

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.

Patent No. 11,014,090

Inter Partes Review No. IPR2024-01381

**PATENT OWNER'S REPLY TO PETITIONER'S OPPOSITION TO
REVISED CONTINGENT MOTION TO AMEND**

TABLE OF CONTENTS

	Page
I. THE NEW GROUNDS RELY ON NON-ANALOGOUS ART.....	1
A. Piepho Is Not In The Field Of Endeavor Of The '090 Patent.....	1
1. Different subject matters.....	2
2. Different functions and structure	3
3. Petitioner's and Mr. Smith's analysis is lacking, error- filled or conclusory	5
B. Piepho Is Not Reasonably Pertinent To The Particular Problem Of The '090 Patent	6
II. THERE IS NO MOTIVATION TO COMBINE.....	8
A. Coxhill And Piepho	8
B. Fatigue Failure In Coxhill	9
III. CLAIMS 16 AND 24 ARE PATENTABLE.....	11

TABLE OF AUTHORITIES

	Page(s)
Cases	
<i>In re Bigio</i> , 381 F.3d 1320 (Fed. Cir. 2004)	1
<i>In re Chu</i> , 66 F.3d 292 (Fed. Cir. 1995)	12
<i>In re Clay</i> , 966 F.2d 656 (Fed. Cir. 1992)	1, 5, 6, 8
<i>Cutsforth, Inc. v. MotivePower, Inc.</i> , 636 Fed.Appx. 575 (Fed. Cir. 2016).....	12
<i>Impax Lab’ys, Inc. v. Lannett Holdings Inc.</i> , 893 F.3d 1372 (Fed. Cir. 2018) . (Ex. 2022, ¶¶ 36–37.)	9
<i>In re Oetiker</i> , 977 F.2d 1443 (Fed. Cir. 1992)	9
<i>Rolls-Royce, PLC v. United Techs. Corp.</i> , 603 F.3d 1325 (Fed. Cir. 2010). (Ex. 2022, ¶ 58.)	12
<i>Sanofi-Aventis Deutschland GmbH v. Mylan Pharms. Inc.</i> , 66 F.4th 1373 (Fed. Cir. 2023)	5
<i>Wang Lab’ys, Inc. v. Toshiba Corp.</i> , 993 F.2d 858 (Fed. Cir. 1993)	6
Statutes	
35 U.S.C. § 325(d)	10

Patent Owner's Exhibit List

Exhibit #	Exhibit Description
2001	Declaration of Harri Kytömaa, PH.D.
2002	Curriculum Vitae and Publications of Dr. Kytömaa
2003	Richard G. Budynas & J. Keith Nisbett, <i>Shigley's Mechanical Engineering Design</i> , Ninth Edition (2011) (Chapter 3)
2004	Andrew W. Batchelor & Gwidon W. Stachowiak, <i>Engineering Tribology</i> , Second Edition (2001)
2005	Robert C. Juvinall & Kurt M. Marshek, <i>Fundamentals of Machine Component Design</i> , 3rd Edition (2000) (Chapter 9)
2006	Oscar J. Horger, <i>Metals Engineering Design</i> , First Edition (1953)
2007	Second Declaration of Harri Kytömaa, Ph.D.
2008	EP Application No. 13192402.9
2009	U.S. Application No. 15/035,774
2010	Third Declaration of Harri Kytömaa, Ph.D.
2011	Deposition Transcript of David Smith dated June 11, 2025
2012	Merriam-Webster's Collegiate Dictionary, 11th ed. (2012) (definition of "end")
2013	The Oxford English Dictionary, 2nd ed. (1989) (definition of

Exhibit #	Exhibit Description
	“indented”)
2014	PCT Application No. PCT/EP2014/060594
2015	Richard G. Budynas & J. Keith Nisbett, <i>Shigley’s Mechanical Engineering Design</i> , Ninth Edition (2011) (Chapter 8)
2016	John H. Bickford, <i>An Introduction to the Design and Behavior of Bolted Joints</i> , 3rd Edition (1995) (excerpts from Chapter 2)
2017	Robert C. Juvinall & Kurt M. Marshek, <i>Fundamentals of Machine Component Design</i> , 3rd Edition (2000) (excerpts from Chapter 10)
2018	Board’s email of October 15, 2025, extending DUE DATE 3 and portion of DUE DATE 5 pertaining to Petitioner’s sur-reply related to the motion to amend
2019	Second deposition transcript of David Smith, dated October 24, 2025
2020	Fourth Declaration of Harri Kytömaa, Ph.D.
2021 [NEW]	Third Deposition Transcript of David Smith dated December 3, 2025
2022 [NEW]	Fifth Declaration of Harri Kytömaa, Ph.D.
2023 [NEW]	U.S. Patent No. 4,034,922 to Coxhill (“Coxhill ’922”)
2024 [NEW]	Innovative Combustion Technologies, Inc. “Optimum Operation and Maintenance of EL Pulverizers”
2025	https://www.rockprocessing.sandvik/en/products/stationary-

IPR2024-01381

Patent No. 11,014,090

Exhibit #	Exhibit Description
[NEW]	crushers/stationary-cone-crushers/ch440-cone-crusher/ (Last accessed Dec. 15, 2025).
2026 [NEW]	Sandvik CH440 Crusher Maintenance Instructions
2027 [NEW]	YouTube Video entitled Sandvik Parts Evolution (https://www.youtube.com/watch?v=P-6xpGLxv2U)
2028 [NEW]	U.S. Patent No. 4,027,825 (“Coxhill ’825”)

Patent Owner Sandvik submits that the substitute claims in the Revised Motion to Amend (“RMTA”) (Paper 28) are patentable.

I. THE NEW GROUNDS RELY ON NON-ANALOGOUS ART

All of Petitioner’s new grounds combine Coxhill (Ex. 1053) with Piepho (Ex. 1018). Both the ’090 patent and Coxhill relate to gyratory crushers, but Piepho is directed to a coal pulverizer. A coal pulverizer differs so much in function and structure from a gyratory crusher that no POSITA would consider Piepho as pertinent art. (Ex. 2022, ¶ 13.) Indeed, a prerequisite for obviousness is that the art must be analogous to the subject matter of the claimed invention. *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992). The art must be either from the same field of endeavor or reasonably pertinent to the particular problem which the ’090 inventors were involved. *Id.*, at 658–59. Although Petitioner’s expert, Mr. Smith, sets out these tests, he fails to establish that Piepho is analogous art. (Ex. 1051, ¶ 13.) Nor could he, because Piepho does not qualify under either test.

A. Piepho Is Not In The Field Of Endeavor Of The ’090 Patent

The field of endeavor test considers the “explanations of the invention’s subject matter in the patent [], including the embodiments, function, and structure of the claimed invention.” *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004).

1. Different subject matters

The '090 patent's field is a gyratory crusher. (Ex. 2022, ¶ 14.) It describes a gyratory crusher main shaft assembly having a tapered wear sleeve and configured for pressurized fluid delivery to enable convenient mounting and dismounting. (Ex. 1001, 1:63–2:9.) The '090 patent is entitled a “Gyratory Crusher Main Shaft And Assembly,” and its “Field of Invention” is directed to a “gyratory crusher main shaft and main shaft assembly for positioning within a gyratory crusher.” (Ex. 1001, 1:1–20.) The “Background Art” section discusses only gyratory crushers and their protective sleeves. (Ex. 1001, 1:35–41.) Every reference cited there is a gyratory crusher patent. For its invention description, the '090 patent describes and illustrates a gyratory crusher having a tapered main shaft fit with a tapered sleeve, oil grooves, and an internal oil path. (*See, e.g.*, Ex. 1001, 2:31–45, FIG. 1). During prosecution, the Examiner only cited gyratory crusher art. (Ex. 1001-1, References Cited (September 25, 2018).)

In contrast, Piepho is not directed to a gyratory crusher at all. (Ex. 2022, ¶ 15.) Piepho instead relates “to an improved main shaft for a coal pulverizer[.]” (Ex. 1018, 1:5–8; *see also* Ex. 2011, 57:17–20.) Moreover, its purported invention is not a sleeve, but a coating layer for a coal pulverizer shaft. (Ex. 1018, 2:16–25; *see also* 2:55–58, 3:24–27; Ex. 2011, 57:11–16.) As such, Piepho touts that its coating

invention does not require changing the geometries of the shaft and its yoke in contrast to the '090 patent's focus on a wear sleeve's geometry. (Ex. 1018, 4:24–26.)

2. Different functions and structure

The '090 patent's gyratory crusher is a starkly different apparatus than Piepho's coal pulverizer. Mr. Smith repeatedly testified that he had little knowledge on the operation of Piepho's coal pulverizer—putting into question his credibility as being knowledgeable on “industrial equipment design.” (*See, e.g.*, Ex. 2011, 57:21–58:7; Ex. 2021, 65:5–16, 65:23–66:4, 71:11–15, 76:18–77:9; Ex. 1002, ¶ 30.) In contrast, Dr. Kytömaa testifies that a POSITA would have readily understood that the two apparatuses are functionally and structurally different. (Ex. 2022, ¶¶ 14–31.)

Operation. The shaft of the '090 patent's gyratory crusher rotates eccentrically, or gyrates, about the crusher's axis without a roller bearing. Piepho's shaft does not gyrate. It, instead, rotates only about its own axis with the upper end of the shaft cantilevered above the upper bearing. The yoke and yoke bushing are attached to the cantilevered region of the shaft. The shaft of the '090 patent is not cantilevered.

Loading. The crushing load of the '090 patent is not evenly distributed. Unlike a coal pulverizer, crushing forces in a gyratory crusher are always concentrated on one side of the shaft and not distributed around the circumference. In contrast, Piepho's balls 8 provide an evenly distributed crushing load.

Wear environment. Due to the eccentric motion of the main shaft in the '090 patent, there is a gap between the shaft and the bearing assembly. Rocks can enter this gap, creating an abrasive environment necessitating a wear sleeve on the main shaft. Piepho's yoke bushing is sealed and is not a wear member.

Rotation. The wear sleeve of the '090 patent is intended to have relative motion with respect to the bearing assembly, whereas Piepho's yoke bushing 18 is not intended to have relative motion with respect to main shaft 14 and yoke 12. Indeed, the purpose of the yoke bushing in Piepho is to *secure* the yoke to the main shaft. The yoke bushing must be able to transmit torque between the shaft and the yoke.

Assembly/Disassembly. The wear sleeve of the '090 patent is a sacrificial member that needs to be replaced, but Piepho has no disclosure or suggestion that its yoke bushing is a sacrificial member that needs to be replaced.

Each of these differences on its own would be sufficient to functionally and structurally distinguish a gyratory crusher from a coal pulverizer, but collectively

they underscore that the apparatuses are not only different but also operate in entirely different ways. (Ex. 2022, ¶ 31.)

3. Petitioner’s and Mr. Smith’s analysis is lacking, error-filled or conclusory

Petitioner’s new grounds are legally deficient, because Petitioner does not attempt to make the prerequisite showing that Piepho is analogous art. *See Clay*, 966 F.2d at 658. In his declaration accompanying the Opposition, Mr. Smith sets forth the “field of endeavor” test and even mentions it for a prior art reference (Yagi). (Ex. 1051, ¶¶ 13, 46.) But Mr. Smith makes no mention of the test for Piepho, let alone provide any analysis. Petitioner’s Opposition is similarly lacking.

Even if one were to consider Mr. Smith’s earlier declarations, which related to different claims and grounds, those declarations were error-filled on the field of endeavor. For example, in his first declaration, Mr. Smith states: “As a rock crushing apparatus, Piepho is in the same field of endeavor as Polinski and thus (being analogous art) would easily be within[] the purview of a POSITA.” (Ex. 1002, ¶ 85.) But the analogous art test requires comparison of Piepho to the ’090 patent—not other art. *Sanofi-Aventis Deutschland GmbH v. Mylan Pharms. Inc.*, 66 F.4th 1373, 1377 (Fed. Cir. 2023). Petitioner similarly erred. (Paper 2, 12.)

Moreover, simply referring to Piepho as a rock crushing apparatus is insufficient under Federal Circuit authority. For example, in *Clay*, the Court held

that the prior art reference (Sydansk) “cannot be considered to be within Clay’s field of endeavor merely because both relate to the petroleum industry.” *Clay*, 966 F.2d at 659. In *Wang Lab ’ys, Inc. v. Toshiba Corp.*, 993 F.2d 858 (Fed. Cir. 1993), the patent at issue and the art (Allen-Bradley) both related to memory modules. But the Court found that Allen-Bradley was not in the same field of endeavor “merely because it relates to memories.” *Wang*, 993 F.2d at 864. Treating the ’090 patent and Piepho as being in the same field because they merely reside within the broad universe of comminution equipment improperly elevates a high-level industrial label over the actual field of endeavor defined by the ’090 patent. (Ex. 2022, ¶ 31.)

B. Piepho Is Not Reasonably Pertinent To The Particular Problem Of The ’090 Patent

Mr. Smith explained the pertinence test in his third declaration (Ex. 1051, ¶ 13), and he even sought to apply it to other references. (Ex. 1051, ¶¶ 46, 56, 60, 64, 68.) But he never relied on this test to qualify Piepho. Nor did Petitioner. It is thus foreclosed from arguing that Piepho is analogous art through this test.

In any event, under this test, the focus is on the purposes or problems of the claimed invention and the reference. *Clay*, 966 F.2d at 659. Piepho does not qualify under this test, because the ’090 patent and Piepho are directed to different problems. The ’090 patent concerns the problem of assembling and disassembling

a wear sleeve from a main shaft of a gyratory crusher. (Ex. 1001, 1:51–2:9; Ex. 2011, 21:9–22:1; *see also* Ex. 2027 (video showing the benefits provided by aspects of the invention, including increased safety and efficiency).) Piepho, on the other hand, addresses the problem of a coal pulverizer shaft failing due to fretting-induced bending fatigue at the joint between the yoke bushing and the main shaft. (Ex. 1018, 1:45–2:14.) The wear components in Piepho are its balls and rings—not a sleeve (which Piepho does not disclose) or even the yoke bushing. And there is no discussion on the yoke bushing being assembled or disassembled from the shaft or the yoke. Indeed, the reason that Piepho is concerned with *fretting-induced* fatigue is because the yoke bushing remains assembled with the main shaft, such that fretting wear would not be readily identifiable during machine maintenance. (Ex. 2022, ¶¶ 32–33.)

Petitioner and Mr. Smith emphasize that Piepho discloses a tapered yoke bushing and main shaft. (Paper 33, 12; Ex. 1051, p. 66.) But Piepho also discloses that the shaft/yoke bushing interface may be cylindrical as well. (Ex. 1018, 3:33–35; Ex. 1051, ¶ 36 (Mr. Smith testifying on the “interchangeability” of cylindrical and tapered joints in Piepho).) That is, Piepho does not consider a cylindrical fit to be a problem, unlike the ’090 patent. (Ex. 2022, ¶ 34.)

Petitioner and Mr. Smith also emphasize that a tapered shaft aids in sleeve-shaft alignment. (Paper 33, 13; Ex. 1051, p. 67.) But fretting-induced fatigue—not yoke bushing-shaft alignment—is the problem on which Piepho focuses. To be sure, Piepho describes “accurate alignment” but that is with respect to the *yoke*—not the yoke bushing. (Ex. 1018, 3:27–29 (“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.”) (emphasis added).) The yoke must be aligned accurately to drive the pulverizer’s balls—something that Mr. Smith with his limited understanding of Piepho’s coal pulverizer missed. (Ex. 1018, 1:25–26.) Thus, under either test, Piepho is not analogous art. (Ex. 2022, ¶ 35.)

II. THERE IS NO MOTIVATION TO COMBINE

A. Coxhill And Piepho

The fact that Piepho is non-analogous art underscores that Petitioner’s new combinations are without motivation. *Clay*, 966 F.2d at 659 (“If [the reference] is directed to a different purpose, the inventor would accordingly have had less motivation or occasion to consider it.”). Mr. Smith plucks isolated snippets from Piepho, testifying that he did not consider Piepho beyond its disclosure of a tapered shaft. (Ex. 2021, 65:5–16.) His approach thus suggests that he improperly used the tapered shaft claim language of the ’090 patent as a blueprint to select Piepho—a

non-analogous reference. *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992) (“The combination of elements from non-analogous sources, in a manner that reconstructs the applicant’s invention only with the benefit of hindsight, is insufficient to present a *prima facie* case of obviousness.”).

Petitioner and Mr. Smith’s use of hindsight is also reflected in their limited motivation analysis. They either provide generic *KSR* language without explication or say that it would have been “notoriously more difficult” to align with a cylindrical joint. (Paper 33, 11–13, 16; Ex. 1051, ¶ 77, p. 67.) But Piepho itself notes a cylindrical joint is an alternative to a tapered joint. (Ex. 1018, 3:33–35.) Only by ignoring Piepho’s field and focus—in other words, everything other than Piepho’s disclosure of a tapered shaft—could Petitioner and Mr. Smith conclude obviousness. *Impax Lab’ys, Inc. v. Lannett Holdings Inc.*, 893 F.3d 1372, 1379 (Fed. Cir. 2018) (prior art reference considered as a whole). (Ex. 2022, ¶¶ 36–37.)

B. Fatigue Failure In Coxhill

Petitioner’s proposed combination of Coxhill and Yagi would require machining oil grooves into the external surface of Coxhill’s main shaft. A POSITA, however, would have understood that introducing additional grooves into the Coxhill shaft could *increase* the risk of catastrophic fatigue failure. As of the ’090 Patent’s filing date, it was known that the shaft disclosed by Coxhill was

prone to fatigue failure. (Ex. 1017, 1:11–37.) Polinski—previously relied upon by Petitioner—criticizes the shaft configuration of Coxhill ’922 (a sister patent to Coxhill with the same shaft configuration). (Ex. 1017, 1:11–37; Ex. 2023, FIG. 1; *but see* Ex. 2019, 61:18-62:1 (Mr. Smith incorrectly contradicting Polinski).) Polinski explains that “high local stress concentrations” and “substantial stresses generated by the cyclic bending loads” lead to “fatigue cracks or fractures” in the shaft and ultimately “render the shaft unserviceable.” (Ex. 1017, 1:11–37; Ex. 2022 ¶¶ 38–42.)

Against that backdrop, a POSITA would have recognized that cutting additional oil grooves into the Coxhill shaft would reduce the cross-sectional area of the shaft and introduce additional stress raisers in the region that Polinski identifies as fatigue-prone. Indeed, Coxhill’s shaft is even more vulnerable than the shaft disclosed in Polinski. Whatever advantages that the grooves would provide would have been insufficient to motivate a POSITA in view of the known fatigue-failure risk *of the particular shaft in Coxhill*. Indeed, during prosecution, the Examiner *considered* Coxhill ’825 (Ex. 2028), which has the same relevant disclosure as Coxhill ’800 and ’922. Yet she allowed the (broader) issued claims over it, underscoring the deficiency of the art. Petitioner is simply recycling considered art and arguments. *See* 35 U.S.C. § 325(d); (Ex., 2022 ¶¶ 43–46).

III. CLAIMS 16 AND 24 ARE PATENTABLE

The closed “consisting of” language narrows these claims in two important ways. First, the internal oil path is limited to exactly one axial conduit and one radial conduit. Second, that internal path extends within the shaft body only to the first groove—that is, there is no internal branch or continuation to the second groove. Neither Coxhill nor Piepho disclose any oil grooves, and Yagi is deficient.

Yagi’s embodiments either route the internal passage to a *single* groove (first embodiment), *both* grooves (second embodiment) or route the internal passage *only to the second groove* and feed the first groove externally along the shaft *downstream* from the second groove (third embodiment). (See Ex. 1040, FIGS. 1B, 3A–3B, 4, 5A–5C.) Petitioner’s assertion that “[i]n one embodiment Yagi teaches an internal oil path that extends only to the first groove” (Paper 33, 15) is unsupported by any citation because no such embodiment exists. Where Yagi contemplates multiple grooves, it discloses an internal fluid path to the second groove. (See Ex. 1040.) Petitioner and Mr. Smith also rely on Yagi’s FIG. 6B and the statement that “oil is fed from the first oil groove 44 only.” But FIGS. 6A–6C merely depict a procedure for decoupling the tapered shaft 40 from the hub 30 in the second embodiment. Also, the second embodiment does not have an external axial channel. (See Ex. 1040, 7:37–57; Ex. 2020 ¶¶ 47–53.)

Petitioner next asserts a “design choice” without any supporting rationale. (Paper 33, 15.) “Merely stating that a particular placement of an element is a design choice does not make it obvious.” *Cutsforth, Inc. v. MotivePower, Inc.*, 636 Fed.Appx. 575, 578 (Fed. Cir. 2016). As for Mr. Smith, he fails to acknowledge the significant improvements provided by the claimed oil path. Here, in addition to the fact that “[m]inimizing an axial length of an internally extending fluid supply conduit is advantageous during manufacture as the use of very long and thin drills should be avoided” (Ex. 1001, 3:6–10), the shorter internal bore also means *less oil volume* is required to fill the system, *less time* is needed to pump the oil to reach the desired pressure, there is *less cleanup* of residual oil, and *less machine downtime* for coupling/decoupling operations. (Ex. 2022, ¶¶ 54–57.) The claimed structure and its function being different from the prior art precludes an obvious “design choice.” *See In re Chu*, 66 F.3d 292, 298-299 (Fed. Cir. 1995).

Finally, Petitioner raises “obvious to try.” (Paper 33, 15.) But Petitioner has not identified any finite set of porting options, nor has Petitioner shown that the claimed arrangement was an “identified, predictable solution” at the time. Yagi describes a broad range of options for introducing oil between a shaft and hub, none of which correspond to the claimed oil flow path. *See Rolls-Royce, PLC v. United Techs. Corp.*, 603 F.3d 1325, 1339 (Fed. Cir. 2010); (Ex. 2022, ¶ 58).

IPR2024-01381
Patent No. 11,014,090

Dated: December 16, 2025

By /Mehran Arjomand/
Mehran Arjomand, Reg. No. 48, 231
MORRISON & FOERSTER LLP
707 Wilshire Blvd., Suite 6000
Los Angeles, CA 90017
Email: MArjomand@mofo.com
Tel: 213-892-5200

Counsel for Patent Owner

IPR2024-01381
Patent No. 11,014,090

Certificate of Service (37 C.F.R. § 42.6(e)(4))

I hereby certify that the attached “PATENT OWNER’S REPLY TO
PETITIONER’S OPPOSITION TO REVISED CONTINGENT MOTION TO
AMEND” was served on the below date on the Petitioner via e-mail (by consent)
to the following counsel of record:

Terry M. Sanks
tsanks@firstiniplaw.com
litigation@firstiniplaw.com

Dated: December 16, 2025

/Mehran Arjomand/
Mehran Arjomand