

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CMS CEP COR LTD. and
CMS CEP COR AMERICAS LLC,
Petitioner,

v.

SANDVIK INTELLECTUAL PROPERTY AB,
Patent Owner.

IPR2024-01381
Patent 11,014,090 B2

Before CYNTHIA L. MURPHY, RICHARD H. MARSCHALL, and
ARTHUR M. PESLAK, *Administrative Patent Judges*.

PESLAK, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining No Challenged Claims Unpatentable

Dismissing Patent Owner's Motion to Amend

35 U.S.C. § 318(a)

Dismissing Petitioner's Motion to Exclude Evidence

37 C.F.R. § 42.64(c)

I. INTRODUCTION

CMS Cepcor Ltd. and CMS Cepcor Americas LLC (collectively, “Petitioner”) filed a Petition requesting *inter partes* review of claims 1–14 (“the Challenged Claims”) of U.S. Patent No. 11,014,090 B2 (Ex. 1001, “the ’090 patent”). Paper 2 (“Pet.”). Petitioner filed a Declaration of David G. Smith in support of the Petition. Ex. 1002. Sandvik Intellectual Property AB (“Patent Owner”) filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). Patent Owner filed a Declaration of Harri Kytömaa in support of the Preliminary Response. Ex. 2001. On March 18, 2025, we instituted *inter partes* review of the Challenged Claims. Paper 9 (“Dec.”).

After institution, Patent Owner filed a Response to the Petition (Paper 15, “PO Resp.”) supported by the Second Declaration of Harri Kytömaa, Ph.D. (Ex. 2007). Petitioner filed a Reply supported by a second Declaration of David G. Smith (Ex. 1044). Paper 18 (“Pet. Reply”). Patent Owner filed a Sur-reply. Paper 27 (“Sur-reply”).

Patent Owner filed a Contingent Motion to Amend on June 24, 2025 (Paper 14, “MTA”) and Petitioner filed an Opposition. (Paper 19, “Opp.”). We provided Preliminary Guidance in response to Patent Owner’s Motion to Amend. Paper 24 (“Preliminary Guidance”). Patent Owner then filed a Revised Contingent Motion to Amend. Paper 28 (“RMTA”). Petitioner filed an Opposition to Patent Owner’s Revised Motion to Amend (Paper 33, “RMTA Opp.”) to which Patent Owner filed a Reply in support of its Motion to Amend (Paper 38, “RMTA Reply”), and Petitioner filed a Sur-reply (Paper 47). Petitioner also filed an Amended Sur-Reply (Paper 52, “RMTA Sur-reply”) intended to “replace Paper 47 to remove the fourth declaration of Mr. Smith since it was improperly included.” RMTA Sur-reply 1.

Petitioner filed a Motion to Exclude (“Motion” or “MTE”). Paper 44. The Motion seeks “to exclude portions of the Fifth Declaration of Harri Kytömaa, Ph.D. submitted as Exhibit 2022 and the entireties of Exhibits 2024 – 2027 as violating the Federal Rules of Evidence (“FRE”) or rules of the Board.” MTE 1. Patent Owner filed an opposition (Paper 45) (“MTE Opp.”) and Petitioner filed a Reply in support of its Motion (Paper 46).

An oral hearing was held on January 13, 2026 and the transcript is in the record. Paper 57.

We have jurisdiction under 35 U.S.C. § 6. This is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of the Challenged Claims. For the reasons discussed below in section II, we determine that Petitioner does not establish by a preponderance of the evidence that any Challenged Claim is unpatentable. Consequently, we dismiss Patent Owner’s Revised Contingent Motion to Amend as moot.¹ We also dismiss Petitioner’s Motion to Exclude as moot.

A. Real Parties in Interest

Petitioner identifies CMS Cepcor Ltd. and CMS Cepcor Americas LLC as real parties-in-interest. Pet. 50. Patent Owner identifies Sandvik Intellectual Property AB, Sandvik Mining and Construction USA LLC, and Sandvik Rock Processing Solutions AB as real parties-in-interest. Paper 4, 1.

B. Related Matters

Petitioner filed a petition for *inter partes* review of a related patent, U.S. Patent No. 9,827,568 B2 (“the ’568 patent”), in IPR2024-01380. Paper 4, 1. The ’090 patent at issue here and the ’568 patent are also the subject of

¹ Patent Owner’s objections to the RMTA Sur-reply (Paper 55) are also moot in light of the dismissal of Patent Owner’s Revised Contingent Motion to Amend.

an infringement action, *Sandvik Mining and Construction USA LLC v. CMS Cepcor Ltd.*, Case No. 1-24-cv-00481-JLH (D. Del.). Pet. 50; Paper 4, 1.

C. The '090 Patent

The '090 patent relates to “[g]yratory crushers . . . used for crushing ore, mineral and rock material to smaller sizes.” Ex. 1001, 1:24–25.

Specifically, the '090 patent discloses “a main shaft having an axial upper end region that tapers radially inward and comprises at least one groove to receive a pressurised fluid to facilitate mounting and demounting of a sleeve at the shaft.” *Id.* at 1:17–20.

Figure 1 shows a representative embodiment and is reproduced below.

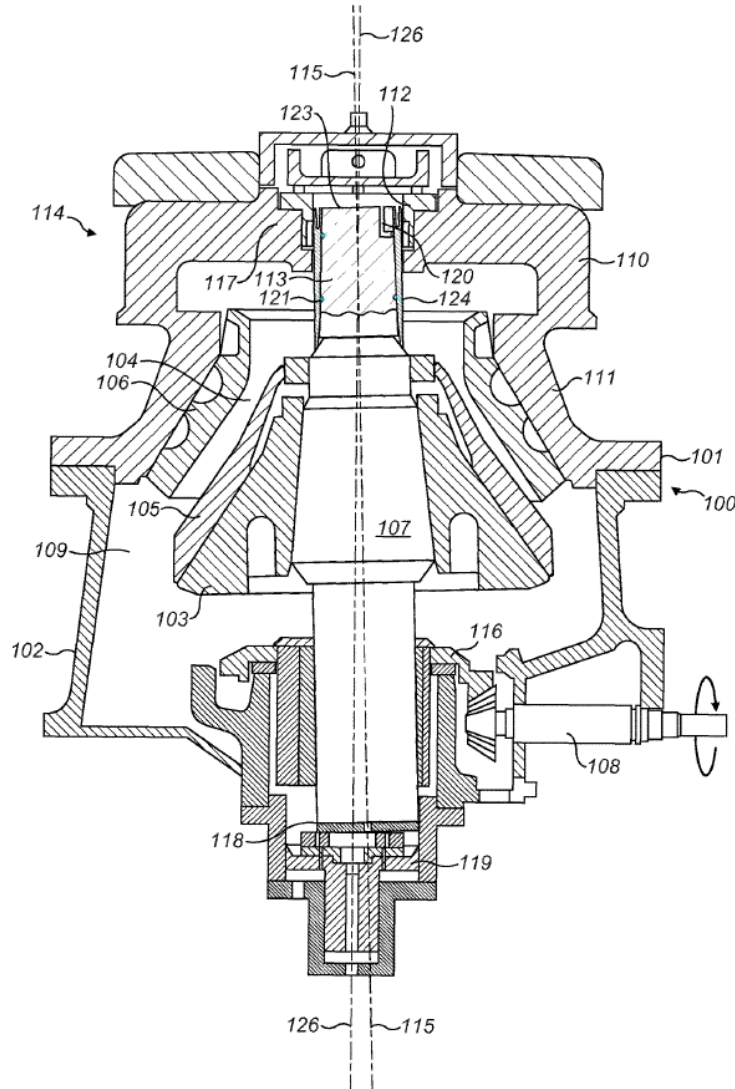


FIG. 1

Figure 1 depicts “a crusher” with “an elongate shaft 107 having a longitudinal axis 115.” Ex. 1001, 4:42, 4:44–45. The ’090 patent further describes the main shaft and sleeve shown in Figure 1 as follows:

Upper end region 113 comprises a radial taper that defines an upper conical region of main shaft 107. The conical region 113 is tapered so as to decrease in cross sectional area in a direction from shaft second (lower) end 118 to an upper end surface 123 positioned uppermost within the crusher. To avoid excessive wear of the conical region 113, by contact with bearing assembly 112, a substantially cylindrical wear sleeve 124 is

mounted over and about region 113 by an interference or friction fit and is provided in close touching contact over an axial length of both sleeve 124 and region 113.

Id. at 5:1–11.

According to the '090 patent, in order to “facilitate mounting and dismounting of sleeve 124 at shaft region 113, shaft 107 is configured to enable a fluid to be introduced into the contact region between the sleeve 124 and shaft region 113.” Ex. 1001, 5:16–19. To supply the fluid, the '090 patent describes fluid supply conduit 120, which “extends axially and radially along shaft 107 (within region 113) from end surface 123 to the contact region between sleeve 124 and region 113.” *Id.* at 5:19–22. A “channel” or “groove” 121 “is indented within the external facing surface of shaft 107 at region 113 and is provided in fluid communication with the conduit 120.” *Id.* at 5:22–25.

D. Illustrative Claims

Claims 1, 9, and 14 are independent claims. Independent claim 1 is representative and recites:

1. [1P] A gyratory crusher main shaft of a crusher comprising:
 - [1a] a shaft body having a radially outward facing external surface, and a first end and a second end;
 - [1b] an axial region of the shaft body extending from the second end and being tapered relative to a longitudinal axis of the shaft body such that a cross sectional area of the shaft body at the tapered axial region decreases in a direction from the first end to the second end;
 - [1c] a shaft sleeve mounted on the tapered axial region;
 - [1d1] and at least one groove indented at the external surface and positioned at the tapered axial region,
 - [1d2] the at least one groove being arranged to receive a pressurised fluid to facilitate mounting and dismounting of the shaft sleeve at the shaft body.

Ex. 1001, 7:2–15 (bracketed nomenclature added to reflect Petitioner’s nomenclature, *see* Pet. 13–21).

E. Prior Art and Asserted Ground

Petitioner asserts that claims 1–14 would have been unpatentable on the following ground (Pet. 11–13):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–14	103	Polinski, ² Piepho, ³ Harless ⁴

II. ANALYSIS

A. Legal Standards

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

A claim is unpatentable as obvious “if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103; *see KSR Int’l*

² U.S. Patent No. 4,410,143, issued October 18, 1983 (Ex. 1017, “Polinski”).

³ U.S. Patent No. 6,270,026 B1, issued August 7, 2001 (Ex. 1018, “Piepho”).

⁴ U.S. Patent No. 2,840,399, issued June 24, 1958 (Ex. 1033, “Harless”).

Co. v. Teleflex Inc., 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations)⁵. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

The Supreme Court explained in *KSR* that

Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” (alteration in original))).

“Whether an ordinarily skilled artisan would have been motivated to modify the teachings of a reference is a question of fact.” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1327 (Fed. Cir. 2016). “[W]here a party argues a skilled artisan would have been motivated to combine references, it must show the artisan ‘would have had a reasonable expectation of success from doing so.’” *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360–61 (Fed. Cir. 2017) (quoting *In re Cyclobenzaprine*

⁵ No evidence of secondary considerations is in the record.

Hydrochloride Extended-Release Capsule Patent Litig., 676 F.3d 1063, 1068–69 (Fed. Cir. 2012)).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In determining the level of ordinary skill in the art, we may consider certain factors, including: “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (quoting *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007)).

Petitioner argues that a person of ordinary skill in the art (“POSITA”) relating to the ’090 patent would have had “a bachelor’s degree in mechanical engineering or a related field, and at least 2 years of experience with industrial equipment design and development.” Pet. 3 (citing Ex. 1002 ¶ 29). Petitioner further contends that one of ordinary skill “may also have a combination of more formal education and less work experience or a combination of less/different formal education and more work experience.” *Id.*

In the Patent Owner Response, Patent Owner states that it “does not object to the defined level of skill in the art.” PO Resp. 12 (citing Pet. 3).

We apply Petitioner’s proffered level of skill in the art because it appears consistent with the problems addressed in the ’090 patent and the prior art.

C. Claim Construction

We apply the same claim construction standard used by Article III federal courts and the International Trade Commission, both of which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. 37 C.F.R. § 42.100(b) (2023). Accordingly, we construe each Challenged Claim to generally be “the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.*

If the specification “reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316 (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). Another exception to the general rule that claims are given their ordinary and customary meaning is “when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Uship Intellectual Props., LLC v. United States*, 714 F.3d 1311, 1313 (Fed. Cir. 2013) (quoting *Thorner v. Sony Comput. Ent. Am., LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)).

Petitioner contends that “[n]o terms need construction because the claims read on the prior art identified below under any construction consistent with [*Phillips*].” Pet. 10–11.

Patent Owner offers constructions for two claim terms, i.e., “end” and “indented at the external surface.” PO Resp. 13–23. We address Patent

Owner's proposed construction of "end" but do not reach "indented at the external surface" because it is not necessary for purposes of this Decision.

1. "end"

Patent Owner contends "that the proper construction of 'end' is an extremity of a shaft body or sleeve under its plain and ordinary meaning." PO Resp. 14. Patent Owner points out that "claims 1, 9, and 14 refer to 'a first end and a second end' of a shaft body," claim 2 "refers to 'a fluid conduit extending axially from the second end [of the shaft body]'" and claims 9 and 14 "refer to 'a first end of [a] sleeve' and 'a second end of [a] sleeve.'" *Id.* (alterations in original).

Patent Owner next contends that the claim language supports its proposed construction. PO Resp. 15. For claims 1, 9, and 14, Patent Owner argues that each recite "a shaft body having a 'second end' and 'an axial region of the shaft body *extending from the second end.*'" *Id.* Patent Owner further argues that "[t]he most natural reading of this claim language is that the axial region *extends* from a starting point or originating point, *i.e.*, the outermost extremity of the shaft body." *Id.* Patent Owner further argues that claim 2 supports its reading because the recited "fluid *inlet* conduit requires an inlet at some location and is described as extending *axially*" and an ordinarily skilled artisan "would understand that the second end where the inlet is located is the extremity of the shaft and not a location along the length of the shaft." *Id.* (citing Ex. 2007 ¶ 23).

Although not specifically stated as such, Patent Owner incorporates an implicit claim construction in its analysis. After summarizing the language of claims 1 and 2 that it contends support its construction of "end," Patent Owner argues that "[c]laims 1 and 2 thus require that both *the tapered axial*

region and the fluid inlet extend from the same second end.” PO Resp. 15 (emphasis added).

Patent Owner next contends that the Specification of the ’090 patent supports its proposed construction. PO Resp. 15. Patent Owner argues that “every single feature of the shaft body in the ’090 Patent illustrates the tapered axial region extending from the outermost extremity (end surface 123).” *Id.* at 15–16 (citing Ex. 1001, Figs. 1–4; Ex. 2007 ¶¶ 24–25). Patent Owner further argues that “just like the end surface 123 of the shaft body, the ’090 Patent illustrates the uppermost end 215 of the sleeve at the sleeve’s upper most extremity” and “lowermost end 216 at a chamfer region 207.” *Id.* at 17 (citing Ex. 1001, 5:52–55, Fig. 2). According to Patent Owner, “chamfers and fillers are extremely common features often positioned at the outermost edges of objects, for instance, to reduce stress concentrations and ease assembly of components . . . consistent with the lowermost end 216 being at an extremity of the sleeve.” *Id.* (citing Ex. 2007 ¶¶ 27–28).

Patent Owner provides a dictionary definition of “end” to support its proposed construction. PO Resp. 18. The cited definition is “the extreme or last part lengthwise: TIP.” *Id.* (citing Ex. 2012, 411).

Petitioner, in turn, contends that “[e]nd’ is used multiple times in the ’090 patent where at least two meanings are identified.” Pet. Reply 8–9 (citing Ex. 1044 ¶ 10). According to Petitioner Mr. Smith identified “many examples of where ‘end’ denotes a region, and not ‘an extremity of a shaft body or sleeve’ and other places where “‘end’ is used to denote ‘an extremity of a shaft body or sleeve.’” *Id.* at 9 (citing Ex. 1044 ¶¶ 11–15). Mr. Smith also identified a dictionary definition of “end” as “a part or place at or adjacent to an extremity: at the end of the table; the west end of town.” Ex. 1044 ¶ 21 (citing Random House Webster’s Unabridged Dictionary

2001, 641). Petitioner does not address Patent Owner’s argument that the most natural reading of claim 1 is that the starting point of the tapered axial region is located at the uppermost extremity of the shaft. *See* Pet. Reply 8–9. Based on this, Petitioner contends “that ‘end’ should have its broadest possible meaning, which includes both ‘end region’ and ‘an extremity of a shaft body or sleeve.’” *Id.* at 9 (citing Ex. 1044 ¶ 16).

In the Sur-reply, Patent Owner argues that none of the claims “use the term ‘end’ with the modifier ‘region.’” Sur-reply 2. Patent Owner further argues that “[o]ther claim limitations, however, do use the modifier ‘region.’” *Id.* Patent Owner then points to “tapered axial region” in claims 1, 9, and 14, “perimeter region” in claim 10, and “lower region” and “upper region” in claim 14. According to Patent Owner, “[t]his shows that when the claims refer to a region, they do so expressly.” *Id.*

For the following reasons, we do not reach Patent Owner’s proposed construction of “end.”

First, we note that Patent Owner does not argue that the Specification contains a lexicographic definition of “end” nor does Patent Owner contend that there is a disclaimer of the full scope of “end” as claimed. *See* PO Resp. 13–19. Further, Patent Owner does not direct us to any part of the prosecution history in support of its proposed construction. *Id.*

We begin with the claim language.

For the shaft, claim 1 recites “a shaft body having a radially outward facing external surface, and a first end and a second end; an axial region extending from the second end and being tapered relative to a longitudinal axis of the shaft body” and “the tapered axial region decreases in a direction from a first end to a second end.” Ex. 1001, 7:3–9. Independent claims 9 and 14 contain substantially similar limitations. *See id.* at 7:45–52, 8:32–42.

Claim 2 depends from claim 1 and recites “a fluid inlet conduit extending axially from the second end.” *Id.* at 7:16–18. Claim 12 depends from claim 9 and contains a substantially similar limitation. *Id.* at 8:21–25.

In our Decision on Institution, we noted: “Patent Owner appears to assume that ‘extending from the second end’ in limitation 1b requires the tapered axial region to include a taper that extends all the way to the outermost extremity at the end of the shaft” and asked for further briefing on this point. Dec. 14–15. Patent Owner maintains that position. *See* PO Resp. 15.

Patent Owner argues that construing “end” as the uppermost extremity is the “most natural reading of the claim language” and that “claim 2 supports this reading.” PO Resp. 15. With respect to claim 2, we agree with Patent Owner that “a fluid inlet conduit requires an inlet at some location.” *Id.* (emphasis omitted). Petitioner does not dispute this nor does Petitioner provide any evidence or argument to dispute Patent Owner’s assertion that where “the inlet is located is the extremity of the shaft” (*id.*). *See* Pet. Reply 8–10; Ex. 1002, 65 (“a POSITA would understand that fluid would ordinarily be delivered through a fluid inlet conduit as is customary and well known.”). We agree with Patent Owner that claim 2 requires an axially extending fluid inlet conduit extending from the extremity of the shaft. However, as a dependent claim, claim 2 further limits claim 1 so the fact that claim 2 requires the fluid inlet to be located at the extremity of the shaft does not necessarily limit the scope of claim 1 to a “tapered axial region” extending from the upper extremity of the shaft.

For the sleeve, claim 1 recites “a shaft sleeve mounted on the tapered axial region.” Ex. 1001, 7:10. Claim 9 recites “a sleeve fitted over the tapered axial region, the sleeve having a tapered wall thickness, such that the

wall thickness at a second end of the sleeve is greater than the wall thickness at a first end of the sleeve.” *Id.* at 8:6–9. Claim 14 recites “a sleeve fitted over the tapered axial region, the sleeve having a tapered wall thickness such that a wall thickness at a second upper end of the sleeve is greater than a wall thickness at a first lower end of the sleeve.” *Id.* at 8:43–46. We find that these limitations shed little light on whether “end” should be limited to the extremity of the shaft.

We now turn to the Specification.

Figure 3 of the ’090 patent is reproduced below:

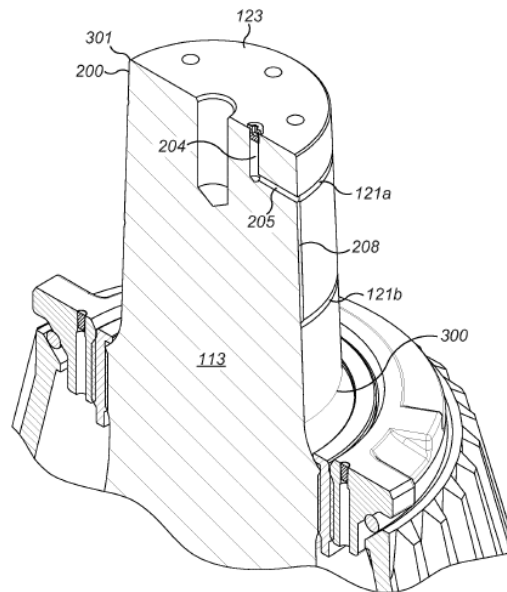


FIG. 3

Figure 3 “is a perspective partial cross-section of the shaft through *the upper end of the main shaft.*” Ex. 1001, 4:34–35 (emphasis added). Figure 3 shows “[a] first (axial upper) end region 113 of shaft 107.” *Id.* at 4:57–58. “Upper end region 113 comprises a radial taper that defines an upper conical region” that is tapered so as to decrease in cross-sectional area in a direction from shaft second(lower) end 118 to an upper end surface 123.” *Id.* at 5:1–5. “[T]apered region 113 comprises a lowermost end 300 and an uppermost

end 301.” *Id.* at 5:26–27. “Fluid supply conduit 120 comprises an axial section 204 extending downwardly from end surface 123.” *Id.* at 6:24–25; *id.* at 5:16–22, 5:58–61.

Figure 2 of the '090 patent is reproduced below:

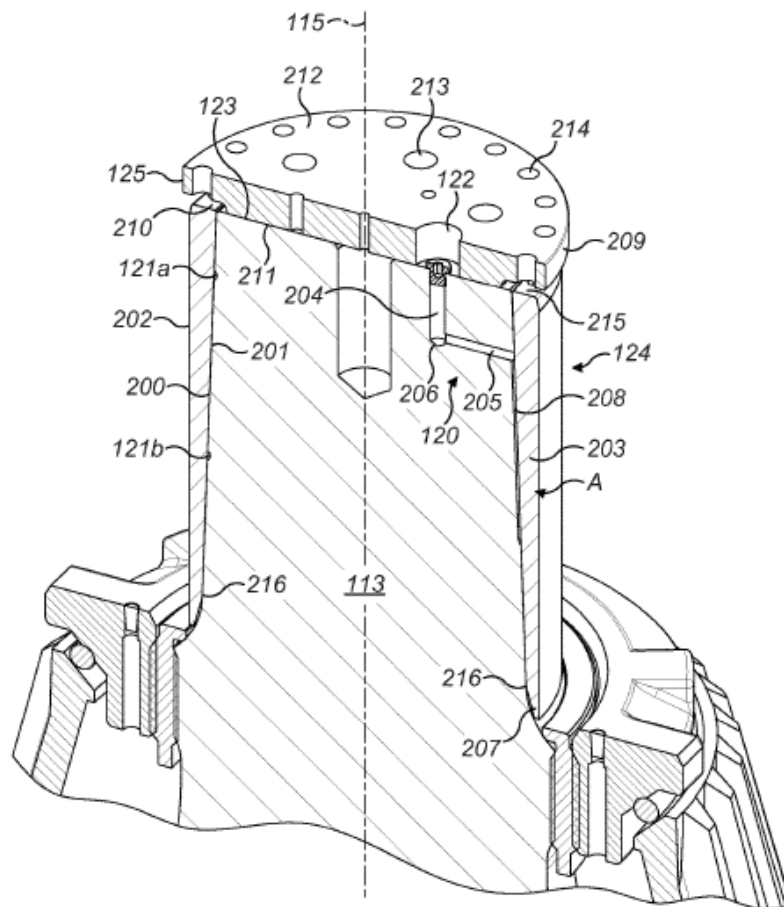


FIG. 2

Figure 2 “is a perspective partial cross section through the *upper end of the main shaft.*” Ex. 1001, 4:33–34 (emphasis added). Figure 2 shows “[s]leeve 124 comprises a first (lower) end 216 for mating at the end 200 of region 113 and a second (upper) end 215 for positioning at uppermost end 301 substantially coplanar with shaft end surface 123.” *Id.* at 5:31–35. “Sleeve lower end 216 comprises a chamfer region 207 of decreasing wall thickness such as a very lowermost end region of sleeve 124 is chamfered to sit close

to a radius section of main shaft region 113 below region end 300.” *Id.* at 5:52–55. “[A]n underside surface 211 of retainer 125 is positioned in contact and aligned substantially coplanar with shaft end surface 123.” *Id.* at 6:5–7.

Figures 2 and 3 are described as “perspective partial cross-section views through the upper end of the main shaft.” Ex. 1001, 4:33–35. Both of these drawings show the upper extremity of the shaft plus a region of the shaft below the extremity. The ’090 patent explicitly describes the upper extremity of the shaft alternatively as either “uppermost end 301” or “end surface 123.” The general descriptions of Figures 2 and 3 as well as the identification of the upper extremity of the shaft as the uppermost end or end surface, thus, arguably support Petitioner’s position that term “end” *by itself* should not be construed as limited to the extremity of the shaft.

Element 216 is described as the “[s]leeve lower end.” Ex. 1001, 5:52. As can be seen in Figure 2, the line from identification number 216 does not point to the lower extremity of the sleeve but chamfer 207 extends below 216. The Specification’s illustration and description of the sleeve end 216, thus, does not support Patent Owner’s position that “end” by itself should be construed as the “extremity” of the sleeve.

The parties each offer a dictionary definition of “end” to support their respective constructions. We find that these conflicting dictionary definitions have do not materially affect our analysis of the intrinsic evidence.

As explained below in our analysis of Petitioner’s patentability challenge, the crux of the parties’ dispute revolves around the limitation in claim 1 of “an axial region of the shaft body *extending from the second end* and being tapered relative to a longitudinal axis of the shaft.” We agree with

Patent Owner’s argument that this claim language requires a starting point for the tapered axial region and that starting point would be the extremity of the shaft not an undefined point in the “end region.” Because Patent Owner proposes a construction of “end” that would have general application to all claim terms including the first end of the shaft, the second end of the shaft, and the sleeve end, and that construction has no bearing on the issues we address below, we do not reach Patent Owner’s proposed general construction of “end” by itself.

We determine that no other claim terms require express construction for purposes of this Decision. *See 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’”) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

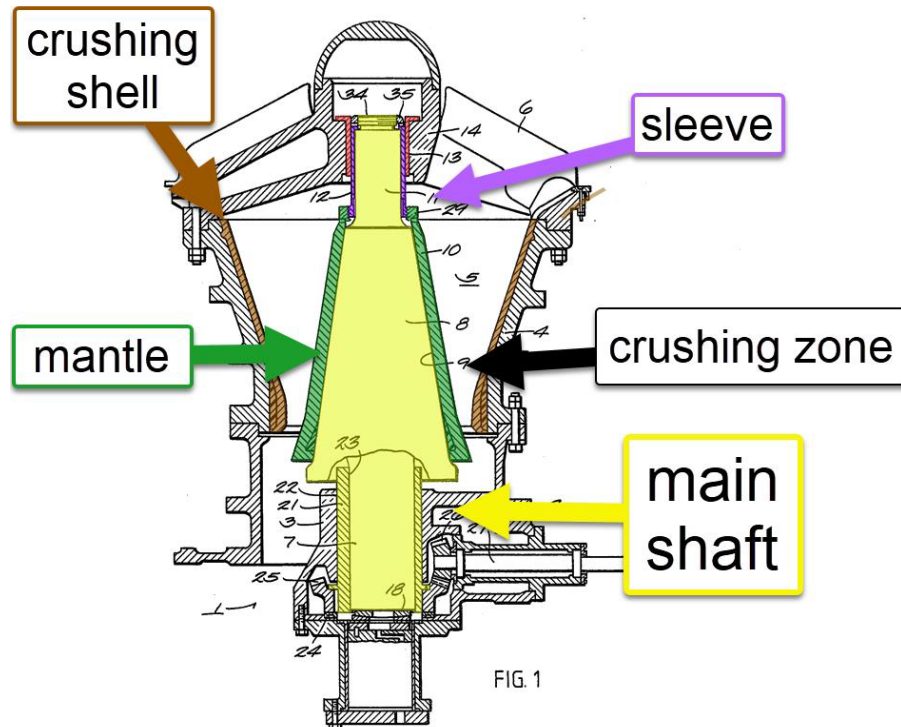
*D. Ground 1: Obviousness of Claims 1–14 over
Polinski, Piepho, and Harless*

Petitioner contends claims 1–14 would have been obvious over Polinski in view of Piepho and Harless. Pet. 11–49. Petitioner supports its contentions with the Declaration of David G. Smith. Ex. 1002.

We begin with a brief summary of Polinski, Piepho, and Harless. We then address the parties’ contentions.

1. Polinski

Polinski discloses “a gyratory crusher” with “a main shaft having a tapered mantle supporting portion extending through a correspondingly tapered bore in the crusher mantle to support the mantle on the shaft.” Ex. 1017, code (57). We reproduce Petitioner’s annotated version of Polinski’s Figure 1 below (Pet. 14).

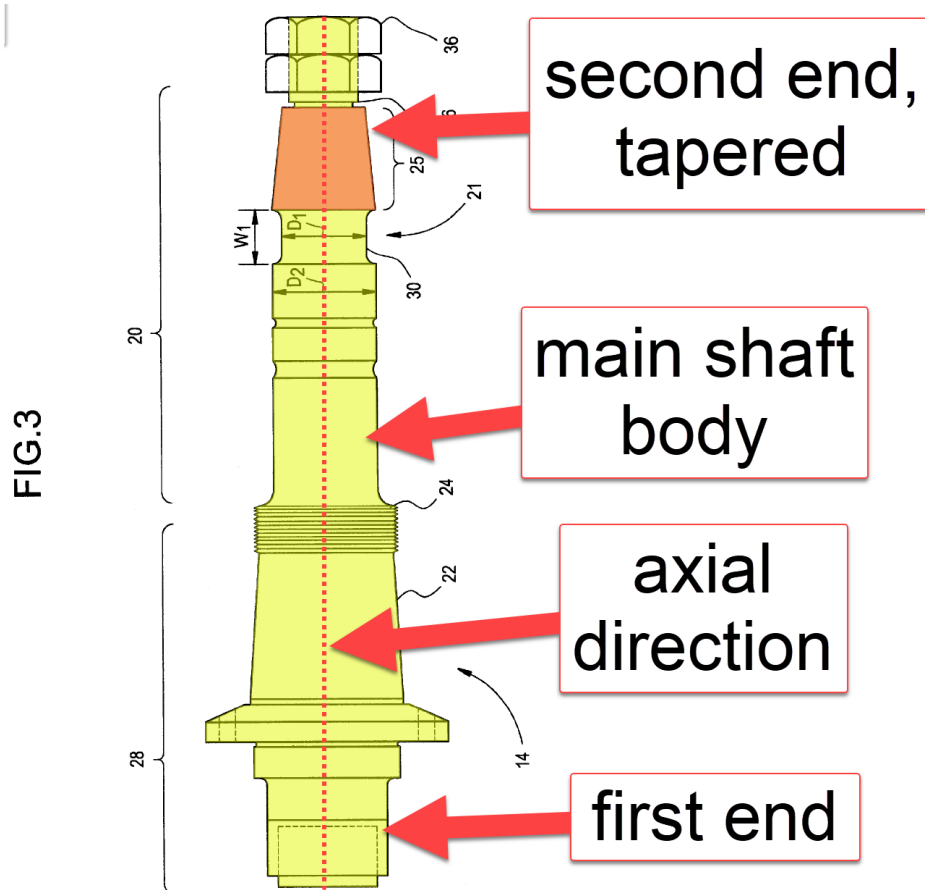


The annotated version of Figure 1 shown above includes labels for “mantle” (mantle supporting portion 8), “main shaft” 7, and “sleeve” (bearing sleeve 12). Pet. 14; Ex. 1017, 2:36–47, Fig. 1. Polinski describes the bearing sleeve as “fitted about the end of the shaft releasably securing the crusher mantle to the tapered portion of the shaft.” Ex. 1017, code (57).

Polinski states that “the cross-section of the upper end of the shaft 7 gradually converges to form a bearing journal 11 extending from the tapered portion of the shaft which is fitted with a cylindrical bearing sleeve 12 rotatably retained within a bearing bushing 13 secured within a coaxially aligned hub 14 in the spider 6.” Ex. 1017, 2:42–47. According to Polinski, “abrupt structural discontinuities in the normally high-stressed regions of the main shaft have been essentially eliminated to minimize the development of fatigue fractures in the shaft while at the same time providing an arrangement which can be easily maintained and repaired in the field.” *Id.* at 1:62–67.

2. Piepho

Piepho discloses “[a]n improved main shaft for a coal pulverizer” that “provides improved fretting resistance.” Ex. 1018, code (57), 2:19–20. We reproduce an annotated version of Piepho’s Figure 3 from the Petition to illustrate the main shaft in Piepho’s device.



Annotated Figure 3 depicts shaft 14, with four annotations added by Petitioner, including “second end, tapered” and “main shaft body.” Pet. 16; Ex. 1018, Fig. 3. The “second end, tapered” label points to a section of shaft 14 corresponding to “shaft end (25),” which Petitioner highlights with orange coloring. See Pet. 16, Ex. 1018, 3:23–24.

Piepho describes “an intervening material between the shaft end (25) and the mating bore in the yoke bushing (18) fitted within the bore of yoke

(12) to prevent fretting damage.” Ex. 1018, 3:23–26. Piepho also describes a “joint (21) . . . capable of accepting radial, axial, and bending or overturning loads” where “joint 21 is a tapered joint with the tapered end (25) of shaft (14)” and “yoke bushing (18) has a mating bore similarly tapered.” *Id.* at 3:26–32. Piepho further states that “shaft end (25) alternatively may be cylindrical rather than tapered.” *Id.* at 3:33–34.

3. Harless

Harless discloses “improvements in the attachment of gears and other members having axially projecting hubs to tapered shaft ends.” Ex. 1033, 1:15–17. Harless describes “tapered end 1 of the shaft 2,” wherein “[o]il under pressure is introduced into a circumferential groove 12 through a bore 13, expanding the bearing sufficiently to permit it to be pushed up against the spacer 6 by conventional means.” *Id.* at 1:63–64, 2:19–22. We reproduce Figure 7 from Harless below.

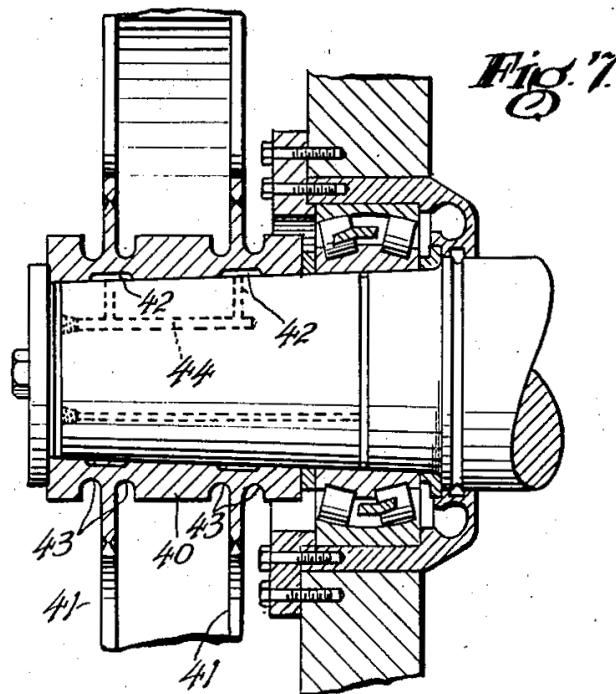


Figure 7 above depicts an axial section view of the assembly of Harless. Ex. 1033, 1:61–62. Figure 7 includes hub 40 surrounding a shaft running from left to right in the figure. *Id.* at Fig. 7, 4:18–19. Oil bore 44 disposed within the shaft includes branches that supply oil to grooves 42. *Id.* at 4:20–22.

4. Analysis of Claim 1

a) Motivation to Combine

Petitioner contends that an ordinarily skilled artisan would have been “motivated to combine the tapered joint of Piepho with the teachings of Polinski based on the explicit teachings of the prior art.” Pet. 12 (citing Ex. 1002 ¶ 86). Petitioner further contends that an ordinarily skilled artisan “would understand the advantages afforded by the use of a tapered joint as compared with a cylindrical joint” and “[t]apered interference fits have significant and important benefits over straight fits.” *Id.* (citing Ex. 1002 ¶ 87). According to Petitioner, these benefits of tapered fits include “ease of removal and ability to prevent damage,” ability to “be used in more locations as they do not require presses and gear pullers,” and making removal of “components on a tapered shaft particularly easy, particularly when combined with known hydraulic systems for making and breaking the interference fit.” *Id.* at 12–13 (citing Ex. 1002 ¶ 88; Ex. 1033, 3:15–22; Ex. 1034, 1:15–24; Ex. 1035, 1:13–15, 1:35–42) (footnotes omitted).

Based on the foregoing, Petitioner contends an ordinarily skilled artisan would have been “motivated to combine Polinski in view of Piepho, and further in view of Harless to gain multiple advantages as taught in the prior art.” Pet. 13 (citing Ex. 1002 ¶¶ 90–94).

b) 1P: A gyratory crusher main shaft of a crusher comprising:

Petitioner contends that Polinski is directed to “**gyratory crushers** and, in particular, to the main shaft supporting the crusher head or mantle within the crusher.” Pet. 13–14 (citing Ex. 1017, 1:6–8, Fig. 1).

Patent Owner does not address Petitioner’s contentions for the preamble of claim 1. *See generally* PO Resp.

We have reviewed Petitioner’s contentions and evidence and find that Polinski teaches the subject matter of the preamble of claim 1.

c) 1a: a shaft body having a radially outward facing external surface, and a first end and a second end

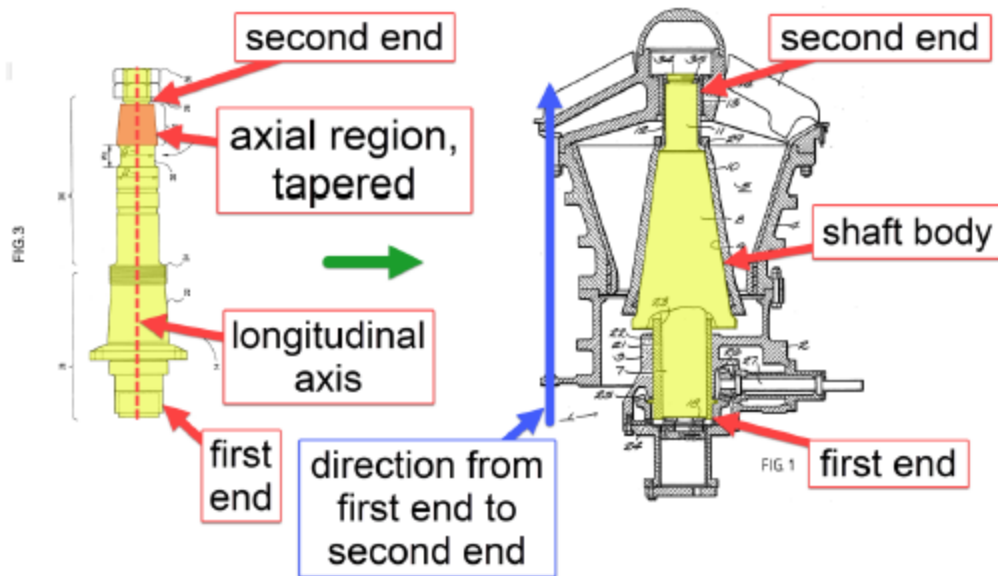
Petitioner contends that each of Polinski and Piepho disclose limitation 1a. Pet. 14–15 (citing Ex. 1017, 2:32–37; Ex. 1018, 1:26–27).

Patent Owner does not address Petitioner’s contentions for this limitation. *See generally* PO Resp.

We have reviewed Petitioner’s contentions and evidence and find that Piepho and Polinski each teach this limitation.

d) 1b: an axial region of the shaft body extending from the second end and being tapered relative to the longitudinal axis of the shaft body such that a cross sectional area of the shaft body at the tapered region decreases in a direction from the first end to the second end

Petitioner contends that the combination of Polinski and Piepho teaches this limitation. Pet. 15. Petitioner provides the following side by side comparison of Piepho’s Figure 3 on the left and Polinski’s Figure 1 on the right:



Petitioner annotates both drawings by, *inter alia*, highlighting the shaft of both Polinski and Piepho in yellow, highlighting a tapered region in Piepho's shaft in orange, adding text of "first end" and "second end" to the bottom and top respectively of each shaft, and "shaft body" to Polinski. Pet. 16.

Petitioner contends that annotated Figure 3 of Piepho shows "the shaft body of Piepho has a tapered region that extends from the first end" and the taper "is relative to the longitudinal axis of the shaft body." Pet. 16. According to Petitioner, "the cross-sectional area of the shaft body decreases as shown by the orange highlight area" and the "decrease in cross-sectional area occurs in the direction from the first (bottom) end of the main shaft to the second (top) end of the main shaft." *Id.*

Petitioner next contends that an ordinarily skilled artisan "would have been motivated to incorporate the tapered end on the main shaft of Piepho with the main shaft on Polinski" because "Piepho describes, the tapered shaft aids in accurate alignment which is notoriously more difficult with purely cylindrical shafting." Pet. 16–17 (citing Ex. 1002, 59). According to

Petitioner, “[i]ncorporating the tapered portion of the Piepho shaft with Polinski would be a combination of known elements, in known ways, producing predictable results.” *Id.* (citing Ex. 1002, 59).

Patent Owner first contends that “Polinski and Piepho, taken both alone and in combination, fail to disclose or suggest” this limitation. PO Resp. 42. Relying on its construction of “end” as “the outermost extremity of the shaft,” Patent Owner argues that “[n]either Polinski nor Piepho discloses this claim limitation” but rather both “disclose threaded regions extending from the upper end of the shaft.” *Id.* (citing Ex. 2007 ¶¶ 58–60).

With respect to Polinski, Patent Owner contends that Figure 2 of Polinski shows “[t]he second (upper) end of the shaft . . . is defined by the top end of a threaded lug 34” that “extends from the second end to a bearing journal 11.” PO Resp. 42 (citing Ex. 1017, 3:23–25). Patent Owner further contends that the threaded lug 24 “receive[s] a sleeve nut 35 of a sleeve 12” that “in turn, secures annular lip 36 of sleeve 12 to the journal 11 of the shaft 7,” thus “plac[ing] sleeve nut 35 in contact with annular lip 36 of sleeve 12, securing sleeve 12 to the bearing journal 11.” *Id.* at 42–43 (citing Ex. 1017, 2:30–47, 3:15–48, Fig. 2; Ex. 2001 ¶ 28; Ex. 2007 ¶¶ 59–60).

With respect to Piepho, Patent Owner argues that Figure 3 of Piepho shows “an axial region being tapered relative to a longitudinal axis of the shaft body (region labeled 25)” but “tapered region 25 does not extend from the end of Piepho’s shaft.” PO Resp. 44 (citing Ex. 1018, Fig. 3).

According to Patent Owner, “a threaded region labeled 26 extends from the second (top) end of the shaft discloses by Piepho between the top end and the tapered portion 25.” *Id.* (citing Ex. 2007 ¶¶ 61–63).

As discussed above in our claim construction analysis, apart from the issue of the general construction of “end,” we determine that this limitation

requires a starting point for the tapered axial region to be located at the uppermost extremity of the shaft. Because neither Polinski nor Piepho disclose a tapered axial region starting at the uppermost extremity of the shaft, we find that Petitioner has not shown that the combination of Polinski and Piepho discloses this limitation.

As to the separate motivation to combine issue, because Petitioner bears the burden of persuasion, we analyze Petitioner's reasons for why a person of ordinary skill in the art would have been motivated to combine the teachings of Polinski and Piepho to meet this claim limitation. According to Petitioner, a person of ordinary skill in the art would have been motivated to combine Polinski and Piepho because "Piepho describes, the tapered shaft aids in accurate alignment which is notoriously more difficult with purely cylindrical shafting." Pet. 16–17 (citing Ex. 1002, 59).⁶

In Mr. Smith's cited testimony in support of Petitioner's contention, he reproduces the following text in Piepho⁷ to support the argument that Piepho teaches that a tapered shaft aids in alignment:

The present invention provides an intervening material between the shaft end (25) and the mating bore in yoke bushing (18) fitted within the bore of yoke (12) to prevent fretting damage. *For accurate alignment* and for reliable support of the yoke, *this joint (21)* must be capable of accepting radial, axial, and bending or overturning loads. Preferably, the joint (21) is a tapered joint with the tapered end (25) of shaft (14). The yoke bushing (18) has a mating bore similarly tapered. Shaft end (25) may be constructed for either a keyless or keyed fit.

⁶ As discussed above, Petitioner also provides generic reasons for combining Polinski, Piepho, and Harless. We find these reasons have little relevance to whether Petitioner has shown that the combination of Polinski and Piepho teaches this claim limitation.

⁷ Mr. Smith does not include the last two sentence of this paragraph (Ex. 1002, 59) which we include for completeness and context.

Also, shaft end (25) alternatively may be cylindrical rather than tapered as seen in FIG. 4.

Ex. 1018, 3:23–35 (emphasis added).

This paragraph discusses “accurate alignment” in connection with joint 21, not tapered end 25. Ex. 1018, 3:23–35. The paragraph subsequently states that both joint 21 and end 25 are tapered but that shaft end 25 may alternatively be cylindrical. *Id.* We also find nothing in this paragraph supporting Petitioner’s assertion that alignment “is notoriously more difficult with purely cylindrical shafting” (Pet. 16–17).

In order to support its position, Petitioner improperly conflates separate statements in this paragraph of Piepho, i.e., joint 21 provides accurate alignment, joint 21 is tapered, and end 25 is tapered. Petitioner makes an unsupported logical leap that the result of these three statements is that tapered end 25 provides accurate alignment. However, Petitioner fails to reconcile this argument with the final sentence in this paragraph that shaft end 25 may also be cylindrical as shown in Figure 4.

Figure 4 of Piepho is reproduced below:

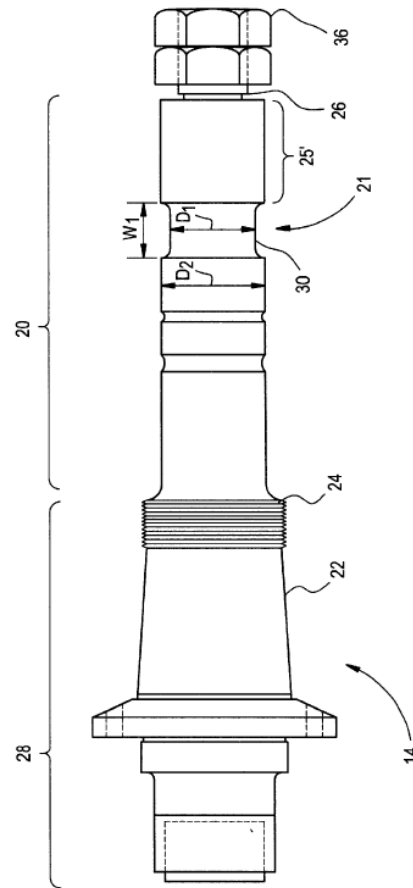


Figure 4 “is an external view of another embodiment of” Piepho’s shaft. Ex. 1018, 2:49–50. In Figure 4, joint 21 has the same tapered configuration as shown in Figure 3 but end 25 is not tapered. Based on our review of Piepho’s Figures 3 and 4, we find that Piepho’s reference to “accurate alignment” refers to joint 21 and not to tapered end 25 as Petitioner alleges.

Because Mr. Smith’s testimony (Ex. 1002, 59) essentially parrots the Petition on this point and is inconsistent with our finding, his testimony is entitled to little, if any, weight.

For the foregoing reasons, we find that Petitioner has not established that a person of ordinary skill in the art would have been motivated to

combine the teachings of Polinski and Piepho such that the combination would teach this claim limitation.⁸

Because Petitioner has not shown that the combination of Polinski and Piepho teaches limitation 1b or an adequate motivation to combine, Petitioner has not shown by a preponderance of the evidence that claim 1 is obvious over Polinski, Piepho, and Harless.

5. Analysis of Independent Claims 9 and 14

For the limitations in claims 9 and 14 that parallel limitation 1b, Petitioner relies on its contentions for limitation 1b. Pet. 33, 44–45. Consequently, for the same reasons discussed above for claim 1, Petitioner has not shown by a preponderance of the evidence that claims 9 and 14 are obvious over Polinski, Piepho, and Harless.

6. Analysis of Dependent Claims 2–8 and 10–13

Claims 2–8 depend directly or indirectly from claim 1. Ex. 1001, 7:16–42. Claims 10–13 depend directly or indirectly from claim 9. *Id.* at 8:10–30. Petitioner provides additional arguments and evidence for these dependent claims. *See* Pet. 22–33, 36–43. We have reviewed the additional evidence and argument and determine that it does not cure the deficiencies in the challenge to claims 1 and 9. Consequently, we determine that Petitioner has not shown by a preponderance of the evidence that claims 2–8 and 10–13 are obvious over Polinski, Piepho, and Harless.⁹

⁸ Our conclusion as to the motivation to combine issue does not turn on whether we accept or reject Patent Owner’s proposed claim construction for “end.”

⁹ Petitioner apparently withdrew its challenge to claim 11. Pet. Reply 11.

III. PATENT OWNER’S CONTINGENT MOTION TO AMEND

Patent Owner’s Motion to Amend, and Revised Motion to Amend, are “contingent upon a finding of unpatentability with respect to the challenged claims of” the ’090 patent. MTA 1. Because we determine that Petitioner has not shown by a preponderance of the evidence that the Challenged Claims are unpatentable, we dismiss the MTA and RMTA as moot.

IV. PETITIONER’S MOTION TO EXCLUDE

Petitioner moves to exclude certain paragraphs of Mr. Kytomaa’s Declaration, Exhibit 2022, and Exhibits 2024–2027. MTE, 3–12. Patent Owner opposes. MTE Opp.

Because we do not rely on any of the evidence that Petitioner seeks to exclude, we dismiss Petitioner’s Motion to Exclude as moot.

V. CONCLUSION

Weighing the competing evidence and testimony, we determine that Petitioner does not establish by a preponderance of the evidence that any of the Challenged Claims are unpatentable.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not shown Unpatentable
1–14	103	Polinski, Piepho, Harless		1–14

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that none of claims 1–14 of the '090 patent have been shown by a preponderance of the evidence to be unpatentable; and

FURTHER ORDERED that Patent Owner's Revised Contingent Motion to Amend (Paper 28) is dismissed as moot;

FURTHER ORDERED that Petitioner's Motion to Exclude (Paper 44) is dismissed as moot; and

FURTHER ORDERED that any party seeking judicial review must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2024-01381
Patent 11,014,090 B2

FOR PETITIONER:

Terry Sanks
BEUSSE SANKS, PLLC
tsanks@firstiniplaw.com

FOR PATENT OWNER:

Mehran Arjomand
Alex Yap
Jeffrey Young
MORRISON & FOERSTER LLP
marjomand@mofo.com
ayap@mofo.com
jeffreyyoung@mofo.com