

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WIRTGEN AMERICA, INC.,
Petitioner,

v.

CATERPILLAR INC.,
Patent Owner.

IPR2022-01397
Patent 9,975,538 B2

Before BARRY L. GROSSMAN, JAMES J. MAYBERRY, and
MATTHEW S. MEYERS, *Administrative Patent Judges*.

MEYERS, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. *Background and Summary*

Wirtgen America, Inc. (“Petitioner”) filed a Petition to institute *inter partes* review of claims 1–13 (the “challenged claims”) of U.S. Patent No. 9,975,538 B2 (Ex. 1001, “the ’538 patent”). Paper 1 (“Pet.”). Caterpillar Inc. filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2021) (permitting the Board to institute trial on behalf of the Director). To institute an *inter partes* review, we must determine that the information presented in the Petition shows “a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). For the reasons set forth below, upon considering the current record, we institute an *inter partes* review.

B. *Real Parties in Interest*

Wirtgen America, Inc. identifies itself and Wirtgen GmbH as the real parties-in-interest. Pet. 80. Patent Owner indicates that Caterpillar Inc. is the real party-in-interest. Paper 3, 1.

C. *Related Matters*

Petitioner and Patent Owner state that the ’538 patent is involved in *Wirtgen America, Inc. v. Caterpillar Inc.*, Case No. 1:17-cv-00770 (D. Del.). Pet. 81; Paper 3, 1. Patent Owner also identifies three related *inter partes* review proceedings, IPR2022-01394 (U.S. Patent No. 7,525,995), IPR2022-01395 (U.S. Patent No. 7,523,995), and IPR2022-01396 (U.S. Patent No. 9,371,618). Paper 3, 1.

D. The '538 patent

The '538 patent, titled “MILLING MACHINE FUEL EFFICIENCY CONTROL SYSTEM,” issued on May 22, 2018. Ex. 1001, codes (54), (45). The '538 patent “relates to . . . methods and systems for controlling the rotor speeds of cold planers and rotary mixers with optimized performance and fuel efficiency.” *Id.* at 1:6–9. According to the '538 patent, “changes in engine speed and engine load throughout the operation can cause unwanted variations in the rotor speed” and existing milling machines “provide variable transmissions which allow for variations in the engine speed without affecting rotor speed.” *Id.* at 1:32–37. However, “these conventional systems do not further address fuel efficiency, which . . . can be adversely affected by variations in engine speed and engine load.” *Id.* at 1:37–40. Thus, the '538 patent purports to provide “solutions for controlling and maintaining a desired rotor speed of a milling machine, which also takes fuel consumption or efficiency into consideration.” *Id.* at 1:41–44.

Figure 1, reproduced below, shows a side view of an exemplary milling machine. Ex. 1001, 2:22.

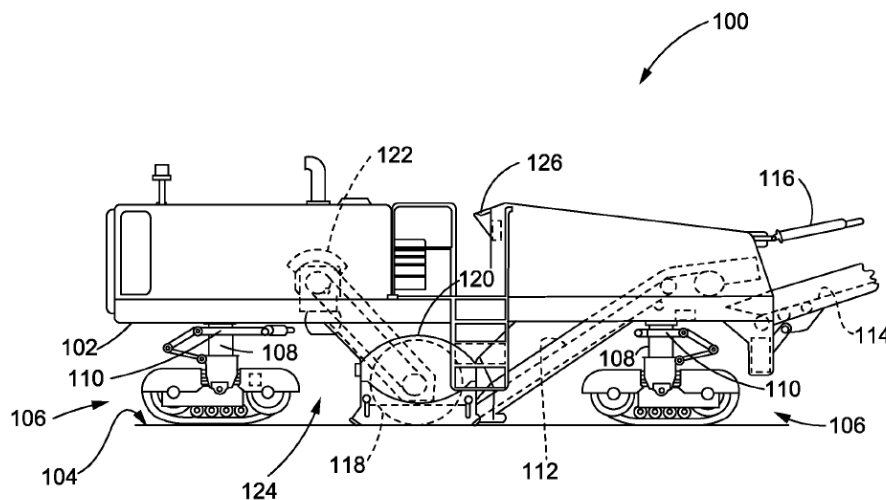


Figure 1 above shows milling machine 100 including rotor engine 122 as a power source that drives rotor 118 “via a hydrostatic, mechanical, or hydromechanical drive arrangement, such as a continuously variable transmission (CVT) 124.” *Id.* at 2:63–67.

Figure 2, reproduced below, shows a diagrammatic view of an exemplary control system. Ex. 1001, 2:24–25.

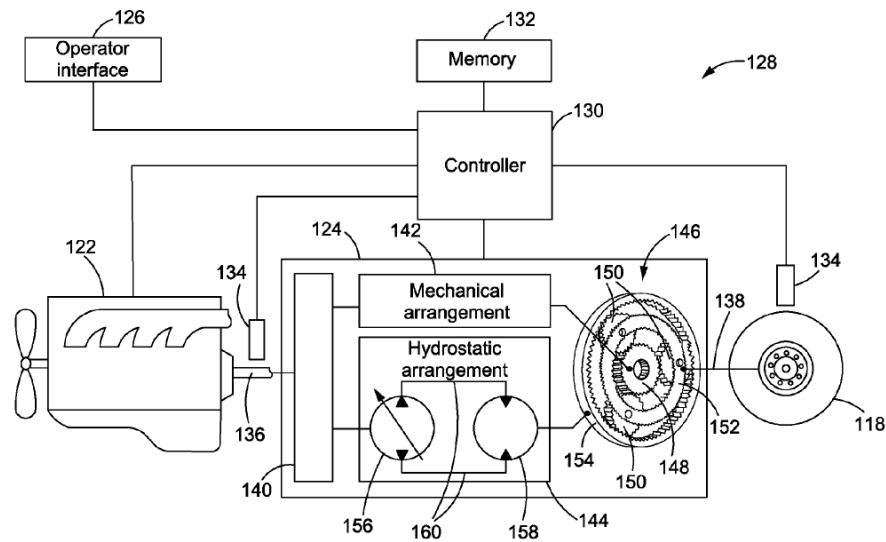


FIG.2

Figure 2 above shows control system 128 that may be integrated with milling machine 100 of Figure 1, to control rotor 118 in response of input received via operator interface 126. *Id.* at 3:8–12. Control system 128 includes controller 130 in communication with memory 132, operator interface 126, engine 122, rotor 118, and CVT 124. *Id.* at 3:12–15.

Controller 130 communicates with sensors 134 for determining engine speed via engine output 136 and for determining rotor speed via CVT output 138. *Id.* at 3:15–20. Predetermined algorithms or instructions stored in memory 132 are used to operate controller 130. *Id.* at 3:27–29. CVT 124 includes

clutch 140, mechanical arrangement 142, hydrostatic arrangement 144, and planetary gear set 146. *Id.* at 3:30–37.

CVT output 138 provides communication between rotor 118a and carrier 152 of planetary gear set 146. Ex. 1001, 3:48–50. CVT 124 and planetary gear set 146 “may be operated to continuously adjust the gear ratio, for instance, between the engine output 136 and the CVT output 138, in a manner which substantially maintains the rotor speed at the desired rotor speed specified by the operator irrespective of changes in the engine speed.” *Id.* at 3:51–57. Memory 132 is associated with controller 130 “in the form of lookup tables, maps, mathematical formulations, or any other suitable format” that enables controller 130 to automatically adjust one of, engine 122 and hydraulic motor 158 of hydrostatic arrangement 144, to output a desired rotor speed. *Id.* at 3:65–4:3.

Figure 4, reproduced below, “is a tabular illustration of fuel consumption rates and the associated efficiency points that may be referenced by” the disclosure of the ’538 patent. *Id.* at 2:30–32.

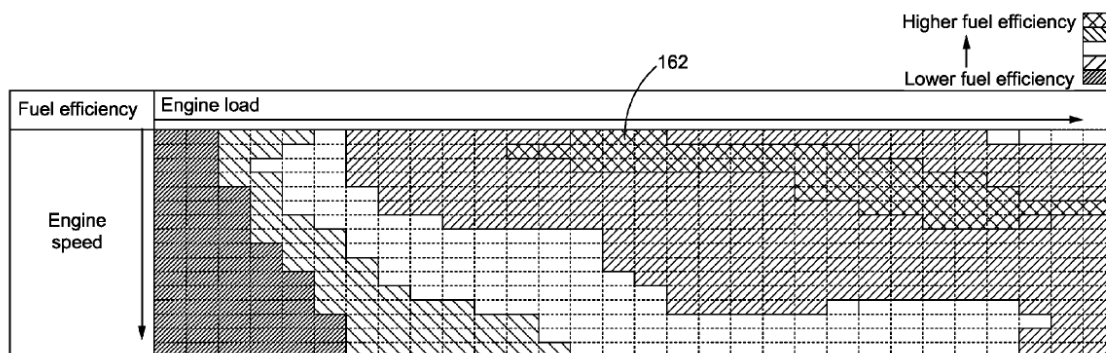


FIG.4

Figure 4 above is a graphical representation of the relative fuel consumption rates that may be used to predefine efficiency points 162, or combinations of engine speed and engine load expected to provide relatively better fuel economy. *Id.* at 4:14–18. According to the ’538 patent “[i]nformation

pertaining to these relationships between fuel consumption rate, engine speed and engine load, or at least the efficiency points 162 associated therewith, may be preprogrammed within the memory 132 and available to the controller 130, such as in the form of lookup tables, maps, mathematical formulations, or the like.” *Id.* at 4:18–23. Using efficiency points 162 as reference, controller 130 may control engine 122 to output an engine speed that is not only appropriate for the determined engine load, but also fuel efficient. *Id.* at 4:24–27. In particular, controller 130 communicates with engine 122 “to adjust engine speed based on changes in the engine load and predefined efficiency points 162 for better fuel economy.” *Id.* at 4:31–34.

Figure 5, reproduced below, is a flow diagram of a method for controlling a milling machine. *Id.* at 2:33–34.

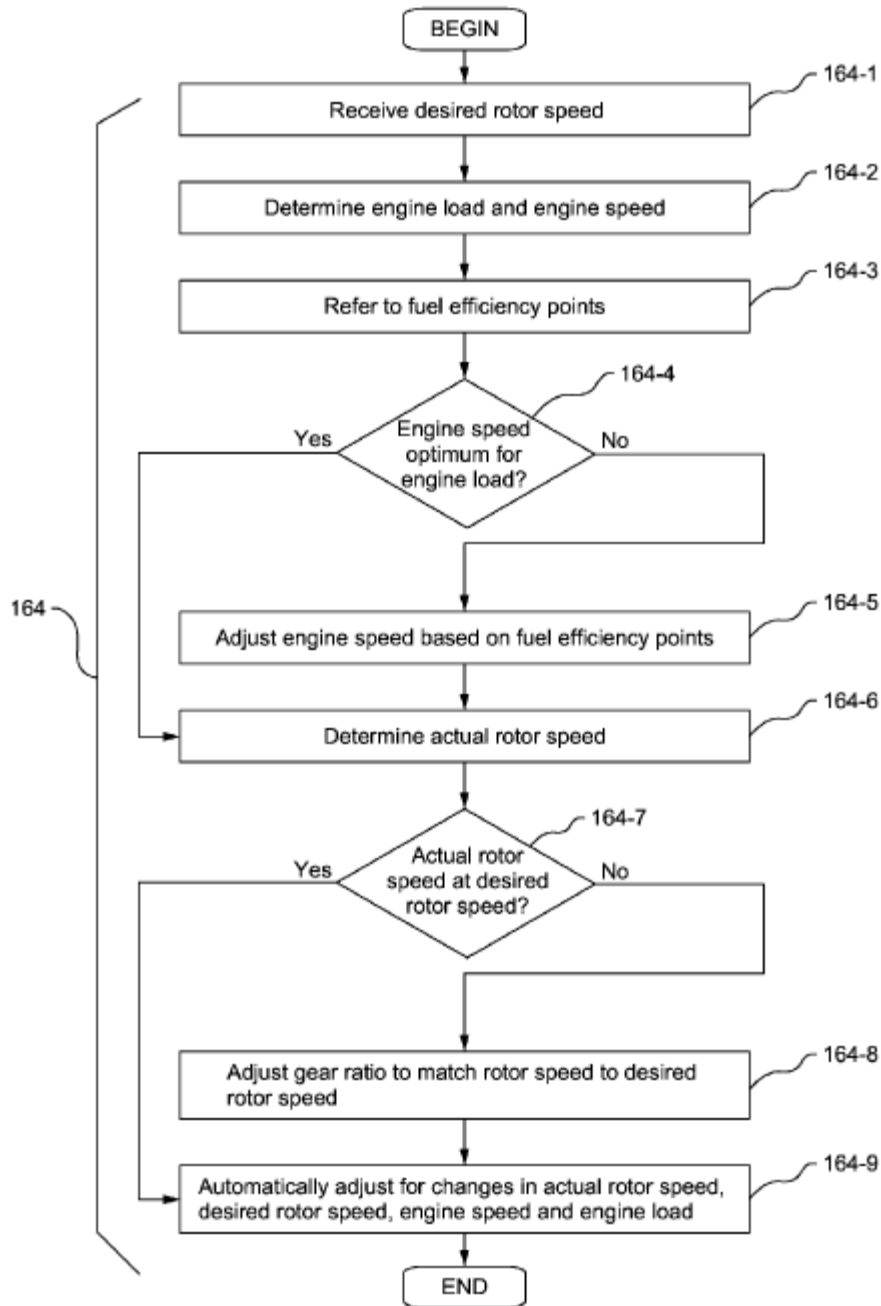


FIG.5

Figure 5 above shows method 164 for controlling milling machine 100 that has rotor 118 coupled to engine 122 through CVT 124, from the previous figures. *Id.* at 4:64–67. Starting in block 164-1, controller 130 receives a desired rotor speed from operator interface 126 of milling machine 100. *Id.*

at 4:67–5:3. In block 164-2, controller 130 determines the current engine load and speed via sensor 134 at engine output 136. *Id.* at 5:3–7. In block 164-3, controller 130 retrieves predefined fuel efficiency points 162 from memory 132 to determine an optimum engine speed for the given engine load. *Id.* at 5:7–12. Then, at block 164-4, controller 130 compares the actual speed to the optimum engine speed. *Id.* at 5:15–17. If the actual speed is not at the optimum engine speed, controller 130 adjusts the engine speed at block 164-5, whereas if the actual speed is at the optimum engine speed, controller 130 then determines the actual rotor speed at block 164-6. *Id.* at 5:18–26. Thereafter, at block 164-7, the actual rotor speed is determined whether it is the desired speed such that: (1) if it is not, the gear ratio is adjusted at block 164-8, and (2) if it is, controller 130 monitors “for any changes necessitating further gear ratio adjustments” including actual rotor speed, desired rotor speed, engine speed, and engine load, at block 164-9. *Id.* at 5:26–64.

E. Challenged Claim

Petitioner challenges claims 1–13 of the ’538 patent. Pet. 1. Claims 1 and 6 are independent claims. Independent claim 1, reproduced below, is illustrative of the challenged claims.

1. A controller-implemented method of controlling a machine having a rotor coupled to an engine through a variable transmission, comprising:
 - receiving a desired rotor speed;
 - determining an engine load of the engine;
 - adjusting an engine speed of the engine based on the engine load and one or more predefined efficiency points at least partially based on predetermined fuel consumption rates and providing optimum engine speeds for different engine loads; and

adjusting a gear ratio of the variable transmission based on the engine speed and the desired rotor speed.

Ex. 1001, 6:20–32.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–13 are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–13	103 ¹	Willis ² , Xing ³
8, 13	103	Willis, Xing, Laux ⁴

To support its Petition, Petitioner proffers a Declaration of Jeffrey L. Stein, Ph.D. Ex. 1003.

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

1. Overview of Willis (Ex. 1005)

Willis “relates to road milling machines, and more particularly to systems for controlling milling machine operation.” Ex. 1005 ¶ 1. Figure 2, reproduced below, “is a side elevational view of a milling machine with a control system.” *Id.* ¶ 8.

¹ The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, took effect on March 16, 2013. Because the application that issued as the ’538 patent was filed after March 16, 2013, we apply the AIA version of § 103. *See* Ex. 1001, code (22).

² U.S. Patent Application Pub. No. 2010/0014917 A1, published Jan. 21, 2010 (Ex. 1005, “Willis”).

³ U.S. Patent No. 9,656,656 B2, issued May 23, 2017 (Ex. 1006, “Xing”).

⁴ U.S. Patent No. 9,864,347 B2, issued Jan. 9, 2018 (Ex. 1012, “Laux”).

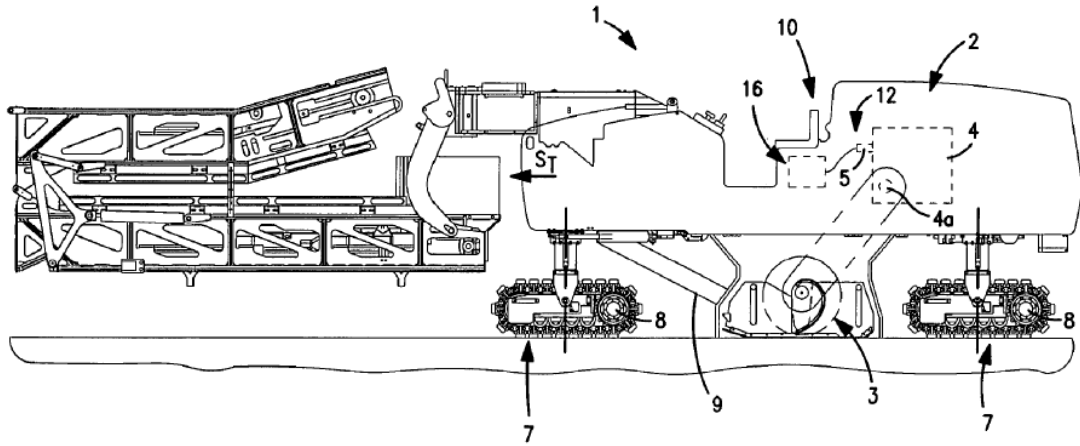


FIG. 2

Figure 2 above shows milling machine 1 including cutter drum 3 coupled to engine 4. *Id.* ¶ 17. Milling machine 1 also includes control system 10 that comprises regulator 12 configured to adjust a speed of cutter drum 3. *Id.*

Figure 1, reproduced below, “is a schematic view of a control system for a milling machine.” Ex. 1005 ¶ 7.

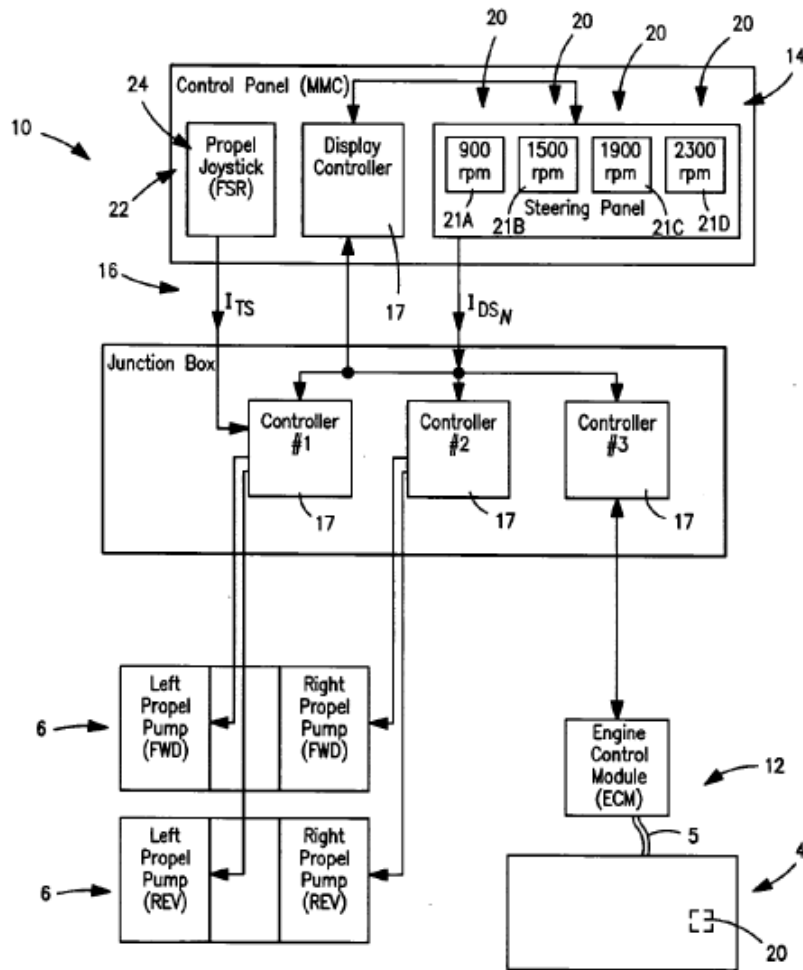


FIG. 1

Figure 1 above shows control system 10 having drum speed selector 14 “configured to generate an input I_{DS} corresponding to a desired drum cutting speed DS_D ,” and control 16.” *Id.* ¶ 17. Control 16 receives the input I_{DS} from selector 14 to operate regulator 12 “such that the actual drum speed DS at least generally corresponds to the desired speed DS_D .” *Id.* Drum speed selector 14 includes buttons 21A, 21B, 21C, and 21D as input members 20 to generate inputs that correspond to different desired drum speeds. *Id.* ¶ 18. Thus, each button or input member corresponds to a different desired

rotational speed DS_{DN} of cutter drum 3. *Id.* Control system 10 preferably further comprises sensor 20 “configured to sense the actual drum speed DS and to communicate with” control 16, “such as by transmitting a signal corresponding to drum speed DS .” *Id.* ¶ 21. Willis discloses that “[w]hen the engine 4 is configured to directly drive the cutter drum 3 as preferred, the regulator 12 is configured to adjust a speed of the engine 4 so that the sensed drum speed DS_S is generally equal to the desired drum speed DS_D .” *Id.* ¶ 22.

Figure 9, reproduced below, “is a logic flow chart depicting preferred operating features of a control.” Ex. 1005 ¶ 15.

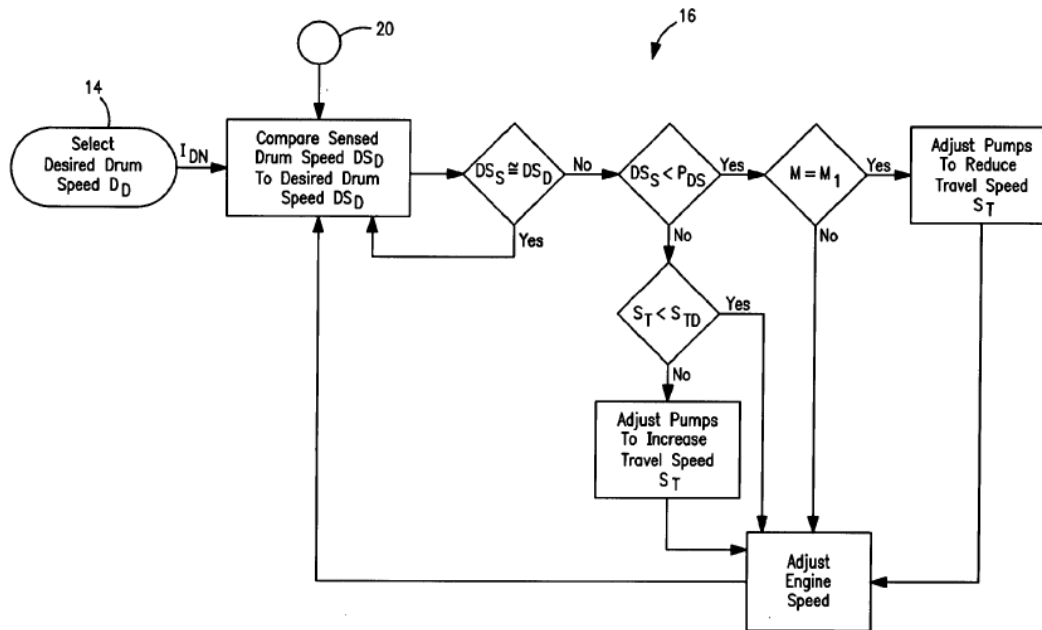


FIG. 9

Figure 9 above shows control 16 for operating pumps and crawler assemblies of milling machine 1. *Id.* ¶ 24. Willis discloses that control 16 is “configured to compare the sensed drum speed DS_S with the desired speed DS_D , and to adjust” the pumps to reduce the speed of the crawler motors “when the sensed drum speed DS_S has a value lesser than a predetermined portion P_{DS} of the desired speed DS_D .” *Id.* Thus, control 16 “causes the

milling machine travel speed S_T to be reduced whenever the cutting drum 3 is rotating at less than a desired speed DS_D , which generally indicates that the load on the drum 3 is greater than desired (e.g., drum 3 begins cutting relatively harder material).” *Id.*

Willis further discloses control 16 is also configured to adjust the pumps so as to increase the speed of the crawler motors “when the value of the sensed drum speed DS_S increases from lesser than or about the predetermined portion P_{DS} of the desired speed to either greater than the desired speed predetermined portion P_{DS} or to about the desired speed DS_S .” Ex. 1005 ¶ 25. Thus, control 16 “provides a ‘load control’ feature that decreases the machine travel speed S_T whenever the load on the drum 3 is sufficiently increased so as to lower the drum speed DS substantially below a desired speed, and returns the travel speed S_T to a desired value when the drum load is reduced.” *Id.*

2. Overview of Xing (Ex. 1006)

Xing is directed to “a system and method for reducing the fuel consumption of a work vehicle.” Ex. 1006, 1:19–21. Xing explains that typically, continuously variable transmissions (CVTs) “have a hydro-mechanical configuration such that power from the engine flows in parallel through both a hydrostatic branch and a mechanical branch.” *Id.* at 1:30–33. “While the efficiency characteristics of conventional engines are relatively straight forward, the efficiencies of a CVT are much more complicated.” *Id.* at 1:39–41. “Thus, selecting the optimal operational settings in order to achieve the desired productivity and minimize fuel consumption can be quite challenging” for vehicles with a CVT. *Id.* at 1:52–54. For example, existing “control algorithms fail to take into account the role that other vehicle components play in impacting the overall efficiency of the vehicle.” *Id.* at

1:59–62. Accordingly, Xing purports to provide “a system and method for reducing the fuel consumption of a work vehicle that takes into account the operating efficiencies of the engine, transmission and various other power consuming components of the vehicle.” *Id.* at 1:63–67.

Figure 2, reproduced below, is a schematic view of “a transmission suitable for use with the work vehicle” (vehicle 10 is shown in Figure 1). Ex. 1006, 3:1–2.

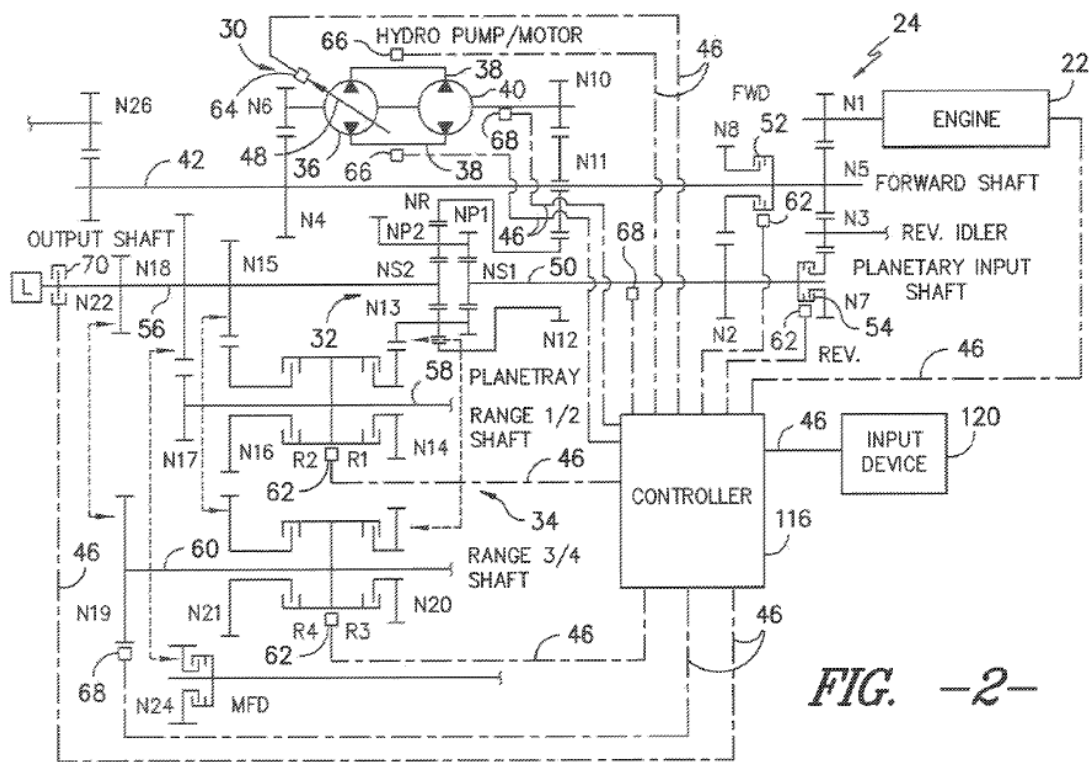


Figure 2 above shows transmission 24 including hydrostatic unit 30 and planetary unit 32. *Id.* at 4:42–43. Transmission 24 is coupled to engine 22 and controller 116 controls hydraulic pump 36 of hydrostatic unit 30. *Id.* at 4:27–31, 4:54–5:8.

Figure 3, reproduced below, is a schematic view of “a system for reducing the fuel consumption of a work vehicle.” Ex. 1006, 3:4–6.

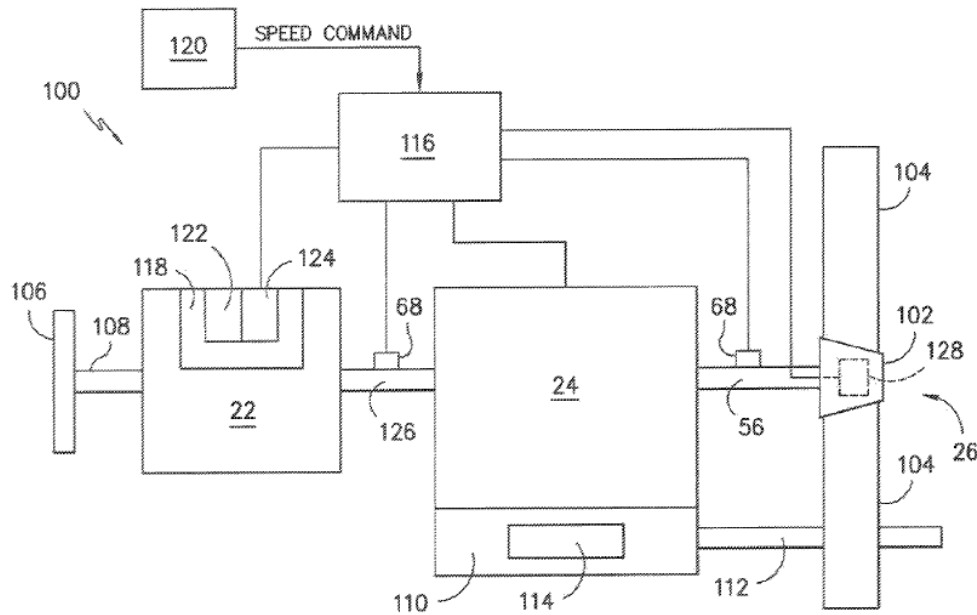


FIG. -3-

Figure 3 above shows system 100 including power take-off (PTO) 110 as part of transmission 24, configured to transfer power from engine 22 to one or more implements via PTO shaft 112. *Id.* at 6:64–7:3. Torque sensor 122 and speed sensor 124 may be mounted on engine 22 and coupled to controller 116 for monitoring engine speed. *Id.* at 8:17–28. Sensor 68 monitors rotational speeds of various shafts of transmission 24. *Id.* at 8:29–34. Xing discloses that the various drive train components and other power consuming components of the work vehicle “may generally operate at different efficiencies, with each component consuming varying amounts of power at differing vehicle operating parameters,” and “[a]s such, the most efficient operating conditions for one component may result in decreased efficiency for one or more other vehicle components.” *Id.* at 7:4–11. “For example, the efficiency of the transmission 24 may be relatively low when the engine settings (i.e., engine speed and engine torque) are selected to provide the most fuel efficient engine operation” and system 100 “may be

utilized to enhance fuel efficiency and achieve performance/productivity requirements by taking into account the individual component efficiencies of the various power consuming components of the work vehicle 10.” *Id.* at 7:11–21.

Figure 4, reproduced below, is a flow diagram of “a method for reducing the fuel consumption of a work vehicle.” Ex. 1006, 3:8–9.

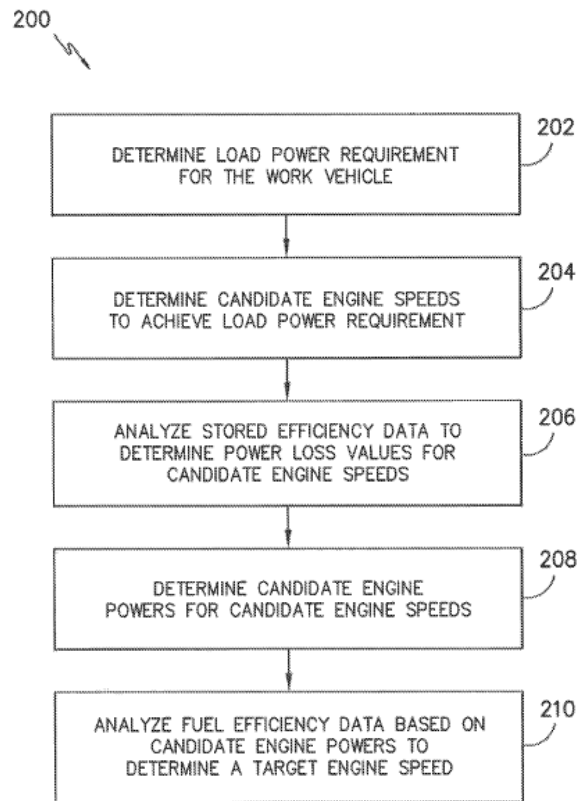


FIG. -4-

Figure 4 above shows method 200 starting with step 202 in which “a load power requirement for the work vehicle 10 may be determined.” *Id.* at 9:18–19. “The load power requirement generally corresponds to the amount of power required for the vehicle 10 to finish useful work, which may be a function of numerous factors, such as the weight of the work vehicle 10, the type of implement being hauled by the vehicle 10, field conditions and/or the

like.” *Id.* at 9:19–24. Xing discloses that the relationship between the load power requirement (P_{load}), the power produced by engine 22 of work vehicle 10 (P_{engine}), and the vehicle’s power loss due to system inefficiencies (P_{loss}) is $P_{engine} = P_{load} + P_{loss}$. *Id.* at 9:27–36. At step 204, “a plurality of candidate engine speeds may be determined based on the load power requirement.” *Id.* at 10:16–18. At step 206, “suitable efficiency data for one or more of the components of the work vehicle 10 may be analyzed to determine a power loss value (P_{loss}) for each candidate engine speed.” *Id.* at 10:43–46. At step 208, “a candidate engine power may be determined for each of the candidate engine speeds.” *Id.* at 11:65–67. Finally, at step 210, “fuel efficiency data may be analyzed to determine a target engine speed for the work vehicle 10 based on the candidate engine powers.” *Id.* at 12:26–28.

3. Overview of Laux (Ex. 1012)

Laux is directed to “a method for optimizing an operating function of a ground milling machine.” Ex. 1012, 1:15–16. According to Laux, “[t]he operation of such ground milling machines is comparatively costly, so that the demand always exists for the most optimum possible machine operation, for example, with respect to the lowest possible fuel consumption and, at the same time, the highest possible milling performance.” *Id.* at 1:33–37. Laux describes a milling machine powertrain that included an engine that drove a rotor via a variable transmission and a controller that coordinated the operation of the engine and transmission to control rotor speed. *Id.* at 8:60–9:28. More particularly, Laux discloses

drive transmission 17 is implemented as a planetary transmission and acts as a summation transmission, wherein drive energy is fed via the input shafts 22 and 23 from the drive unit 4 and from the auxiliary drive 20 and is transmitted via the output shaft 21 from the planetary transmission 17 to the support tube 10.

Id. at 9:19–24.

II. ANALYSIS

A. *Legal Standards*

Petitioner’s asserted grounds of unpatentability are based on obviousness under 35 U.S.C. § 103.

Section 103(a) 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, objective evidence, such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

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. “[O]bviousness must be determined in light of *all the facts*, and . . . a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine” teachings from multiple references. *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (emphasis added); *see also PAR Pharm.*,

Inc. v. TWI Pharms., Inc., 773 F.3d 1186, 1196 (Fed. Cir. 2014) (“The presence or absence of a motivation to combine references in an obviousness determination is a pure question of fact.”).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of invention. *Graham*, 383 U.S. at 17. Petitioner asserts that one of ordinary skill in the art

would have had a bachelor’s degree in mechanical engineering or an equivalent degree and two to five years of experience working on designing or developing machine powertrains in which a controller controls a powertrain’s internal combustion engine and coupled transmission. Additional education may substitute for lesser work experience and vice versa.

Pet. 8 (citing Ex. 1003 ¶¶ 21–24). Patent Owner does not address the level of skill in the art or otherwise dispute Petitioner’s assertion. *See* Prelim. Resp.

Accordingly, for purposes of this decision, we apply Petitioner’s definition of the level of skill in the art, as reproduced above. We determine that this definition is consistent with the prior art of record and the skill reflected in the Specification of the ’538 patent, based on our review of the limited record.

C. Claim Construction

In an *inter partes* review proceeding for a petition filed on or after November 13, 2018, a patent claim shall be construed using the same claim

construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b).⁵ This rule adopts the same claim construction standard used by Article III federal courts, which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*), and its progeny. Under that standard, the words of a claim are generally given their “ordinary and customary meaning,” which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *See Phillips*, 415 F.3d at 1312–13. “[W]here a party believes that a specific term has meaning other than its plain meaning, the party should provide a statement identifying a proposed construction of the particular term and where the disclosure supports that meaning.” Patent Trial and Appeal Board Consolidated Trial Practice Guide 44 (Nov. 2019), available at <https://www.uspto.gov/TrialPracticeGuideConsolidated> (“CTPG”).

Petitioner asserts that “[i]n this Petition, all terms of the ’538 [p]atent claims have been given their ordinary and customary meaning as understood by one of ordinary skill in the art in light of the specification and the prosecution history pertaining to the patent” and that it “does not believe any specific constructions are required at this time.” Pet. 31. Patent Owner asserts that the claim subject matter receives its “plain and ordinary meaning, interpreted in light of the specification of the patent in which it appears” and that “[t]he terms of the challenged claims do not require express construction in order to reach a decision denying institution.” Prelim. Resp. 3–4.

⁵ The Petition in this case was filed August 10, 2022. *See* Paper 5, 1.

We determine, at this stage, that no explicit construction of these terms is needed to resolve the issues presented by the arguments and evidence of record to reach a decision on institution. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed “only to the extent necessary to resolve the controversy” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Alleged Obviousness over Willis and Xing (Ground 1: Claims 1–13)

Petitioner asserts that claims 1–13 are unpatentable as obvious over Willis and Xing. Pet. 32–76. Petitioner also relies on the testimony of Dr. Stein to support its arguments. *Id.* (citing Ex. 1003). Patent Owner disputes Petitioner’s contentions that the proposed combination teaches or suggests elements 1[b] and 1[c] of claim 1, as well as the proposed motivation to combine Willis and Xing. Prelim. Resp. 4–26. We address Petitioner’s contentions and Patent Owner’s arguments below, beginning with the motivation to combine Willis and Xing.

1. Motivation to Combine Willis and Xing

According to Petitioner, “[t]he ’538 [p]atent claims the combination of known milling machine components and powertrain systems with known controller-implemented methods for optimizing fuel efficiency while maintaining a desired rotor speed.” Pet. 32. In this context, Petitioner contends that one of ordinary skill in the art “would have been motivated to include a system and method like that taught by Xing in Willis’s milling machine.” *Id.* at 33. Petitioner further contends that one of ordinary skill in the art “would have known that milling machines were costly to operate and wanted to minimize fuel consumption to lower operating cost without

sacrificing performance.” *Id.* at 33 (citing Ex. 1003 ¶¶ 63, 65; Ex. 1012, 1:33–45).

Petitioner asserts that “it was known that implementing a variable transmission in a milling machine could improve fuel efficiency” (*id.* at 33–34), and relying on the declaration testimony of Dr. Stein, reasons that one of ordinary skill in the art “would have recognized that using a hydromechanical CVT permitted controlling an engine to a speed that minimizes fuel consumption for a given load while controlling transmission gear ratios to achieve desired transmission output speeds that maximize machine performance.” *Id.* at 34 (citing Ex. 1003 ¶ 66). Petitioner further asserts that

Xing taught a method of controllably adjusting a CVT to further improve fuel efficiency without impacting machine performance. *Supra* [Pet. 18–24]. Thus, implementing a CVT and control method like that taught by Xing in Willis’s milling machine would have been a matter of combining prior art elements according to known methods to yield predictable results.

Id. (citing Ex. 1003 ¶ 66).

Relying on the declaration testimony of Dr. Stein, Petitioner takes the position that one of ordinary skill in the art “would have expected to successfully incorporate Xing’s teachings, including those related to CVTs, engines, transmission control algorithms, and associated sensors, into Willis’s milling machine” because it would have been no more than the combination of “prior art elements according to known methods to yield predictable results.” Pet. 34 (citing Ex. 1003 ¶¶ 65–66); *see also id.* at 34–35 (“This combination would further apply a known technique and hardware to a known device that was ready for improvement, predictably yielding the result of the expected improvement.”). Petitioner concludes that

one of ordinary skill in the art “would have expected that such a combination would improve the fuel consumption and energy efficiency of Willis’s milling machine, while maintaining desired rotor speed during operation.” *Id.* at 35.

In response, Patent Owner argues that Petitioner fails to establish that one of ordinary skill in the art would have been motivated to combine Willis and Xing. Prelim. Resp. 19–26. Patent Owner contends that “Xing’s variable transmission and control method that would be incompatible with Willis’s principle of operation.” *Id.* at 19. According to Patent Owner, the control system in Willis includes “a load control feature” that controls the load on its cutter “drum by monitoring sensed drum speed relative to the desired drum speed and correspondingly reducing machine travel speed based on the sensed drum speed regardless of the desired drum speed selected by the operator” (*id.* at 19–23 (citing Ex. 1005 ¶¶ 21–22, 24–25)) whereas Xing’s control method “seeks to provide a fuel-efficient method to maintain a desired ground speed.” *Id.* at 20. Consequently, Patent Owner argues

when incorporated into Willis’s system, Xing’s control method would result in Willis’s system in ***maintaining*** the desired rotor speed, which, in turn, would ***maintain*** any resulting load on the drum, regardless if that load is higher than desired. Such a method would frustrate Willis’s goal of controlling the load on the drum by monitoring sensed drum speed relative to the desired drum speed and correspondingly reducing machine travel speed based on the sensed drum speed regardless of the desired drum speed selected by the operator.

Id. at 23. Patent Owner argues further that Petitioner fails to provide any reason why one of ordinary skill in the art “would have adapted Xing’s

control method away from utilizing desired ground speed to utilizing desired drum speed.” *Id.* at 24.

We have reviewed Patent Owner’s arguments and cited evidence and determine, on the current record, that Petitioner provides sufficient arguments and evidence, at this stage of the proceeding, to support its reasoning that a person having ordinary skill in the art would have been motivated to modify Willis’s system for controlling a milling machine with Xing’s system for reducing the fuel consumption of a work vehicle, as Petitioner proposes. In this regard, we credit Dr. Stein’s opinion that one of ordinary skill in the art “would have understood that teachings regarding powertrain systems in a wide variety of machines could be universally applied to a wide range of mobile machines, including agricultural tractors and milling machines.” Ex. 1003 ¶ 66 (citing Ex. 1008, 2:43–61). We also credit Dr. Stein’s opinion that one of ordinary skill in the art “would have expected to successfully incorporate Xing’s teachings regarding the configuration and operation of its controller, control algorithm, engine, and transmission system, or relevant components into Willis’s milling machine” because doing so would have amounted to no more than the application of “a known technique to a known device ready for improvement to yield predictable results.” *Id.* We still further credit Dr. Stein’s declaration testimony that one of ordinary skill in the art “would have had a reasonable expectation of successfully adapting Xing to use its transmission, controller algorithms, associated sensors and control circuits . . . in other work machines to power the machine’s drive wheels/tracks or other components and implements, such as the milling drum in Willis’s milling machine.” *Id.* ¶ 71.

At this stage of the proceeding, Patent Owner offers only attorney argument regarding the incompatibility of the proposed modification, including no evidence that the proposed modification is beyond the level of ordinary skill in the art. In contrast, Petitioner, relying on the declaration testimony of Dr. Stein, provides sufficient evidence that one of ordinary skill in the art “would have known that milling machines were costly to operate and wanted to minimize fuel consumption to lower operating cost without sacrificing performance.” Pet. 33 (citing Ex. 1003 ¶¶ 63, 65; Ex. 1012, 1:33–45 (describing the costs associated with the operating of milling machine and identifying that “demand always exists for the most optimum possible machine operation, for example, with respect to the lowest possible fuel consumption and, at the same time, the highest possible milling performance.”)).

Accordingly, on the current record, we determine that Petitioner has provided sufficient arguments and evidence to support its assertion that one of ordinary skill in the art would have been motivated to combine Willis and Xing. *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”).

2. Analysis of Claim 1

We now turn our analysis to the scope and content of the prior art and any differences between the prior art and the subject matter of independent claim 1, on a limitation-by-limitation basis. We use Petitioner’s notations to identify the claim elements. *See* Pet. 35–52.

- a) *[1[p]] A controller-implemented method of controlling a machine having a rotor coupled to an engine through a variable transmission, comprising:*⁶

Petitioner asserts that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[p]. Pet. 35–41. More particularly, Petitioner annotates Figure 3 of Willis and asserts that Willis teaches milling machine 1 with engine 4 coupled to rotor 3, under control of a drum speed control system.” *Id.* at 35–36 (citing Ex. 1005 ¶ 17).

Petitioner also annotates Figure 3 of Xing, and asserts that Xing teaches “a work machine control system in which a controller controlled an output speed of a variable transmission’s output shaft by adjusting the variable transmission’s gear ratio as well as the speed of the machine’s coupled engine.” *Id.* at 37–38 (citing Ex. 1006, 4:8–54, Figs. 2, 3; Ex. 1003 ¶ 69); *see also id.* at 38–39 (citing Ex. 1006, 8:56–59 (“Using its CVT and control system, Xing practiced method 200, which allowed ‘for a work vehicle 10 to be controlled in a manner that minimizes fuel consumption while maintaining the desired vehicle performance/productivity.”). Dr. Stein provides declaration testimony that one of ordinary skill in the art

would have been motivated to modify Willis to include a variable transmission and control system like that taught by Xing to improve fuel consumption and machine energy efficiency while maintaining desired machine performance. [Ex. 1003] ¶¶ 71–72. This would have involved coupling a CVT between Willis’s engine and rotor and configuring Willis’s controller with Xing’s algorithm, sensors, and control devices necessary to implement Xing’s algorithm.

⁶ We need not decide whether the preamble of claim 1 is limiting for purposes of this Decision, because Petitioner has demonstrated a reasonable likelihood of showing that the cited art teaches the preamble.

Id. at 39 (citing Ex. 1006, 7:51–8:2).

Patent Owner does not raise any arguments regarding these assertions

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combination of Willis and Xing teaches or suggests the subject matter of the preamble of claim 1.

b) [1[a]] receiving a desired rotor speed;

Petitioner asserts that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[a]. Pet. 41–44. More particularly, Petitioner asserts that “Willis’s milling machine, modified to include Xing’s algorithm and CVT, would have resulted in a controller that received a desired rotor speed.” *Id.* at 41 (citing Ex. 1005 ¶¶ 3, 5, 7). Petitioner further asserts that one of ordinary skill in the art “adapting Willis’s controller to run Xing’s algorithm would have expected to successfully modify Xing’s algorithm to utilize the desired drum speed DS_D (corresponding a desired rotor speed) input (I_{DS}) received by Willis’s controller from Willis’s speed selector rather than the desired ground speed that Xing teaches.” *Id.* at 43 (citing Ex. 1003 ¶¶ 74–75).

Patent Owner does not raise any arguments regarding these assertions.

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[a].

c) [1[b]] determining an engine load of the engine;

(1) *Petitioner's Contentions*

Petitioner asserts that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[b]. Pet. 44–47. More particularly, Petitioner asserts that “Willis’s milling machine, modified to include Xing’s algorithm and CVT, would have resulted in a controller that determined an engine load of the engine because Xing’s algorithm was already configured to ‘determine an engine load’ during operation.” *Id.* at 44. Petitioner asserts that Xing teaches “a conventional controller that stores algorithms for performing a method of optimizing fuel efficiency, as described, e.g., in Xing’s Figure 4.” *Id.* (citing Ex. 1006, 7:33–56). Petitioner further asserts that Xing’s “controller receive[s] signals from sensors communicatively coupled to the controller, such as torque sensor 122 and engine speed sensor 124.” *Id.* at 45 (citing Ex. 1006, 8:16–40). According to Petitioner,

Based on those signals, the controller in Xing evaluate[s] power losses from the transmission and other power consuming components at different candidate operating speeds, measure[s] engine load to determine the work output demanded of the machine, and independently set engine speeds and transmission ratios to minimize fuel consumption while achieving desired performance.

The processor calculated a current load power requirement (P_{load})—the amount of power for the machine to accomplish work—by measuring the current engine power (P_{engine}) and estimating current power loss (P_{loss}). In block 202 of Figure 4, controller 116 calculated P_{engine} , based on signals indicating “the engine speed and the engine torque.”

Id. at 46 (citing Ex. 1006, 8:67–9:3, 9:9–56).

(2) Patent Owner's Contentions

Patent Owner contends that Petitioner “fails to identify and explain what part of Xing’s process constitutes ‘determining an engine load of the engine.’” Prelim. Resp. 4–5 (citing Pet. 44–47). More particularly, Patent Owner argues that “Figure 4 of Xing does not show a step where an ‘engine load’ of the engine is determined by the controller, nor does the petition point to any step of the method illustrated in the figure as constituting such a determination.” *Id.* at 5 (citing Pet. 44–45). Patent Owner argues, “the portions of Xing on which the petition relies only refer to the method shown in Figure 4” and Petitioner “again does not specify which step in Xing’s method shown [in] Figure 4 results in the controller ‘determining an engine load.’” *Id.* (citing Ex. 1006, 8:67–9:3, 9:9–17). Patent Owner argues that Petitioner does not explain which or any of Xing’s three variables (P_{load} , P_{engine} , and P_{loss}) “equates to the claimed ‘engine load,’ let alone what specific aspect of Xing is purported to describe ‘determining’ such an engine load.” *Id.* at 6 (citing Pet. 46–47). According to Patent Owner, Petitioner

admits that the “load power requirement (P_{load})” of Xing does not constitute the claimed “determining an engine load of the engine.” Pet., 47. In fact, Petitioner distinguishes between the claimed engine load and Xing’s P_{load} , arguing that Xing first determines the engine load in order to subsequently calculate P_{load} . *Id.*, 47 (“As explained for limitation 1[b], Xing’s algorithm determined the current engine load to calculate the machine’s power load requirement.”)

If Petitioner intended to map either Xing’s “engine power (P_{engine})” or “power loss (P_{loss})” to the claimed “engine load of the engine,” no such identification can be found in the petition. Nor does the petition provide any assertion or explanation as to how the calculation of either Xing’s P_{engine} or P_{loss} might be understood as “determining an engine load of the engine.”

Prelim. Resp. 6–7.

(3) *Discussion*

Having considered the conflicting positions of the parties, we conclude that, at this stage of the proceeding, Petitioner has shown a reasonable likelihood that it would prevail in establishing that the combination of Willis and Xing discloses or suggests the subject matter of limitation 1[b].

On the current record, we do not agree with Patent Owner that Petitioner does not explain which or any of Xing’s three variables (P_{load} , P_{engine} , and P_{loss}) “equates to the claimed ‘engine load,’ let alone what specific aspect of Xing is purported to describe ‘determining’ such an engine load.” Prelim. Resp. 6 (citing Pet. 46–47). Instead, we agree with Petitioner that Xing teaches that its controller 116 determines an engine load or “current load power requirement (P_{load}) based on the relationship of Equation 1: ‘ $P_{engine} = P_{load} + P_{loss}$.’” Pet. 46–47 (citing Ex. 1006, 9:18–56); *see also* Ex. 1006, 9:53–56 (“[B]y determining the current engine power and the current engine power loss, the current power load requirement may be calculated using Equation 1.”). Petitioner explains that Xing’s controller 116 “receive[s] signals from sensors communicatively coupled to the controller, such as torque sensor 122 and engine speed sensor 124” (Pet. 45 (citing Ex. 1006, 8:16–40)), and

[b]ased on those signals, the controller in Xing evaluated power losses from the transmission and other power consuming components at different candidate operating speeds, measured engine load to determine the work output demanded of the machine, and independently set engine speeds and transmission ratios to minimize fuel consumption while achieving desired performance.

Id. at 46 (citing Ex. 1006, 8:67–9:3, 9:9–17). Here, we credit the declaration testimony of Dr. Stein that one of ordinary skill in the art “would have

understood that engine load measured in terms of torque can be converted to engine load in terms of power by multiplying measured torque by engine speed.” Ex. 1003 ¶ 78.

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[b].

- d) [1[c]] adjusting an engine speed of the engine based on the engine load and one or more predefined efficiency points at least partially based on predetermined fuel consumption rates and providing optimum engine speeds for different engine loads;*

(1) Petitioner’s Contentions

Petitioner asserts that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[c]. Pet. 47–49. More particularly, Petitioner asserts that “Willis’s milling machine, modified to include Xing’s algorithm and CVT, would have resulted in a controller that adjusted engine speed based on load and predefined efficiency points, as claimed.” *Id.* at 47 (citing Ex. 1006, 2:9–12, 3:50–67, 11:65–12:11). According to Petitioner, in order to determine “the machine’s power load requirement,” Xing’s controller- implemented method determined “the current engine load.” *Id.* (citing Ex. 1006, 9:37–56).

With reference to Figure 4 of Xing, Petitioner asserts that “controller 116 calculated a plurality of candidate engine settings (i.e., pairs of specific engine speeds and engine torques) based on the power load requirements and the estimated power loss due to the machine’s components.” Pet. 47 (citing Ex. 1006, 10:16–12:25, Fig. 4, elements 204–208). Petitioner then asserts

that “[i]n block 210 of Figure 4, controller [1]16 determined which engine settings may be used for minimizing fuel consumption based on a fuel consumption maps (such as the one shown in Figure 11) or other suitable fuel efficiency data (such as that shown in Figure 5 above).” *Id.* at 48 (citing Ex. 1006, 3:58–63, 12:26–13:18, Fig. 4, element 210). Relying on the declaration testimony of Dr. Stein, Petitioner asserts that one of ordinary skill in the art “would have incorporated Xing’s engine map data and fuel efficiency data to determine an optimal engine speed for minimizing fuel consumption,” and “would have had a reasonable expectation of success because storing such standard data structures for use by machine controllers was universally applicable to different machines, including milling machines.” *Id.* at 49 (citing Ex. 1003 ¶¶ 80–81; Ex. 1008, 5:12–6:59, 7:6–13).

(2) Patent Owner’s Contentions

Patent Owner contends that “the petition fails to establish that the method of Xing discloses ‘adjusting an engine speed’ that is (1) based on ‘the engine load’ and (2) based on ‘one or more predefined efficiency points’ that ‘provid[e] optimum engine speeds for different engine loads.’” Prelim. Resp. 8. According to Patent Owner, the Petition fails for several reasons:

First, the petition’s deficiencies with respect to the claimed “determining an engine load” similarly fail to show that Xing discloses “adjusting an engine speed based on the engine load.” Second, the petition only identifies the “load power requirement,” a variable the petition concedes does not constitute the claimed “engine load,” as a basis for adjusting an engine speed. Third, to the extent the petition conclusory alleges that a “current engine load” underlies the calculation of the “load power requirement” of Xing, Xing’s control method still fails to

disclose that the adjustment of engine speed is based on the “current engine load” because such adjustment is based on candidate engine powers.

Id. Patent Owner also argues the petition also fails to establish that “Xing’s method ‘adjust[s] an engine speed’ based on one or more ‘predefined efficiency points’ that ‘provid[e] optimum engine speeds for different engine loads.’” *Id.* at 15. We address each argument in turn.

(3) Discussion

Having considered the conflicting positions of the parties, we conclude that, at this stage of the proceeding, Petitioner has shown a reasonable likelihood that it would prevail in establishing that the combination of Willis and Xing discloses or suggests the subject matter of limitation 1[c].

First, Patent Owner argues that Xing fails to teach or suggest “a method in which an engine speed is adjusted based on ‘the engine load’ because, as explained above, the petition fails to specifically identify what in Xing’s method constitutes the claimed determination of the ‘engine load.’” Prelim. Resp. 9 (citing *id.* at 4–7). However, as discussed above, at this stage of the proceeding, Petitioner appears to have made a sufficient showing that Xing’s controller 116 determines an engine load or “current load power requirement (P_{load}) based on the relationship of Equation 1: ‘ $P_{engine} = P_{load} + P_{loss}$.’” Pet. 46–47 (citing Ex. 1006, 9:18–56); *see also* Ex. 1006, 12:3–6 (“[U]sing Equation 1, each candidate engine power may be equal to the summation of the load power requirement and the associated power loss value.”).

Second, Patent Owner argues that “Xing’s ‘load power requirement’ cannot be the claimed ‘engine load’ because the petition distinguishes the two.” Prelim. Resp. 11 (citing Pet. 47). However, on the current record, we do not agree with Patent Owner that Petitioner make such a distinction. Instead, Petitioner states “Xing’s algorithm determined the current engine load to calculate the machine’s power load requirement.” *See* Pet. 47. According to Dr. Stein, one of ordinary skill in the art would have understood that Xing’s “controller adjusts the engine to run at one of the speeds at which the engine can produce sufficient power to meet the current load and at which the engine and the speed at which the engine minimizes fuel consumption.” Ex. 1003 ¶ 80.

Third, Patent Owner argues that “Xing does not disclose adjusting an engine speed based on any alleged current ‘engine load.’” Prelim. Resp. 11–15. Patent Owner asserts that

Xing’s method does not “adjust[] an engine speed” based on the current engine power (P_{engine}) or current power loss (P_{loss}) that were used to calculate the load power requirement. Instead, Xing discloses a method that first identifies a plurality of candidate engine speeds that are then used to identify ***candidate engine powers.***”

Id. at 13. And, according to Patent Owner, “it is these pairs of candidate engine speeds and engine powers that are used to adjust the engine settings (i.e., engine torque and engine speed) for fuel efficiency purposes.” *Id.* Patent Owner argues that “Xing confirms that its method for adjusting the engine settings for fuel efficiency purposes is not based on either the current engine power (P_{engine}) or current power loss (P_{loss})” because “Xing acknowledges that ‘the various drive train components and other power consuming components of the work vehicle 10 may generally operate at

different efficiencies, with each component consuming varying amounts of power at differing vehicle operating parameters.” *Id.* at 14 (citing Ex. 1006, 7:4–8).

On the current record, we do not agree with Patent Owner’s arguments. Instead, we are persuaded by Petitioner’s argument, supported by the declaration testimony of Dr. Stein, that the combination of Willis and Xing teaches or suggests “adjusting an engine speed of the engine based on the engine load,” as required in part by limitation 1[c]. Pet. 47–49. We credit Dr. Stein’s declaration testimony that one of ordinary skill in the art “would have understood that engine load measured in terms of torque can be converted to engine load in terms of power by multiplying measured torque by engine speed.” Ex. 1003 ¶ 78. We also credit Dr. Stein’s declaration testimony that one of ordinary skill in the art “would have been motivated to incorporate Xing’s engine map to utilize the engine load data from the sensors such that the controller could execute the algorithm and select engine settings to achieve an optimized engine speed.” *Id.* ¶ 81.

Consistent with this understanding, Xing discloses that “controller 116 may be configured to utilize the current load power requirement as the basis for determining the candidate engine speeds.” Ex. 1006, 10:35–38, Fig. 4, 204. Xing then discloses that “suitable efficiency data for one or more of the components of the work vehicle 10 may be analyzed to determine a power loss value (P) for each candidate engine speed.” *Id.* at 10:43–46, Fig. 4, 206. Xing further discloses that “a candidate engine power may be determined for each of the candidate engine speeds” (*id.* at 11:65–67, Fig. 4, 208), and for “the specific load power requirement determined at 202, the controller 116 may be configured to calculate

candidate engine powers based on the power loss values determined at 206.”

Id. at 11:67–12:3. Xing still further discloses

at 210, fuel efficiency data may be analyzed to determine a target engine speed for the work vehicle 10 based on the candidate engine powers. Specifically, in several embodiments, a candidate engine torque (as shown in FIG. 5) may be determined by the controller 116 for each pair of candidate engine powers and speeds (e.g., by dividing each candidate engine power by its associated engine speed). Each set of engine torques and engine speeds may then be utilized to determine the most fuel efficient engine settings for achieving the desired load power requirement.”

Id. at 12:26–35.

Patent Owner also argues the petition also fails to establish that “Xing’s method ‘adjust[s] an engine speed’ based on one or more ‘predefined efficiency points’ that ‘provid[e] optimum engine speeds for different engine loads.” Prelim. Resp. 15. Patent Owner asserts that the petition fails to expressly identify what aspect of Xing Petitioner constitutes a “predefined efficiency point,” as called for by limitation 1[c]. *Id.* at 16–17. According to Patent Owner, even if Xing discloses “one or more predefined efficiency points,” “the petition fails to establish that any ‘point’ disclosed in Xing ‘provid[es] optimum engine speeds for different engine loads.’” *Id.* at 18.

We have considered Patent Owner’s arguments and determine that Petitioner has made a sufficient showing, at this stage of the proceeding, that Xing discloses “one or more predefined efficiency points,” as required by limitation 1[c]. Here, Petitioner asserts that Xing’s “controller 116 calculated a plurality of candidate engine settings (i.e., pairs of specific engine speeds and engine torques) based on the power load requirements and

the estimated power loss due to the machine's components.” Pet. 47 (citing Ex. 1006, 10:16–12:25).

Patent Owner asserts that “[i]n Xing’s method, each candidate engine power is paired with a single candidate speed (*see, e.g., id.*, FIG. 5), and the speed (and corresponding power loss) determines the power,” but “Petitioner provides no explanation how this maps to the claimed ‘providing optimum engine speeds for different engine loads.’” Prelim Resp. 19. However, Petitioner asserts that engine settings determined by controller 116 “may be used for minimizing fuel consumption based on a fuel consumption maps (such as the one shown in Figure 11) or other suitable fuel efficiency data (such as that shown in Figure 5 []).” *Id.* at 48 (citing Ex. 1006, 3:58–63, 12:26–13:18). Xing discloses that “fuel efficiency data may be analyzed to determine a target engine speed for the work vehicle 10 based on the candidate engine powers” (Ex 1006, 12:26–28), and

a candidate engine torque (as shown in FIG. 5) may be determined by the controller 116 for each pair of candidate engine powers and speeds (e.g., by dividing each candidate engine power by its associated engine speed). Each set of engine torques and engine speeds may then be utilized to determine the most fuel efficient engine settings for achieving the desired load power requirement.

Id. at 12:29–35. At this stage of the proceeding, we credit Dr. Stein’s declaration testimony that one of ordinary skill in the art “would have been motivated to incorporate Xing’s engine map to utilize the engine load data from the sensors such that the controller could execute the algorithm and select engine settings to achieve an optimized engine speed.” Ex. 1003 ¶ 81.

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this

stage of the proceeding, that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[c].

e) [1[d]] adjusting a gear ratio of the variable transmission based on the engine speed and the desired rotor speed.

Petitioner asserts that the combination of Willis and Xing teaches or suggest the subject matter of limitation 1[d]. Pet. 50–52. More particularly, Petitioner asserts that “Willis’s milling machine, modified to include Xing’s algorithm and CVT, would have resulted in a controller that adjusted the CVT’s gear ratio based on engine speed and desired rotor speed as claimed. Xing’s variable transmission was operatively coupled to the engine.” *Id.* at 50 (citing Pet. 21–24). Relying on the declaration testimony of Dr. Stein, Petitioner asserts that one of ordinary skill in the art “would have been motivated to modify Willis to include a variable transmission and control system like that taught by Xing to ‘maintain a desired rotor speed.’” *Id.* at 51 (citing Ex. 1003 ¶¶ 85–87). According to Dr. Stein, one of ordinary skill in the art

would have utilized the desired rotor speed in place of the ground speed. Like Xing’s desired ground speed, Willis’s desired rotor speed is dictated by the rotary speed of Xing’s output shaft 56. Thus, to control the transmission gear ratio in the proposed combination, [one of ordinary skill in the art] would have used the desired rotor speed in place of the desired ground speed.

Ex. 1003 ¶ 85.

Patent Owner does not raise any arguments regarding these assertions

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this

stage of the proceeding, that the combination of Willis and Xing teaches or suggests the subject matter of limitation 1[d].

f) Conclusion

For the reasons discussed above, we determine, on the current record, that the information presented in the Petition shows a reasonable likelihood that claim 1 is unpatentable under 35 U.S.C. § 103 over the combination of Willis and Xing.

3. Claims 2–13

Petitioner also contends that dependent claims 2–13 are unpatentable as obvious over the combination of Willis and Xing. Pet. 52–76. As we discuss above, Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the '538 patent is unpatentable, and we institute on all challenges raised in the Petition. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018); *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require “a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”); CTPG 64 (“The Board will not institute on fewer than all claims or all challenges in a petition.”).

Still, we have reviewed Petitioner’s contentions and citations to the evidence and determine that Petitioner has made a sufficient showing, on the current record, that claims 2–13 are unpatentable under 35 U.S.C. § 103 over the combination of Willis and Xing.

E. Alleged Obviousness over Willis, Xing, and Laux (Ground 2: Claims 8 and 13)

Petitioner further contends that the combined teachings of Willis, Xing, and Laux render obvious the subject matter of claims 8 and 13

(Ground 3). Pet. 76–80. As we discuss above, Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the ’538 patent is unpatentable. Accordingly, we institute on all challenges raised in the Petition, including those challenged under Ground 3. *See SAS Inst.*, 138 S. Ct. at 1354, 1359–60; *see also PGS*, 891 F.3d at 1360; CTPG 64.

Still, we have also reviewed Petitioner’s contentions and citations to the evidence for dependent claims 8 and 13, and determine that Petitioner has made a sufficient showing, on the current record, that these claims are unpatentable under 35 U.S.C. § 103 over the combination of Willis, Xing, and Laux.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has established a reasonable likelihood that it would prevail with respect to at least one of the Challenged Claims. Accordingly, we institute an *inter partes* review on all challenges.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review is instituted as to claims 1–13 of U.S. Patent No. 9,975,538 B2;

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

IPR2022-01397
Patent 9,975,538 B2

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