

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

SANDVIK INTELLECTUAL PROPERTY AB,
Patent Owner.

Patent No.
9,827,568

Inter Partes Review No. IPR2024-01380

PATENT OWNER'S REVISED NON-CONTINGENT MOTION TO AMEND

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. THE SUBSTITUTE CLAIMS MEET THE REQUIREMENTS OF 37 C.F.R. § 42.121	1
A. Reasonable Number Of Substitute Claims.....	1
B. The Substitute Claims Are Responsive To The Instituted Grounds	1
C. The Substitute Claims Do Not Enlarge The Scope Of The Original Claims	2
D. The Substitute Claims Are Supported By The Original Disclosures And Do Not Introduce New Matter.....	2
Substitute Independent Claim.....	3
III. LEVEL OF ORDINARY SKILL IN THE ART	9
IV. THE SUBSTITUTE CLAIMS ARE PATENTABLE OVER THE PRIOR ART.....	10
A. Substitute Claim 11	10
1. Polinski in view of Piepho fails to disclose or suggest [11a]	10
2. Polinski in view of Piepho fails to disclose or suggest [11e]	17
3. Coxhill in view of Piepho fails to disclose or suggest [11f].....	20
B. Substitute Claim 12	22
1. Polinski in view of Piepho and Pollak fails to disclose or suggest claim 12.....	22
2. Coxhill in view of Piepho fails to disclose or suggest claim 12.....	24
C. Substitute Claims 13–17.....	24
D. Substitute Claim 18	25

TABLE OF CONTENTS
(continued)

	Page
1. Polinski in view of Piepho and Pollak fails to disclose or suggest clam 18.....	25
2. Coxhill in view of Piepho fails to disclose or suggest claim 18.....	26
E. Substitute Claim 19	27
1. Polinski in view of Piepho and Pollak fails to disclose or suggest claim 19.....	27
2. Coxhill in view of Piepho fails to disclose or suggest claim 19.....	27
F. Objective Indicia Of Non-Obviousness	28
V. CONCLUSION.....	37

TABLE OF AUTHORITIES**Page(s)****Cases**

<i>Aqua Prod., Inc. v. Matal</i> , 872 F.3d 1290 (Fed. Cir. 2017)	1
<i>Ariad Pharms, Inc. v. Eli Lilly & Co.</i> , 598 F.3d 1336 (Fed. Cir. 2010) (en banc)	6
<i>Medtronic, Inc. v. Teleflex Innovations Sarl</i> , 70 F.4th 1331 (Fed. Cir. 2023)	28, 37
<i>Quanergy Sys. v. Velodyne Lidar USA, Inc.</i> , 24 F.4th 1406 (Fed. Cir. 2022)	28, 33
<i>Vas-Cath Inc. v. Mahurkar</i> , 935 F.2d 1555 (Fed. Cir. 1991)	6
<i>Volvo Penta of the Americas, LLC v. Brunswick Corp.</i> , 81 F.4th 1202 (Fed. Cir. 2023)	34, 37

Other Authorities

37 C.F.R. § 42.121	1
37 C.F.R. § 42.121(a)(2)(i)	1
37 C.F.R. § 42.121(a)(2)(ii)	2
37 C.F.R. §§ 42.121(a)(2)(ii) and (b)(1)	2
37 C.F.R. § 42.121(a)(3)	1

PATENT OWNER'S EXHIBIT LIST

Exhibit #	Exhibit Description
2001	Declaration of Harri Kytömaa, Ph.D.
2002	Curriculum Vitae and Publications of Dr. Kytömaa
2003	EP Application No. 12179089.3
2004	U.S. Application No. 14/418,535
2005	PCT Application No. PCT/EP2013/062861
2006	Deposition Transcript of David Smith dated June 11, 2025
2007	Declaration of David G. Smith in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent 11,014,090
2008	Merriam-Webster's Collegiate Dictionary, 11th ed. (2012) (definition of "end")
2009	Sandvik CH440 Webpage at https://www.rockprocessing.sandvik/en/products/stationary-crushers/stationary-cone-crushers/ch440-cone-crusher/ (accessed on June 23, 2025)
2010	CMS Cepercor Webpage at https://www.cmscepcor.com/us/crusher-parts/brands/sandvik-hydrocone-superior/ch-series/ch440/ (accessed on June 23, 2025)
2011	CMS Cepercor Webpage at https://www.cmscepcor.com/us/crusher-parts/brands/sandvik-hydrocone-superior/ (accessed on June 23, 2025)
2012	Richard G. Budynas & J. Keith Nisbett, <i>Shigley's Mechanical Engineering Design</i> , Ninth Edition (2011)

2013	John H. Bickford, <i>An Introduction to the Design and Behavior of Bolted Joints</i> , 3rd ed. (1995)
2014	Robert C. Juvinall & Kurt M. Marshek, <i>Fundamentals of Machine Component Design</i> , 3rd Edition (2000)
2015	Stipulation to Stay Pending <i>Inter Partes</i> Review with exhibits
2016	Signed Stipulation to Stay Pending <i>Inter Partes</i> Review
2017	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
2018 [NEW]	Second Deposition Transcript of David Smith dated October 24, 2025
2019 [NEW]	Sandvik CH440 Crusher Maintenance Instructions
2020 [NEW]	Second Declaration of Harri Kytömaa, Ph.D.

I. INTRODUCTION

Pursuant to 37 C.F.R. § 42.121 and the Board’s Order (Paper 8) and email (Ex. 2017) and in view of Petitioner’s Opposition to Patent Owner’s Non-Contingent Motion to Amend (“Opposition”) (Paper 15) and the Board’s Preliminary Guidance (“Preliminary Guidance”) (Paper 20), Patent Owner Sandvik Intellectual Property AB submits this revised non-contingent Motion to Amend (“revised Motion” or “revised “MTA”). This Motion and the supporting Second Declaration of Dr. Harri Kytömaa (Ex. 2020) demonstrate that substitute claims 11–19 are patentable over the ground in this proceeding, even though Patent Owner does not bear a burden of persuasion to demonstrate the patentability of the substitute claims. *Aqua Prod., Inc. v. Matal*, 872 F.3d 1290, 1327 (Fed. Cir. 2017).

II. THE SUBSTITUTE CLAIMS MEET THE REQUIREMENTS OF 37 C.F.R. § 42.121

A. Reasonable Number Of Substitute Claims

As shown in Appendix A, Sandvik proposes, at most, only one substitute claim for each challenged claim. This Motion is thus consistent with the general presumption that “only one substitute claim would be needed to replace each challenged claim.” 37 C.F.R. § 42.121(a)(3).

B. The Substitute Claims Are Responsive To The Instituted Grounds

Substitute claims 11–19 are responsive to the instituted grounds. 37 C.F.R. § 42.121(a)(2)(i). Sandvik proposes one substitute independent claim—claim 11—

with recitations that overcome the grounds as described *infra*. Substitute dependent claims 12–19 are also responsive to the instituted grounds based at least on their dependence from the substitute independent claim.

C. The Substitute Claims Do Not Enlarge The Scope Of The Original Claims

Substitute independent claim 11 *adds* further recitations to challenged independent claim 1 (as discussed below) and thus does not enlarge the scope of the claims. 37 C.F.R. § 42.121(a)(2)(ii).

D. The Substitute Claims Are Supported By The Original Disclosures And Do Not Introduce New Matter

The '568 patent issued from U.S. App. No. 14/418,535 (Ex. 2004, the "'535 application"), filed on January 30, 2015. The '535 application is a national stage entry of PCT/EP2013/062861 (Ex. 2005), filed on June 20, 2013, which claims priority to EP Application No. 12179089.3 (Ex. 2003), filed August 2, 2012. As set forth below, the originally filed disclosure (Exs. 2003 & 2004) supports each substitute claim and makes clear that no new matter has been introduced. 37 C.F.R. §§ 42.121(a)(2)(ii) and (b)(1). The left column of the chart below shows the substitute independent claim in comparison to the challenged independent claim, with added recitations underlined and deleted recitations with strikethroughs. The right column shows exemplary support in the original disclosure—first with

respect to the recitations of the challenged independent claims and then for the newly added recitations.

Substitute Independent Claim	Support in the EP Application No. 12179089.3 (Ex. 2003) and '535 Application (Ex. 2004)
[11pre] Claim 11. A gyratory crusher comprising: [11a] a main shaft including a shaft body having a first end for positioning at a lower region of the crusher and a second end for positioning at an upper region of the crusher relative to the first end, a thickness of the shaft body being tapered in an axial direction of the main shaft at a <u>tapered</u> region of the second end so as to <u>taper and decrease in cross-sectional area, wherein the tapered region extends from an uppermost extremity of the shaft</u>; and [11b] a sleeve fitted over the tapered region at the second end of the main shaft, the sleeve including an elongate axial wall extending around a longitudinal axis of the sleeve, the axial wall having an internal facing surface for positioning in contact with an outward facing surface of the main shaft, and an external facing surface relative to the longitudinal axis, the axial wall extending between the internal and external facing surfaces, the axial wall having a first <u>sleeve end</u> for positioning at a lower region of the main shaft and a second <u>sleeve end</u> for positioning at an upper region of the main shaft relative to the lower region,	<u>'568 patent claim 1</u> Exs. 2003 & 2004: 3:12–23; 4:23–29; FIGS. 1–2. [11a] “a thickness of the shaft body being tapered in an axial direction of the main shaft at a <u>tapered</u> region of the second end so as to <u>taper and decrease in cross-sectional area, wherein the tapered region extends from an uppermost extremity of the shaft</u>” Exs. 2003 & 2004: 3:5; 6:1–3; FIG. 1–2. [11b] “the axial wall extending between the internal and external facing surfaces, the axial wall having a first <u>sleeve end</u> for positioning at a lower region of the main shaft, and a second <u>sleeve end</u> for positioning at an upper region of the main shaft relative to the lower region” Exs. 2003 & 2004: 3:1–3; 6:14–20; 6:24–27; FIG. 2. [11c] “a thickness of the axial wall at a region between the first and second <u>sleeve ends tapers and decreases in a direction from the second sleeve end to the first sleeve end, wherein the first sleeve end is a lowermost extremity of the sleeve</u>”

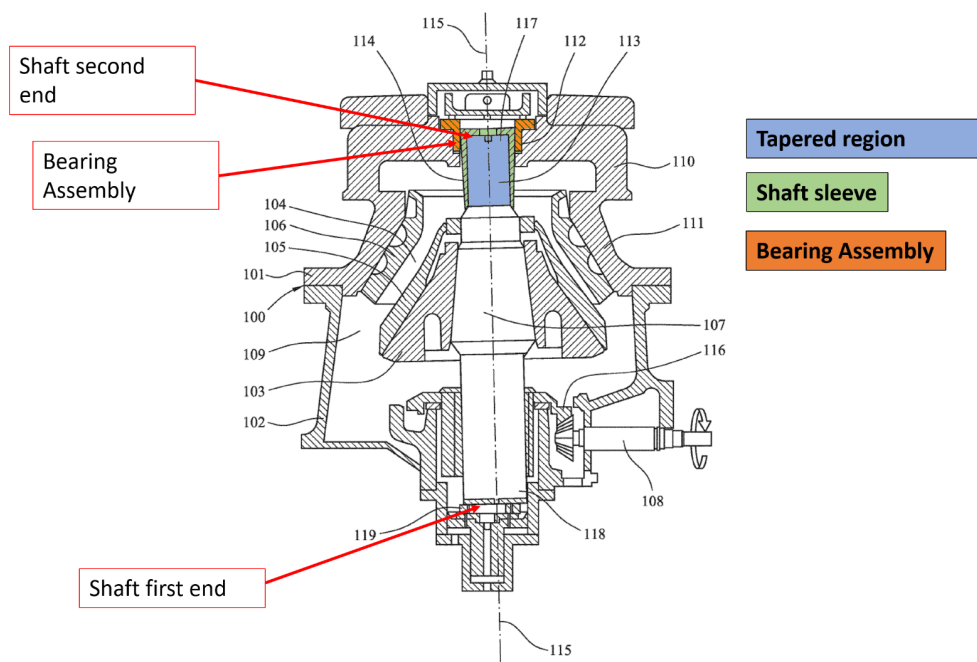
[11c] wherein a thickness of the axial wall at a region between the first and second <u>sleeve ends tapers and decreases in a direction from the second sleeve end to the first sleeve end, wherein the first sleeve end is a lowermost extremity of the sleeve,</u> [11d] in the axial direction the internal facing surface at said region between the first and second <u>sleeve ends extending transverse to the longitudinal axis so as to taper inwardly towards the longitudinal axis of the sleeve in the direction from the first sleeve end to the second sleeve end, and</u> [11e] wherein the external facing surface from the first sleeve end to the second sleeve end is <u>parallel to the longitudinal axis of the sleeve such that the external facing surface of the sleeve when viewed externally has a cylindrical geometry</u> [11f] wherein the second end of the shaft body is configured to be <u>supported by a top bearing assembly such that the second end is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly.</u>	Exs. 2003 & 2004: 3:19–21; 6:24–27; FIGS. 1–2. [11d] “in the axial direction the internal facing surface at said region between the first and second <u>sleeve ends extending transverse to the longitudinal axis so as to taper inwardly towards the longitudinal axis of the sleeve in the direction from the first sleeve end to the second sleeve end</u>” Exs. 2003 & 2004: 3:1–3; 6:18–20; FIG. 2. [11e] “<u>wherein the external facing surface from the first sleeve end to the second sleeve end is parallel to the longitudinal axis of the sleeve such that the external facing surface of the sleeve when viewed externally has a cylindrical geometry.</u>” Exs. 2003 & 2004: 6:14-24; FIGS. 1–2. [11f] wherein the second end of the shaft body is configured to be <u>supported by a top bearing assembly such that the second end is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly</u> Exs. 2003 & 2004: 3:67–4:1; FIGS. 1–2.
---	---

The chart below shows the exemplary support for the substitute dependent claims.

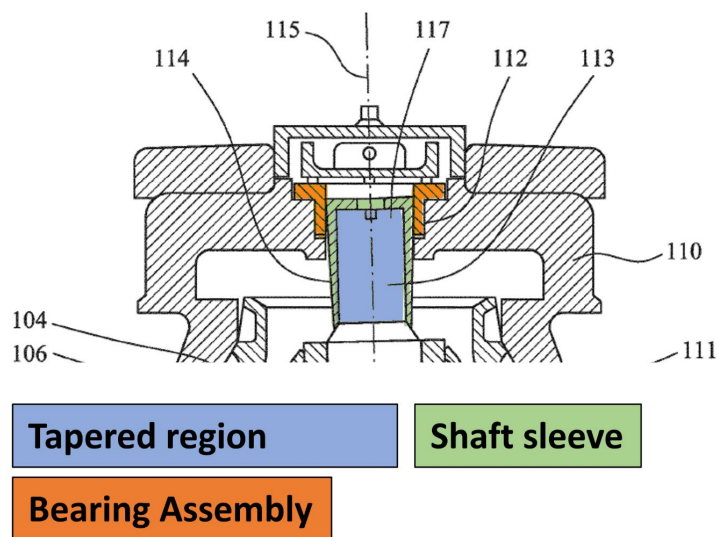
Substitute Dependent Claims	Support in the '535 Application (Ex. 2004) and EP Application No. 12179089.3 (Ex. 2003).
Claim 12 (corresponding to claim 2)	“wherein the region over which the thickness of the axial wall <u>tapers and decreases</u> extends <u>substantially</u> the full axial length of the sleeve” Exs. 2003 & 2004: 3:19–21; 25–26; 6:24–27; FIGS. 1–2.
Claim 13 (corresponding to claim 3)	Exs. 2003 & 2004: 3:28–30.
Claim 14 (corresponding to claim 5)	Exs. 2003 & 2004: 4:1–2.
Claim 15 (corresponding to claim 6)	Exs. 2003 & 2004: 4:2–3.
Claim 16 (corresponding to claim 8)	Exs. 2003 & 2004: 4:4–5.
Claim 17 (corresponding to claim 9)	Exs. 2003 & 2004: 4:10–11.
Claim 18 The gyratory crusher as claimed in claim 11, wherein at a ~~curved~~ region ~~[[of]] proximal to the first sleeve end, the thickness of the axial wall reduces at an increased rate relative to a region of the axial wall proximal to the second sleeve end~~ ~~the internal facing surface is curved radially outward relative to the longitudinal axis in a direction towards the external facing surface such that the axial wall thickness decreases to zero at the curved region.~~ (corresponding to claim 10)	“wherein at a ~~curved~~ region <u>proximal to the first sleeve end, the thickness of the axial wall reduces at an increased rate relative to a region of the axial wall proximal to the second sleeve end</u> ” Exs. 2003 & 2004: 4:19–21; 7:1–5; FIG. 2.
Claim 19. The gyratory crusher as claimed in claim 18, wherein the thickness of the axial wall reduces at a uniform rate along an entire axial length of the sleeve other than the region proximal to the first sleeve end.	Exs. 2003 & 2004: 7:18–20; FIG. 2.

Courts consider a number of factors in determining written description support, including “the existing knowledge in the particular field, the extent and content of the prior art, the maturity of the science or technology, [and] the predictability of the aspect at issue.” *Ariad Pharms, Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). Moreover, the “description requirement does not demand any particular form of disclosure” or that the “specification recite the claimed invention in *haec verba*.” *Id.*, at 1352. The drawings and/or figures alone can be enough to show written description support. *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1564 (Fed. Cir. 1991) (finding that “drawings alone *may* be sufficient to provide the ‘written description of the invention’ required by § 112, first paragraph.”).

With respect to 11[f], the original disclosure describes that a “very uppermost end 117 of shaft 107 is maintained in an axially rotatable position by a top bearing assembly 112.” (Ex. 2003, 6:3–5; Ex. 2004, 3:67–4:1.) This arrangement is illustrated in FIGS. 1 and 2 of the original disclosure, annotated below.



(Ex. 2001, FIG. 1 (annotated))



(Ex. 2001, FIG. 1 (cropped and annotated))

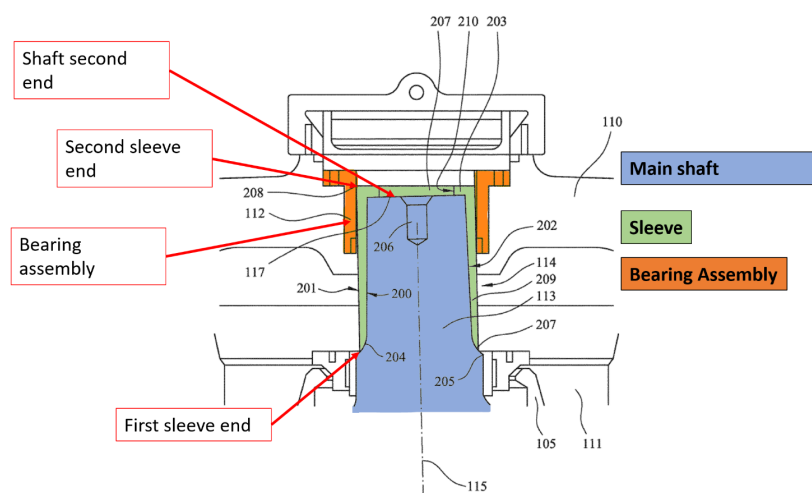


FIG. 2

(Ex. 2001, FIG. 2 (annotated))

As depicted, the second end of the shaft is positioned within bearing assembly 112. The second end is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly. In his second deposition, Mr. Smith agreed that a POSITA, looking at the disclosure of the '568 patent, would understand the second end of the shaft is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly.

Q. As you noted, there is description in the '568 patent that the conical region 113 of the shaft rotates eccentrically about longitudinal axis 115; is that correct?

A. That's correct.

Q. And you've also testified that a person of ordinary skill in the art looking at Figure 2 of the '568 patent would also understand that conical region 113 of the shaft also rotates about itself?

A. Yes, I would agree to that.

Q. Okay. What I'm trying to ask is, would a person of ordinary skill in the art looking at Figure 2 of the '568 patent understand that conical region 113 of the shaft rotates about itself freely with respect to bearing assembly 112?

A. Yes, I think that's correct, that 113 will rotate within bearing 112.

(Ex. 2018, 36:13–37:4.) Thus, the original disclosure of the '568 patent provides written description support for [11f].

III. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner contends that “a person having ordinary skill in the art [POSITA] would be a person who has a bachelor’s degree in mechanical engineering or a related field, and at least 2 years of experience with industrial equipment design and development.” (Paper 2, 5; *see also* Ex. 2006, 38:25–39:24 (Mr. Smith testifying that the two years of experience is not limited to rock crushers and that “industrial equipment” is a “broad category”).) This POSITA “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.” (Ex. 1002, ¶ 30.; *see also* Ex. 2006, 49:3–7.) For the purposes of this Motion, Sandvik does not object to Petitioner’s proposed level of skill in the art. Sandvik’s technical expert, Harri Kytömaa, Ph.D., readily meets this definition. (Ex. 2020, ¶ 6.)

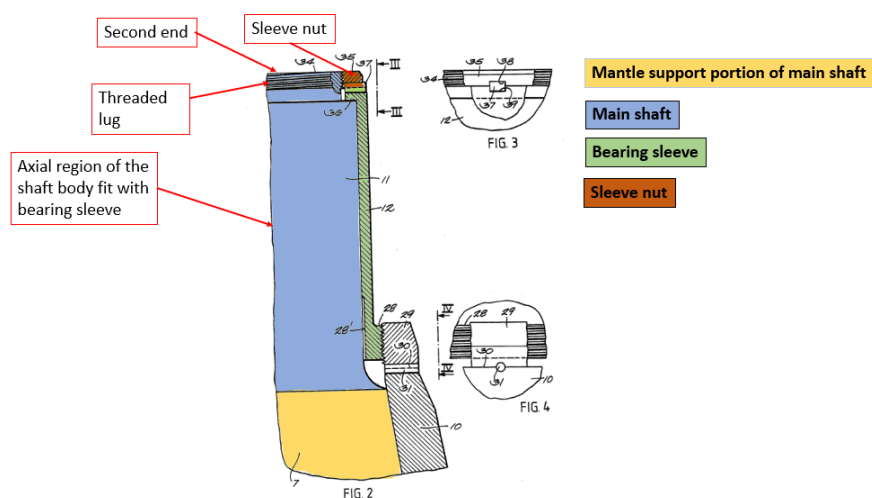
IV. THE SUBSTITUTE CLAIMS ARE PATENTABLE OVER THE PRIOR ART

Substitute independent claim 11, and those claims that depend therefrom, are patentable over the instituted grounds. Petitioner has raised additional art, such as Coxhill (Ex. 1039), in its opposition to Sandvik’s first Motion to Amend. The Board addressed such additional art in its Preliminary Guidance (Paper 20). For completeness, this revised Motion addresses such additional art below.

A. Substitute Claim 11

1. Polinski in view of Piepho fails to disclose or suggest [11a]

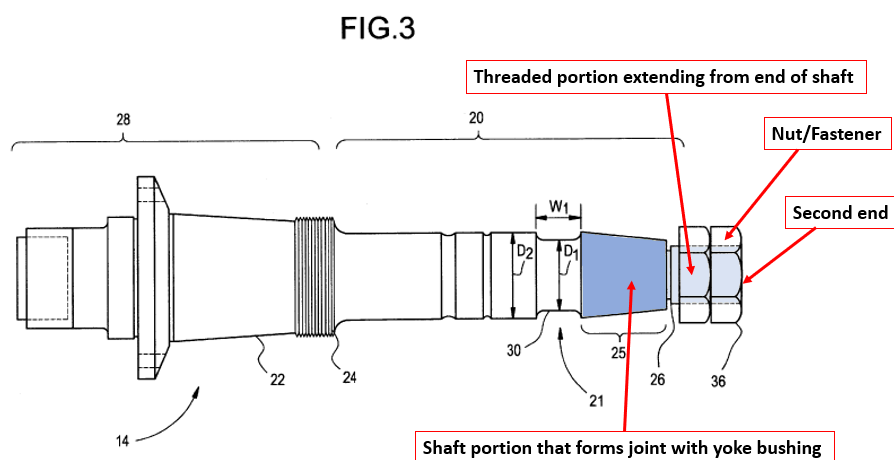
Polinski discloses a cylindrical journal 11 forming an upper region of a gyratory crusher main shaft 7. (Ex. 1015, 2:42–47.) A sleeve 12 having an inner cylindrical surface is fit via heat-shrink fit to the journal 11. (Ex. 1015, 3:15–18.) This arrangement is depicted below in FIG. 2 of Polinski. (Ex. 2020, ¶¶ 16–18.)



(Ex. 1015, FIG. 2 (annotated).)

Nothing in FIG. 2 nor elsewhere in Polinski discloses or suggests a tapered region extending from the uppermost extremity of the shaft. (See Ex. 2020, ¶¶ 16–18; *see also* Ex. 2001, ¶ 38.) Polinski necessarily also fails to disclose a sleeve having a corresponding taper on its inner surface mounted to the shaft. (See Ex. 2001, ¶¶ 34–38; *see also* Ex. 2020, ¶ 19.)

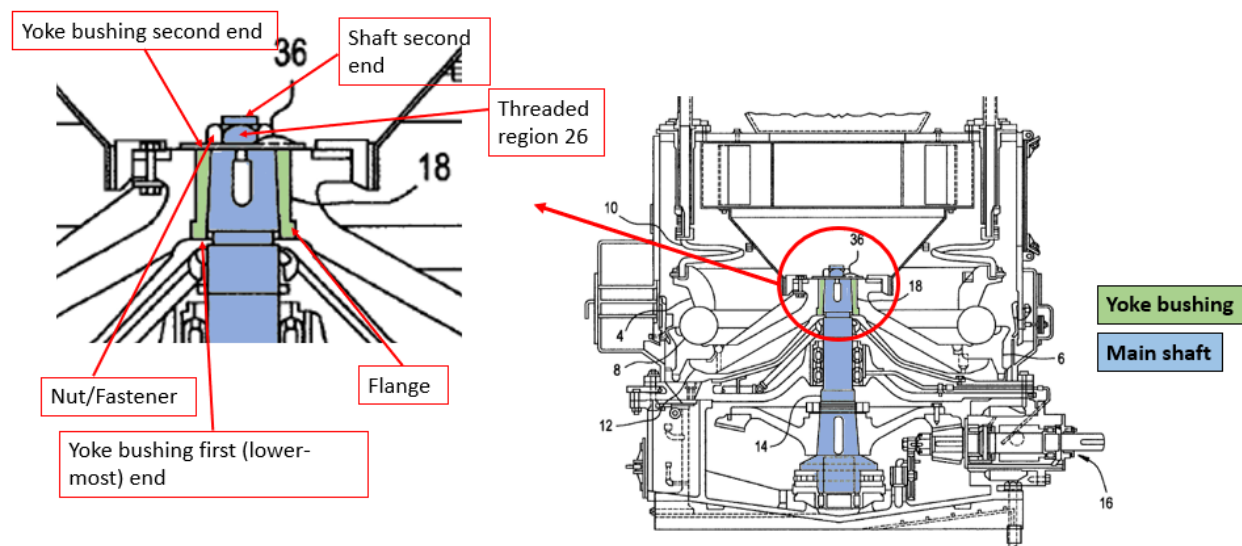
Piepho also fails to disclose or suggest a tapered region extending from the uppermost extremity of the shaft. FIG. 3 of Piepho, shown below, depicts an axial region being tapered relative to a longitudinal axis of the shaft body (region labeled 25). (Ex. 2020, ¶ 20.)



(Ex. 1016, FIG. 3.)

The tapered region 25 does not extend from the uppermost extremity of Piepho's shaft. Instead, a threaded region labeled 26 extends from the uppermost extremity of the shaft disclosed by Piepho. (Ex. 2001, ¶ 45.) Consistent with FIG.

3, FIG. 1 of Piepho, below, shows that the threaded region 26 extends above the yoke and is connected to an element labeled 36. (Ex. 2020, ¶ 21.)

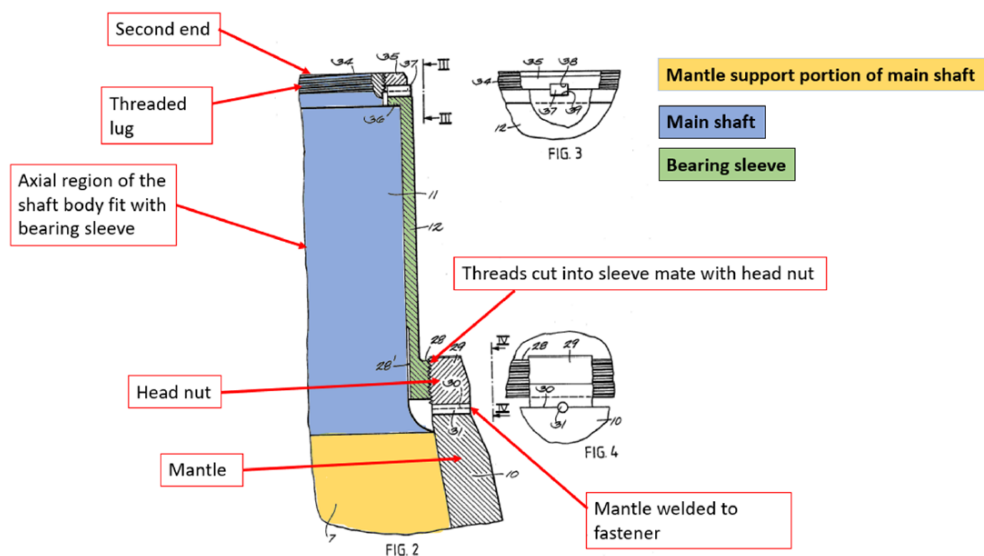


(Ex. 1016, FIG. 1.)

A POSITA would understand that element 36 is a fastener secured to the cylindrical portion 26 of the shaft to secure the yoke to the shaft of the coal pulverizer. (Ex. 2001, ¶ 45.) Mr. Smith agreed that the region labeled 26 is a threaded region used to attach the yoke. (Ex. 2006, 77:18–78:1; *see also* Ex. 2020, ¶ 22.) Thus, neither Polinski nor Piepho disclose or suggest [11a].

Moreover, it would not have been obvious to modify Polinski in view of Piepho to meet [11a]. For the reasons I discuss below, such a modification to Polinski would undermine Polinski's load path and render it inoperable for its intended purpose. Polinski's sleeve 12 is configured to support a crusher mantle 10

on journal 11 of the crusher shaft, as illustrated in Polinski FIG. 2, below. (Ex. 2020, ¶¶ 23–24.)



(Ex. 1015, FIG. 2 (annotated).)

Polinski provides that “the bearing sleeve 12 extends generally coextensively with the bearing journal 11 and includes an externally threaded annular shoulder 28 about its lower periphery threadably receiving a head nut 29.” (Ex. 1015, 2:67–68; 3:1–9.) “The head nut 29 abuts the upper edge 30 of the mantle 10 to secure it to the tapered portion of the main shaft 7, and at least one rod or dowel 31 is welded in a corresponding pair of semi-circular keyways in the head nut and the mantle to prevent rotation between these members after the head nut is secured in position.” (Ex. 1015, 3:3–9; Ex. 2020, ¶ 25.)

The cylindrical interface between sleeve 12 and journal 11 of Polinski, shown above in FIG. 2, is a critical component of Polinski's invention and allows the sleeve 12 to transfer forces imparted on the sleeve by the mantle 10 to the shaft. (Ex. 2020, ¶ 26.) Mr. Smith testified that he could not determine, based on the disclosure of Polinski, whether the mantle 10 exerts forces on the sleeve 12. (*See* Ex. 2018, 44:6–51:2) However, contrary to Mr. Smith's assertions regarding the ambiguity of Polinski with respect to the forces imparted by the mantle 10 on the sleeve 12, Polinski is perfectly clear that the mantle imparts axial forces on the sleeve: "a bearing sleeve [is] releasably secured about said journal including shoulder means engaging the crusher mantle to **restrain axial displacement of the mantle** along the shaft."¹ (Ex. 1015, 4:49–52.)

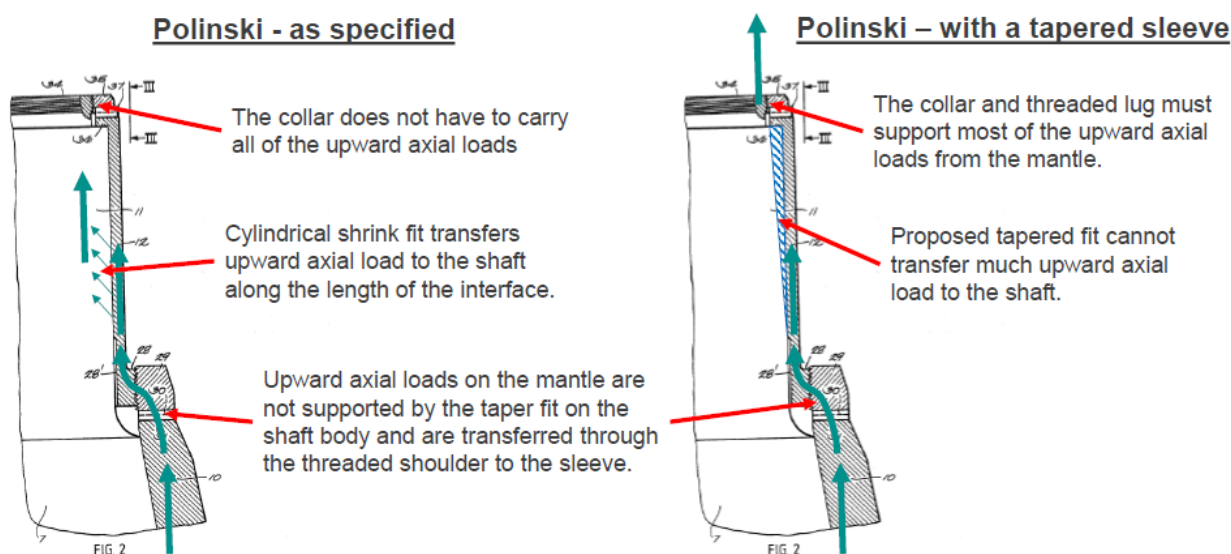
If the crusher in Polinski were "designed in a way to prevent forces [from] being transferred from the mantle into the sleeve" as Mr. Smith believes (Ex. 2018, 50:13-14), then the mantle would not require anything to secure it to the shaft, which is contrary to the specification of Polinski. (Ex. 2020, ¶ 26.)

Moreover, a POSITA would understand that the mantle 10 imparts torsional and bending loads on the sleeve 12 in addition to such axial forces. The mantle in Polinski is secured to the sleeve and the combination of the two is secured to the

¹ All emphases are added unless otherwise noted.

crusher shaft. The combination of the mantle, sleeve, and shaft would behave as a composite shaft. Thus, torsional and bending loads applied to the mantle would be shared by the shaft, mantle, and sleeve. Polinski describes the origin of torsional loads on the mantle as a result of material in the crusher (*see* Ex. 1015, 3:35-39) and bending loads applied to the shaft during operation (*see* Ex. 1015, 1:26-29, 4:61-62; *see also* Ex. 2020, ¶ 26.)

Polinski utilizes a cylindrical journal 11-to-sleeve 12 interface such that the axial and bending loads imposed by the mantle 10 on sleeve 12 via the threaded annular shoulder 28 of sleeve 12 are transferred to the journal 11. This load path is illustrated on the left-hand portion of annotated FIG. 2 of Polinski, below. (Ex. 2020, ¶ 27.)



(Ex. 1015, FIG. 2 (annotated).)

If the cylindrical journal 11-to-sleeve 12 interface were modified to be a tapered interface, the load path of axial and bending forces imposed by mantle 10 on sleeve 12 would instead be directed primarily into the retainer mechanism (*e.g.*, the threaded lug 34 and sleeve nut 35) via the sleeve 12, as illustrated in the right-hand side annotated FIG. 2 above. (Ex. 2020, ¶ 28.) If Polinski is modified to have tapered version of sleeve 12 fit onto a modified tapered version of journal 11, then a mantle-induced upward axial load would no longer be counter-acted by Polinski's designed cylindrical shrink-fit interface. The retention mechanism (*e.g.*, the threaded lug and sleeve nut 35) would have to withstand the forces imparted by the sleeve—forces that Polinski does not contemplate acting on the retention mechanism. (Ex. 2020, ¶ 28.)

Moreover, if the threaded lug 34 and corresponding sleeve nut 35 depicted in FIG. 2 of Polinski were removed to meet the limitation that a tapered region of the shaft body extends from the uppermost extremity of the shaft, as recited in [11a], the wedge geometry between a modified tapered sleeve 12 and modified tapered journal 11 would simply drive the sleeve 12 off the journal 11 under operation. (*See* Ex. 2020, ¶¶ 28–29.)

For at least the reasons discussed above, a POSITA would understand that Polinski and Piepho, taken both alone and in combination, fail to disclose [11a]. (Ex. 2020, ¶ 30.)

2. Polinski in view of Piepho fails to disclose or suggest [11e]

Polinski and Piepho both lack a shaft sleeve in which the external facing surface from the lower-most end of the sleeve to the top-most end of the sleeve is parallel to a longitudinal axis of the sleeve. Thus, as described further below, Polinski and Piepho—alone and in combination—fail to disclose [11e]. (Ex. 2020, ¶ 31.)

Polinski discloses a shaft sleeve 12 (relied on by Petitioner and Mr. Smith for the claimed sleeve) that includes a threaded shoulder 28 extending from the bottom end of the sleeve 12 for securing a mantle 10 to a tapered mantle support portion 8 of the shaft 7. (Ex. 1015, 3:1–8; *see also* Ex. 2006, 54:3–55:4; Ex. 2020, ¶ 32.) As illustrated in FIG. 2 of Polinski, the external facing surface from the first sleeve end (the lower-most end of the sleeve) to the second sleeve end (the top-most end) is not parallel to a longitudinal axis of the sleeve. The external facing surface defined by the threaded shoulder 28 of sleeve 12 is oriented at least partially transverse to the longitudinal axis of the sleeve. (Ex. 2020, ¶ 33.)

Piepho is also deficient. Piepho discloses a flange extending from the lowermost end of a yoke bushing 18, which Petitioner relies on for the sleeve recited in challenged claim 1. (Ex. 1016, FIG. 1; *see also* Ex. 2006, 78:6–8 (Ppetitioner’s expert referring to Piepho’s flange); Ex. 2020, ¶ 34.)

As illustrated in FIG. 1 of Piepho, the external facing surface from the first end of the yoke bushing 18 (the lower-most end) to the second end of the yoke bushing 18 (the top-most end) is not parallel to a longitudinal axis of the yoke bushing 18. Like the threaded shoulder of Polinski, the flange extending from the bottom end of Piepho's sleeve defines a portion of the external facing surface of the yoke bushing that is oriented at least partially transverse to the longitudinal axis of the yoke bushing. (Ex. 2020, ¶ 35.)

Moreover, a POSITA would not have found it obvious to modify Polinski in view of Piepho to meet [11e], because such a modification would change Polinski's principle of operation. Polinski states that "the present invention relates to gyratory crushers and, in particular, to a main shaft and bearing sleeve arrangement supporting the crusher head or mantle within the crusher." (Ex. 1015, 1:44–47.) Polinski's sleeve 12 is configured to secure the crushing mantle 10 to the tapered mantle support portion 8 of the main shaft 7. (Ex. 1015, 3:1–9; *see also* Ex. 2006, 54:3–55:4.) Polinski's threaded shoulder 28 on the sleeve 12 (for securing the crushing mantle 10 to the tapered portion of the main shaft 7) is core to the purported invention of Polinski, which removes threading from the main shaft and instead secures the mantle using a head nut fastened to the sleeve. (Ex. 2020, ¶ 36; *see also* Ex. 2006, 53:20–54:2.)

To eliminate the threaded shoulder 28 of Polinski's sleeve would thus change the very principle of operation of Polinski's purported invention and would not have been obvious to a POSITA. Thus, a POSITA would not be motivated to make such a change.

Mr. Smith has argued that a POSITA would know that a sleeve may be with or without a flange. (*See* Ex. 1043, pp. 44–45.) However, the flange (threaded shoulder 28) included on Polinski's sleeve is not merely a design choice, as asserted by Mr. Smith. The threaded shoulder is core to Polinski's invention of securing the mantle 10 to sleeve 12. This mantle-sleeve joint is accomplished using threaded shoulder 28. To remove the flange would equate to removing Polinski's invention. Piepho's flange is similarly structural—it supports the yoke. (*See* Ex. 2001, ¶¶ 66–69.) A POSITA would not be motivated to remove the flange from either Polinski or Piepho. (Ex. 2020, ¶ 39.)

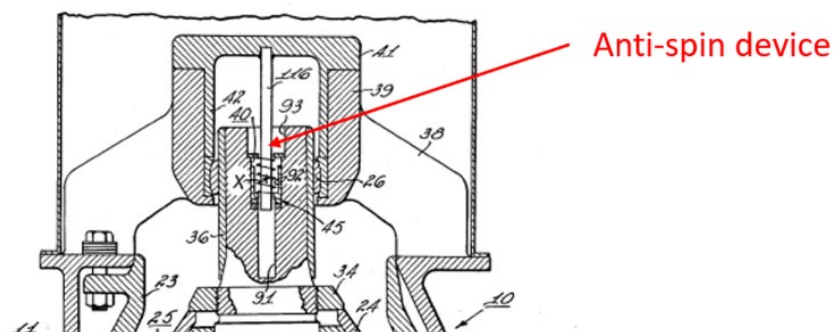
Additionally, a POSITA would not be motivated to modify Polinski to reduce the thickness of the threaded shoulder 28. The increased thickness at the threaded shoulder 28 is used to secure the mantle 10 to a tapered mantle support portion 8 of the shaft 7. A POSITA would recognize that the threaded shoulder adds significant stiffness to the sleeve where it connects the mantle and would expect that stiffness to be required for load transfer through the joint. Additionally, it is well known that threads reduce the tensile strength of a threaded

object relative to the object of the same size. (See Ex. 2012, 411.) Reducing the thickness at the threaded shoulder 28 such that the external facing surface of Polinski's sleeve is parallel to its longitudinal axis would significantly increase the likelihood that the sleeve would fail during operation. (See Ex. 2020, ¶¶ 40–44.)

The remaining references in Petition that are applied against the claims are Bratt (Ex. 1034) and Pollak (Ex. 1017). These two references are merely cited for dependent claim limitations associated with claims 9 and 10. Their disclosures do not change the fact that the proposed modification to Polinski would change Polinski's principle of operation. (Ex. 2020, ¶¶ 45–47.)

3. Coxhill in view of Piepho fails to disclose or suggest [11f]

Coxhill discloses a gyratory crusher with an “antispin” device. (Ex. 1039, 4:7–37.) The antispin device, illustrated in FIG. 1 of Coxhill below, constrains rotation of the shaft about the shaft's own longitudinal axis. (Ex. 2020, ¶ 48.)



(Ex. 1039, FIG. 1 (cropped and annotated).)

When the crusher is idling, Coxhill describes that the antispin device prevents rotation of the shaft 33 beyond 15 degrees about the longitudinal axis of the shaft 33—the point at which torsion rod 116 stops rotation of the shaft about its longitudinal axis. (Ex. 2020, ¶¶ 49–50.) When material is fed into the crusher during operation of the crusher, Coxhill describes that a ratchet mechanism of the antispin device allows for rotation of the shaft in the opposite direction from rotation during idling. (Ex. 2020, ¶¶ 50–51.)

Coxhill thus describes a gyratory crusher with an antispin device that constrains rotation of the crusher shaft about its longitudinal axis. Coxhill does not disclose or suggest [11f]. Piepho also fails to disclose or suggest the limitations recited in [11f]. The second end of Piepho’s shaft is not configured to be “supported by a top bearing assembly” nor is it configured “such that the second end is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly.” The upper end region of Piepho’s shaft—including the second end—is configured to induce rotation of a coal pulverizer yoke when driven. (*See e.g.*, Ex. 1016, FIG. 1; *see also* Ex. 2020, ¶¶ 52–53.)

Moreover, it would not have been obvious to modify Coxhill to meet [11f]. The antispin device is the core invention described by Coxhill. As described in the summary of Coxhill, “[t]he present invention includes among its objects the provision of an improved means for an antispin device.” (Ex. 1039, 1:43–44.)

Modifying Coxhill to remove the antispin device to meet [11f] would render Coxhill inoperable for its intended purpose. (Ex. 2020, ¶ 54.)

B. Substitute Claim 12

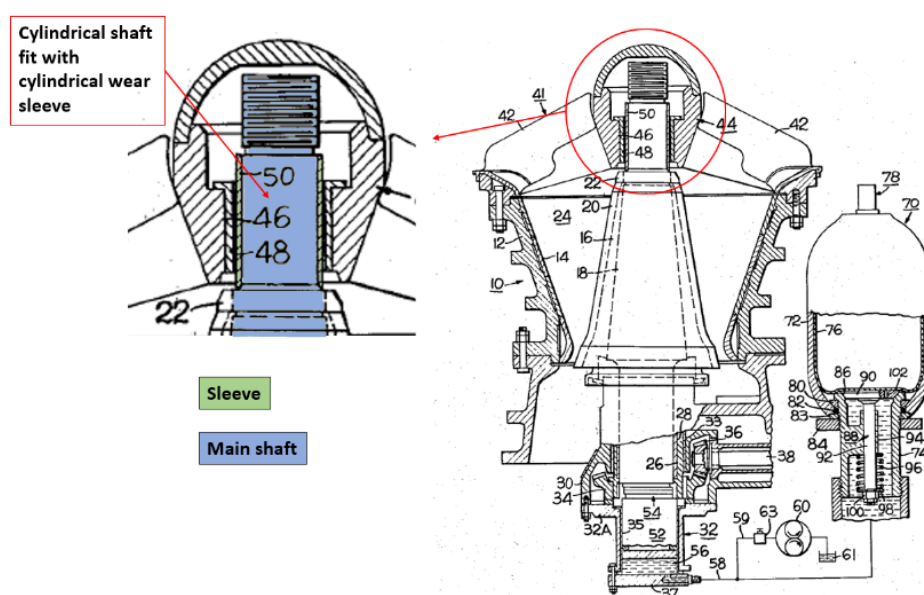
1. Polinski in view of Piepho and Pollak fails to disclose or suggest claim 12

Polinski in view of Piepho and Pollak fails to disclose or suggest that the region over which the thickness of the axial wall tapers and decreases extends the full axial length of the sleeve. Neither Polinski nor Piepho discloses a sleeve in which a thickness of the sleeve's an axial wall tapers and decreases over the full axial length of the sleeve. Polinski's sleeve 12 does not include any taper. Moreover, as discussed above, Polinski's purported invention does not allow for the thickness of its sleeve to decrease at all the way to the bottom end of the sleeve. Polinski's sleeve requires a threaded shoulder 28 extending from its bottom end configured to secure a crusher mantle 10 to the mantle support portion 8 of main shaft 7. (Ex. 1015, 3:1–8; Ex. 2020, ¶ 55.)

Piepho's yoke bushing 18 does disclose a taper, but the thickness Piepho's yoke bushing does not taper and decrease "the full axial length of the sleeve." Rather, Piepho's yoke bushing 18 includes a structural flange at the bottom-most end. (See Ex. 2001, ¶¶ 43, 52, 55–56, 67.) The flange supports the yoke 12 of the coal pulverizer. Petitioner and Mr. Smith agree that the flange acts as a structural

support. (See Paper 2, 31–32 (Petition referring to Mr. Smith’s declaration stating that the flange “provide[s] a shoulder bearing surface which can transmit axial loads.”); Ex. 2020, ¶ 56.)

Pollak (Ex. 1017) discloses a sleeve having a cylindrical inner surface fit to a cylindrical shaft, as illustrated in FIG. 1 of Pollak, below.



(Ex. 1017, FIG. 1 (annotated).)

Pollak at most discloses a sleeve without a taper, having an unlabeled portion that could be a fillet or rounded edge at the bottom end of its sleeve. (Ex. 1017, FIG. 1; Ex. 2020, ¶¶ 57–58.)

Again, a POSITA would not have found it obvious to modify Polinski in view of Piepho and Pollak to arrive at the limitations of substitute claim 12. Modifying the purported sleeve of Polinski to meet claim 12 would require

changing Polinski's sleeve such that the region over which the thickness of the axial wall tapers and decreases extends the full axial length of the sleeve. If Polinski's sleeve were modified to include a taper along its entire length, the thickness of Polinski's sleeve would still be greater at the region associated with the threaded shoulder 28. The thickness of Polinski's sleeve could only decrease along the entire axial length of the sleeve from the second (top-most) sleeve end to the first (lower-most) sleeve end if there was no threaded shoulder 28 for securing the crusher mantle 10. As discussed above, that would change the principle of operation of Polinski's purported invention and render Polinski inoperable for its intended purpose. (Ex. 2020, ¶¶ 59–61.)

2. Coxhill in view of Piepho fails to disclose or suggest claim 12

Coxhill in view of Piepho fails to disclose the limitations of substitute dependent claim 12 at least for the reasons discussed with reference to substitute claim 11. (Ex. 2020, ¶ 62.)

C. Substitute Claims 13–17

Polinski in view of Piepho fails to disclose or suggest the limitations of substitute claims 13–16 for at least the reasons set forth above based on their respective dependencies. Polinski in view of Piepho and Bratt fail to disclose or suggest the limitations of substitute claim 17 at least the reasons set forth above based on its dependency. Coxhill in view of Piepho and Polinski fails to disclose

the limitations of substitute claim 13 at least for the dependency of claim 13 on substitute claim 11. Coxhill in view of Piepho fail to disclose the limitations of substitute claims 14-16 at least for the dependencies of those claims on substitute claim 11. Coxhill in view of Piepho and Bratt fail to disclose or suggest the limitations of substitute claim 17 at least for the dependency of claim 17. (Ex. 2020, ¶ 63.)

D. Substitute Claim 18

1. Polinski in view of Piepho and Pollak fails to disclose or suggest claim 18

Polinski, Piepho, and Pollak fail to disclose or suggest that “at a region proximal to the first sleeve end, the thickness of the axial wall reduces at an increased rate relative to a region of the axial wall proximal to the second sleeve end,” as required by substitute claim 18. Polinski does not disclose a tapered sleeve. Although Piepho discloses a tapered yoke bushing, the thickness of the yoke bushing increases near its first end due to the flange. Thus, neither Polinski nor Piepho discloses or suggests that the thickness of the axial wall reduces at an increased rate relative to a region of the axial wall proximal to the second sleeve end, as required by substitute claim 18. (Ex. 2020, ¶ 64.)

Moreover, Pollak does not disclose the limitations of substitute claim 18. At most, Pollak discloses a sleeve without a taper, having an unlabeled portion that

could be a fillet or rounded edge at the bottom end of its sleeve. (Ex. 1017, FIG. 1; Ex. 2020, ¶ 65.) Bratt likewise fails to disclose or suggest that “at a region proximal to the first sleeve end, the thickness of the axial wall reduces at an increased rate relative to a region of the axial wall proximal to the second sleeve end,” as required by substitute claim 18. Bratt discloses a sleeve having an external facing surface that is cylindrical along a first portion and tapered along a second portion. The internal facing surface of the sleeve in Bratt is not tapered. Thus, Bratt necessarily fails to disclose or suggest the limitations of substitute claim 18. (Ex. 2020, ¶ 66.)

Moreover, a POSITA would not have found it obvious to modify Polinski’s sleeve to meet the claimed limitation. As reiterated throughout, removing Polinski’s threaded shoulder would alter the principle of operation of Polinski’s purported invention. A POSITA would not have found such a modification to be obvious. (Ex. 2020, ¶ 67.)

2. Coxhill in view of Piepho fails to disclose or suggest claim 18

Coxhill in view of Piepho fails to disclose or suggest the limitations of substitute dependent claim 18 at least for its dependency on substitute claim 11. (Ex. 2020, ¶ 68.)

E. Substitute Claim 19

1. Polinski in view of Piepho and Pollak fails to disclose or suggest claim 19

Polinski in view of Piepho and Pollak fails to disclose or suggest a sleeve having an axial wall in which the thickness of the axial wall decreases at a uniform rate along the entire axial length of the sleeve, other than the region proximal to the first sleeve end, where the thickness decreases at an increased rate. As discussed above, it would not have been obvious to modify Polinski in view of Piepho to eliminate or change Polinski's threaded shoulder such that the sleeve thickness decreases uniformly along its entire length, because this modification would change Polinski's core principle of operation. For similar reasons, it would not have been obvious to modify Polinski such that the thickness of the axial wall reduces at a uniform rate along most of its axial length, with an increased rate of thickness reduction near the first sleeve end (where the threaded shoulder is located), as required by substitute dependent claim 19. A POSITA would not find such a modification to be obvious. (Ex. 2020, ¶ 69.)

2. Coxhill in view of Piepho fails to disclose or suggest claim 19

Coxhill in view of Piepho fails to disclose or suggest the limitations of substitute dependent claim 19 at least for its dependency on substitute claim 11. (*See also* Ex. 2020, ¶ 70.)

F. Objective Indicia Of Non-Obviousness

“Evidence of objective indicia of nonobviousness, if present, must always be considered before reaching a determination on the issue of obviousness.”

Quanergy Sys. v. Velodyne Lidar USA, Inc., 24 F.4th 1406, 1417 (Fed. Cir. 2022).

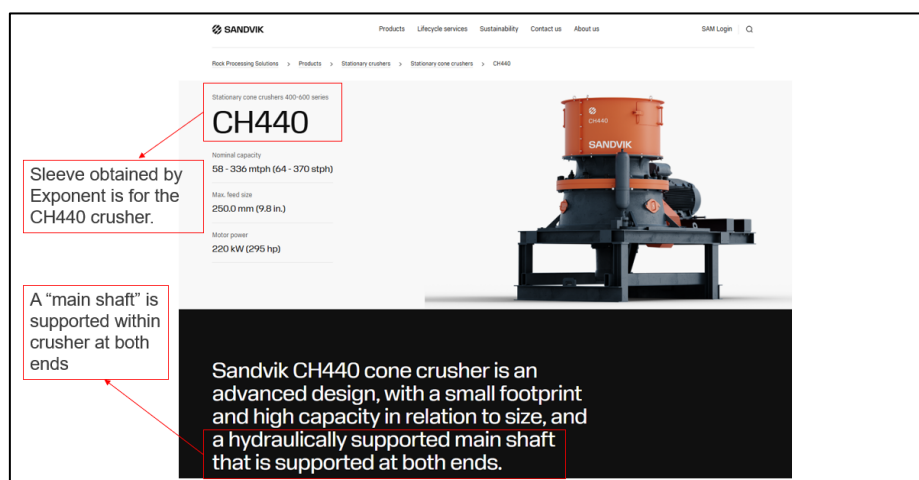
Objective indicia of non-obviousness “may often be the most probative and cogent evidence in the record.” *Medtronic, Inc. v. Teleflex Innovations Sarl*, 70 F.4th 1331, 1342 (Fed. Cir. 2023) (quotation and citation omitted). Nexus is presumed “when the patentee shows that the asserted objective evidence is tied to a specific product and that product embodies the claimed features, and is coextensive with them.” *Quanergy*, 24 F.4th at 1417 (quotation and citation omitted). The strong evidence of copying here supports the patentability of the substitute claims.

Beginning with nexus, the copying evidence is tied to Sandvik’s CH440 main shaft sleeve and accompanying main shaft. An example of the sleeve (referred to as Copying Ex. 1) was obtained by Dr. Kytömaa and his team as shown below:

IPR2024-01380



This sleeve has a corresponding main shaft as shown below from Sandvik's website (annotated).

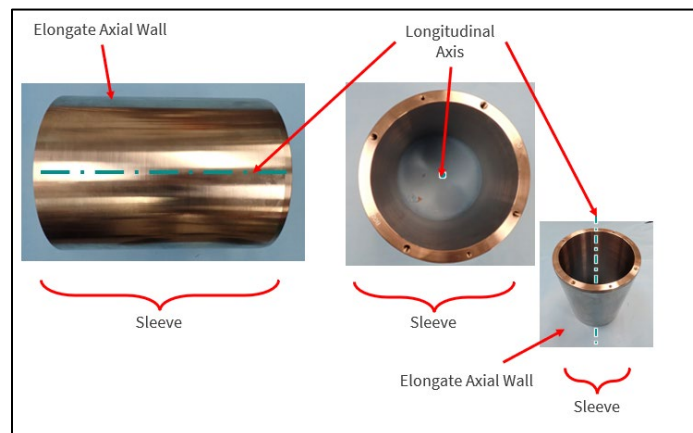


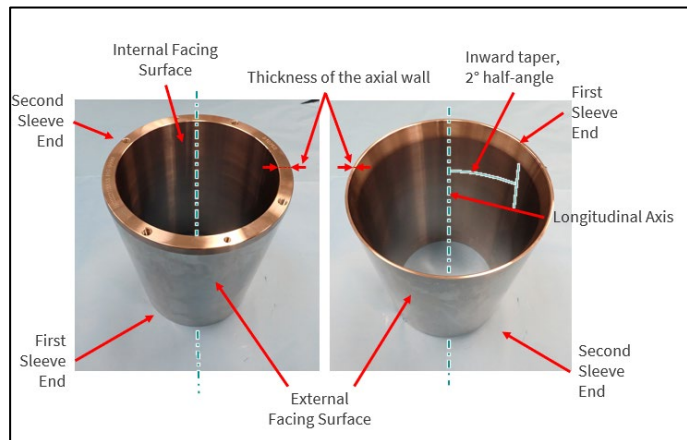
(Ex. 2009.) The CH440 main shaft sleeve and its shaft embody substitute claim 11 and are coextensive with the claim recitations as shown below. (Ex. 2001, ¶¶ 76–106; *see also* Ex. 2020, ¶¶ 71–103.)

[11pre]: Patent Owner maintains, and Petitioner agrees, that the preamble to substitute claim 11 is not limiting. (Paper 2, 17.)

[11a]: As shown above from Sandvik’s website, the main shaft is supported “at both ends” within a cone crusher. (Ex. 2009.) The shaft body would necessarily be tapered to mate with the sleeve of Copying Ex. 1. (Ex. 2001, ¶ 86; Ex. 2020, ¶¶ 80–81; *see also* Ex. 2007, 80 (Mr. Smith testifying in the related IPR proceeding that “a bushing that . . . mates with a tapered portion of shaft will naturally have a wall thickness that tapers from one end to the other in order to fill the space between the two surfaces.”).)

[11b]: The Sandvik CH440 main shaft sleeve includes an elongate axial wall extending around a longitudinal axis of the sleeve, as shown below in annotated images of Copying Ex. 1 by Dr. Kytömaa and his team. The sleeve includes a tapered internal facing surface. Thus, the sleeve is configured to be fit over a tapered region of the main shaft of the CH440 stationary cone crusher such that the internal facing surface is in contact with an outward facing surface of the main shaft. (Ex. 2001, ¶¶ 87–99; Ex. 2020, ¶¶ 82–94.)





The Sandvik CH440 main shaft sleeve also includes an external facing surface positioned relative to the longitudinal axis, and an axial wall extends between the internal and external facing surfaces, as shown in the annotated images (above). Finally, the Sandvik CH440 main shaft sleeve includes a first end and a second end. The first end is at a lower-most end of the sleeve and would be positioned at a relatively lower region of the main shaft. The second end is at a top-most end and would be positioned at an upper region of the main shaft relative to the lower region. (Ex. 2001, ¶¶ 87–99; Ex. 2020, ¶¶ 82–94.)

[11c]: As illustrated above with respect to Copying Ex. 1, a thickness of the axial wall at a region between the first and second sleeve ends of the Sandvik CH440 main shaft sleeve tapers and decreases in a direction from the second sleeve end to the first sleeve end, wherein the first sleeve end is a lowermost extremity of the sleeve. (Ex. 2001, ¶¶ 100–101; Ex. 2020, ¶¶ 95–96.)

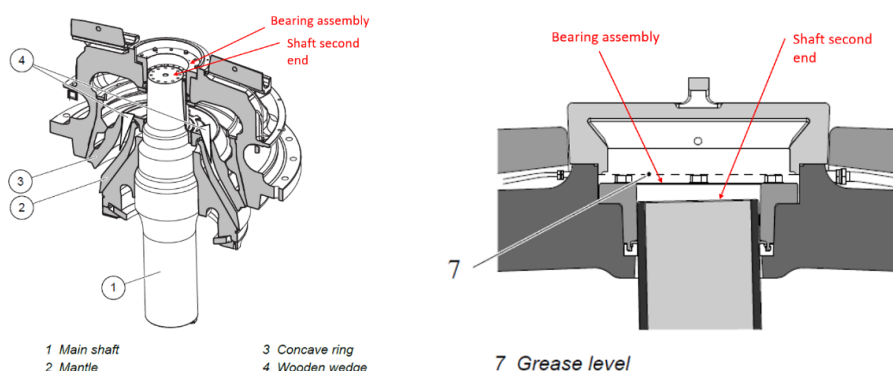
[11d]: As shown above, the internal facing surface at the region between the first and second sleeve ends of Copying Ex. 1 extends transverse to the longitudinal axis so as to taper inwardly towards the longitudinal axis of the sleeve in the direction from the first sleeve end to the second sleeve end. (Ex. 2001, ¶¶ 102–103; Ex. 2020, ¶¶ 97–98.)

[11e]: Copying Ex. 1, as shown below, has an essentially perpendicular measurement of the external facing surface relative to a substantially flat support surface on which the sleeve is positioned in the figure below. (Ex. 2001, ¶¶ 104–105; Ex. 2020, ¶¶ 99–100.)



[11f]: As indicated above, Sandvik sells a corresponding shaft upon which the sleeve identified in Copying Ex. 1 is mounted, as indicated by the excerpted content from Sandvik’s website (Ex. 2009). The corresponding shaft includes a “second end of the shaft body [that] is configured to be supported by a top bearing assembly such that the second end is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly.” This is

demonstrated by at least two figures, annotated below, included in the CH440 Crusher Maintenance Instructions. (See Ex. 2019, pp. 37, 43; *see also* Ex. 2020, ¶¶ 101–102.)

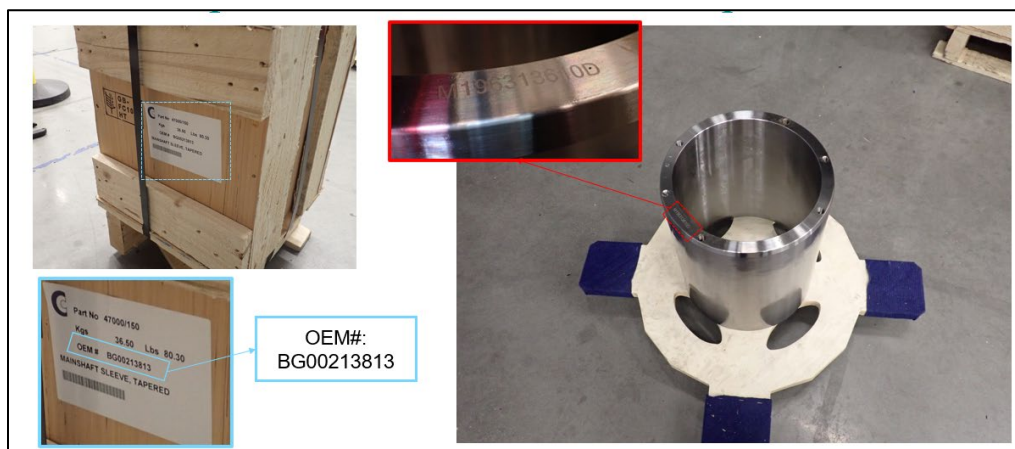


(Ex. 2019, pp. 37, 43 (annotated).)

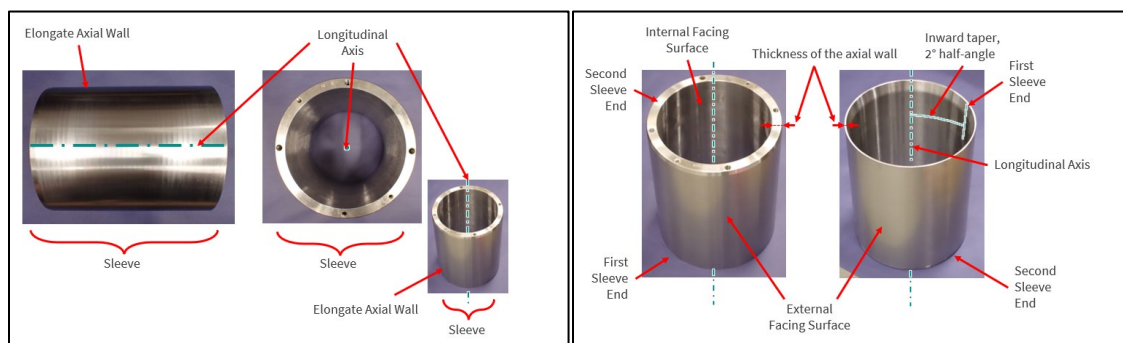
Thus, Sandvik’s CH440 main shaft sleeve, as exemplified by Copying Ex. 1, and its accompanying main shaft, as shown in Sandvik’s website (Ex. 2009), embody the claim recitations of substitute claim 11. Moreover, they are coextensive with those recitations. The coextensive requirement “does not require a patentee to prove perfect correspondence between the product and a patent claim.” *Quanergy*, 24 F.4th at 1418. Rather, it “requires the patentee to demonstrate that the product is essentially the claimed invention.” *Id.* (quotations omitted). That is the case here: as shown above, the CH440 main shaft sleeve and its accompanying shaft are essentially the claimed invention. (Ex. 2001, ¶¶ 76–106; Ex. 2020, ¶¶ 71–103.) Accordingly, nexus should be presumed here.

Even if nexus is not presumed, Sandvik is still afforded an opportunity to prove nexus “via a showing that the evidence is a direct result of the unique characteristics of the claimed invention.” *Volvo Penta of the Americas, LLC v. Brunswick Corp.*, 81 F.4th 1202, 1210 (Fed. Cir. 2023)). Petitioner’s copying of Sandvik’s product is a direct result of the unique characteristics of the claimed invention.

Dr. Kytömaa and his team obtained an example of Petitioner’s shaft sleeve (referred to as Copying Ex. 2) as shown below. (Ex. 2001, ¶¶ 78–82, 107–131; Ex. 2020, ¶¶ 104–120.)



Petitioner’s product—its main shaft sleeve with an accompanying main shaft—also embody the claim recitations of substitute claim 11 and are coextensive with them. The annotated images below of Copying Ex. 2 show all the recitations of claim 11, with the exception of [11pre] (which the parties agree is not limiting), [11a] and 11[f]. (Ex. 2001, ¶¶ 107–131; Ex. 2020, ¶¶ 104–120.)

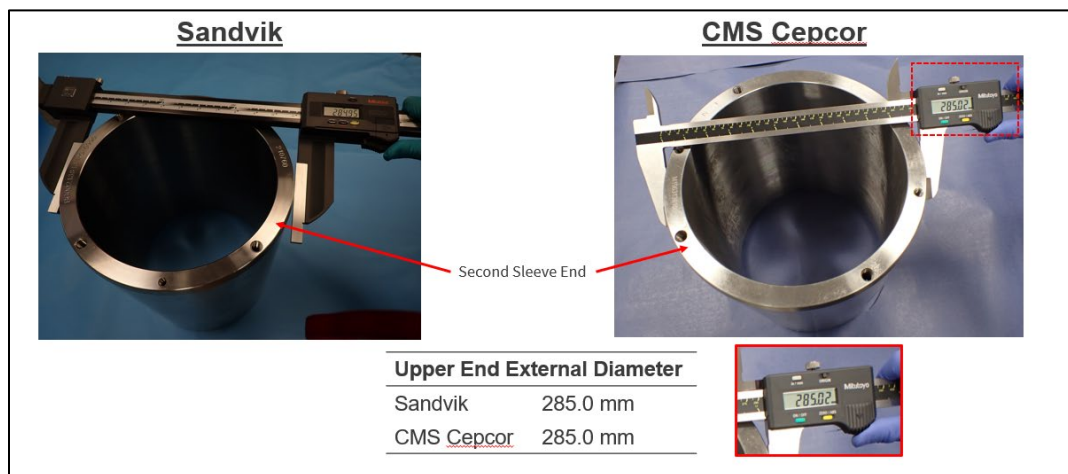


For [11a] and [11f], Petitioner’s website states that it is selling “all [of] the replacement parts you need for [Sandvik’s] CH440,” indicating that Petitioner also sells a corresponding main shaft for the shaft sleeve depicted above. (Ex. 2010; *see also* Ex. 2001, ¶¶ 110–111; Ex. 2020, ¶¶ 107–108; Ex. 2011.) Moreover, in the related IPR proceeding, Mr. Smith testified that a bushing mating with a “tapered portion of a shaft will naturally have a wall thickness that tapers from one end to the other in order to fill the space between the two surfaces.” (Ex. 2007, 80.)

Furthermore, there is strong evidence that Petitioner’s copying is due to the unique characteristics of the claimed invention, particularly with respect to the merits of the sleeve in achieving convenient assembly of the sleeve to the shaft. (*See also* Ex. 1001, 1:66–2:2; Ex. 2001, ¶¶ 79, 132; Ex. 2020, ¶¶ 73–74, 129–130.) Copying Ex. 2 is substantially **identical** to Sandvik’s sleeve. As an initial matter, the Original Equipment Manufacturer (OEM) number for the Petitioner’s sleeve in Copying Ex. 2 is the **same** as Sandvik’s Copying Ex. 1. The matching OEM

numbers indicates that Petitioner is selling the same product as Sandvik. (Ex. 2001, ¶¶ 81, 133; Ex. 2020, ¶ 76, 131.)

There is more. Dr. Kytömaa and his team took corresponding measurements of Copying Exs. 1 and 2. The corresponding measurement included the upper (second end) external diameter, upper (second end) internal diameter, lower (first end) external diameter, lower (first end) internal diameter, and overall length. *Each* of these corresponding measurements are *within one millimeter* of one another as shown below. (Ex 2001, ¶¶ 132–141; Ex. 2020, ¶¶ 130–139.)



Upper End Internal Diameter		Lower End External Diameter		Lower End Internal Diameter	
Sandvik	240.7 mm	Sandvik	285.1 mm	Sandvik	277.5 mm
CMS Cepcor	240.9 mm	CMS Cepcor	284.9 mm	CMS Cepcor	277.3 mm

Sleeve Length		Axial Wall Taper		Taper Near Lower End	
Sandvik	353.4 mm	Sandvik	2° half-angle	Sandvik	15° half-angle
CMS Cepcor	354.1 mm	CMS Cepcor	2° half-angle	CMS Cepcor	15° half-angle

The taper angles of the internal facing surface relative to the longitudinal axis of each sleeve is also substantially identical. (Ex. 2001, ¶ 139; Ex. 2020, ¶ 137.) Finally, Petitioner markets their own products as identical replacements for Sandvik’s products, indicating that its replacement parts for Sandvik’s crushers are “manufactured in consideration of original tolerances.” (Ex. 2010.)

Given the above evidence, there can be no question that Petitioner had access to Sandvik’s CH440 main shaft sleeve and accompanying main shaft and created an essentially identical product—in short, Petitioner copied Sandvik. *Medtronic*, 70 F.4th at 1340 (Fed. Cir. 2023); *see also* Exs. 2015 and 2016 (Petitioner stipulating to an injunction against the CH440, including the shaft, if the Patent Owner prevails in this IPR). And such copying “may indeed be another form of flattering praise for inventive features.” *Id.*, at 1339 (quotation and citation omitted). In fact, copying can be one of the strongest indicia of non-obviousness. *Volvo Penta*, 81 F.4th at 1213. The evidence of copying here, along with the other *Graham* factors, squarely points to the patentability of the substitute claims.

V. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board grant this Motion as to the substitute claims.

IPR2024-01380

Dated: October 31, 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

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

I hereby certify that the attached “PATENT OWNER’S REVISED NON-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 (Reg. No. 45,069)
tsanks@firstiniplaw.com
Beusse Sanks, PLLC
157 E New England Ave., Ste. 375
Winter Park, FL 32789

Dated: October 31, 2025

/Mehran Arjomand/
Mehran Arjomand

APPENDIX A – LISTING OF SUBSTITUTE CLAIMS

Patent Owner presents the following substitute claims in marked-up form with underlining indicating inserted text and brackets or strikethrough indicating deleted text from the original patent claims.

11. (Substitute for claim 1) A gyratory crusher comprising:

a main shaft including a shaft body having a first end for positioning at a lower region of the crusher and a second end for positioning at an upper region of the crusher relative to the first end, a thickness of the shaft body being tapered in an axial direction of the main shaft at a tapered region of the second end so as to taper and decrease in cross-sectional area, wherein the tapered region extends from an uppermost extremity of the shaft; and

a sleeve fitted over the tapered region at the second end of the main shaft, the sleeve including an elongate axial wall extending around a longitudinal axis of the sleeve, the axial wall having an internal facing surface for positioning in contact with an outward facing surface of the main shaft, and an external facing surface relative to the longitudinal axis, the axial wall extending between the internal and external facing surfaces, the axial wall having a first sleeve end for positioning at a lower region of the main shaft and a second sleeve end for positioning at an upper region of the main shaft relative to the lower region,

wherein a thickness of the axial wall at a region between the first and second sleeve ends tapers and decreases in a direction from the second sleeve end to the first sleeve end, wherein the first sleeve end is a lowermost extremity of the sleeve,

in the axial direction the internal facing surface at said region between the first and second sleeve ends extending transverse to the longitudinal axis so as to taper inwardly towards the longitudinal axis of the sleeve in the direction from the first sleeve end to the second sleeve end, and

wherein the external facing surface from the first sleeve end to the second sleeve end is parallel to the longitudinal axis of the sleeve such that the external facing surface of the sleeve when viewed externally has a cylindrical geometry, and

wherein the second end of the shaft body is configured to be supported by a top bearing assembly such that the second end is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly.

12. (Substitute for claim 2) The gyratory crusher as claimed in claim 11, wherein the region over which the thickness of the axial wall tapers and decreases extends substantially the full axial length of the sleeve.

13. (Substitute for claim 3) The gyratory crusher as claimed in claim 11, further comprising a radial wall extending perpendicular or transverse to the axial wall, the radial wall being positioned at or towards the second end and extending inwardly towards the longitudinal axis.

14. (Substitute for claim 5) The gyratory crusher as claimed in claim 11, wherein a cross-sectional shape profile of the external facing surface is substantially circular.

15. (Substitute for claim 6) The gyratory crusher as claimed in claim 11, wherein a cross-sectional shape profile of the internal facing surface is substantially circular.

16. (Substitute for claim 8) The gyratory crusher as claimed in claim 11, wherein a shape profile of the internal facing surface defines a section of a cone in the axial direction.

17. (Substitute for claim 9) The gyratory crusher as claimed in claim 11, further comprising at least one bore provided through the axial wall to allow the passage of a fluid to the internal facing surface.

18. (Substitute for claim 10) The gyratory crusher as claimed in claim 11, wherein at a ~~curved~~ region ~~[[of]]~~ proximal to the first sleeve end, the thickness of the axial wall reduces at an increased rate relative to a region of the axial wall proximal to the second sleeve end ~~the internal facing surface is curved radially outward relative to the longitudinal axis in a direction towards the external facing surface such that the axial wall thickness decreases to zero at the curved region.~~
19. (Substitute for claim 4) The gyratory crusher as claimed in claim ~~[[3]]~~18, wherein the thickness of the axial wall reduces at a uniform rate along an entire axial length of the sleeve other than the region proximal to the first sleeve end ~~the radial wall includes a through bore positioned at the longitudinal axis of the sleeve.~~