

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NAVISTAR, INC.,
Petitioner,

v.

FATIGUE FRACTURE TECHNOLOGY, LLC,
Patent Owner.

Case IPR2018-00853
Patent 7,143,915 B2

Before LINDA E. HORNER, BENJAMIN D. M. WOOD, and
RICHARD H. MARSCHALL, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Navistar, Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1, 7, 9, and 10 of U.S. Patent No. 7,143,915 B2 (Ex. 1001, “the ’915 patent”). Paper 1 (“Pet.”). Fatigue Fracture Technology LLC (“Patent Owner”) filed a Preliminary Response. Paper 9 (“Prelim. Resp.”). Upon consideration of the Petition and Preliminary Response, we instituted an *inter partes* review pursuant to 35 U.S.C. § 314, as to all of the challenged claims and on all grounds raised in the Petition. Paper 13 (“Inst. Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 19, “PO Resp.”), Petitioner filed a Reply to Patent Owner’s Response (Paper 29, “Reply”), and Patent Owner filed a Patent Owner Sur-Reply (Paper 32, “Sur-Reply”).

Petitioner filed a Motion to Strike portions of Patent Owner’s Sur-Reply and the accompanying Exhibits (Paper 35, “Mot. to Strike”) and Patent Owner filed an Opposition to Petitioner’s Motion (Paper 38, “Opp. Mot. to Strike”).

Petitioner also filed a Motion to Exclude (Paper 40, “Pet. Mot. Exclude”), Patent Owner filed an Opposition to Petitioner’s Motion (Paper 48, “PO Opp. Mot. Exclude”), and Petitioner filed a Reply (Paper 50, “Pet. Reply Mot. Exclude”).

Patent Owner filed a Motion to Exclude (Paper 45, “PO Mot. Exclude”), Petitioner filed an Opposition to Patent Owner’s Motion (Paper 46, “Pet. Opp. Mot. Exclude”), and Patent Owner filed a Reply (Paper 51, “PO Reply Mot. Exclude”).

On June 11, 2019, we held an oral hearing. Paper 57 (“Tr.”).

This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1, 7, 9, and 10 of the '915 patent are unpatentable. We also grant, in part, Petitioner's Motion to Strike and Petitioner's Motion to Exclude. We deny Patent Owner's Motion to Exclude.

A. Related Matters

The parties indicate that the '915 patent is asserted in the United States District Court for the Northern District of Illinois, in a case captioned *Fatigue Fracture Technology, LLC v. Navistar, Inc.*, Case No. 1:15-cv-5667 (N.D. Ill.). Paper 7 (Petitioner's Second Updated Mandatory Notices); Paper 5 (Patent Owner's Mandatory Notices). The parties also indicate that related U.S. Patent No. 7,497,361, which is a divisional of the '915 patent, is the subject of a reexamination proceeding (Appl. No. 90/014,120) before this Office. *Id.*

B. Real Parties in Interest

Petitioner identifies only itself as a real party in interest. Pet. 83; Paper 7. Patent Owner identifies only itself as a real party in interest. Paper 5.

C. The '915 Patent

The '915 patent relates to a method to fracture connecting rods. Ex. 1001, 3:3–4. The patent describes that most known methods for fracturing connecting rods apply an outward pressure to the crank bore until the generated stresses are high enough to fracture the connecting rod. *Id.* at 1:30–33. The patent teaches that the large magnitude forces required to fracture connecting rods made of high strength materials have a negative

effect on quality of the fractured connecting rod. *Id.* at 1:39–43. The patent also teaches that such forces cause disadvantages, such as plastic deformation, lack of flexibility in adapting the same technique to different sizes of connecting rods, repeated breakage of force exertion elements of the machine, and poor quality of the fractured connecting rod. *Id.* at 1:43–48. The '915 patent recognizes that some fracture methods attempted to overcome these difficulties by reducing or weakening the cracking area using techniques such as cryogenic cooling and electronic beam hardening. *Id.* at 1:34–38. According to the patent, however, these techniques have “a deleterious effect on material performance.” *Id.* at 1:38.

The process of the '915 patent uses several small magnitude forces to raise the stress intensity factor in the connecting rod up to the fracture point to avoid the use of a single large force to fracture the rod. *Id.* at 3:4–8. The '915 patent describes that this approach eliminates many problems associated with the use of large forces and provides better control over the fracturing process, because the contribution of each factor is optimized to achieve the best results. *Id.* at 3:8–11.

In the method described in the '915 patent, time-varying forces, such as harmonic forces, are applied to a pre-notched connecting rod to cause the pre-existing crack to grow incrementally depending on the range of fluctuation in the stress intensity factor. *Id.* at 3:16–20. “[A]s the crack grows, the absolute value of the stress intensity factor will increase.” *Id.* at 3:22–24. The '915 patent describes that the time-varying forces are applied simultaneously to two sides of the connecting rod and act along a straight line parallel to the predetermined fracture plane and perpendicular to the axis of the bore cylindrical surface. *Id.* at 3:54–58. “The crack extends, and

fracture may occur, depending on the relative magnitude of stress intensity factor and material fracture toughness.” *Id.* at 3:49–52. Alternatively, the time-varying force can be applied in a direction perpendicular to the predetermined fracture plane. *Id.* at 6:41–44.

In addition, a primary pre-stressing force can be applied in a direction perpendicular to, and away from, the predetermined fracture plane by moving an upper jaw of a clamping arrangement away from the fracture plane. *Id.* at 4:3–7. A secondary pre-stressing force can be applied by two static forces equal in magnitude and acting on the same straight line in opposite directions, using the same mechanism used to apply the time-varying forces. *Id.* at 4:14–18. Specifically, two contacts advance until they slightly press the part applying the secondary pre-stressing forces, and then they move forward and backward applying the time-varying forces. *Id.* at 4:18–21. The ’915 patent describes that application of these pre-stressing forces is optional and elimination of these pre-stressing forces is not a departure from the scope of the invention. *Id.* at 6:45–48.

The ’915 patent describes that in the process a dynamic force is applied at a time instant T_f by increasing the primary pre-stressing force suddenly as an impulsive force at T_f , or at a slower rate within a period centered on T_f . *Id.* at 4:35–38. “The time instant T_f , to be determined by performing several simple tests, by applying the fracturing force during different cycles at different time instants such as T_0 (minimum deformation) or T_{max} (maximum K_I) and comparing the quality of the fractured connecting rods.” *Id.* at 4:38–43. “[A] longer period before applying the dynamic force, increases the fatigue effect [imparted by the time varying force].” *Id.* at 4:55–56.

The '915 patent describes one implementation of the process as follows, with reference to Figure 3 reproduced below.

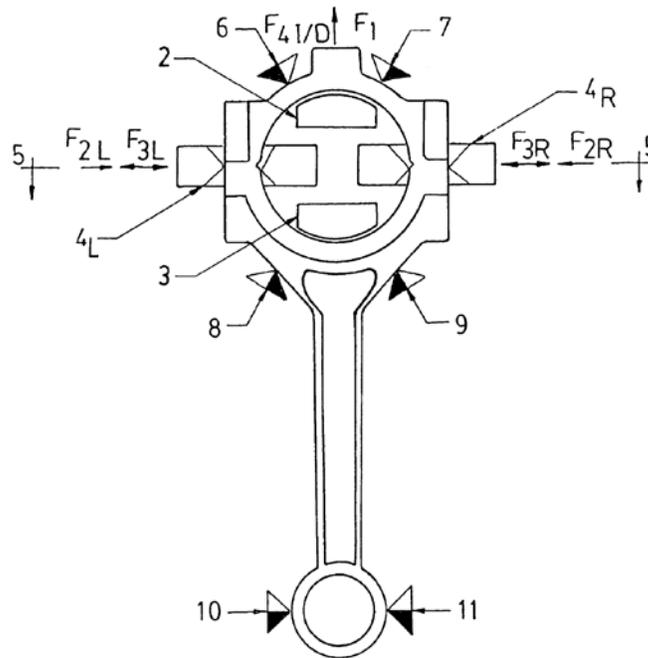


FIG. 3

Figure 3 shows the external force system used to fracture the connecting rod, wherein F_1 is the primary pre-stressing force, F_{2L} and F_{2R} are the secondary pre-stressing forces, F_{3L} and F_{3R} are the harmonic forces, and F_{4I} and F_{4D} are the impulsive and the slow rate dynamic forces, respectively. *Id.* at 5:15–19.

In the exemplary method, first, the connecting rod is clamped in position on upper jaw 2 and lower jaw 3, and other elements 6, 7, 8, and 9 press the connecting rod surface against jaws 2 and 3. *Id.* at 6:12–18. The rod also is supported at points 10 and 11. *Id.* at 6:18. Second, pre-stressing force F_1 is applied by moving upper jaw 2 away from the predetermined fracture plane 1E. *Id.* at 6:22–23; *see* Fig. 1. Third, two contacts 4_L and 4_R

advance, in opposite directions, to contact sides $1D_L$ and $1D_R$ to apply secondary pre-stressing forces F_{2L} and F_{2R} . *Id.* at 6:24–26; *see* Fig. 1. Fourth, contacts 4_L and 4_R move forward and backward, simultaneously, applying two harmonic forces F_{3L} and F_{3R} . *Id.* at 6:27–29. Fifth, an impulsive fracturing force F_{4I} is applied at the time instant T_f , causing a sudden increase of F_1 and, thus, fracturing the connecting rod. *Id.* at 6:32–34.

D. Illustrative Claim

Of the challenged claims, claim 1 is the sole independent claim. Each of claims 7, 9, and 10 depends directly from challenged claim 1. Claim 1 is reproduced below.

1. A process for the fracture separation of a part having a cylindrical bore passing therethrough into a first portion and a second portion, the cylindrical bore having a central axis, the part having two opposed sides proximate to the intersection of a predetermined fracture plane passing through the cylindrical bore and the part, the process including the steps of:

a) optionally applying at least one pre-stressing force to at least one of the first portion, the second portion and said sides of said part, said at least one pre-stressing force selected from the group comprising [*sic*]:

i) a longitudinal pre-stressing force applied to one of the first portion and the second portion relative to the other of the portion and the second portion, said longitudinal pre-stressing force being applied in a direction substantially perpendicular to said predetermined fracture plane, and

ii) a lateral pre-stressing force applied to each of the opposed sides of the part, each of said lateral pre-stressing forces being applied along substantially straight line that is substantially parallel to the predetermined fracture plane and substantially

perpendicular to the central axis, where at any time instant, each of the lateral pre-stressing forces being substantially equal in magnitude and acting opposite in direction to one another,

b) applying at least one fatigue force to at least one of the first portion and the second portion, said at least one fatigue force being selected from the group comprising:

i) a longitudinal cyclic force applied to one of the first portion and the second portion relative to the other of the first portion and the second portion, said longitudinal cyclic force being applied in a direction substantially perpendicular to said predetermined fracture plane, and

ii) a lateral cyclic force applied to each of the opposed sides of the part, each of the said lateral cyclic forces being applied along a substantially straight line that is substantially parallel to the predetermined fracture plane and substantially perpendicular to the central axis, where at any time instant, each of said lateral cyclic forces being substantially equal in magnitude and acting opposite in direction to one another;

c) applying at least one dynamic force to one of the first portion and the second portion relative to the other of the first portion and the second portion, said at least one dynamic force being applied in a direction substantially perpendicular to said predetermined fracture plane, said dynamic force being applied to fracture the part into the first portion and the second portion so as to separate the first portion from the second portion substantially along said predetermined plane.

Ex. 1001, 6:61–7:45.

E. Asserted Prior Art and Grounds of Unpatentability

Petitioner relies on the following prior art references in the presented grounds of unpatentability:

- a) *Brovold*: U.S. Patent No. 4,754,906, issued July 5, 1988, filed in the record as Exhibit 1003.
- b) *Cavallo*: U.S. Patent No. 5,699,947, issued December 23, 1997, filed in the record as Exhibit 1004.
- c) *Becker*: U.S. Patent No. 5,320,265, issued June 14, 1994, filed in the record as Exhibit 1005.
- d) *Bayliss*: U.S. Patent No. 3,155,300, issued November 3, 1964, filed in the record as Exhibit 1006.

Petitioner challenges the patentability of claims 1, 7, 9, and 10 of the '915 patent on each of the following grounds (Pet. 2):

Ground	Statutory Basis	Reference(s)
1	§ 102(b) or § 103(a)	Brovold
2	§ 102(b) or § 103(a)	Cavallo
3	§ 103(a)	Brovold in view of Cavallo
4	§ 103(a)	Cavallo in view of Brovold
5	§ 103(a)	Brovold in view of Bayliss and/or Becker
6	§ 103(a)	Brovold in view of Cavallo and further in view of Bayliss and/or Becker
7	§ 103(a)	Cavallo in view of Bayliss
8	§ 103(a)	Cavallo in view of Brovold and further in view of Bayliss

Petitioner supports its challenge with a Declaration of Thomas E. Brovold, filed as Exhibit 1007 (“Brovold Declaration”).

In its Response, Patent Owner relies on a Declaration of Sameh Guirgis, filed as Exhibit 2001 (“Guirgis Declaration”), a Declaration of Sheldon Mostovoy, filed as Exhibit 2036 (“Mostovoy Declaration”), and a

Supplemental Declaration of Sheldon Mostovoy, filed as Exhibit 2042 (“Supp. Mostovoy Declaration”).¹

F. Incorporation by Reference

Patent Owner attempts to incorporate certain arguments made in its Preliminary Response (Paper 9) into the Patent Owner’s Response. PO Resp. 33 (“FFT therefore relies on its Patent Owner’s Preliminary Response with respect to [grounds 1, 2, and 5].”). Our Rules prohibit incorporating arguments by reference. As stated in 37 C.F.R. § 42.6(a)(3): “[a]rguments must not be incorporated by reference from one document into another document.” Incorporation by reference circumvents our Rule limiting the word count in the Patent Owner response to 14,000 words. *See* 37 C.F.R. § 42.24(b)(2). Arguments that are not developed and presented in the Patent Owner Response, itself, are not entitled to consideration. *See* Paper 14 (Scheduling Order), 5 (cautioning Patent Owner “that any arguments for patentability not raised in the response may be deemed waived”).

II. ANALYSIS

A. Legal Principles

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). To establish anticipation, “all of the elements and limitations of the claim must be shown in a single prior reference, arranged

¹ Patent Owner also cites to a document signed by Honghui Yu (Exhibit 2040) that was filed in the reexamination proceeding of the related ’361 patent. This exhibit is excluded as containing inadmissible hearsay as explained below in Section VI.A. addressing Petitioner’s Motion to Exclude.

as in the claim.” *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001).

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) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). A patent can be obvious in light of a single prior art reference if it would have been obvious to modify that reference to arrive at the patented invention. *See, e.g., Takeda Chem. Indus., Ltd. v. Alphapharm Pty, Ltd.*, 492 F.3d 1350, 1357 (Fed. Cir. 2007); *SIBIA Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1356 (Fed. Cir. 2000).

B. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (internal quotation marks and citation omitted). Petitioner defines the relevant field of the invention as “manufacturing techniques for mechanical components, including fracturing connecting rods or similar parts.” Pet. 15 (citing Ex. 1007 ¶ 45). Petitioner proffers, via its declarant Mr. Brovold that a person having ordinary skill in this art would have:

a bachelor’s degree in mechanical engineering or an equivalent field, and approximately 1–2 years of practical experience fracturing connecting rods or similar parts; an associate’s degree in mechanical engineering or an equivalent field, and

approximately 2–3 years of practical experience fracturing connecting rods or similar parts; or equivalent knowledge and experience.

Pet. 15 (citing Ex. 1007 ¶¶ 46–49, 51, 66). In the Response, Patent Owner does not address Petitioner’s proffered assessment of the level of ordinary skill in the art.² Petitioner’s proposal is consistent with the problems and solutions in the ’915 patent and prior art of record. We adopt the definition of a person of ordinary skill in the art as proposed by Petitioner.

C. Claim Construction

In an *inter partes* review filed before November 13, 2018, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear.³ 37 C.F.R. § 42.100(b) (2017); *see also* *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016) (affirming that the USPTO has statutory authority to construe claims according to 37 C.F.R. § 42.100(b)). Under the broadest reasonable interpretation standard, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Only those claim terms that are in controversy need to be construed, and only to the extent necessary

² In a Joint Claim Construction Chart filed in the related litigation, Petitioner and Patent Owner agreed on this same definition of a person of ordinary skill in the art. Ex. 1037, 2.

³ This Petition was filed before the effective date of the amendment to 37 C.F.R. § 42.100 that changed the claim construction standard applied in *inter partes* reviews. *Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board*, 83 FR 51,340 (Oct. 11, 2018) (37 C.F.R. § 42.100(b) (Nov. 2018)).

to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (noting that “we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

In our Institution Decision, we interpreted the claim terms as set forth in the table below:

Claim Term	Interpretation
Fatigue force	a time-varying force that causes fluctuations of stresses that weaken the part
Cyclic force	a force that regularly repeats between a maximum value and a minimum value
Dynamic force	a force that changes with time

Inst. Dec. 10–15.

Neither Patent Owner nor Petitioner disputes the claim constructions set forth in our Institution Decision. PO Resp. 9; Reply 3–4. Thus, we employ the same interpretations of these claim terms in this Final Written Decision.

Despite Patent Owner stating that it “does not dispute the claim constructions set forth in the original institution Decision,” Patent Owner attempts to add additional narrowing aspects to each claim term. PO Resp. 9–11. We address Patent Owner’s arguments here to make clear that we are not changing our interpretations.

For instance, Patent Owner argues that “fatigue force,” as interpreted in the institution decision, should be further limited to elastic forces (as opposed to ductile forces) and should not encompass forces that can be used to break the part. *Id.* at 9–10. We decline to further limit “fatigue force” to

only elastic forces. Patent Owner's expert admits that "[t]here is no such thing as a purely linear elastic fatigue failure . . . because there is a certain amount of plastic deformation ahead of the crack tip." Ex. 1068 (Mostovoy Depo.), 281:23–282:2. This understanding is confirmed by the description in the '915 patent, which states, "[i]n the presence of a V-notch or a crack, fracture occurs under essentially elastic conditions with a limited plasticity zone at the tip of the crack." Ex. 1001, 2:4–7; *see also id.* at 4:58–60 (describing that the external forces applied to the rod "generally, stress the connecting rod within the linear elastic regime"). We understand the '915 patent to describe applying forces that are not exclusively or purely in the elastic regime. Further, Patent Owner's expert admits that the claims do not require application of forces in the elastic regime or that the fracture be "non-ductile." Ex. 1068, 28:4–30:12.

We also decline to limit fatigue force only to forces applied to weaken, but not break, the part. For instance, an elastic force used to weaken the part will eventually break the part if applied for a sufficient number of cycles. Ex. 1031 (Rules of Thumb for Mechanical Engineers), 79 (describing the stages of fatigue failure including crack initiation, stable crack growth, and unstable crack growth that leads to fracture). Further, Patent Owner's expert admits that the claim does not require stopping the application of a fatigue force prior to application of a dynamic force or prior to separation of the part. Ex. 1068, 35:11–18.

In sum, the language employed in claim 1 is broad. It does not limit the "fatigue force" to an elastic force and it does not recite a time period for application of the fatigue force. We see no reason based on the description of "fatigue force" provided in the '915 patent to further limit the

interpretation set forth in the Institution Decision and agreed to by the parties.

Patent Owner also argues that dynamic force, as interpreted in the Institution Decision, should be further limited to a force “that is much lower than load bearing capacity of the part before it is weakened due to the application of fatigue.” PO Resp. 11. We decline to further limit dynamic force to a force of a particular magnitude. Patent Owner’s expert acknowledged that the claim language does not limit the dynamic force to a force of a particular magnitude, and Patent Owner conceded this point during oral argument. Ex. 1068, 34:24–35:5; Tr. 38:21–23 (Patent Owner’s counsel stating that the claim language does not contain values for fatigue force or dynamic force). The ’915 patent is silent as to the magnitude of the dynamic force as compared to the load bearing capacity of the part prior to weakening. The ’915 patent provides no context or measure by which to evaluate how much lower the dynamic force must be as compared to the original load bearing capacity of the part so as to inform us of what Patent Owner intends in its description of a “much lower” force. *See also* Tr., 37:13–18 (Patent Owner’s counsel describing that the difference between “fatigue force” and “dynamic force” is that “the fatigue force is a cyclic force that weakens the part. And the dynamic force doesn’t have to be.”).

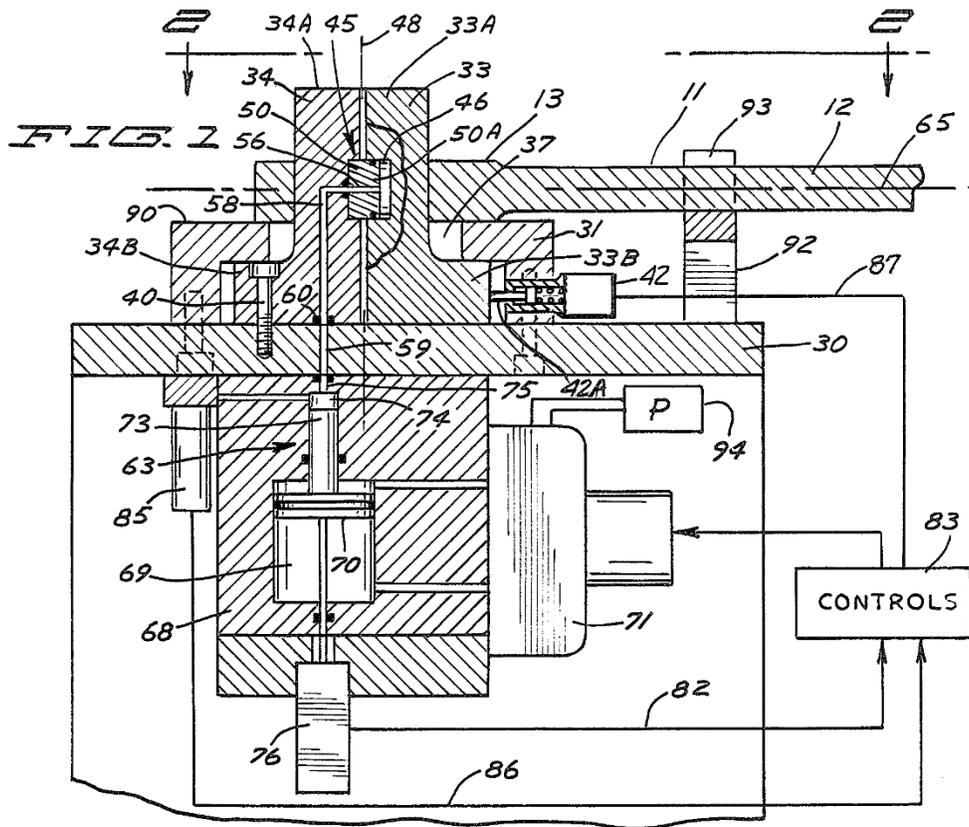
For these reasons, we render this Final Written Decision using the claim interpretations as set forth in our Institution Decision.

D. Anticipation by, or Obviousness over, Brovold (Ground 1)

1. Overview of Brovold

Brovold discloses a tool that uses servo controls for a pressure intensifier system and load and stroke feedback signals to control breaking

of connecting rods. Ex. 1003, 1:49–53, 2:20–24. Brovold discloses that “[t]he tool system is adaptable for either brittle fractures using one load cycle or for cycling the members to cause fatigue breaks, generally under a low number of cycles.” *Id.* at 2:29–32. Brovold’s tool system 10 is shown in Figures 1 and 2, reproduced below.



program. *Id.* at 4:24–33, 5:11–12, 5:34–35. When servovalve 71 is energized, it directs pressure to pressure intensifier system 63, which creates pressure in piston-cylinder arrangement 45, to force first tool portion 33 away from second tool portion 34 and elongate bearing 13 and “cause the cracks or breaks 22.” *Id.* at 5:11–24. Brovold discloses, “[i]n some instances, the controls 83 can be programmed to fatigue fail the bearing housing 13. The part may be cyclically loaded two or three times before fracture by controlling the pressure displacement or time cycle and having the servo-valve programmed to repeat the needed cycle.” *Id.* at 6:19–24.

2. Analysis of Claim 1

Claim 1 recites in its preamble:

A process for the fracture separation of a part having a cylindrical bore passing therethrough into a first portion and a second portion, the cylindrical bore having a central axis, the part having two opposed sides proximate to the intersection of a predetermined fracture plane passing through the cylindrical bore and the part.

Ex. 1001, 6:61–67. Brovold discloses a process for the fracture separation of bearing housing 13 of connecting rod 11 into bearing cap 15 and yoke 14 along a fracture plane that is predetermined by notches 20.⁴ Ex. 1003, Abstract, 1:7–11, 2:58–3:4. Petitioner has shown how this disclosure in Brovold anticipates the preamble of claim 1. Pet. 40–42 (citing Ex. 1003, 2:63, 2:66–3:4, Fig. 2; Ex. 1007 ¶¶ 147–150). Patent Owner does not offer evidence or argument in the Patent Owner Response to dispute Petitioner’s showing. PO Resp. 33.

⁴ Because Brovold discloses the process recited in the preamble, we need not reach the issue of whether the preamble is limiting in this case.

Claim 1 also recites applying a longitudinal, cyclic fatigue force to at least one of the first portion and the second portion of the part in a direction substantially perpendicular to the predetermined fracture plane. Ex. 1001, 7:20–28 (limitation (b), option (i)).⁵ Petitioner asserts that Brovold teaches applying longitudinal cyclic fatigue forces to the rod in the manner claimed. Pet. 44–46 (citing Ex. 1003, 2:20–24, 2:29–32, 5:11–12; 6:19–24, Figs. 1, 2; Ex. 1007 ¶¶ 156–159).

As discussed above in Section II.D.1., Brovold discloses applying a longitudinal force, via servo controls 83, servovalve 71, pressure intensifier system 63, piston-cylinder arrangement 65, and first and second tool portions 33, 34, to bearing cap 15 and yoke 14 portions of bearing housing 13 in a direction substantially perpendicular to predetermined bisecting fracture plane 65. Ex. 1003, 1:49–58, 4:18–23, Figs. 1, 2. Further, because Brovold discloses that tool system 10 can be used to cycle the members to cause fatigue breaks, and discloses specifically that this longitudinal force can be “cyclically loaded two or three times before fracture,” Brovold discloses a longitudinal cyclic fatigue force. *Id.* at 6:19–24.

Patent Owner argues that Brovold “does not teach or suggest the claimed cyclic fatigue force, which (1) is in the elastic regime, or (2) is

⁵ We do not address limitation (a) of claim 1 because the parties filed a joint stipulation in this proceeding agreeing that “the optional, pre-stressing language in the Challenged Claims of the ’915 Patent is non-limiting.” Paper 11. We also do not address option (ii) of limitation (b) in claim 1, because the claim language requires only one of options (i) and (ii) to be present, and the Petition relies on the disclosure of option (i) in the prior art.

completed before failure or break of the part.” PO Resp. 34.⁶ As noted above in Section II.C., claim 1 does not limit the fatigue force to a force only in the elastic regime and does not require that application of the cyclic fatigue force stop before a dynamic force is applied to break the part.

Patent Owner’s expert conceded that Brovold’s disclosure to apply two to three cycles to fatigue fail the part is a disclosure of a cyclic force that regularly repeats between a maximum and a minimum value and that this force causes fluctuation of stresses in the part. Ex. 1068, 143:22–145:4. Based on the breadth of the claim language, Brovold’s disclosure of cyclically loading the part two or three times to fatigue fail the part anticipates step (b)(i) of claim 1. Ex. 1003, 6:19–24.

Claim 1 also recites applying at least one dynamic force to one of the first portion and the second portion of the part in a direction substantially perpendicular to the predetermined fracture plane so as to separate the first portion from the second portion substantially along this predetermined fracture plane. Ex. 1001, 7:37–45 (limitation (c)). Petitioner asserts that Brovold teaches applying a dynamic force to the rod in a direction substantially perpendicular to a predetermined fracture plane to cause separation of the bearing housing into the bearing cap and yoke. Pet. 46–49 (citing Ex. 1007 ¶¶ 162–168).

In the Institution Decision, we disagreed with one reading of Brovold set forth in the Petition that asserts that Brovold discloses using feedback from transducer 42 to apply “an increased hydraulic force” or otherwise

⁶ Although Patent Owner raised this argument in rebuttal to the challenge based on Brovold in view of Cavallo, we address it here to the extent this argument also applies to the challenge based on Brovold alone.

adjust the applied hydraulic force, when the connecting rod is nearing complete fracture. Inst. Dec. 21–24. In the Institution Decision, we explained, however, that we understood, under an alternate theory, Petitioner’s declarant determined the first few cycles of Brovold’s cyclic force to be the claimed fatigue force, and the final cycle of Brovold’s cyclic force to be the dynamic force used to break the part. Inst. Dec. 24–25. We stated, “[i]n theory, we see no problem with such an interpretation based on our interpretation of ‘dynamic force’ to mean ‘a force that changes over time.’” *Id.* at 25.

In the Reply, Petitioner emphasizes this reading of the claim language, arguing that “[n]othing in the Claims, under the Board’s (undisputed) construction, precludes a single force profile from serving as the claimed fatigue and dynamic forces.” Reply 10–11 (citing Ex. 1068, 42:8–10, 43:24–44:2). Petitioner asserts that the claim language does not require the fatigue to stop before the dynamic force is applied, or before the part separates. *Id.* at 11 (citing Ex. 1068, 35:11–18). Petitioner asserts that “Brovold’s longitudinal, cyclic forces, which Brovold calls ‘fatigue’ (Ex. 1003, 2:32–33, 6:19–24) and which change with time and cause fluctuation of stresses, will necessarily also weaken the conrod.”⁷ *Id.* at 10. Thus, Petitioner argues that even under Patent Owner’s reading of Brovold as applying 2–3 cycles to break the part, Brovold renders claim 1 unpatentable. *Id.*; *see also* Tr. 24:9–14 (Petitioner’s counsel arguing that in Brovold’s application of three cycles of fatigue, the last cycle would be an application of the claimed dynamic force).

⁷ The term “conrod” is a shorthand reference to a connecting rod. Reply 3.

Patent Owner's expert agreed that because a cyclic fatigue force varies over time, such a force generally is also a dynamic force as claimed. Ex. 1068, 41:2–23. Patent Owner's expert also conceded that the cyclic force disclosed in Brovold also is a dynamic force. *Id.* at 145:5–12.

Based on this evidence and the breadth of the claim language, we find that in the method disclosed in Brovold of loading the part three times before fracture, the first and second loads constitute applying a longitudinal cyclic fatigue force to the part (element 1(b)(i)) and the third load constitutes applying a dynamic force to the part to separate the part along the predetermined fracture plane (element 1(c)).

Patent Owner argues that a logical reading of the claim limitation requires that the fatigue force that weakens the part cannot be the same force that breaks the part. Sur-Reply 7. Patent Owner argues that “[e]ach of Brovold’s repeated strikes is designed to break the part; there is no discussion of weakening.” *Id.* at 8. This argument ignores the fact that Brovold’s fatigue force varies with time, and thus, it also is a dynamic force. Ex. 1068, 145:5–12. Brovold discloses programming the controls to fatigue fail the bearing housing by cyclically loading the part two or three times before fracture by controlling the pressure displacement or time cycle and having the servo-valve programmed to repeat the needed cycle. Ex. 1003, 6:19–24. After application of the first two loads, the part is fatigued and, thus, weakened as compared to the part prior to application of these loads. Ex. 1007 ¶ 67 (“‘fatigue’ refers to a ‘decrease of strength [of a material] by repetitive loading’”) (quoting Ex. 1014 (ASTM Dictionary of Engineering Science & Technology), 3; also citing Ex. 1020 (Suresh, Fatigue of Materials), 20, 37; Ex. 1031 (Rules of Thumb for Mechanical Engineers),

79); *see also* Ex. 2036 (Mostovoy Decl.) ¶ 35 (“Fatigue is the weakening of a material caused by repeatedly applied loads.”).

For the reasons discussed above, Petitioner has shown by a preponderance of the evidence that Brovold anticipates claim 1.

Petitioner asserts an alternate reading of Brovold that seeks to have us understand Brovold’s disclosure of “cycling . . . generally under a low number of cycles” (Ex. 1003, 2:29–32) to mean cycling the part between 100 and 10,000 cycles. Reply 11–12. Specifically, Petitioner asserts that this disclosure in Brovold would be understood by a person having ordinary skill in the art to mean 100 to 10,000 cycles. *Id.* In support of this assertion, Petitioner cites to various excerpts from the deposition of Patent Owner’s expert. *Id.* (citing Ex. 1068). We do not agree with Petitioner that Patent Owner’s expert conceded that one having ordinary skill in the art reading Brovold would understand Brovold to disclose cycling the part 100 to 10,000 cycles. *See, e.g.*, Ex. 1068, 212:14–19, 234:11–17 (Patent Owner’s expert disagreeing that one of skill in the art reading Brovold would understand a low number of cycles in Brovold to be 100 or 1,000 cycles). Petitioner also cites to its own expert’s testimony as to how one having ordinary skill in the art would read Brovold. Reply 12 (citing Ex. 1069 (Brovold Depo.), 41:10–42:1, 67:13–25, 69:1–70:8). Brovold describes:

In some instances, the controls 83 can be programmed to fatigue fail the bearing housing 13. The part may be cyclically loaded two or three times before fracture by controlling the pressure displacement or time cycle and having the servo-valve programmed to repeat the needed cycle.

Ex. 1003 (Brovold), 6:19–24. According to Petitioner, “fatigue fail” in the first sentence of this description above refers to cyclically loading the part

100 to 10,000 times until a microcrack develops. Reply 12–13. First, Petitioner’s position is not supported adequately by Mr. Brovold’s testimony. Mr. Brovold stated during his deposition that the disclosure in his patent of a “low number of cycles” is not specific to a particular number of cycles, and that it refers to “a number that would be determined to be low” based on the manufacturer, the hardness of the material, the type material, the size and shape of the part, and the time to break the part. Ex. 1069 (Brovold Depo.), 41:10–42:1, 67:13–25. Second, we do not find this proposed interpretation consistent with the remainder of the Brovold disclosure, which appears to describe the fatigue failure occurring after cyclically loading the part two or three times. If Petitioner’s theory were correct, then the second sentence of the description above would describe cyclically loading the part an additional two or three times to cause fracture. We find the Patent Owner’s interpretation of Brovold is consistent with the entire disclosure of Brovold and is the more persuasive interpretation. Mr. Brovold’s testimony, after the fact, as to what his own reference discloses is less probative than the words actually written in the reference itself.

Petitioner also cites to “objective evidence” to support its interpretation of “low number of cycles” to mean fatigue for 100 – 10,000 cycles. Reply 12 (citing Ex. 2009, 5, Fig. 4; Ex. 1031, 34; Ex. 2045, 2). We have considered this evidence but do not find that it adequately supports Petitioner’s reading of Brovold.

Exhibit 2009 is a paper written in 2002 that studied fracture splitting of powder forged connecting rods. Ex. 2009, 3. Figure 4 of the paper shows a testing setup for fracture splitting of connecting rods using an MTS Test Machine that conducted a dynamic test at 10 Hz. *Id.* at 5, Fig. 4. This

disclosure describes one way to fracture a connecting rod using a dynamic load, but it does not define or otherwise shed light on the number of cycles one having ordinary skill in the art would have understood Brovold to have meant by “low number of cycles.”

Exhibit 1031 is a document entitled Rules of Thumb for Mechanical Engineers. This document, in describing fatigue testing, states that “[t]he limit between high-cycle and low-cycle fatigue can also be drawn based on the number of cycles sustained prior to failure—typically fewer than 10^4 cycles.” Ex. 1031, 34. Likewise, Exhibit 2045, a Wikipedia entry for “fatigue,” describes “low cycle fatigue” as “loading that typically causes failure in less than 10^4 cycles). Ex. 2045, 2. These document explain an understanding in the art of the general distinction between low-cycle and high-cycle fatigue but they do not exclude a reading of Brovold’s disclosure of a “low number of cycles” to mean 2–3 cycles. For these reasons, we understand Brovold’s disclosure of “cycling the members to cause fatigue breaks, generally under a low number of cycles” to refer to cycling the members 2–3 times before fracture. However, even under this reading of Brovold, for the reasons explained above, we find that Petitioner has shown that Brovold anticipates claim 1.

3. Dependent Claims 7, 9, and 10

Petitioner challenges claims 7, 9, and 10 based on anticipation by Brovold. Pet. 51–52. Patent Owner does not address these contentions. PO Resp. 47 (dependent claims 7, 9, and 10 not argued separately from the arguments presented for claim 1).

Dependent claim 7 further limits the optional pre-stressing force of limitation (a) of claim 1. Ex. 1001, 8:16–22. As noted by Petitioner, “this

language remains optional and non-limiting.” Pet. 51–52. Thus, dependent claim 7 is anticipated for the same reasons discussed above for claim 1.

Dependent claim 9 recites “wherein said part is a connecting rod, said first portion is a cap portion and said second portion is a rod portion.” Ex. 1001, 8:32–34. As discussed above in our analysis of claim 1, Brovold discloses a process for separation of bearing housing 13 of connecting rod 11 into cap 15 (cap portion) and yoke 14 (rod portion). Ex. 1003, 2:58–61, Fig. 2; *see also* Pet. 52 (citing Ex. 1007 ¶¶ 172–173).

Dependent claim 10 recites that the “at least one fatigue force” of claim 1 is “said longitudinal cyclic force.” Ex. 1001, 8:35–41 (limiting step (b) to option (i)). As discussed above in our analysis of claim 1, Brovold discloses this limitation. *See* Section II.D.2. above; *see also* Pet. 52 (citing Ex. 1007 ¶¶ 174–175).

For these reasons, we find that Petitioner has shown that Brovold anticipates claims 7, 9, and 10.

4. *Obviousness of Challenged Claims*

Petitioner also presents an alternate challenge to the contested claims based on obviousness over Brovold. Pet. 50–51. Because anticipation is the epitome of obviousness, Petitioner has met its burden of showing obviousness of the challenged claims over Brovold for the reasons discussed above that Brovold discloses each and every limitation of the claims. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019) (“[I]t is well settled that ‘a disclosure that anticipates under § 102 also renders the claim invalid under § 103, for anticipation is the epitome of obviousness.’”) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). Although the obviousness analysis under *Graham* also requires

consideration of objective indicia of nonobviousness, in this case, Patent Owner has not submitted any such evidence.⁸

E. Anticipation by, or Obviousness over, Cavallo (Ground 2)

1. Overview of Cavallo

Cavallo describes that prior approaches for fracturing connecting rods were “essentially mechanical or hydraulic.” Ex. 1004, 1:45-46. Cavallo explains a drawback in conventional mechanical parting procedures is that “the blow transmitted by the striking mass must act so that it is exactly centered on the axis of symmetry of the connecting rod.” *Id.* at 1:59–61. Thus, the procedure entails requirements that negatively affect the manufacturing and running costs of the machine and negatively affect efficiency in terms of the parts machined per unit time. *Id.* at 1:61–2:2. This mechanical procedure also entails considerable and quick wear of the contact surfaces of the machine parts due to the intensity of the forces involved. *Id.* at 2:3–6.

Cavallo explains that a drawback in conventional hydraulic parting procedures is “the relatively slow rate at which the pressure of the hydraulic fluid fed into said hydraulic cylinder reaches the value required to part the cap.” *Id.* at 2:22–25. Cavallo describes that the material of the cap undergoes yielding and elongation, which negatively affect both the microcrystalline structure of the parting sections and the geometry of the

⁸ Patent Owner belatedly presented arguments directed to secondary considerations of nonobviousness in its Sur-reply. Sur-reply 30. Patent Owner later agreed to strike this portion of its Sur-Reply. Paper 37 (Joint Stipulation stating that Patent Owner will not rely on the secondary considerations argument in the Sur-Reply).

connecting rod, causing problems in the subsequent assembly of the cap. *Id.* at 2:25–30. As one example of a “typical hydraulic parting procedure,” Cavallo references the Brovold patent. *Id.* at 2:13–22.

Cavallo is directed to combining the advantages of mechanical and hydraulic parting procedures, while eliminating their respective drawbacks. *Id.* at 2:36–38. Cavallo addresses these drawbacks by combining the two parting procedures using a mixed hydraulic and mechanical procedure. *Id.* at 2:66–67. The application of hydraulic pressure to the connecting rod according to Cavallo is shown in Figure 4 below.

FIG. 4

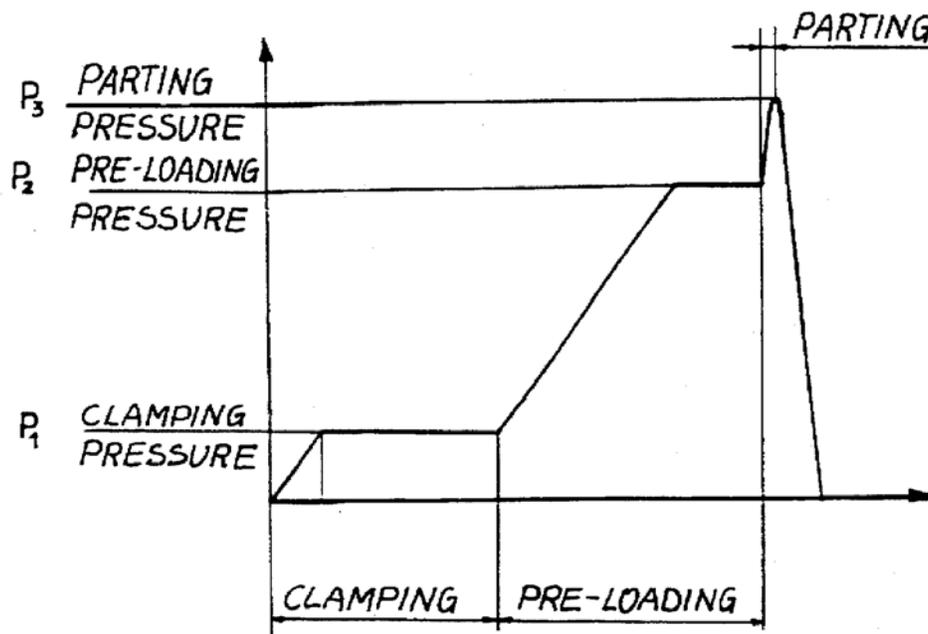


Figure 4 is a plot of the pressure of the fluid at each parting cycle. *Id.* at 3:61–62. In Cavallo’s procedure, the connecting rod is acted on by hydraulic forces at a pre-loading pressure lower than one required to reach the yield point of the material, and is subsequently acted on by an

instantaneous peak in hydraulic fluid pressure, wherein the fluid pressure is increased through the momentary action of a mechanical striking mass, in order to fracture the rod. *Id.* at 3:5–13.

Machine 10 used to implement Cavallo's procedure is shown below in Figure 3.

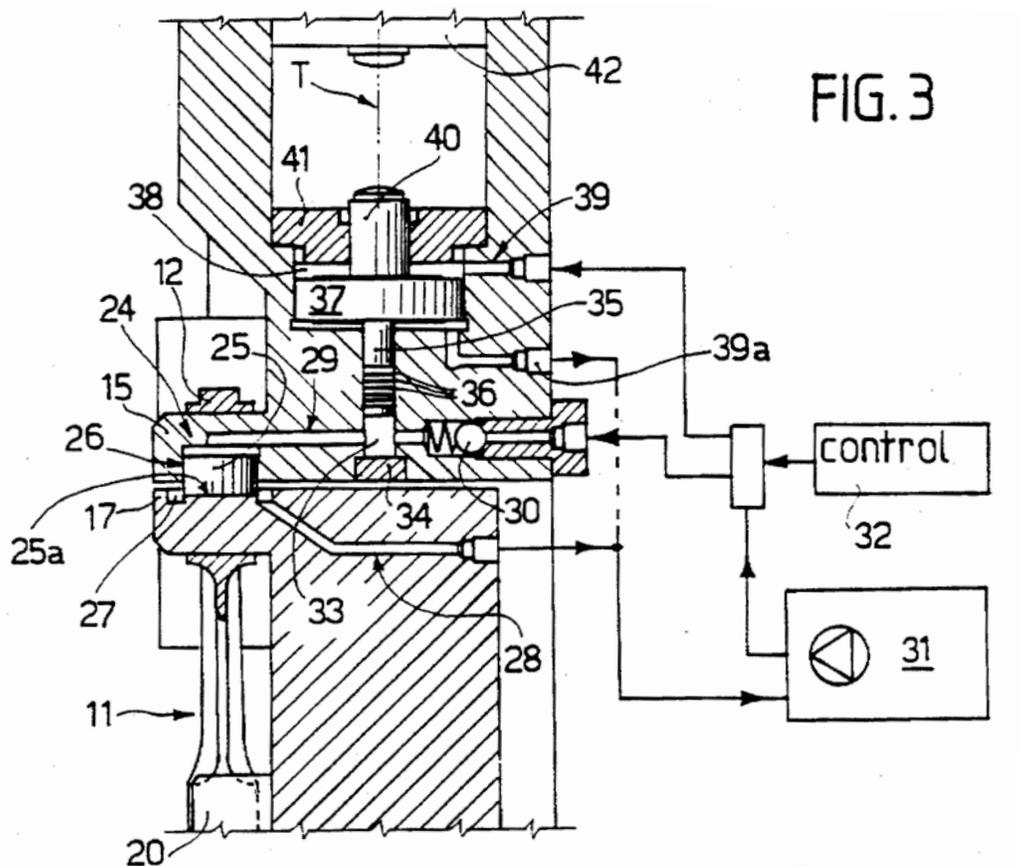


Figure 3 is a sectional view of a portion of machine 10 acting on connecting rod 11. *Id.* at 3:59–60, 3:66–4:1. As shown above, similar to Brovold, hydraulic actuator 24 is interposed between fixed fixture 15 and movable fixture 17 of machine 10 to cause expansion of the fixtures in a diametrical direction against the inner surface of the eye of connecting rod 11 to part cap 12 from the rod. *Id.* at 4:33–40. Cavallo teaches that “parting

occurs along a parting plane that passes through diametrically opposed initiation grooves provided on the inner surface of the eye of rod 11. *Id.* at 4:41–44. Also, similar to Brovold, Cavallo’s machine 10 uses control 32 to control valve 30 to feed fluid from source 31 to hydraulic actuator 24. *Id.* at 4:55–59. As in Brovold, Cavallo’s machine 10 also includes multiplier piston 37, to which fluid is fed via control 32 and valve 30. *Id.* at 4:62–5:4. Cavallo describes that fluid is fed to hydraulic actuator 24 at a moderate pressure, shown above in Figure 4 as clamping pressure P1, and then is fed via multiplier piston 37 to raise the pressure of the fluid in actuator 24 to pre-loading value P2. *Id.* at 4:59–61, 5:2–9. Cavallo describes that pre-loading pressure P2 produces a force that is “lower than the yield point of the metal of the connecting rod 11.” *Id.* at 5:9–11.

Cavallo’s machine 10 also includes striking mass 42, which acts on second rod 40 of multiplier piston 37 to produce a momentary pressure peak P3 as shown in Figure 4 in the cylinder of actuator 24. *Id.* at 5:14–23. This momentary pressure peak causes actuator 24 to discharge a momentary force into fixtures 15, 17 capable of instantaneously parting cap 12. *Id.* at 5:24–25. Cavallo teaches that the momentary nature of the action of actuator 24 on fixtures 15, 17 avoids yielding and elongation of the material of connecting rod 11. *Id.* at 5:26–30.

Thus, Cavallo describes an improvement to Brovold’s tool system and parting method, in which Cavallo uses Brovold’s hydraulic system to apply clamping and pre-loading pressures below the yield point of the material of the connecting rod, and uses Cavallo’s striking mass to impart a momentary pressure peak sufficient to part the rod. *Id.* at 2:13–39; Ex. 1007 ¶ 120.

2. Analysis of Claim 1

Petitioner asserts that “[u]nder a broad construction of ‘fatigue force,’” Cavallo discloses applying a cyclic, longitudinal fatigue force. Pet. 56. Specifically, Petitioner asserts that Cavallo’s application of pre-loading pressure P2 varies over time from a lower magnitude P1 to a higher magnitude P2. *Id.* at 56–57. Petitioner argues that this force can be considered to be a force that cycles because “[a] skilled artisan would recognize that this force is repeated with each connecting rod as one cycle (the pre-load cycle) in the overall fracturing process, during which the pressure increases from an initial pressure to a higher pressure and resets back to the initial pressure for the next fracturing operation.” *Id.* at 59–60.⁹ Based on our interpretation of “cyclic” to require a recurrent application force, we determined, in our Institution Decision, that Petitioner had not met its burden to show a reasonable likelihood of prevailing based on the unpatentability of the challenged claims over Cavallo. Inst. Dec. 28. Petitioner did not present any further evidence or arguments in its Reply addressing this proposed ground. We determine that Petitioner has not met its burden to show that the challenged claims are anticipated by, or obvious over, Cavallo alone because we disagree with Petitioner’s interpretation of “cyclic” to encompass Cavallo’s pre-loading pressure.

F. Obviousness over Brovold in Combination with Cavallo (Ground 3)

Petitioner asserts that even if the Board concludes that Brovold fails to disclose the dynamic force limitation of step (c), claim 1 is obvious in light

⁹ Petitioner’s alternative assertion that claims 1, 7, 9, and 10 are unpatentable as obvious over Cavallo likewise are based on this same interpretation of “cyclic.” Pet. 63.

of Cavallo's teaching to use an impulsive dynamic force. Pet. 65–66. According to Petitioner, Cavallo teaches adding an impulsive dynamic force to hydraulic fracturing systems to overcome drawbacks of hydraulic fracturing systems, such as the relatively slow speed of the process as compared to a strong impact force. *Id.* at 66 (citing Ex. 1004, 2:10–26, 2:33–39). Petitioner argues that a skilled artisan would have been motivated by the teaching in Cavallo of adding an impulsive force to a hydraulic force to, for example, modify Brovold's piston 70 in view of Cavallo's piston 37 and adding Cavallo's striking mass. *Id.* (citing Ex. 1007 ¶¶ 209–212). Petitioner asserts that Cavallo demonstrates “the magnitude of the impulsive force can be smaller when added to the forces generated by the hydraulic forces,” thus making it obvious to a skilled artisan to apply the impulsive force during application of Brovold's fatigue force. *Id.* at 66–67 (citing Ex. 1004, Fig. 4; Ex. 1007 ¶¶ 212–213). Petitioner asserts that a skilled artisan would have been motivated to make such a modification to Brovold's system to “decrease the amount of time needed to fracture a component or to improve on the hydraulic fracturing process, as explicitly taught by Cavallo.” *Id.* at 66 (citing Ex. 1007 ¶¶ 212–213).

Patent Owner asserts that “one of skill in the art would not combine Cavallo's alleged instantaneous force with Brovold's low-cycle, ductile force at least because Cavallo's [sic] fails to provide any teaching or suggestion that its instantaneous force may be lower than [sic, than] the force already applied by Brovold to split the part.” PO Resp. 36–37 (citing Ex. 2042 (Supp. Mostovoy Dec.) ¶ 41).

We understand Cavallo's identification of the drawbacks with Brovold's method, and Cavallo's discussion of an improvement to this

method, to be directed to the process of using Brovold's hydraulic system to part the cap in a single shot. *See* Tr. 27:10-16 (Petitioner's counsel agreeing that Cavallo's disclosed pre-loading force does not weaken the part, and that its purpose is to ramp up the hydraulics to the point where you need less of the impulsive force to separate the part); *id.* at 29:4–24 (admitting that Cavallo's disclosed improvement to Brovold is probably just to the single shot embodiment of Brovold). Petitioner has not provided an adequate explanation of why one having ordinary skill in the art, upon reading Cavallo, would use Brovold's fatigue embodiment in combination with Cavallo.

Petitioner's explanation of a reason to combine the prior art in the manner claimed fails to account for the fact that Cavallo's express teaching is directed to an improvement to Brovold's process of fracturing the part in one shot. Petitioner relies on Brovold's alternate fatigue embodiment to disclose the claimed cyclic force, yet the combination suggested by Cavallo would result in a system that improves not upon Brovold's fatigue embodiment, but upon Brovold's single shot embodiment, and would not necessarily lead one skilled in the art to a system that includes the claimed cyclic force. Petitioner has not explained adequately why one having ordinary skill in the art would have been led to implement this combination in the manner claimed. For instance, Petitioner's expert explains that it would have been nothing more than the predictable use of prior art elements according to their established functions to modify Brovold to add Cavallo's impulsive force at either the peak of Brovold's fatigue force or simply during the application cycle of Brovold's fatigue force. Ex. 1007 (Brovold Dec.) ¶ 213. Petitioner's expert cites, however, to the disclosure in the '915

patent as support. *Id.* n.15. Petitioner’s rationale for the combination is based on the express teaching in Cavallo of an improvement to Brovold, yet this express teaching is directed to Brovold’s single shot embodiment.

For these reasons, Petitioner has not met its burden to show obviousness of independent claim 1 and dependent claims 7, 9, and 10 over Brovold in view of Cavallo.

G. Obviousness over Cavallo in Combination with Brovold (Ground 4)

1. Analysis of Claim 1

Petitioner asserts in proposed Ground 4 that even if the Board concludes that Cavallo fails to disclose the cyclic fatigue force limitation of step (b)(i), claim 1 would have been obvious over Cavallo in light of Brovold’s teaching to use a cyclic fatigue force in a rod fracture system. Pet. 68. Petitioner asserts that Cavallo uses hydraulics to exert its pre-load force on the rod, and Cavallo specifically identifies Brovold as an exemplary hydraulic process as a reference point for its “mixed hydraulic and mechanical procedure.” *Id.* (citing Ex. 1004, 2:13–22, 2:66–3:9). Petitioner argues that “a skilled artisan would have readily considered incorporating Brovold’s hydraulic, longitudinal, cyclic force as part of (or instead of) Cavallo’s “pre-loading” step. *Id.* (citing Ex. 1007 ¶¶ 224–226). Petitioner further provides evidence of motivation to use fatigue to reduce the magnitude of the force necessary to fracture the rod to avoid wear of parts used to fracture the rod, and provides evidence that a skilled artisan would have known that applying a cyclic fatigue force would lower the force required to complete the fracture separation of the part. *Id.* at 69 (citing Ex. 1004, 2:3–6; Ex. 1007 ¶ 227). Petitioner’s expert notes that Cavallo recognizes how the “intensity of the forces” involved in prior art mechanical

parting procedures created “considerable and quick wear of the contact surfaces of the machine parts that are subjected to the parting force.” Ex. 1007 ¶ 227 (quoting Ex. 1004, 2:3–6). Petitioner’s expert opines that “a skilled artisan would have known that applying a cyclic fatigue force would lower the fracture strength of the connecting rod, thus requiring a lower-magnitude impulsive force to complete the fracture separation.” *Id.* Thus, Petitioner contends that modifying Cavallo to include a cyclic fatigue force, as taught by Brovold, would have been “nothing more than the ‘predictable use of prior art elements according to their established functions.’” Pet. 69 (quoting *KSR*, 550 U.S. at 417 and citing Ex. 1007 ¶¶ 227, 233).

Patent Owner’s expert agrees that “[a] person of ordinary skill in the art in 1999 would have understood that a fatigued connecting rod requires a lower magnitude dynamic force for fracture than does a connecting rod that has not been fatigued.” Ex. 1068, 109:16–21. Patent Owner’s expert also agrees that “by adding the fatigue in place of Cavallo’s pre-load . . . you don’t need as large of a parting pressure.” *Id.* at 281:1–4. Patent Owner argues, however, that the combination does not result in the claimed method because Brovold does not teach or suggest application of a fatigue force that is a longitudinal cyclic force to weaken the part. PO Resp. 37 (arguing that Brovold only discusses “fatigue” for causing “fatigue failure” or “fatigue break,” not weakening). Although Brovold teaches applying a longitudinal cyclic force until the part separates, and Brovold does not explicitly disclose that each cycle of the cyclic force prior to separation results in weakening of the part, Brovold does discuss the use of its hydraulic parting method to “fatigue” the part. Ex. 1003, 6:19–24. A person of ordinary skill in the art

would have understood “fatigue” in Brovold to refer to a “decrease of strength [of a material] by repetitive loading.” Ex. 1007 ¶ 67 (quoting Ex. 1014 (ASTM Dictionary of Engineering Science & Technology), 3; also citing Ex. 1020 (Suresh, *Fatigue of Materials*), 20, 37; Ex. 1031 (Rules of Thumb for Mechanical Engineers), 79); *see also* Ex. 2036 (Mostovoy Decl.) ¶ 35. A person having ordinary skill in the art also would have been familiar with using fatigue in the connecting rod fracturing process. Ex. 1007 (Brovold Decl.) ¶ 69 (citing Ex. 1003, 2:18–32; Ex. 1006, 1:11–19, 1:68–2:7, 2:37–57). Thus, Brovold’s teaching of using its hydraulic system to “fatigue” the part until failure would have been understood by one having ordinary skill in the art to be a teaching to use its hydraulic system to repeatedly apply loads to the part, where application of each cycle of the load results in weakening of the part.

Further, Patent Owner’s argument fails to squarely address the proposed application of Brovold’s teaching of a hydraulic system capable of fatiguing a part to the method of Cavallo, which uses Brovold’s hydraulic system to apply a pre-load force to the part that is below the yield point of the material of the part. *Compare* Ex. 1004, Fig. 4, *with* Ex. 1003, Fig. 1. In light of Cavallo’s teaching to pre-load the part below the yield point (Ex. 1004, 2:66–3:9) and its teaching to use a hydraulic system like Brovold’s for this pre-loading (*id.* at 3:29–36), and its recognition of a desire to lower the intensity of the forces required to separate the part to avoid wear of the contact surfaces of the machines parts (*id.* at 2:3–6), and in light of Brovold’s suggestion that its hydraulic system can be used to “fatigue” the part (Ex. 1003, 6:19–24), and the background knowledge of one having ordinary skill in the art that fatiguing a part will result in weakening the part,

which will result in a lower force required to break the part, we are persuaded by Petitioner's reasoning, based on the evidence provided, that one having ordinary skill in the art would have been led to employ Brovold's hydraulic system to apply a longitudinal cyclic force to weaken the part during the pre-load portion of Cavallo's method in order to lower the amount of impact force required to subsequently break the part. Ex. 1007 ¶¶ 120, 226–227.

Patent Owner argues that Cavallo criticized Brovold's use of a low number of cycles of a load to cause ductile fracture. PO Resp. 38 (citing Ex. 1004, 2:22–30; Ex. 2036 (Mostovoy Decl.) ¶ 36).¹⁰ Cavallo criticizes hydraulic parting methods, such as the method disclosed in Brovold, because the relatively slow rate at which the hydraulic cylinder reaches the value required to part the cap results in yielding and elongation of the material of the cap. Ex. 1004, 2:22–30. As explained by Patent Owner's expert, "low-cycle fatigue [is] when the stress level approaches or exceeds the yield stress and the deformation is in the plastic range." Ex. 2036 ¶ 36. Even if we assume as true Patent Owner's assertion that Brovold's methods of parting the cap causes deformation in the plastic range, Cavallo cures this deficiency by using Brovold's hydraulic machine in a manner that applies a pre-load force, where the pre-loading pressure is lower than the one required to reach the yield point of the material. Ex. 1004, 3:5–9. One having ordinary skill in the art would have understood, based on the teaching in Cavallo, to apply the pre-load force at a pressure below the yield point, and

¹⁰ Patent Owner also cites to Exhibit 2040 (Yu Statement). Because we exclude this evidence as inadmissible hearsay, as discussed below, we do not consider it here.

that if one were to use Brovold's hydraulic system to fatigue the part during the pre-load stage, it would need to do so in a manner that applies the fatigue load to maintain the stress level below the yield point. *See, e.g.*, Ex. 1031, 34 (Fig. 19) (showing that it was known in the art that higher stress cyclic loads cause plastic deformation (yielding) and lower stress cyclic loads are elastic (below yield point)).

To the extent that Patent Owner's arguments are based on bodily incorporation of Brovold's specific cyclic load amount used to fracture the part, we do not understand Petitioner's proposed Ground 4 to be based on such a bodily incorporation of Brovold's system into Cavallo. This is particularly the case in view of Petitioner's assertion that a skilled artisan would be able to modify the control 32 of Cavallo to include the cyclical fatigue controls provided by the servo-valve and controls of Brovold as a matter of routine engineering work. Ex. 1007 ¶ 227. Further, Patent Owner's expert concedes that there is nothing unpredictable about Brovold or Cavallo. Ex. 1068, 257:10–12, 258:3–5, 9–11. And, Patent Owner's expert admits that there are numerous ways a person having ordinary skill in the art would know how to add cyclic fatigue forces to Cavallo. *Id.* at 253:10–24, 225:11–16, 226:5–227:4.

Petitioner has presented adequate evidence and reasoning to meet its burden to show why one having ordinary skill in the art would have been led to modify Cavallo with the teachings of Brovold in the manner claimed, resulting in the method of claim 1.

2. *Dependent Claims 7, 9, and 10*

Petitioner challenges claims 7, 9, and 10 based on obviousness over Cavallo in view of Brovold. Pet. 67–69. As discussed above in Section

II.D.3., Petitioner presented sufficient evidence in the Petition to meet its burden to show unpatentability of dependent claims 7, 9, and 10 over Cavallo in view of Brovold. Pet. 51–52 (demonstrating where these dependent claim limitations are disclosed in Brovold); *id.* at 63 (demonstrating where the limitations of claim 9 also are disclosed in Cavallo). Patent Owner does not address substantively Petitioner’s challenge to these dependent claims. PO Resp. 37–39, 47.

Thus, Petitioner has shown that claims 1, 7, 9, and 10 are unpatentable over Cavallo and Brovold.

H. Obviousness over Brovold in Combination with Bayliss and/or Becker (Ground 5)

1. Overview of Bayliss

Bayliss relates to parting-off a length from metal bar stock, such as steel. Ex. 1006, 1:11–12. Bayliss describes weakening a bar using a sharp notch and “applying alternating stresses to induce rapid fatigue failure of the bar at the weakened section.” *Id.* at 1:15–19. Bayliss recognizes the problem with ductile necking at the area of the fracture, which causes an undesirably wide variation in the shape of the parted-off section. *Id.* at 1:32–38. To address this problem, Bayliss teaches applying the alternating stresses while the part of the bar undergoing the stress is maintained at a temperature below the brittle/ductile transition temperature of the metal. *Id.* at 1:40–44. Bayliss teaches that the frequency of alternation of the stresses and their magnitude depends on the metal of the bar stock, its cross-sectional area, and shape. *Id.* at 2:13–16. Bayliss teaches that “[b]y increasing the frequency of the stress reversals, fracture can be brought about in a much shorter time.” *Id.* at 2:58–59.

2. Overview of Becker

Becker teaches a means to produce a dynamic force to separate a connecting rod. Ex. 1005, 3:22–60, 4:6–21. Becker describes fracturing connecting rods using “either an impulsive force or a relatively slowly applied force” longitudinally applied to the connecting rod through “semi circular dies” (33, 35) placed in the bore of the connecting rod. *Id.* at Abstract, 3:22–4:21, 7:66–8:6, Fig. 11. Becker discloses applying an impulsive force to the connecting rod using “a fluid powered system with an appropriately designed accumulator.” *Id.* at 3:22–27.

3. Analysis of Claim 1

Petitioner asserts that if Brovold does not disclose the cyclic fatigue force of limitation (b) of claim 1, then Bayliss discloses such a force. Pet. 71 (citing Ex. 1006, 1:15–26, 2:8–22; Ex. 1007 ¶¶ 240–241). Petitioner asserts that a skilled artisan would have been motivated to modify Brovold to use the cyclic fatigue forces of Bayliss “in order to, *e.g.*, ensure positive force on the connecting rod, thereby ensuring continuous contact with the connecting rod and thus preventing slack or play in the system.” *Id.* at 72 (citing Ex. 1007 ¶ 243).

In our Institution Decision, we found inadequate explanation in the Petition of a reason to modify Brovold in the manner claimed. Inst. Dec. 35. We found that Petitioner’s proffered reasoning to modify Brovold to use the cyclic forces of Bayliss was too conclusory to demonstrate a reasonable likelihood of prevailing on this proposed ground of unpatentability. *Id.* Petitioner did not present any further evidence or arguments in its Reply addressing this proposed ground. Reply 2 (omitting discussion of Ground 5). We find that Petitioner has not met its burden to show unpatentability of

the challenged claims over Brovold in view of Bayliss because Petitioner failed to provide an adequate explanation of the reason that a skilled artisan would have been led by Bayliss to modify Brovold in the manner claimed. Specifically, Petitioner's expert's conclusory statement of the reason for the proposed modification, "e.g., to ensure positive force on the connecting rod," was not supported by adequate reasoning or evidence. Ex. 1007 ¶ 243.

Petitioner also asserts that if Brovold does not disclose the dynamic force of limitation (c) of claim 1, then Becker discloses such a force. Pet. 72–73 (citing Ex. 1005, 3:24–60, 4:6–21; Ex. 1007 ¶¶ 240–241). Petitioner asserts that a skilled artisan would have been motivated to modify Brovold to use the dynamic forces of Becker "in order to, e.g., decrease the number of fatigue force cycles and/or to decrease the amount of time needed to fracture a component, thereby reducing the resources needed for each fracture separation operation and creating a more efficient overall process." *Id.* at 74 (citing Ex. 1007 ¶ 251). This ground is based on the premise that Brovold fails to disclose using both a cyclic force and a dynamic force to fracture the connecting rod. *Id.* As discussed above in our analysis of Ground 1, we determined that Brovold discloses a fatigue embodiment that employs both a cyclic force (the first two cycles) and a dynamic force (a third cycle) to fracture a connecting rod. Becker does not appear to suggest using a cyclic fatigue force and a dynamic force in combination. Rather, Becker's impulsive force appears cumulative of Brovold's single shot embodiment. Thus, Petitioner has not explained adequately what would have led one having ordinary skill in the art to modify Brovold's fatigue embodiment to add Becker's dynamic force.

I. Obviousness over Brovold in Combination with Cavallo, and Bayliss and/or Becker (Ground 6)

This challenge to the claims is based on the proposed modification of Brovold with Cavallo that we found unavailing above.¹¹ See Section II.F. above (discussing Ground 3). This challenge also is based on the further modification of the Brovold/Cavallo combination with the cyclic fatigue force of Bayliss, as presented in Ground 5. We likewise found this proposed modification unavailing. See Section II.H.3 above (discussing Ground 5). The additional disclosure of Becker relied on by Petitioner does not cure the deficiencies in the combination of Brovold, Cavallo, and Bayliss as proposed by Petitioner. For the reasons discussed above, we find that Petitioner has not shown by a preponderance of the evidence that claims 1, 7, 9, and 10 are unpatentable over Brovold in view of Cavallo and Bayliss and/or Becker.

J. Obviousness over Cavallo in Combination with Bayliss (Ground 7)

1. Analysis of Claim 1

Petitioner asserts that it would have been obvious to a skilled artisan to modify Cavallo to apply the longitudinal cyclic fatigue force of Bayliss, “to, e.g., fatigue the connecting rod and thereby reduce the magnitude of the

¹¹ Ground 6 is based on the premise that if Brovold, as modified by Cavallo as discussed in Ground 3, does not disclose the cyclic fatigue force of limitation (b) of claim 1, then Bayliss discloses such force. Pet. 76 (referring to the discussion of Bayliss from Ground 5). Ground 6 also is based on the premise that if Brovold, as modified by Cavallo as discussed in Ground 3, does not disclose the dynamic force of limitation (c) of claim 1, then Becker discloses such force. Pet. 76–77 (referring to the discussion of Becker from Ground 5).

forces required to fracture the connecting rod,” thereby avoiding wear of the machines parts. Pet. 79 (citing Ex. 1004, 2:3–6).¹² Petitioner asserts that the proposed modification “would have involved nothing more than routine engineering work, for example, modifying the ‘control 32’ in Cavallo and adding a servo-valve to produce those cyclic fatigue forces.” *Id.* (citing Ex. 1007 ¶¶ 300–306, 312–314). Petitioner asserts that this modification “would have been nothing more than ‘the predictable use of prior art elements according to their established functions.’” *Id.* at 79–80 (citing *KSR*, 550 U.S. at 417; Ex. 1007 ¶ 305).

We agree with Petitioner’s contention that Bayliss discloses application of longitudinal cyclic fatigue forces because Bayliss discloses application of cyclic fatigue forces in the form of longitudinal, tensile “positive half-waves of [] alternating stress,” perpendicular to the fracture plane, which is predetermined by a stress-riser notch. Pet. 35–36 (citing Ex. 1006, 1:11–19, 1:24–26, 1:68–2:22, 2:37–57; Ex. 1007 ¶ 131), 71 (citing Ex. 1006, 1:15–26, 2:8–22; Ex. 1007 ¶¶ 240–241), 79; Reply 23 (citing Exs. 1051–1054 (drawings submitted by Petitioner to depict the purely tensile embodiment disclosed in Bayliss); Ex. 1068, 153:16–154:16, 155:4–8, 156:12–158:12 (Patent Owner’s expert agreeing that Exhibits 1051–1054 are an acceptable depiction of the tensile embodiment of Bayliss)). Patent Owner’s expert concedes that Bayliss’s alternating tensile fatigue force is

¹² Petitioner also contends that it would have been obvious to modify Cavallo to add an application of Bayliss’s longitudinal “pre-stress” force. Pet. 78 (addressing element (a)(1) of claim 1). Because the parties have stipulated that element (a) of claim 1 is non-limiting, we do not address this proposed modification to Cavallo.

applied to one portion of the metal bar relative to the other, in a direction substantially perpendicular to the predetermined fracture plane, is a longitudinal cyclic force, changes with time, causes fluctuation of stresses, regularly repeats between a maximum and minimum value. Ex. 1068, 158:2–162:11.

Patent Owner argues Bayliss’s alternating force

is not operable for the separation of connecting rods because:

(1) Bayliss admits that its application of alternating forces applied to the metal bar stock itself, causes ductile necking and tries to solve that problem by [sic, by] introducing a cooling step; (2) application of the stress on the metal bar stock causes friction which results in damage that is inappropriate in the connecting rod industry; [and] (3) Bayliss does not teach ending application of its alternating stresses prior to parting of the bar stock in order to apply a dynamic force.

PO Resp. 43; *see also* Sur-reply 23–29 (raising similar arguments). We address each argument in turn below.

First, Patent Owner’s argument that Bayliss’s method requires use of a cooling step does not convince us that one having ordinary skill in the art would not have used Bayliss’s teaching in Cavallo’s method. The fact that the challenged patent does not describe the use of a cooling step is immaterial, because the challenged claims do not preclude using cooling in combination with application of the cyclic fatigue force. Sur-Reply 29 (arguing that “the ’915 Patent does not disclose, much less require, cooling”); Ex. 1001, 7:20–36 (step (b) of claim 1 does not preclude cooling); Ex. 1068, 36:2–4, 184:20–186:12 (Patent Owner’s expert admitting that the claims do not require the absence of cooling or any specific temperature; the claims cover a process that includes cooling; a person having ordinary skill

in the art would understand the process of the '915 patent could use cooling; and cooling “would work just fine” for some materials). Further, as to the suitability of using Bayliss’s method to separate a connecting rod, Patent Owner’s expert concedes the relevant Bayliss embodiment results in “two surfaces” that “are probably good enough [that] you could connect them together.” Ex. 1068, 270:24–271:5.

Patent Owner argues that the reduction in temperature required by Bayliss would undesirably increase the time frame for separation of the metal stock. PO Resp. 45 (citing Ex. 2042 (Supp. Mostovoy Dec.) ¶ 49)). Paragraph 49 of the Supplemental Mostovoy Declaration relied on by Patent Owner does not address, however, either reduction in temperature required by Bayliss or the amount of time required to reach the needed temperature. Elsewhere in the Supplemental Declaration, Patent Owner’s expert states that Bayliss is not suitable for fracturing connecting rods because it is extremely slow and requires an expensive and complex cooling step as well as very deep notching. Ex. 2042 ¶ 57. This conclusory statement by Patent Owner’s expert is not supported by evidence or explanation of how long it would take to reach the reduced temperature. Further, Patent Owner’s expert acknowledged that Bayliss’s cooling “is not a fixed temperature,” is material-dependent, and is “very difficult to pre-judge.” Ex. 1068, 271:14–272:3. Thus, Patent Owner does not adequately support this argument with evidence sufficient to rebut Petitioner’s assertion that one would have used Bayliss’s longitudinal cyclic fatigue to weaken the rod during Cavallo’s method.

As to the impact of adding Bayliss’s longitudinal cyclic force to the time frame for Cavallo’s method, Patent Owner argues that in the example

provided in Bayliss, it took 17 ½ minutes to fracture the rod. PO Resp. 45; *see also* Ex. 2042 (Supp. Mostovoy Dec.) ¶ 58 (arguing that the fractured bar of Bayliss is less than 1/8th the cross sectional area of some connecting rods in the automotive industry). Patent Owner's expert admitted, however, that his statement about Bayliss's bar being less than 1/8th the size of a connecting rod was based on a particularly large connecting rod, and that some connecting rods are admittedly smaller than Bayliss's bar. Reply 24 (citing Ex. 1068, 101:16–102:24, 104:2–10; Ex. 1049 (photo of a connecting rod from a riding lawnmower)); *see also* Ex. 1001, 4:66–5:3 (describing that the method described in the '915 patent is “suitable for the wide variety of connecting rods types and sizes, starting from those intended for light duty applications such as lawnmowers and outboard marine engines, up to the most powerful combustion engines.”). Also, during the deposition of Patent Owner's expert, Dr. Mostovoy admitted that the claims do not require the part to be of any particular size or strength, or require any particular depth of the notch, or require the parting process to be completed within any particular time frame. Ex. 1068, 36:15–23, 37:18–24, 99:10–19.

Bayliss also discloses that fracture of the rod can be accelerated by increasing the frequency of the stress reversals. Ex. 1006, 2:58–59. Thus, a person having ordinary skill in the art would understand how to employ the longitudinal cyclic fatigue force disclosed in Bayliss within an appropriate time frame for use during Cavallo's method to weaken the rod. Ex. 2041 (Brovold Depo. (rough draft)), 93:4–94:2 (Petitioner's expert testifying that given the same stress levels, it will take less time to fracture a part by increasing the frequency of the stress reversals); Ex. 1069 (Brovold Depo.), 95:1–10 (same).

Second, Patent Owner's argument that Bayliss's application of the stress on the metal bar stock causes friction which results in damage that is inappropriate in the connecting rod industry does not convince us that one having ordinary skill in the art would not have used Bayliss's teaching in Cavallo's method. Patent Owner asserts that "the connecting rod prior art did not grip the bar stock due to the friction that would be caused during separation of the part. PO Resp. 45–46 (citing Ex. 2042 ¶ 49); *id.* at 44–45 (citing Exhibit 2042 ¶¶ 69–70). Dr. Mostovoy admitted, however, during his deposition that "in the 30 years between Bayliss being published and 1999 one of skill in the art would understand and know that there are gripping means that could be used in Bayliss that would not damage the part in any way" such as "[h]ydraulic grips by Instrom or MTS." Ex. 1068, 281:11–22; *see also id.* at 187:23–188:12, 191:19–192:12, 193:18–24; Ex. 1055 (depicting gripping means that would not cause friction issues).

Further, it appears that Patent Owner's argument is based, in part, on the fact that the metal bar stock in Bayliss is not disclosed as having a bore, and thus, it does not disclose mechanical means to apply pressure from inside the bore. PO Resp. 44. Dr. Mostovoy conceded during his deposition, however, that Bayliss is not limited to metal bar stock of circular cross-section. Ex. 1068, 163:13–17.

Third, Patent Owner's argument that Bayliss teaches to apply its alternating stresses until fracture or separation of the part does not convince us that one having ordinary skill in the art would not have used Bayliss's teaching in Cavallo's method. First, as noted in Section II.C. above, the claim language does not require stopping the application of the longitudinal, cyclic force prior to application of the dynamic force. Second, the argument

addresses Bayliss individually instead of addressing the combined teachings of Bayliss and Cavallo. Cavallo teaches advantages to using momentary force applied via its striking mass to separate the part. We decline Patent Owner's invitation to overlook this teaching of Cavallo.

In conclusion, Petitioner has demonstrated, by a preponderance of the evidence, the unpatentability of claim 1 over Cavallo in view of Bayliss.

2. Dependent Claims 7, 9, and 10

Petitioner challenges claims 7, 9, and 10 as unpatentable based on obviousness over Cavallo in view of Bayliss. Pet. 78. Petitioner has presented sufficient evidence to demonstrate the unpatentability of these dependent claims.

As discussed above in Section II.D.3., dependent claim 7 further limits the optional pre-stressing force of limitation (a) of claim 1. Ex. 1001, 8:16–22. As noted by Petitioner, “this language remains optional and non-limiting.” Pet. 51–52. Thus, dependent claim 7 is unpatentable for the same reasons discussed above for claim 1.

Dependent claim 9 recites “wherein said part is a connecting rod, said first portion is a cap portion and said second portion is a rod portion.” Ex. 1001, 8:32–34. As discussed above in our analysis of claim 1, Cavallo discloses a process for separation of connecting rod 11 into a first portion (cap 12) and a second portion (the rest of rod 11). Ex. 1004, 3:66–4:3; *see also* Pet. 53 (citing Ex. 1007 ¶ 177).

Dependent claim 10 recites that the “at least one fatigue force” of claim 1 is “said longitudinal fatigue force.” Ex. 1001, 8:35–41 (limiting step (b) to option (i)). As discussed above in our analysis of claim 1, Bayliss

discloses this limitation. *See* Section II.J.1. above; *see also* Pet. 35–36 (citing Ex. 1007 ¶¶ 131–133).

For these reasons, we find that Petitioner has shown that the combination of Cavallo and Bayliss renders unpatentable claims 7, 9, and 10. Patent Owner does not address substantively Petitioner’s challenge to these dependent claims. PO Resp. 43–47.

K. Obviousness over Cavallo in Combination with Brovold and Bayliss (Ground 8)

Petitioner asserts that it would have been obvious to modify the pre-stressing force of Cavallo to use the cyclic fatigue force of Brovold and/or Bayliss based on the same reasoning as set forth in proposed grounds 4 and 7. Pet. 81–82. Patent Owner raises the same arguments presented against proposed grounds 4 and 7. PO Resp. 46; Reply 29.

For the reasons discussed above in our analysis of Grounds 4 and 7, Petitioner has met its burden to show unpatentability of claim 1 over Cavallo in view of Brovold and further in view of Bayliss. Petitioner also has presented sufficient evidence in the Petition to meet its burden to show unpatentability of dependent claims 7, 9, and 10 over Cavallo in view of Brovold and further in view of Bayliss. Pet. 51–52 (demonstrating where the limitations of claims 7, 9, and 10 are disclosed in Brovold); *id.* at 53 (demonstrating where the limitations of claim 9 are disclosed in Cavallo); *id.* at 35–36 (demonstrating where the limitations of claim 10 are disclosed in Bayliss). Patent Owner does not address substantively Petitioner’s challenge to these dependent claims. PO Resp. 46–47.

III. CONCLUSION

On this record, for the reasons provided above, we are persuaded that Petitioner has shown that claims 1, 7, 9, and 10 are anticipated by Brovold and rendered unpatentable by: Cavallo and Brovold; Cavallo and Bayliss; and Cavallo, Brovold, and Bayliss.

IV. PETITIONER'S MOTION TO STRIKE

Petitioner filed a Motion to Strike portions of Patent Owner's Sur-Reply and Exhibits 2051–2056 filed with the Sur-Reply. Paper 35 (“Mot. to Strike”). Thereafter, the parties filed a Joint Stipulation to exclude Exhibits 2011, 2012, 2013, 2014, 2015, 2016, and 2050 from evidence and agreeing to strike arguments presented in Section III.B. of Patent Owner's Sur-Reply relating to secondary considerations. Paper 37 (Joint Stipulation). Patent Owner also filed an Opposition to Petitioner's Motion to Strike. Paper 38 (“Opp. Mot. to Strike”).

In its Motion to Strike, Petitioner contends that Patent Owner presented new claim construction arguments in its Sur-Reply that are outside the scope of a proper sur-reply and unduly prejudicial. Mot. to Strike, 1–4. We disagree with Petitioner's characterization of the claim construction arguments raised in Patent Owner's Sur-Reply as “new.” As discussed above in Section II.C., Patent Owner presented these claim construction arguments in its Patent Owner Response. We deny Petitioner's request to strike these arguments from the Sur-Reply.

Petitioner also seeks to strike Exhibits 2051–2056 and arguments in the Sur-Reply related to these Exhibits. Mot. to Strike 4–5. In support of its request, Petitioner cites to the guidance provided in the PTAB Trial Practice Guide, which states, “[A] sur-reply may not be accompanied by new

evidence other than deposition transcripts of the cross-examination of any reply witness.” *Id.* at 4 (quoting TPG at 14). In its Opposition to the Motion to Strike, Patent Owner describes Exhibits 2051 and 2053 as demonstratives, and asserts that Exhibits 2052 and 2056 are annotated versions of Petitioner’s Exhibits 1056 and 1058, respectively. *Opp. Mot. to Strike* 4–5. Further, Exhibits 2054 and 2055 are compilations of excerpts of deposition testimony taken from the deposition transcripts of Dr. Mostovoy (Ex. 1068) and Mr. Brovold (Ex. 2041). We agree with Petitioner that these exhibits do not comply with our rules for proper evidence to accompany a sur-reply. It appears from the record that Patent Owner is referring to these exhibits as demonstrative aids to explain their arguments and not as evidence. Rather than strike these exhibits, we will allow these exhibits to remain in the record as demonstratives; not as evidence. Thus, the motion to strike is moot because we are treating the exhibits as demonstratives.

Thus, we deny Petitioner’s Motion to Strike portions of the Sur-Reply, but we grant Petitioner’s Motion to Strike Exhibits 2051–2056 as evidence. Exhibits 2051–2056 will remain in the record and will be treated as demonstratives.

V. PATENT OWNER’S MOTION TO EXCLUDE

Patent Owner filed a Motion to Exclude Evidence. Paper 45 (“PO Mot. Exclude”). Patent Owner seeks to have us exclude those portions of Exhibit 1069 (Brovold Deposition) relied on in Petitioner’s Reply (Paper 29) that Patent Owner asserts contain testimony that contradicts or is inconsistent with the Brovold patent (Ex. 1003). *PO Mot. Exclude* 1–14 (citing Patent Owner’s objections to Petitioner’s Reply Evidence (Paper

31)). Specifically, Patent Owner objects to this deposition testimony “as biased and uncorroborated.” *Id.* at 3 (quoting Paper 31, 1).¹³

We are not convinced by Patent Owner’s arguments that this testimony should be excluded. Patent Owner’s arguments go to the weight of this evidence, which the Board can determine from the transcripts provided. The Board is capable of making this determination without being confused, misled, or prejudiced by this testimony. Accordingly, we deny Patent Owner’s motion to exclude this testimony.

VI. PETITIONER’S MOTION TO EXCLUDE

Petitioner filed a Motion to Exclude Evidence. Paper 40 (“Pet. Mot. Exclude”); Ex. 1076 (listing the exhibits addressed in the Petitioner’s Motion to Exclude).

A. Exhibit 2040 (Yu Statement)

Petitioner seeks to have us exclude Exhibit 2040 (Yu statement) because it is inadmissible hearsay. Pet. Mot. Exclude 1–3.¹⁴ Exhibit 2040 is a statement filed by Mr. Yu in the reexamination proceeding involving a related patent. The statement lacks the required language of 37 C.F.R. § 1.58 or 28 U.S.C. § 1746 for a declaration and is not otherwise in proper form to constitute an affidavit. Patent Owner filed Exhibit 2040 along with

¹³ Patent Owner also objected to Exhibits 1039–1047, 1049–1067, and 1070–1074 in Paper 31; however, Patent Owner did not preserve these objections by filing a motion to exclude these exhibits. PO Mot. Exclude (limited to portions of Ex. 1069). *See* 37 C.F.R. § 42.64(c) (“A motion to exclude evidence must be filled to preserve any objections.”)

¹⁴ Petitioner also argues that Exhibit 2040 should be excluded because it is irrelevant, conclusory, and lacks foundation. Pet. Mot. Exclude 3–9. Because we agree that Exhibit 2040 is inadmissible hearsay, we do not reach these additional arguments.

its Patent Owner Response. Petitioner timely filed an objection to this evidence as hearsay. Paper 20 (“Pet. Obj. to PO Evid.”).

In an *inter partes* review, direct testimony is typically provided via affidavit, with cross-examination taken via deposition. 37 C.F.R. § 42.53(a). Hearsay is inadmissible under Fed. R. Evid. 802. In Patent Owner’s opposition to Petitioner’s motion, Patent Owner states that “each of the relied upon paragraphs in the Yu Declaration discuss scientific principles or overlapping prior art about which Professor Yu is entirely qualified to opine.” Paper 48 (“PO Opp. Pet. Mot. Exclude”), 1. Patent Owner also states that the Yu Statement is being offered to “corroborate other evidence.” *Id.* at 2. Thus, Patent Owner is relying on the statements in Exhibit 2040 for the truth of the matter asserted. Mr. Yu’s statement is hearsay because it is an out-of-court statement offered to prove the truth of the matter asserted. Fed. R. Evid. 801.

Patent Owner argues that Exhibit 2040 is admissible as a publicly available record under 37 C.F.R. § 42.61(b) because it “is taken from related Ex-Parte Reexamination No. 90/014120.” *Id.* at 4 (quoting Paper 23 (PO Opp. to Pet. Obj.), 3). Rule 42.61(b) addresses certification of documents as a condition to admissibility. Thus, this rule addresses authentication of the document, but does not address the hearsay objection raised by Petitioner. Further, 37 C.F.R. § 42.61(c) clarifies that 42.61(b) does not create a blanket hearsay exception for PTO records.

Patent Owner also argues that Exhibit 2040 complies with 37 C.F.R. § 1.4(d)(1)(ii) and (d)(2)(i). *Id.* (quoting Paper 23, 3). These rules address generally signature requirements on documents filed with the Office and the acceptability of facsimile copies of handwritten signatures and S-signatures.

These rules do not address the Board's requirements for direct testimony in an *inter partes* review proceeding or address the hearsay objection raised by Petitioner.

Patent Owner does not argue that any exception to the rule against inadmissibility of hearsay applies to Exhibit 2040. Rather, Patent Owner explains that in the reexamination proceeding of the '361 patent, for which the Yu Statement was prepared, Patent Owner subsequently produced a Supplemental Yu Declaration that includes the language of 37 C.F.R. § 1.68 and 28 U.S.C. § 1746. *Id.* at 4–6. According to Patent Owner, this Supplemental Yu Declaration was filed in the reexamination proceeding on January 18, 2019. *Id.* at 5. Thus, Patent Owner filed the Supplemental Yu Declaration in the reexamination proceeding after Patent Owner received Petitioner's objection to Exhibit 2040 in this proceeding and after Patent Owner had filed its response to Petitioner's Objections (Paper 23, filed January 7, 2019). On January 22, 2019, weeks after service of Petitioner's objections, and as part of Patent Owner's mandatory services requirements of the *ex parte* reexamination proceeding, Patent Owner provided a copy of the Supplemental Yu Declaration to Petitioner. Ex. 2057. Thereafter, on February 21, 2019, more than two months after Petitioner's Objections, Patent Owner belatedly filed (as Exhibit 2050) and served a copy of the Supplemental Yu Declaration in response to Petitioner's objections in this proceeding. 37 C.F.R. § 42.64(b)(2) (requiring supplemental evidence to be served within ten business days of service of the objection). Petitioner objected to the belated filing and service of this evidence, and, in response, Patent Owner requested that Exhibit 2050 be expunged. Ex. 1077 (email thread between Petitioner and Patent Owner about Exhibit 2050); Ex. 1078

(email thread between Patent Owner and PTAB about expunging Exhibit 2050). The Board expunged Exhibit 2050, and Patent Owner additionally stipulated that Exhibit 2050 shall be excluded from evidence. Paper 37 (Joint Stipulation). Exhibit 2050 cannot be relied on to cure the hearsay problem with Exhibit 2040 because Petitioner did not serve Patent Owner with this evidence within ten business days of service of Petitioner's objection as required by our Rules.

We agree with Petitioner that Exhibit 2040 is inadmissible hearsay because the statement does not qualify as direct testimony in the form of an affidavit under our rules. 37 C.F.R. § 42.63(a). The statement is an out-of-court statement offered to prove the truth of the matter asserted and Patent Owner has not shown that any exceptions to the hearsay rule apply. Thus, we grant Petitioner's motion to exclude Exhibit 2040.

B. Foreign-Language Documents

Petitioner also seeks to have us exclude Exhibits 2006, 2007, 2024, 2025, 2027–2032, and 2034 because each exhibit is a foreign-language patent or published patent application for which Patent Owner failed to provide a translation. Pet. Mot. Exclude 9–10 (citing 37 C.F.R. § 42.63(b)). Patent Owner asserts that these patents are cited in paragraphs 4 and 68 of the Guirgis Declaration (Exhibit 2001) and the reason for Mr. Guirgis's citation to these exhibits is clear. Paper 48 (“PO Opp. Pet. Mot. Exclude”), 11–12.¹⁵ Petitioner is correct that our rules require translations of foreign-

¹⁵ Patent Owner filed these Exhibits to accompany its Patent Owner Preliminary Response. PO Prelim. Resp. 6–7 (Exhibit List). Patent Owner did not cite any of these Exhibits in its Patent Owner Response or Patent

language documents submitted as evidence. Because Patent Owner failed to comply with 37 C.F.R. § 42.63(b) to provide translations of these documents, we grant Petitioner's Motion to Exclude this evidence.

C. Additional Documents and Evidence

Petitioner also seeks to exclude as irrelevant Exhibits 2002–2008 and 2018–2035 because these documents, filed in support of Patent Owner's Preliminary Response, were not relied upon by Patent Owner or any of its witnesses in Patent Owner's Response or Sur-Reply. Pet. Mot. Exclude 40, 11. We do not rely upon any of these documents in our Decision and, thus, Petitioner's motion to exclude these documents is moot.

Petitioner also moves to exclude portions of the Guirgis Declaration, Mostovoy Declaration, and Supplemental Mostovoy Declaration as irrelevant because Patent Owner does not cite to, or otherwise rely on, these portions. Pet. Mot. Exclude 11–12. We do not rely upon any of the paragraphs from these Exhibits identified in Petitioner's Motion to Exclude and, thus, Petitioner's motion to exclude these documents is moot.

D. Exhibits in Sur-Reply

Petitioner further moves to exclude Exhibits 2051–2053 and 2056 for lack of foundation and authentication. Pet. Mot. Exclude 13. Petitioner argues that these exhibits were not created by, discussed by, or vouched for by any expert, in either a declaration or deposition, and, thus, at most, each would be a demonstrative aid. As discussed above in our treatment of Petitioner's motion to strike, we agree with Petitioner that these exhibits,

Owner Sur-Reply. PO Resp. iv (List of Exhibits Used); Sur-Reply v (Exhibits cited in Sur-Reply). Patent Owner cited only once to paragraph 4 of the Guirgis Declaration in the Patent Owner Sur-Reply. Sur-Reply 2.

which lack proper authentication and foundation, should be treated as demonstrative aids. *See* Opp. to Pet. Mot. Exclude 15 (Patent Owner characterizing Exhibits 2051 and 2053 as demonstratives). Thus, we grant Petitioner’s motion to exclude these exhibits as lacking proper authentication and foundation.

VII. OBJECTIONS TO DEMONSTRATIVES

Petitioner filed objections to Patent Owner’s demonstrative exhibits. Paper 54 (“Pet. Obj. Demonstratives”). Petitioner objected to slides 6–10 and 14 because these demonstratives allegedly contain new and improper arguments subject to Petitioner’s Motion to Strike. *Id.* at 2–3. Because we denied Petitioner’s Motion to Strike on this basis, we likewise overrule Petitioner’s objections to these slides. Petitioner also objected to slide 8 because it contains images from Exhibits 2052 and 2053, slide 16 because it contains images from Exhibit 2051, and slide 22 because it contains images from Exhibit 2056, which are subject to Petitioner’s Motion to Strike and Motion to Exclude. *Id.* Because we treat these Exhibits as demonstrative aids, we overrule Petitioner’s objections to slides 8, 16, and 22 on this basis. Petitioner also objected to slides 9, 10, and 21 because they allegedly contain new arguments not presented in Patent Owner’s Sur-Reply. *Id.* We do not rely on these slides or the objected-to arguments presented on the slides in our Decision. Thus, Petitioner’s objections are moot. Finally, Petitioner objected to slides 12 and 17 because they include images from Exhibit 2040, which is subject to Petitioner’s Motion to Exclude. *Id.* at 3. Because we grant Petitioner’s Motion to Exclude this Exhibit, we likewise sustain Petitioner’s objection to slides 12 and 17 on this basis.

Patent Owner filed objections to Petitioner's demonstrative exhibits. Paper 56 ("PO Obj. Demonstratives"). Patent Owner objected to slides 95, 97, 102, and 104 because they contain quotes from the Brovold testimony that are the subject of Patent Owner's Motion to Exclude. *Id.* at 1. Because we deny Patent Owner's Motion to Exclude, we likewise overrule Patent Owner's objection to these slides. The remaining objections raised by Patent Owner are based on alleged mischaracterizations of, or misleading statements about, the evidence. *Id.* at 1–3. These concerns go to the weight of the evidence and are not a convincing basis on which to sustain the objection. The panel is capable of judging the accuracy of Petitioner's characterizations of the evidence. Thus, we do not sustain any of the objections to the demonstratives raised by Patent Owner.

VIII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 7, 9, and 10 of the '915 patent have been shown by a preponderance of the evidence to be unpatentable as anticipated by Brovold;

FURTHER ORDERED that claims 1, 7, 9, and 10 of the '915 patent have been shown by a preponderance of the evidence to be unpatentable as obvious over Cavallo in view of Brovold;

FURTHER ORDERED that claims 1, 7, 9, and 10 of the '915 patent have been shown by a preponderance of the evidence to be unpatentable as obvious over Cavallo and Bayliss;

FURTHER ORDERED that claims 1, 7, 9, and 10 of the '915 patent have been shown by a preponderance of the evidence to be unpatentable as obvious over Cavallo, Brovold, and Bayliss;

FURTHER ORDERED that Petitioner has not shown claims 1, 7, 9, and 10 of the '915 patent are unpatentable as anticipated by, or obvious over, Cavallo alone, or are unpatentable as obvious over Brovold in view of Cavallo, Brovold in view of Bayliss and/or Becker, and Brovold in view of Cavallo and Bayliss and/or Becker.

FURTHER ORDERED that Petitioner's Motion to Strike is denied-in-part and granted-in-part as set forth above;

FURTHER ORDERED that Petitioner's Motion to Exclude is denied-in-part and granted-in-part as set forth above;

FURTHER ORDERED that Patent Owner's Motion to Exclude is denied;

FURTHER ORDERED that Petitioner's objections to Patent Owner's demonstrative exhibits are overruled in part and sustained in part as set forth above;

FURTHER ORDERED that Patent Owner's objections to Petitioner's demonstrative exhibits are overruled.

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

IPR2018-00853
Patent 7,143,915 B2

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