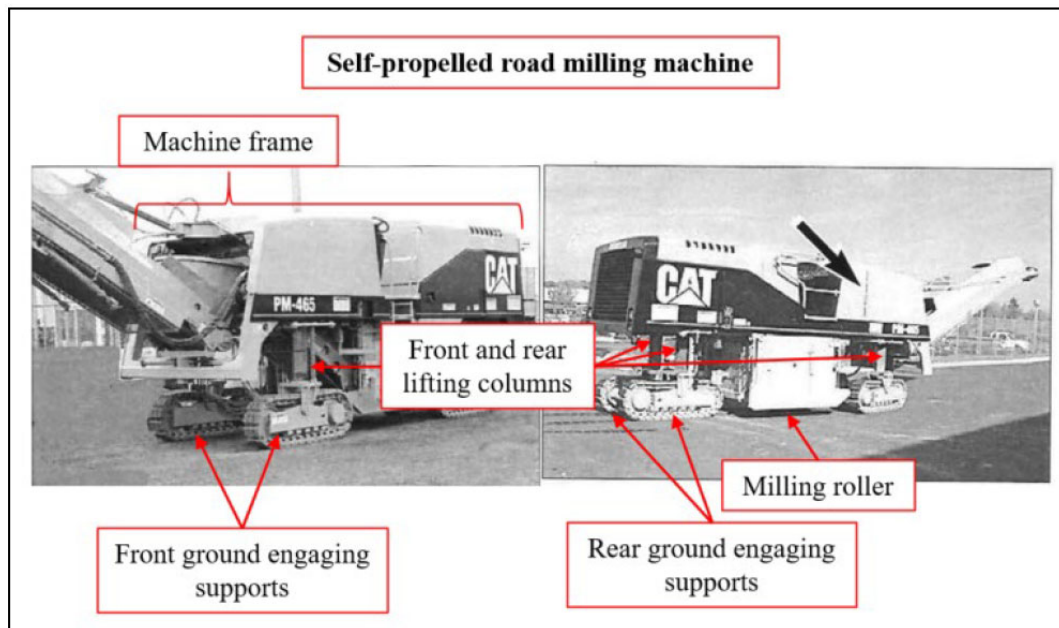
1. OMM (Ex. 1002)

We make the following findings of fact concerning the OMM reference.

OMM is an operation and maintenance manual for a Caterpillar PM-465 cold planer that is used for cold milling pavement. Ex. 1002, 1, 4⁸.

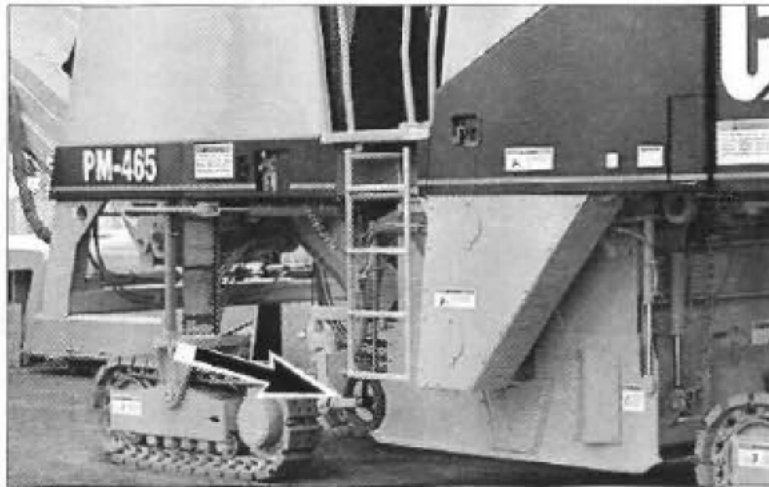
We reproduce below Petitioner’s annotated versions of images depicted on pages 4 and 42 of OMM.

⁸ Ex. 1002 has original page numbers on the top left or top right corners of each substantive page. Petitioner, in accord with our rules (37 C.F.R. § 42.63(d)(2)(i)), also uniquely numbered each page in sequence, placed on the bottom left corner of each page, in the format of “Page 1 of 162.” *See* Ex. 1002, 1. As a result, each page has two different numbers. For example, original page number 2 (upper left corner of the page) corresponds to “Page 4 of 162” (lower left corner of the page) based on pagination required by our rules. *Petitioner*, however, cites to the original pagination, rather than the unique pagination required by our rules. *See* Pet. 6 (citing to “OMM, 2 and 40” for figures that appear at Ex. 1002, 4 and 42). The purpose of requiring unique pagination is for the parties to cite to these unique page numbers. We note *Patent Owner* cited to the unique page numbers added by Petitioner. *See* PO Resp. 2, n.1 (“The Parties have agreed to use the stamped pagination they have applied to the exhibits for the remainder of the IPR.”). Accordingly, we also will cite to the unique page numbers of all exhibits.

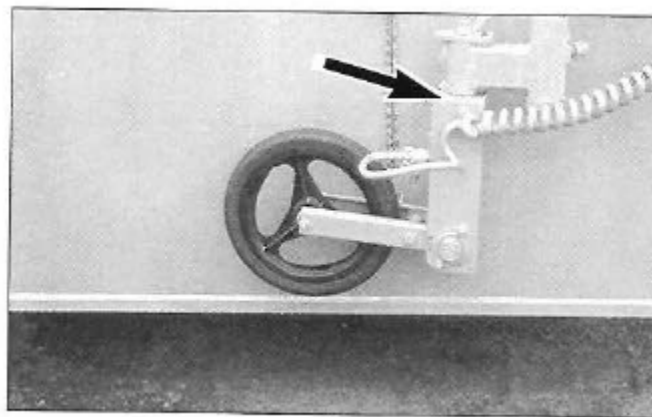


The images on pages 4 and 42 of OMM are annotated by Petitioner to denote various uncontested components of the milling machine. Pet. 6. In particular, Petitioner adds the title, “Self-propelled road milling machine” placed inside a red rectangle. *Id.* Petitioner also denotes the “machine frame,” “milling 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 milling 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, 34. According to OMM, the contacting sensor can include a grade slope wheel as depicted in the image on Page 51 of OMM, reproduced below.



The image on page 51 of OMM, on the left-hand side of the page, includes a black arrow denoting a grade slope wheel on the side plate of the milling machine. Ex. 1002, 51. An enlarged version of the grade slope wheel is shown on page 64 of OMM, reproduced below.



The image on page 64 of OMM shows the grade slope wheel disclosed in OMM mounted on a side plate of the milling machine.

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 50.

2. *Samuelson (Ex. 1004)*

We make the following findings of fact concerning the Samuelson reference.

Samuelson relates to “a hydraulic cylinder monitoring apparatus for a welded construction-type hydraulic cylinder.” Ex. 1004, 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.

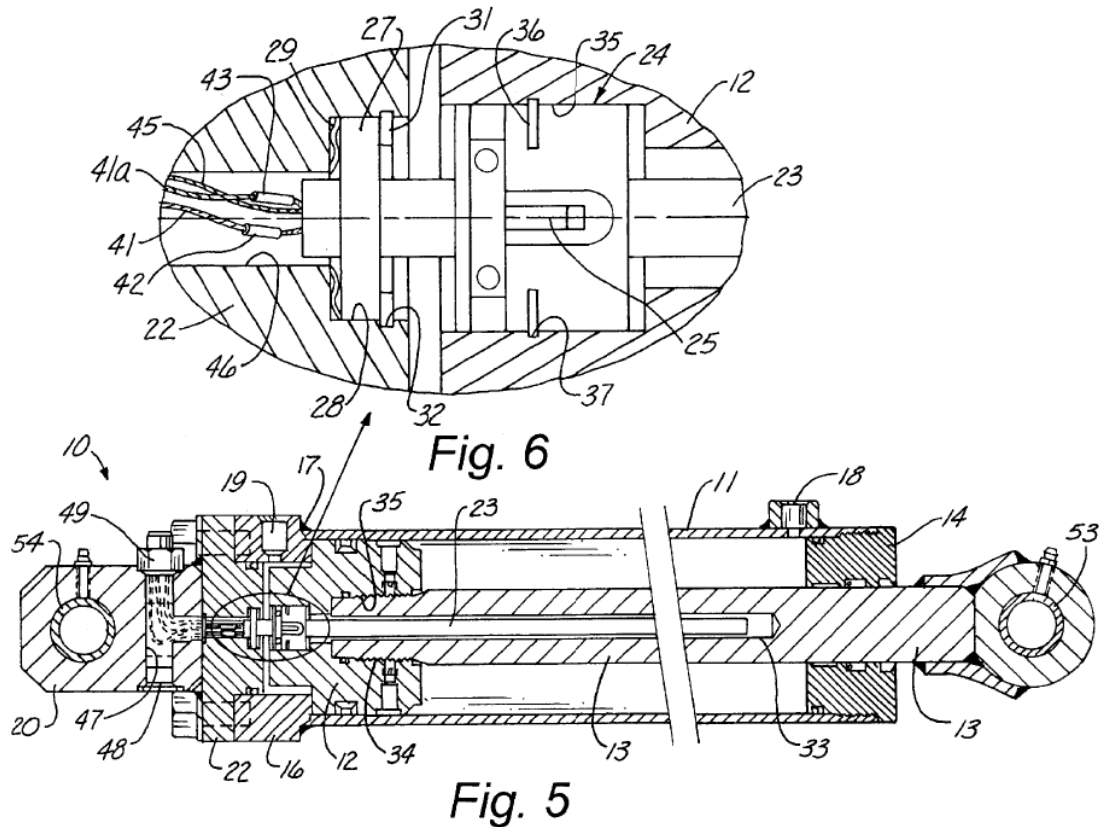


Figure 5 is a cross sectional view of a hydraulic cylinder having a monitoring apparatus disposed therein, and Figure 6 is an enlarged view of the circled portion shown in Figure 5. Ex. 1004, 2:53–57. Samuelson discloses that in operation, hydraulic cylinder 10 is connected at ends 53 and 54 to two objects 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. Ex. 1004, 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. Samuelson discloses the benefits of “smart cylinders:”

As programmable Logic Controller (PLC) usage became more cost effective, original equipment manufacturer’s (OEMs) producing mobile equipment have employed them to improve operator interface requirements (user friendly) as well as automate functions repeatedly used by the equipment. Many functions involved the use of cylinders as linear actuators. The position and movement of these actuators had to be monitored and communicated back to the PLC if closed-loop feedback control was to be utilized. Cylinders were capable of providing this feedback via the output of linear transducers. Placing the transducers inside cylinders inside of tie-rod or threaded construction hydraulic cylinders have provided the most direct method of incorporating them as well as protecting them from damage and environmental degradation.

Id. at 1:35–49.

3. *Claim 1*

a. *Petitioner’s Contentions*

Petitioner provides a clause-by-clause analysis of independent claim 1, identifying where in each of the cited references, OMM or Samuelson, the claimed element is disclosed, and why it would have been obvious to a person of ordinary skill to combine the various disclosed elements with a reasonable expectation of success. *See* Petition 33–51. Throughout its analysis, Petitioner cites the

Declaration testimony (Ex. 1006) of Dr. Singhose for evidentiary support.⁹

Petitioner also provides annotated images from the references to further show the Petitioner’s analysis of the scope and content of the references. *E.g., see* Pet. 34–36.

Petitioner labels each clause for ease of reference. Pet. 33–51. For independent claim 1, the clauses are listed as “[1pre]” through “[1h].” *Id.* For ease of reference and consistency, we will refer to Petitioner’s labeling convention.

At the hearing, counsel for Petitioner stated “the main issues in both proceedings [referring to the combined hearing for IPR2022-01264 and IPR2022-01277] relate to motivations to combine . . . OMM and Samuelson.” Tr. 6:25–7:2.

b. Patent Owner’s Contentions

Patent Owner agrees that motivation to replace OMM’s disclosed hydraulic cylinders with Samuelson’s “sensor-integrated cylinders” is the key dispute between the parties. PO Resp. 1. Patent Owner states:

The Petition fails to carry Petitioner’s burden to show that a [person of ordinary skill] would have been motivated to combine the references to arrive at the claimed invention and would have had a reasonable expectation of success in doing so. The Petition takes a shotgun approach to its motivation-to-combine arguments. In arguing that a POSITA would have replaced PM-465’s side-plate cylinders, moldboard cylinders, and leg cylinders with Samuelson’s (U.S. Patent No. 6,450,048 to Samuelson; EX1004) sensor-integrated cylinders. Petitioner asserts numerous alleged motivations—robustness, increased accuracy, eliminating human error, ripeness, cost-effectiveness, increased stability, and increased efficiency. However, a close reading of the prior-art references and admissions by

⁹ Petitioner cites this testimony as “Singhose.” Pet. ix. We will cite it, as we do all other evidence, by reference to its Exhibit number, which is Exhibit 1006.

Petitioner's declarants during deposition show that none of those motivations are supported by factual evidence.

PO Resp. 1; *see also id.*, Section headings I.A–D and V.A–D (all discussing a lack of a motivation to replace OMM's hydraulic cylinders with Samuelson's sensor-integrated cylinders).

Patent Owner recognizes that OMM discloses “typical features of milling machines, including a frame, tracks for moving the machine, lifting columns to raise the machine, side plates and a moldboard to contain debris from the milling process, and a milling roller to mill the pavement.” PO Resp. 16 (citing Ex. 1002, 4, 7, 16, 32, 40, 42).

Patent Owner also concedes that “[l]ike other typical milling machines, OMM identifies sensors for measuring the grade and slope of the pavement.” *Id.* OMM defines the grade as a measurement of “the difference of the heights between the front and rear legs” and the slope as a measurement of “the difference of the heights between right-front and left-front legs.” Ex. 1002, 50. Patent Owner acknowledges that OMM discloses a milling machine with “two grade sensors (one on each side of the machine) and a slope sensor.” PO Resp. 16 (citing Ex. 1002, 34). Additionally, Patent Owner admits that “[t]he grade sensor may be ‘a contacting or a non contacting sensor.’” *Id.* at 17 (citing Ex. 1002, 34). According to Patent Owner, however, “OMM discloses conventional ultrasonic sensors that utilize sound waves to determine the distance from the sensor to the ground, thereby communicating a distance of the machine frame to the ground.” PO Resp. 17. We note, as discussed further below, that the challenged claims refer only to a “position sensor” (e.g., *see* Ex. 1001, 6:59) or “position sensors” (e.g., *see* Ex. 1001, 7:3). We have not been directed to any persuasive evidence that the

claimed “position sensors” exclude “ultrasonic sensors” or any other type of sensor that can determine a position.

Patent Owner asserts OMM does *not* disclose using “a side plate as part of the sensor mechanism.” PO Resp. 17.

Patent Owner also concedes that OMM discloses “conventional side plates” that may be “lifted and lowered using hydraulic cylinders.” *Id.* at 20. Patent Owner also acknowledges that hydraulic cylinders may also be used to lift and lower the moldboard in OMM. *Id.* (citing Ex. 1002, 62). Additionally, Patent Owner acknowledges that “[b]oth the side plates and moldboard could ‘float,’ i.e., hang from the frame and move vertically relative to the frame as the side plate glides along the undulations of the ground surface. *Id.* (citing Ex. 1002, 41–42, 62).

Patent Owner asserts that the OMM “hydraulic cylinders” do not “include an integrated sensor.” *Id.* (citing Ex. 1002 42). We agree. Petitioner, however, relies on Samuelson for the disclosure of cylinders that include a position sensor.

Patent Owner further concedes that “Samuelson identifies a discrete benefit to sensor-integrated cylinders — “protecting [exposed sensors] from damage and environmental degradation” by placing that sensor into a protected housing.” PO Resp. 23 (citing Ex.1004, 1:40–49).

Against this general background, we specifically consider the challenged claims, beginning with claim 1.

c. Analysis of Independent claim 1

i. Preamble

A self-propelled road milling machine

Petitioner asserts that “OMM discloses this.” Pet. 33 (citing Ex. 1002, 4, 29; Ex. 1006 ¶ 104). With this clause and several other clauses of claim 1, Patent

Owner has admitted that OMM discloses the basic elements of typical road milling machines. PO Resp. 16 (OMM discloses “typical features of milling machines, including a frame, tracks for moving the machine, lifting columns to raise the machine, side plates and a moldboard to contain debris from the milling process, and a milling roller to mill the pavement.” (citing Ex. 1002, 4, 7, 16, 32, 40, 42)).

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM discloses the subject matter of the preamble.

*ii.Limitation [1a]
a machine frame*

Petitioner asserts that OMM discloses a machine frame. Pet. 34–35 (citing Ex. 1002, 2, 8; Ex. 1006 ¶ 105).

Patent Owner does not address this clause.

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM discloses “a machine frame,” as recited in claim 1.

*iii.Limitation [1b]
at least two front ground engaging supports, and at least one rear ground
engaging support*

Petitioner asserts that OMM discloses “two front tracks and two rear tracks (i.e., ‘ground engaging supports’) that support the PM-465.” Pet. 35 (citing Ex. 1002, 4, 31, 42; Ex. 1006 ¶ 106).

Patent Owner does not address this clause.

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM discloses “at least two front ground engaging supports, and at least one rear ground engaging support,” as recited in claim 1.

*iv.Limitation [1c]
front and rear lifting columns supporting
the frame from the ground engaging supports*

Petitioner asserts that OMM discloses “four legs (i.e., ‘lifting columns’)—two that support the PM-465’s frame from the front tracks and two that support the frame from the rear tracks.” Pet. 35–36 (citing Ex. 1002, 4, 32–33, 42; Ex. 1006 ¶ 107).

Patent Owner does not address this clause.

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM discloses “front and rear lifting columns supporting the frame from the ground engaging supports,” as recited in claim 1.

*v.Limitation [1d]
each of the front and rear lifting columns comprising a position sensor
configured to detect a lifted condition for a respective lifting column*

Petitioner asserts that OMM discloses lifting columns as discussed for limitation [1c], and that an ordinary artisan “would have been motivated to use sensor-integrated cylinders like Samuelson’s inside” of OMM’s columns “to measure the extension and retraction of the hydraulic cylinders in each leg, which would have allowed the machine to measure the extension and retraction of the legs themselves (i.e., ‘detect a lifted condition for a respective lifting column’).” Pet. 37 (citing Ex. 1002, 34; Ex. 1006 ¶ 108). Petitioner also provides a reason why it would have been obvious to modify and combine the references with a reasonable expectation of success, as proposed by Petitioner. *Id.* at 37–40.

Petitioner contends that a person having ordinary skill in the art “would have been motivated to use sensor-integrated cylinders like Samuelson’s inside all four of the PM-465’s legs instead of the existing leg cylinders.” Pet. 37. Petitioner

explains that “[t]his modification would have allowed the PM-465 to measure the extension and retraction of the hydraulic cylinders in each leg, which would have allowed the machine to measure the extension and retraction of the legs themselves . . . since the legs are fixed to and driven by the internal cylinders.” Pet. 37. (citing Ex. 1006 ¶ 108).

Petitioner adds that a person having ordinary skill in the art would have had a reasonable expectation of success, as OMM includes sensors that determine whether the rear legs are in service height position, so OMM can process these signals. *Id.* 38; *see also id.* at 28–33 (providing reasons for modifying OMM with Samuelson’s teachings of smart cylinders to include the smart cylinders in each of the four legs).

Petitioner asserts that the existing sensors can be compromised by debris and need routine cleaning. Pet. 57 (referencing Ex. 1002, 112 (“There are sensors at the right-rear corner of the engine compartment. These sensors are used to sense the elevation of the rear legs. The face of these sensors may require cleaning for proper operation. Use a mild soap and water with a soft cloth to remove any debris that prevents proper operation.”)). Petitioner contends that Samuelson provides a configuration where the sensor is contained within a hydraulic cylinder, with “very little chance of damage.” *Id.* (referencing Ex. 1004, 4:48–57, 1:45–49).

Petitioner contends that the proposed “modification would have been simple—the PM-465 already had hydraulic cylinders that raise and lower the legs, and it would have been obvious for a [person having ordinary skill in the art] to replace them with sensor-integrated cylinders like Samuelson’s. Doing so would have made the PM-465’s service height feature more accurate and robust.” Pet. 38 (referencing Ex. 1006 ¶ 110).

Petitioner adds that such a configuration was known in the art, referencing the Roadtec RX-500 machine, which implemented sensor-integrated cylinders in all four legs in 2003. Pet. 38–39.

Patent Owner disputes generally the motivation to combine the references (*e.g.*, PO Resp. 7–8), as further discussed below, but does not further address the limitations in this clause.

We note here that claim 1 merely requires a position sensor in the claimed lifting columns that can detect “a lifted condition,” such as a sensor within the hydraulic cylinders to measure the extension or retraction of the cylinder. This is exactly the function of the sensor-integrated cylinders disclosed in Samuelson. As disclosed in Samuelson:

the position of the piston can be monitored with respect to the supplemental cap by using the transducer to sense the position of the follower member. An object of the present invention is to provide a welded construction type hydraulic cylinder with an apparatus for monitoring the position of the piston and/or piston rod of the hydraulic cylinder.

Ex. 1004, 2:24–31. Thus, Samuelson’s “smart” cylinders detect movement and position of the piston rod within the cylinder, that is they detect a “lifted condition” when they replace the cylinders used on the PM-465 machine, as proposed by Petitioner.

Patent Owner makes a somewhat related argument that “[t]he Petition provides no explanation for how a [person of ordinary skill] would have modified the PM-465 controller to utilize the leg sensor signals in combination with any other sensors to achieve a desired longitudinal orientation of the machine.” PO Resp. 64. Whether a person of ordinary skill would have known how to modify the controller to accommodate four additional sensor input signals is a different issue, which we address in detail below.

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM combined with Samuelson, as proposed by Petitioner discloses “each of the front and rear lifting columns comprising a position sensor configured to detect a lifted condition for a respective lifting column,” as recited in claim 1.

*vi.Limitation [1e]
a milling roller supported from the frame
for treatment of a ground surface*

Petitioner asserts that OMM discloses “a rotor drum (i.e., ‘milling roller’) that is supported from the frame and that is used to treat a ground surface.” Pet. 40–41 (citing Ex. 1002, 14, 34, 53, 115, 121, 136; Ex. 1006 ¶ 117).

Patent Owner does not address this clause.

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM discloses “a milling roller supported from the frame for treatment of a ground surface,” as recited in claim 1.

*vii.Limitation [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*

Petitioner asserts that OMM discloses “a moldboard (i.e., ‘height-adjustable stripping plate’), which is the bottom portion of the rotor door.” Pet. 41–45 (citing Ex. 1002, 16, 40, 122; Ex. 1006 ¶¶ 118–120).

Patent Owner does not address this clause.

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM discloses “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,” as recited in claim 1.

*viii.Limitation [1g]
first and second height adjustable side plates
arranged on opposite sides of the milling roller*

Petitioner asserts that OMM’s “side plates are height-adjustable relative to the frame via two hydraulic, height-adjustment cylinders on each side plate.” Pet. 46 (citing Ex. 1002, 49; Ex. 1006 ¶ 122).

Patent Owner does not address this clause.

Based on the arguments and evidence, we determine that Petitioner has proved, by a preponderance of the evidence, that OMM discloses “first and second height adjustable side plates arranged on opposite sides of the milling roller,” as recited in claim 1.

*ix.Limitation [1h]
at least one of the side plates comprising a plurality of position sensors
spaced apart in a traveling direction of the milling machine,
wherein each side plate position sensor generates position signals
representing changes in position for a respective side plate*

Petitioner asserts that the combination of OMM and Samuelson discloses this limitation. Pet. 47 (citing Ex. 1006 ¶¶ 124–130).

In general, Petitioner asserts OMM and Samuelson “are analogous art to the ’391 patent because they are from the same field of endeavor and are reasonably pertinent to the problem the ’391 patent was trying to solve.” Pet. 16. The ’391 patent relates to “a road milling machine.” Ex. 1001, Abstract. The PM-465 machine described in OMM is a road-milling machine. Ex. 1002, 2. Samuelson discloses a sensor-integrated cylinder for use “in mobile equipment,” including construction equipment. Ex. 1004, 1:35–63, 2:28–31; Ex. 1006 ¶ 63.

Additionally, the designs in the ’391 patent, OMM, and Samuelson address a similar problem—measuring the precise location of various components on construction equipment. OMM describes a sensor-driven control system intended

to increase the accuracy of milling cuts. *E.g., see*, Ex. 1002, 50 (“Sensors at either side of the machine can be positioned in various ways for a variety of conditions to control both the grade and slope^[10] of the cut surface.”). The sensors “detect and follow a string line, curb, etc., and the electronic control system makes adjustments to the heights of the legs to control the grade and slope of the cut surface.” *Id.*

The sensor-integrated cylinders in Samuelson accurately measure the linear position of the piston as it extends/retracts inside the cylinder, and this information is sent to the controller for processing. Ex. 1004, 4:17-47. According to Petitioner, a person of ordinary skill “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.” Pet. 17 (citing Ex. 1006 ¶¶ 64–65).

In particular, Petitioner asserts that OMM discloses various grade sensors including a “grade slope wheel,’ positioned near the side plate.” *Id.* at 48 (citing Ex. 1002, 4, 51, 64). According to Petitioner’s declarant, Dr. Singhose, “it was well known to use side plates and components attached on and around them as ground sensors.” *Id.* at 49 (citing Ex. 1006 ¶ 126).

Dr. Singhose testifies:

Samuelson provides a solution to sensor problems by disclosing its *robust* sensor-integrated cylinder, which could be easily incorporated onto the PM-465 machine’s side plates in a way that monitored ground position. [See Section VIII.A.2.] As mentioned above, it was well known in the art to use side plates and components attached on and around them as ground sensors. [See Section VIII.A.3. *OMM*, 32, 48–49; *Barton*, 9:48-61. *Swisher*, 38:27–41:20.] The state-of-the-art even suggested using *the side plate itself* to actuate sensors

¹⁰ “Grade is determined by . . . the difference of the heights between the front and rear legs.” Ex. 1002, 50. “Slope is determined by . . . the difference of the heights between the right-front and left-front legs.” *Id.*

used in a grade-and-slope control system. [*SOTA*, 15 (explaining that a grade-position sensor can be “actuated by” the “side plate of the machine”).]¹¹

Ex. 1006 ¶ 126 (brackets and italic font in original).

Thus, based on the testimonial evidence of Dr. Singhose and the OMM and Samuelson references, Petitioner concludes that it would have been obvious “to replace the PM-465’s existing side plate cylinders with sensor-integrated cylinders like Samuelson’s.” Pet. 23 (citing Ex. 1002, 40, 49, 59; Ex. 1006 ¶ 78). The reason for this proposed modification asserted by Petitioner is that “instead of the grade slope wheel,” “the sensor-integrated cylinder design is a *robust* design where the sensors are protected inside the hydraulic cylinders, and *OMM*’s grade slope wheel is susceptible to damage and wear.” *Id.* (citing Ex. 1006 79–80). According to Petitioner, “side plates make excellent ground sensors on road-milling machines.” *Id.* at 19 (citing Ex. 1006 ¶ 69).

Another benefit of the proposed modification, according to Petitioner, is that it “would allow the resultant design to accomplish grade-averaging, as known in the art, which would minimize the variation caused by readings taken by a single sensor.” *Id.* at 25 (citing Ex. 1006 ¶ 82).

Additionally, Petitioner also asserts that a person of ordinary skill “would have understood that retrofitting a sensor-integrated cylinder in the PM-465 would require nothing more than simple reprogramming to enable the ECM to read

¹¹ The SOTA acronym refers to Caterpillar’s System Operation Testing and Adjusting manual for the PM-465 Cold Planer (Ex. 1003 “SOTA”). “Barton” (Ex. 1023, U.S. Patent No. 4,186,968 (“Barton”)) and “Swisher” (Ex. 1024, U.S. Patent No. 4,270,801 (“Swisher”)) are background prior art references. The “Section” citations refer to sections of Dr. Singhose’s Declaration.

incoming signals from the sensor-integrated cylinder.” Pet. 18 (citing Ex. 1006 ¶¶ 66–67).

Patent Owner asserts that “[t]he factual evidence contradicts the testimony of Petitioner’s expert, Dr. William Singhose, that the PM-465’s grade wheel suffered from a robustness problem.” PO Resp. 3. We disagree. The prior art supports Dr. Singhose’s testimony. Ex. 1005, 1:23–45 (disclosing that height sensing wheels with mechanical sensors for sensing road surfacing “can easily be damaged under the rough conditions which normally exist in road repair work”).

Patent Owner’s expert, Dr. Rahn, also disputes Dr. Singhose’s opinion on improved data by grade averaging. PO Resp. 4.

Also, Patent Owner asserts that the Petition “fails to explain the hardware and software modifications required for the PM-465 controller to achieve the claimed functionality.” *Id.* at 9 (section heading I.D (bold font and capitalization deleted)).

The knowledge and creativity of a person of ordinary skill are critical components of the obviousness analysis. As explained in *KSR*, “familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *KSR*, 550 U.S. at 420; *see also ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1219 (Fed. Cir. 2016) (“The rationale of *KSR* does not support ClassCo’s theory that a person of ordinary skill can only perform combinations of a puzzle element A with a perfectly fitting puzzle element B.”).

Here, Petitioner is proposing to replace OMM’s “dumb” hydraulic cylinder’s that raise and lower the side plates with smart “sensor-integrated cylinder’s like Samuelson’s.” Pet. 23, 49 (citing Ex. 1002, 42, 51, 61).

Petitioner asserts:

A POSITA would have been motivated to use *Samuelson's* sensor-integrated cylinders (instead the of the grade slope wheel) near the PM-465's side plates to sense the ground and determine if the machine is milling at the intended depth. Singhose [Ex. 1006], ¶ 69. A POSITA would have known that side plates make excellent ground sensors on road-milling machines. The side plates are one of the few components on a milling machine that can move vertically relative to the milling drum—most other relevant components (e.g., the machine frame) are fixed relative to the drum and thus move up and down only when the drum moves up and down, which occurs when the legs are raised/lowered. *Id.*

Pet. 19.

Petitioner also asserts that “during milling operations, side plates routinely ride on top of the ground in ‘float mode,’ meaning that the hydraulic cylinders apply no down pressure on the side plates, and they are free to move up or down relative to the rotor drum as they traverse the ground surface.” *Id.* (citing Ex. 1006 ¶ 70; Ex. 1002, 39–40). According to Petitioner, “[t]he location and ability of side plates to undulate with the ground profile make them ideal candidates to use as ground sensors in grade-and-slope systems for road-milling machines, and a POSITA would have known that.” Pet. 19–20 (citing Ex. 1006 ¶ 70).

Petitioner also relies, in part, on the state-of-the-art disclosure in SOTA (Ex. 1003) stating that a grade “sensor can be actuated by one of the following devices: wheel, ski, and side plate of the machine.” *Id.* at 49 (citing Ex. 1003, 16). Thus, positioning sensors on the side plates of a road milling machine was a known option available to a person of ordinary skill.

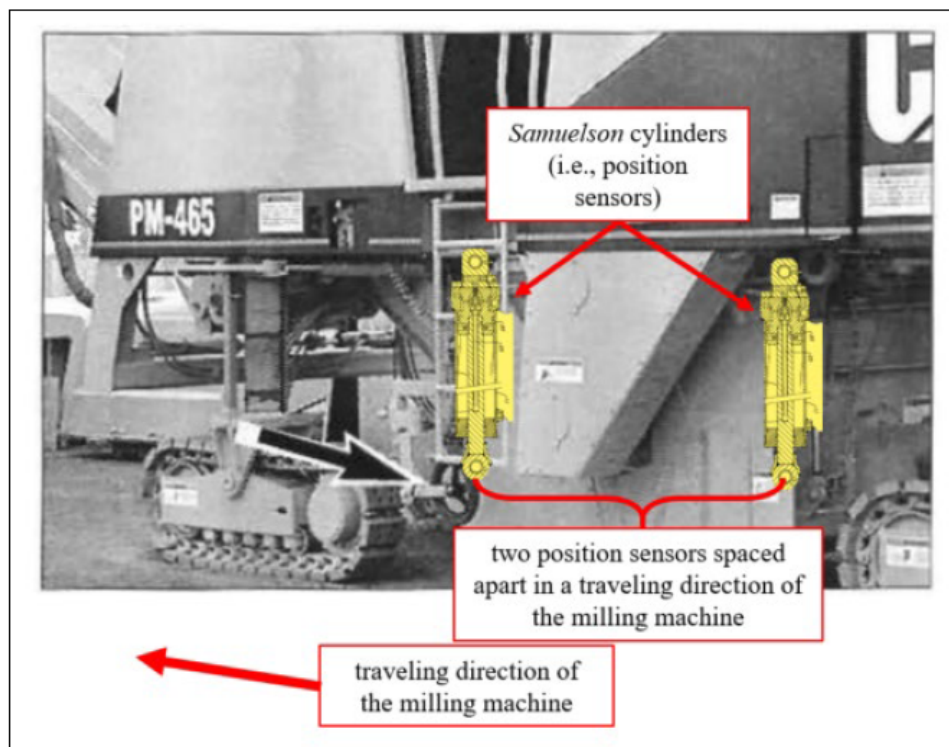
SOTA discloses:

The *method for measuring* grade that contacts a reference surface uses a grade *position sensor*. The *sensor* can be *actuated* by one of the following devices: wheel, ski, and *side plate of the machine*.

Ex. 1003, 16 (emphases added). As we discussed above, these two sentences disclose that the side plate can serve as a “position sensor.”

Claim 1 requires that “at least one of the side plates comprising a plurality of position sensors . . . wherein each side plate position sensor generates position signals representing changes in position for a respective side plate.” Based on the evidence before us, SOTA discloses that the position sensor is “actuated by” movement of the side plate and generates position signals representing changes in position of the side plate.

Dr. Singhose testifies that a “POSITA would have been motivated to replace the [OMM] hydraulic cylinders with robust sensor-integrated cylinders like those taught by Samuelson.” Ex. 1006 ¶ 128. Dr. Singhose illustrates the proposed combination of OMM and Samuelson as follows:



Dr. Singhose’s annotated illustration from Ex. 1002, 51 showing how Samuelson’s cylinders with position sensors would be retrofitted to the OMM machine.

Ex. 1006 ¶¶ 128–130.

Dr. Singhose explains his annotated illustration by explaining that “the in-cylinder position sensors would continuously measure the side plates’ changes in vertical position as the side plates float along the ground.” Ex. 1006 ¶ 130. He also states this modification “would allow for more accurate sensing through grade averaging, because there are two sensor locations on each side plate instead of one.” *Id.* He also explains that “[t]he grade-and-slope controllers already on the PM-465 would then process the side-plate position signals and ensure that the rotor drum is milling at the predetermined depth set by the operator.” *Id.*

Petitioner relies on at least the disclosures of OMM, Samuelson, and SOTA, as discussed above, in combination with Dr. Singhose’s testimony as to what would have been obvious to a person of ordinary skill.

Petitioner contends that one motivating factor expressly disclosed in Samuelson is that “because of improvements in controller technology, over time it became cost effective and easier to use sensor-integrated cylinders in mobile construction equipment.” Pet. 18–19 (citing Ex. 1004, 1:35–45, Ex. 1006 ¶¶ 68); *see also id.* at 24 (“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).” (citing Ex. 1006 ¶ 81).

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 smart cylinders to use OMM’s side plates to monitor ground slope and to employ at least two smart cylinders attached to each side plate.

We agree with Petitioner that a person having ordinary skill in the art would have had reason to use the side plates as grade slope sensors. First, as explained

above, SOTA suggests using the side plates for grade monitoring. Pet. 21; Ex. 1003, 15

Second, we agree with Petitioner that a person having ordinary skill in the art would have looked to replace OMM's grade slope wheel with the side plates "because it provides for a *robust* ground sensing device that *directly contacts the ground*." Pet. 51. We find, on the complete trial record, that one motivating factor is that "OMM's grade slope wheel is susceptible to damage and wear." *Id.* at 22 (referencing Ex. 1006 ("Zarniko") ¶¶ 79–80). Zarniko discloses that a prior art "height control device has a mechanical sensor for sensing the level height of the bearing frame with respect to the unmachined road surfacing. This mechanical sensor in prior art height control devices constitutes, for example, a sensing wheel with height adjustment." Ex. 1005, 1:24–29. That is, a grade slope wheel such as that disclosed in OMM. Zarniko continues that "[a] . . . problem of . . . [this] height control device is that the mechanical sensor for sensing the road surfacing can easily be damaged under the rough conditions which normally exist in road repair work." *Id.* at 1:41–45. This evidence directly supports Petitioner's reasoning in relying on Samuelson for the use of sensor-integrated cylinders. As asserted by Petitioner, "Samuelson solves these problems identified in Zarniko." Pet. 23.

Also, we agree with Petitioner that employing the side panels as the mechanical grade slope sensors would provide for grade averaging, such that the machine would not perform overreactive height adjustments because of minor undulations in the ground surface experienced by the grade slope wheel. *See* Pet. 25 (referencing Ex. 1006 ¶¶ 82–83); *see, e.g.*, Ex. 2005, 52:21–56:7 (Dr. Singhose's deposition testimony that a grade slope wheel will "jump up" when

hitting a rock and cause an overactive height adjustment, which would be experienced by a side plate “to a much lesser degree”).

We also agree with Petitioner that a person having ordinary skill in the art would have modified OMM’s side plate hydraulic cylinders with the smart (sensor-inclusive) hydraulic cylinders as taught by Samuelson. *E.g.*, Pet. 23 (“Samuelson solves these problems”). As Petitioner argues, Samuelson teaches that, given that controller technology has gotten more cost effective, it became easier to employ smart cylinders on mobile construction equipment. *Id.* at 24 (citing Ex. 1004, 1:19–49); *see also* Pet. Reply 9 (“Samuelson states that its sensors were protected ‘from damage and environmental degradation,’ easy to service and maintain, and meant to retrofit/upgrade’ old hydraulic cylinders on mobile equipment.” (internal citations omitted) (referencing Ex. 1004, 1:45–49, 1:58–63, 4:48–52, 4:58–5:1; Ex. 1072, 60:6–63:13)).

We credit Dr. Singhose’s testimony¹² concerning robustness, as it is consistent with the evidence of record. *See, e.g.*, Ex. 1006 ¶ 80 (“A [person having ordinary skill in the art] would have recognized that measuring the ground position using integrated sensors, like those disclosed in Samuelson, provides a significant advantage over the OMM’s grade slope wheel because the grade slope wheel is susceptible to damage and wear.”); *see also* Ex. 1005, 1:24–45 (Zarniko disclosing

¹² Patent Owner characterizes Dr. Singhose’s testimony as “parroting the Petition” and cites to our precedential decision in *Xerox Corp. v. Bytemark, Inc.* PO Resp. 29. To the extent Patent Owner is suggesting that Dr. Singhose’s testimony should be given little or no weight based on *Xerox*, we do not agree. Unlike the case in *Xerox*, Dr. Singhose provides an explanation based on evidence to support his opinions. *See Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential) (“Dr. Jones does not cite to any additional supporting evidence or provide any technical reasoning to support his statement.”); *cf.*, *e.g.*, Ex. 1006 ¶ 77 (discussing Zarniko).

that mechanical sensors such as those like OMM's grade slope wheel "for sensing the road surfacing can easily be damaged under the rough conditions which normally exist in road repair work."); Ex. 1020 ¶ 35 (Mr. Netka's Declaration testimony that "The *contact* grade sensors . . . were exposed to the environment during milling and could be damaged by debris created by . . . obstacles encountered in the surrounding environment during milling machine operations.").

Petitioner contends that each side plate of the PM-425 machine, as unmodified, has two existing cylinders. Petitioner reasons that, in view of the modification to use the side panels as mechanical grade slope sensors, Samuelson suggests modifying both cylinders. Pet. 26; *see also* Ex. 2005, 33:22–34:8 (Dr. Singhose's Deposition testimony that "The other part of this combination is that you're going to put two of these Samuelson smart cylinders in the side plates, for example. So now I'm getting two sensor measurements instead of one. Everyone knows that two sensor measurements increases the accuracy. You can take those two and you could average them, for example. So if one starts to drift or become out of calibration, the one that -- the other one is helping you compensate."). We credit this testimony for at least the reason that it makes logical sense, since the averaging of multiple sensor readings reduces the effect of a single, inaccurate, sensor as compared to the effect if only that single, inaccurate, sensor is used.

Also, we agree with Petitioner that OMM's side plates are configured to include two sensor-integrated hydraulic cylinders, as the unmodified side plates each have two cylinders. *See* Pet. 23 ("Moreover, the PM-465 was already primed to receive Samuelson's design—OMM shows that each side plate on the PM-465

has two existing side-plate cylinders that raise and lower the side plate.” (citing Ex. 1002, “40, 49, 59”)¹³).

We also agree with Petitioner that modifying OMM’s control system, including providing any control logic and software would have been within the level of ordinary skill. *See* Ex. 1006 ¶ 67 (“Indeed, the state of the art recognizes that ‘[t]hose skilled in the art can readily write software for implementing’ controllers that use sensor signals to automatically raise and lower road-milling machines. [Gfroerer (Ex. 1050) Abstract, 4:14–23.]” (first alteration in original)). We credit this testimony, in part, because it is consistent with the level of ordinary skill on which the parties agreed – “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*.” *See supra*, Section II.B (emphasis added).

Dr. Singhose’s Declaration testimony cited and discussed above (Ex. 1006 ¶ 67) also is consistent with Dr. Rahn’s deposition testimony, which states that a person having ordinary skill in the art could do the calculations for determining rotor depth. Ex. 1072, 133:12–17, 134:10–18. With these algorithms in hand, a person having ordinary skill in the art could write the requisite software. *Cf.* Ex. 1050 (Gfroerer) 4:14–24 (indicating that those skilled in the art could write the requisite software for controlling a cold planar given the algorithms).

We have considered Patent Owner’s arguments and supporting evidence and determine, on the complete trial record, that the preponderance of the evidence support’s Petitioner’s reasoning with respect to combining OMM and Samuelson. With respect to Patent Owner’s arguments directed to the robustness of OMM’s

¹³ These cites are to the original page numbers of the exhibit, not the unique page numbers (bottom left of each page) added by Petitioner as required by our rules.

unmodified sensors, we do not agree with Patent Owner that Zarniko's filing date, which Patent Owner asserts "predates OMM by a decade" weighs against its express statements concerning a grade slope wheel mechanical sensor and its tendency to be damaged. *See* PO Resp. 30–31. Patent Owner asserts that Zarniko:

refers to mechanical sensors generally, identifying only a generic "sensing wheel with height adjustment" as an example. EX1005, 1:27-29; EX2003, ¶39. This says nothing about the PM-465 grade wheel, whose components were protected by a housing. EX2003, ¶39. Accordingly, Zarniko fails to inform a POSITA's understanding as to the robustness of the PM-465 grade wheel as disclosed in OMM.

PO Resp. 31. We understand Zarniko to suggest that the general technology used on the OMM, a sensing wheel, was well-known and a decade old. A person having ordinary skill in the art is presumed to be aware of the prior art and would understand that Zarniko is criticizing the type of grade slope wheel disclosed in OMM.

With respect to Mr. Netka's testimony that he has no personal knowledge of any actual damage occurring to grade slope wheels, Mr. Netka deposition testimony is that "there's multiple modes of failure for those sensors," and recognizes that that road conditions could damage the sensor. *See* PO Resp. 31 (reproducing Mr. Netka's testimony). Similarly, as Patent Owner recognizes, Dr. Singhose testifies that "as an engineer I can guarantee, because forces are applied to it, that it moves some amount." *See id.* at 32 (reproducing Dr. Singhose's testimony). The lack of any actual damage in the record is not sufficient to overcome the evidence that a person having ordinary skill in the art would have recognized that a wheel moving along the roadway and connected to the milling machine by a thin rod could be damaged, motivating moving the entire sensing

apparatus to a hydraulic cylinder. *See* Ex. 1002, 64 (providing an image of the grade slope wheel).¹⁴

The PM-465 is a complex machine for milling pavement. OMM includes a substantial number of safety warnings to ensure safe operation. It also points out that replacement parts will be “required.” *E.g.*, Ex. 1002, 5. This is not surprising for a machine milling pavement. One of the safety warnings, cited by Patent Owner (PO Resp. 32–33), is reproduced below.

Operating Techniques

General Operating Information

Cutting Asphalt

WARNING

During operation the side plates can become jammed and not operate freely. This can occur due to sticky material or deformed side plates. Disengage the rotor before attempting to free jammed side plates. Working around the moving rotor with tools to clean or free the side plates can result in accidental contact with the rotor and cause serious injury or death. Deformed side plates should be replaced.

Ex. 1002, 53. As stated in this warning, “[d]uring operation the side plates can become jammed and not operate freely. This can occur due to sticky material or deformed side plates. . . . Deformed side plates should be replaced” *Id.* According to Patent Owner, “[t]his disclosure further suggests the side plates may

¹⁴ We cite to the exhibit page “64 of 162.”

not be a reliable sensing mechanism, and therefore would not be ideal candidates to use as ground sensors in grade-and-slope systems for road-milling machines. PO Resp. 32–33. We disagree.

The side plate provides functions other than a sensor and the fact that in its role of containing material it may be damaged, necessitating replacement, or require some maintenance does not outweigh Petitioner’s reasoning, including SOTA’s express teaching, to use the side plates as grade slope sensors. As discussed above, SOTA discloses:

The *method for measuring* grade that contacts a reference surface uses a grade *position sensor*. The *sensor* can be *actuated by* one of the following devices: wheel, ski, and *side plate of the machine*.

Ex. 1003, 16 (emphases added).

As such, Petitioner’s proposed modification to use the side plates, in conjunction with smart cylinders, as grade slope sensors is nothing more than using known elements to yield predictable results. *KSR Int’l Co.*, 550 U.S. at 416 (“The Court recognized that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, [for the combination to be patentable or valid] the combination must do more than yield a predictable result.”).

Also, the fact that Samuelson teaches that that the *transducer* is protected inside the cylinder is inapposite. See PO Resp. 33–34. Once Samuelson’s teaching is applied to OMM as Petitioner proposes, the sensor configuration becomes OMM’s hydraulic cylinders containing transducers, with Samuelson’s “smart” cylinders (Ex. 1004, 1:58–61) attached to a floating side panel. Samuelson provides a motivation for including the transducers inside the cylinders, and the cylinders controlling the side plates. Other motivations, including the express disclosures in SOTA and Zarniko and the advantages of mechanical grade-slope

averaging and sensor averaging, underpins Petitioner's reasons for its overall modification.

Patent Owner asserts that Dr. Singhose's Declaration and deposition testimony about Swisher '420 and grade slope averaging mischaracterized Swisher '420 and the concept of "grade slope averaging." PO Resp. 34–38. This mischaracterization does not outweigh his other testimony. As we discuss above, we agree with Dr. Singhose that the ground contact length of a side panel would provide mechanical averaging and using two sensors, one in each hydraulic cylinder attached to a side plate, which would allow for averaging of the two sensor measurements on each side plate.

Also, the fact that other types of grade sensors, such as ski-type sensors, were available in addition to using the side plates as sensors, for OMM to use to measure grade slope, does not demonstrate a deficiency in Petitioner's position. As we state above, the side plates clearly are identified in SOTA as a possible mechanical grade slope sensor of the machine disclosed in OMM.

As for Patent Owner's argument that averaging the values from the two sensors would not account for the centerline of the milling drum (PO Resp. 39–42), we find that accounting for the centerline would represent "simple geometry" within the level of ordinary skill. We credit Dr. Singhose's testimony, which was confirmed by testimony from Dr. Rahn, Patent Owner's declarant, during his deposition. *See* Ex. 1006 ¶ 84 ("A [person having ordinary skill in the art] would have recognized that . . . the PM-465's control system would accurately know the position of the milling rotor's centerline relative to the two sensor-integrated cylinders on the side plates (through simple geometry), which means a grade-averaged value factoring in the centerline of the machine could be used."); Ex. 1072 133:12–17 ("So based on the assumptions you've given me, that they

already have sensor-integrated cylinders, somehow they've figured out that's a good idea to have them, you have all the geometry and everything of the side plates, then they could do that [rotor depth] calculation.”), 134:10–18 (“So in terms of doing the kinematic analysis, you can do it with an offset, you can do it where it's centered. . . . I'm not sure which is going to be easier or harder in the end, but - - . . . One of ordinary skill could -- could do that analysis.”).

We also find that Patent Owner's criticism of Petitioner's use of sensor averaging does not demonstrate a deficiency in Petitioner's reasoning. Patent Owner argues that “the proposed control scheme [of using the average of two measurements] at best incorporates the error of a second sensor rather than providing any way to compensate for errors from one sensor.” PO Resp. 42–43. This argument ignores the fact that a system that employs the average of a sensor value that is accurate and a second sensor value that is inaccurate, such an average result would be closer to the true grade than if you have a single sensor value that is inaccurate. In this way, the sensor averaging control scheme is more accurate than a single sensor.

We do not credit Dr. Rahn's testimony concerning error, as it focuses on measurement error, that is, the error associated with any measurement taken when the sensor is operating properly. *See* Ex. 2003 ¶ 66. Instead, Petitioner and Dr. Singhose are accounting for the situation where one of the sensors is not operating properly, such that the error in that measurement exceeds the “ Δ ” considered by Dr. Rahn. *See* Ex. 2005, 32:13–35:6; Ex. 2003 ¶ 66.

We also find that Patent Owner's argument that there is no evidence of actual human error in positioning OMM's grade slope wheel does not demonstrate a deficiency in Petitioner's position. We understand Petitioner's position to be that an operator must position the OMM grade slope wheel and that, under Petitioner's

proposed modification, this manual operation would not be necessary. And, as such, a *potential* avenue for human error is eliminated. *See* Pet. 25 (“Further, using sensor-integrated cylinders as described eliminates the *potential* error caused by humans positioning grade sensors on the machine before milling” (emphasis added)); Ex. 1006 ¶ 84.

We also find that Patent Owner’s criticism of Petitioner’s contentions concerning cost effectiveness does not demonstrate a deficiency in Petitioner’s position, as Patent Owner misunderstands Petitioner’s position. PO Resp. 51–53. Petitioner relies on Samuelson’s teaching that control systems have become more cost effective, allowing such controllers to be added to construction machines. *See* Pet. 15–16, 24; Ex. 1004, 1:35–45. These cost-effective controllers provide a motivating factor in employing Samuelson’s smart cylinders, as the cylinders can be used with the controller technology to provide measurements during use of the machine. *See* Pet. 23.

In summary, we determine, on the complete trial record, that Petitioner has provided sufficient reasoning, supported by a preponderance of the evidence, that a person having ordinary skill in the art would have been motivated to modify OMM’s hydraulic cylinders with Samuelson’s smart cylinders, and use OMM’s side plates as grade slope sensors.

We also find, based on the analysis above, that Petitioner has proven, by a preponderance of the evidence, that a person having ordinary skill in the art would have had a reasonable expectation of success.

If there's a known technique to address a known problem using “prior art elements according to their established functions,” then there is a motivation to combine. *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023) (citation omitted). Moreover, “[i]t's not necessary to show that a

combination is the *best* option, only that it be a *suitable* option.” *Id.* (emphasis in original; citations omitted).

KSR does not require that a combination only unite old elements without changing their respective functions. *KSR*, 550 U.S. at 416. Instead, *KSR* teaches that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *Id.* at 421. And it explains that the ordinary artisan recognizes “that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *Id.* at 420. *KSR* does not support a theory that a person of ordinary skill can only perform combinations of a puzzle element A with a perfectly fitting puzzle element B. *ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1219 (Fed. Cir. 2016).

d. Conclusion as to Independent Claim 1

Having reviewed the complete trial record, we conclude that Petitioner has proved, by a preponderance of the evidence, that claim 1 is unpatentable under 35 U.S.C. § 103(a) based on OMM and Samuelson.

4. Claims 2–7

Claims 2–7 depend, directly or indirectly from independent claim 1.

Petitioner provides a limitation-by-limitation analysis of claims 2–7 asserting where OMM and Samuelson disclose the recited limitations and why it would have been obvious to combine these references with a reasonable expectation of success. Pet. 52–60. Throughout its analysis, Petitioner cites the Declaration testimony of Dr. Singhose for evidentiary support. *Id.*

Patent Owner does not address the patentability of claims 2–7.

Based on Petitioner’s arguments and evidence, and our analysis of the same evidence and substantially similar issues in the context of claim 1, we conclude

that Petitioner has proved, by a preponderance of the evidence, that claims 2–7 are unpatentable under 35 U.S.C. § 103(a) based on OMM and Samuelson.

5. *Independent Claims 8 and 16*

Independent claim 8 is directed to a “method of controlling a milling machine.” Ex. 1001, 7:38–51. Independent claim 16 is directed to a “method of measuring a milling depth of a milling machine.” *Id.* at 8:15–38. In substance, these method claims are substantially similar to independent claim 1.

Petitioner provides a limitation-by-limitation analysis of independent claim 8 asserting where OMM and Samuelson disclose the recited limitations and why it would have been obvious to combine these references with a reasonable expectation of success. Pet. 61–64. Petitioner provides a similar analysis for independent claim 16. *Id.* at 72–75. Throughout its analyses, Petitioner cites the Declaration testimony of Dr. Singhose for evidentiary support. *Id.* These analyses make substantial reference to Petitioner’s arguments and evidence asserted against claim 1.

For independent claim 8, Patent Owner argues only that “[t]he proposed combination does not teach claim element 8[f].” PO Resp. 69–70.

Patent Owner offers no argument or evidence concerning the patentability of claim 16.

Claim element 8[f], again following Petitioner’s claim labelling convention, states:

[8f]: receiving position sensing signals from first and second position sensors spaced apart in a traveling direction on *one or more of the side plates*; and

Pet. 62 (section heading, bold font and capitalization deleted, emphasis added); *see also* Ex. 1001, 7:46–48 (showing the clause labelled [8f] by Petitioner in the context of the entirety of claim 8). This clause requires sensors on only one of the

side plates. As a practical matter, sensors would be on both side plates. Ex. 1002, 50 (“Sensors at either side of the machine can be positioned in various ways for a variety of conditions to control both the grade and slope of the cut surface.”).

Petitioner asserts that “OMM in view of Samuelson discloses this” clause [8f]. Pet. 62. Petitioner further asserts:

As shown in the element [1h] analysis, under OMM/Samuelson combination, the two sensor-integrated cylinders (“position sensors”) on each of the two side plates on the modified PM-465 would be oriented so that one is toward the front of the side plate and one is toward the back of the side plate (“spaced apart in a traveling direction”). *See* [section discussing clause [1h]]. Further, these cylinders would provide the side-plate position signals (“position sensing signals”) to the modified PM-465’s grade and slope control system on the side plate’s vertical position relative to the machine frame.

Id.

Petitioner also asserts “the grade-and-slope controller on the modified PM-465 would receive the position sensing signals generated by the first and second position sensors spaced apart in a traveling direction on one or more of the side plates. *Id.* at 62–63 (citing its claim 1 analysis and Ex. 1006 ¶ 150).

As further explained by Dr. Singhose, “one sensor is placed toward the front of the side plate and the other is placed toward the back of the side plate (‘spaced apart in a traveling direction’).” Ex. 1006 ¶ 150. Additionally, Dr. Singhose testifies that these cylinders would provide the side-plate position signals (“position sensing signals”), relative to the machine frame, to the modified PM-465’s grade and slope control system.” Ex. 1006 ¶ 150. Dr. Singhose also states that this arrangement results in “the grade-and-slope controller on the modified PM-465 would receive the position sensing signals generated by the first and second position sensors spaced apart in a traveling direction on one or more of the

side plates.” *Id.* Based on this analysis, Dr. Singhose, and Petitioner, conclude that the OMM/Samuelson combination discloses the limitations of element [8f]. *Id.*; Pet. 63.

The entirety of Patent Owner’s argument is reproduced below.

Claim element 8[f] requires that the machine “receiving position sensing signals from first and second position sensors spaced apart in a traveling direction on one or more of the side plates.” As discussed above, *supra* V.A.4.b.ii, the proposed combination is not capable of receiving the four inputs from the sensor integrated cylinders on the side plates. To the extent Petitioner argues that only one side plate could be used: (1) this is not the proposed combination alleged (Petition, 62–63), (2) Petitioner has provided no argument for selecting a grade sensor for one side while eliminating the grade sensor on the other, and (3) would render the milling machine inoperable for its intended purpose.

PO Resp.69–70.

Patent Owner cites no persuasive evidence to support its argument that the proposed combination “is not capable of receiving the four inputs from the sensor integrated cylinders on the side plates.” We are persuaded that a degreed engineer in a relevant technology, with two years of experience designing, developing, servicing or operating heavy machinery, including their components *and control systems*, that is, a person of ordinary skill, would understand how to add four or more inputs to a milling machine’s control system.

Based on Petitioner’s arguments and evidence, and based on our analysis of substantially similar issues in the context of claim 1, we conclude that Petitioner has proved, by a preponderance of the evidence, that independent claim 8 is unpatentable under 35 U.S.C. § 103(a) based on OMM and Samuelson.

Patent Owner does not address independent claim 16. Based on Petitioner’s arguments and evidence, and our analysis of the same evidence and substantially

similar issues in the context of claim 1, we conclude that Petitioner has proved, by a preponderance of the evidence, that claim 16 is unpatentable under 35 U.S.C. § 103(a) based on OMM and Samuelson.

6. *Dependent claims 9–15, 17–20*

Patent Owner does not address dependent claims 9–15 and 17–20.

Based on Petitioner’s arguments and evidence, and our analysis of the same evidence and substantially similar issues in the context of claim 1, we conclude that Petitioner has proved, by a preponderance of the evidence, that claims 9–15 and 17–20 are unpatentable under 35 U.S.C. § 103(a) based on OMM and Samuelson.

III.CONCLUSION¹⁵

Petitioner has established by a preponderance of the evidence that claims 1–20 are unpatentable.

IV.MOTIONS TO SEAL

Both Petitioner and Patent Owner have filed motions to seal selected exhibits and documents.

Petitioner filed a motion to seal (Paper 4 (“Pet. Mot. Seal”)) seeking to maintain as confidential versions of the Petition, declaration Exhibit 1006, declaration Exhibits 1020 and 1049 and documentary Exhibits 1025–1030, 1032–

¹⁵ 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*. See 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).

1034, 1036, 1038–1048, and 1054–1056 be sealed. Petitioner requests entry of our Default Standing Protective Order.¹⁶ Pet. Mot. Seal, 7. Petitioner filed redacted public versions of these documents. Patent Owner did not file an opposition to the Motion. Having reviewed the unopposed Motion, we grant Petitioner’s Motion to Seal and entry of our Default Standing Protective Order.

Patent Owner filed a motion to seal (Paper 21 (“PO. Mot. Seal”)) seeking to maintain as confidential portions of its Sur-reply and the entirety of Ex. 1054. Patent Owner filed redacted public versions of these documents. Patent Owner also requests entry of our Default Standing Protective Order. PO Mot. Seal, 4. Petitioner did not file an opposition to the Motion. Having reviewed the unopposed Motion, we grant Patent Owner’s Motion to Seal its Sur-reply.

Exhibit 1054 is a 139-page deposition transcript from a related proceeding in the International Trade Commission marked “Confidential.” The redacted public version of Ex. 1054 is 1 page with the one-sentence statement that: “CATERPILLAR EXHIBIT 1054 REDACTED IN ITS ENTIRETY.”

As stated in our Scheduling Order for this proceeding (Paper 10), “[t]he Board has a strong interest in the public availability of trial proceedings. Redactions to documents filed in this proceeding should be limited to the minimum amount necessary to protect confidential information, and the thrust of the underlying argument or evidence must be clearly discernible from the redacted versions.” Paper 10, 3. Thus, the default policy is that all papers filed in an *inter partes* review are open and available for access by the public; only “confidential information” may be protected from disclosure upon a showing of good cause. *See*

¹⁶ The Default Protective Order is contained at Appendix B, pages 117–122 of the Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019), available at <https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf>.

35 U.S.C. §§ 316(a)(1) and 316(a)(7); 37 C.F.R. §§ 42.14 and 42.54(a). Generally, the party asserting confidentiality bears the burden of showing that the relief requested should be granted. 37 C.F.R. § 42.20(c). This includes showing that the information is truly confidential, and that such confidentiality outweighs the strong public interest in having an open record.

Few, if any, exhibits, even business records, should ever be confidential in their entirety, without good cause to show that *all* of the information contained therein is truly sensitive. *See* 37 C.F.R. § 42.54(a). Even business records (e.g., sales forecasts, license agreements) often contain some non-confidential information serving to identify the nature of confidential portions of the exhibit. Conversely, deposition transcripts, such as Ex. 1054, declarations, and papers containing a party's arguments will generally contain *substantial* non-confidential portions. In all cases, the Motion to Seal must set forth the reasons why the information redacted from the non-confidential version is confidential and should not be made publicly available. Patent Owner has not met its burden to establish that the entirety of Ex. 1054 is confidential.

We have not cited or relied on Exhibit 1054. Accordingly, we dismiss Patent Owner's Motion to Seal Exhibit 1054 as moot.

We grant Patent Owner's Motion to Seal a confidential version of its Sur-reply.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, Petitioner has shown by a preponderance of the evidence that any of claims 1–20 of the '391 patent are unpatentable;

FURTHER ORDERED that we grant the parties request to enter our Default Standing Protective Order;

FURTHER ORDERED that we grant Petitioner’s Motion to Seal confidential portions of the Petition, declaration Exhibit 1006, declaration Exhibits 1020 and 1049 and documentary Exhibits 1025–1030, 1032–1034, 1036, 1038–1048, and 1054–1056;

FURTHER ORDERED that we grant Patent Owner’s Motion to Seal confidential portions of its Sur-reply;

FURTHER ORDERED that we dismiss as moot Patent Owner’s Motion to Seal Exhibit 1054; and

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

VI.SUMMARY TABLE

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not shown Unpatentable
1–20	103	OMM, Samuelson	1–20	

IPR2022-01277
Patent 9,879,391 B2

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