

Filed on behalf of: CMS Cepcor Ltd., and
CMS Cepcor Americas LLC

By: Terry M. Sanks (tsanks@firstiniplaw.com; litigation@firstiniplaw.com)

IN THE 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.

Case No. IPR2024-01381
Patent No. 11,014,090

**PETITIONERS' RESPONSE IN OPPOSITION TO PATENT
OWNER'S CONTINGENT MOTION TO AMEND AND REQUEST
FOR PRELIMINARY GUIDANCE**

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EXHIBIT LIST

Exhibit	Description
Ex. 1033	U.S. Pat. No. 2,840,399 (Harless)
Ex. 1040	U.S. Pat. No. 8,302,754 (Yagi)
Ex. 1017	U.S. Pat. No. 4,410,143 (Polinski)
Ex. 1018	U.S. Pat. No. 6,270,026 (Piepho)
Ex. 1044	Smith 2 nd Declaration
Ex. 1046	Shigley Reference
Ex. 1047	Munsun Reference
EX. 1048	Kytömaa 3 rd Declaration

I. INTRODUCTION

Petitioners, CMS Cepcor Limited and CMS Cepcor America LLC (CMS Cepcor), oppose Patent Owner, Sandvik Mining and Construction USA LLC's Non-Contingent Motion to Amend and Request for Preliminary Guidance (Motion to Amend) the claims of U.S. Patent No. 11,014,090 (the '090 Patent) under 37 C.F.R. § 42.121. As discussed below, the substitute claims are substantively defective. The amendments embodied therein fail to distinguish these new claims over the prior art. Petitioner therefore requests that the Board deny the Motion to Amend.

II. LEGAL STANDARD

Patent Owner needs to establish that it is entitled to make the amendment by distinguishing the claims over the prior art. 37 C.F.R. § 42.20(c). A patent owner is required to come, "forward with technical facts and reasoning about those [added] feature(s), including construction of new claim terms, sufficient to persuade the Board that the proposed substitute claim is patentable over the prior art of record, and over the prior art not of record but known to the patent owner." *Emphasis added. Toyota Motor Corp. v. American Vehicular Sciences LLC*, IPR2013-00419, Paper 32 at 4-5 (PTAB 2014).

Furthermore, to meet this burden, a patent owner should address the general level of ordinary skill in the art outside of the references of record and the references

cited, with respect to the features [patent owner] added to the claims to render the claimed subject matter as a whole allegedly patentably distinct from the prior art. Though the Patent Owner may provide a contrary definition of a term in the specification, it must be done with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). At the same time, the Patent Owner may not read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

III. THE SUBSTITUTE CLAIMS ARE UNPATENTABLE OVER THE PRIOR ART

A. Patent Owner Relies On A Biased Expert Opinion

No terms need construction because the claims read on the prior art as herein. Under any construction, claim terms should be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2004). However, Patent Owner's expert states that claim construction is needed for the terms "end" and "indented at the external surface." However, Patent Owner does not reference a single citation to the specification of the '090 patent for any of the claim constructions proposed. Ex. 1044 at ¶ 8. In view of the numerous inconsistencies Dr. Kytömaa attests to (for example, Ex. 1044 at ¶¶ 25-27, 40-43, 44-45, and Table pp. 23-29), his expert opinion should be given little to no weight.

Specifically, Dr. Kytömaa has taken a position that a POSITA, as defined by Mr. Smith, would not have the understanding necessary to combine the prior art references as stated by Mr. Smith. Ex. 1044 at ¶ 44. To further support this position, Dr. Kytömaa claims that a POSITA would have extraordinary insight of stresses where he attributes this extraordinary insight to the teachings of Shigley's Mechanical Engineering Design ("Shigley"). *Id.* at ¶ 45. Shigley is a common textbook used in undergraduate studies by mechanical engineering students. *Id.* at Table p. 24. However, Dr. Kytömaa is basing his position on one chapter of Shigley—only chapter 8. This position deliberately ignores the other teachings of Shigley, which indeed disclose other complexities that Dr. Kytömaa believes a POSITA, as designed by Mr. Smith, would not typically encounter. *Id.*

It is evident that Dr. Kytömaa is attempting to use opposing arguments to support a biased opinion as to a POSITA whenever one or the other supports his opinion. *Id.* at ¶ 45. It is further evident that Dr. Kytömaa's arguments are not only biased but are also not supported by the intrinsic evidence. Namely, without explaining further, Dr. Kytömaa purports that a POSITA would be dissuaded from combining the prior art references, yet his opinion is contradicted by the very references he cites in support his opinion in an equivalent manner to his deliberate attempt to limit the use of Shigley to only a single chapter. Ex. 1044 at Table pp. 23-25.

As an illustration, Dr. Kytömaa claims that a POSITA would not be aware of “tribology,” “fracture mechanics,” and “fluid mechanics.” Ex. 1048 at ¶ 29. However, Shigley, a book that Dr. Kytömaa acknowledges a POSITA would be aware of (Ex. 1048 at ¶ 35 (citing Ex. 2002), does indeed teach fracture mechanics and tribology (Ex. at 1044 Table p. 23-24; Ex. 1046). Importantly, fluid mechanics is a required subject for all mechanical engineering students. Ex. 1044 at Table p. 24. Munson’s “Fundamental of Fluid Mechanics,” another commonly used textbook in college for mechanical engineering, dedicates much of the book to aspects of fluid dynamics. Ex. 1044 at Table pp. 24; Ex. 1047. Thus, claiming a POSITA would be without such knowledge is patently false.

Dr. Kytömaa’s biased misrepresentations also includes unsupported assumptions about a POSITA. For example, Dr. Kytömaa claims:

“[t]he shaft must withstand variable and unpredictable fatigue loads resulting from a wide range of material hardnesses. Its eccentric design introduces complexity not typically encountered by an engineer with only two years of experience.”

See Ex. 1048 at ¶ 30. This opinion ignores the Shigley chapters specific to fatigue failure resulting from variable loading, strain-life method, linear-elastic fracture mechanics method, hardness, and surface fatigue strength. Ex. 1044 at Table p. 25-26. A POSITA, as claimed by Mr. Smith, would not be so intimidated to lack any motivation to combine known solutions as taught in the prior art as the challenges faced in the prior art are taught in engineering school. Ex. 1044 at Table p. 25.

Then, Dr. Kytömaa goes as far as to state incorrect opinions regarding the cited prior art. Dr. Kytömaa claims that it would not have been obvious to modify Polinski (Ex. 1017) to reduce the thickness of the threaded shoulder because this would significantly increase the likelihood that the connection between the sleeve and mantle would fail. Ex. 1048 at ¶ 36. Dr. Kytömaa further opines that adding an oil groove to the bearing journal would have a similar effect to the threads described by Polinski and that this would have been evident to a person of ordinary skill in the art. Ex. 1048 at ¶ 37. These opinions are incorrect as a POSITA would be educated to solve these types of stress concerns. Ex. 1044 at Table p. 25-26. The many sections in Shigley dedicated to calculating fatigue failure both enable a POSITA to analyze the stress as well as educate them on the many methods to reduce high stress regions and concentrations in order to optimize a design for the intended use. *Id.* No experienced mechanical engineer would immediately know the fatigue life of a component, or the fatigue life due to a change to that component, without some analysis. *Id.*

Given Polinski's teaching that discontinuities should be removed from high-stress regions of the shaft, a POSITA would not have been motivated to one or more grooves in the journal 11 of the shaft body of Polinski. Ex. 1048 at ¶ 36. Dr. Kytömaa also states that such failure would be an existential threat and that any benefits

associated with the addition of a groove in Polinski would appear diminished in view of the existential risk of shaft failure. Ex. 1048 at ¶ 37.

The teachings in Polinski do not support Dr. Kytömaa's position. Specifically, Polinski teaches:

“[t]o secure the mantle to the shaft, a threaded section has generally been provided on the shaft immediately above the tapered portion supporting the mantle for receiving a head nut which forces the mantle against the tapered portion of the shaft. While **this type of arrangement has proven to be satisfactory for most crusher installations**, experience has indicated that the relatively abrupt changes in the cross-sectional area of the shaft above and below the threaded section have resulted in high local stress concentrations in these regions of the shaft.”

See Ex. 1017 (Polinski) 1:15-25 (emphasis added). A POSITA would know that the small depth of the grooves required to perform their function would not necessarily result in the “abrupt changes in cross-sectional area of the shaft” that Polinski alludes to. Ex 1044 at Table p. 26.

Polinski further teaches:

“[t]he sleeve arrangement, which is releasably **secured to the bearing journal at the low stressed, outermost end of the shaft, includes a head nut** which abuts the mantle to secure it to the tapered portion of the shaft. From the foregoing, it can be seen that the invention contemplates an arrangement wherein 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.”

See Ex. 1017 (Polinsky) 1:56-67 (emphasis added). Hence, Polisky teaches that stress must be calculated and then the stress must be managed to meet the

requirements of the machine operation. This is a typical and normal task for any machine design, or redesign, which any POSITA would understand. Ex. 1044 at Table p. 27.

Dr. Kytömaa further contends that “a POSITA would not be motivated to incorporate an oil groove into the shaft of Polinski as modified by the proposed combination with Piepho (Ex. 1018) at least for the additional reason that incorporating such plurality of grooves would increase the likelihood of would create structural discontinuities that would increase the likelihood of fatigue failure.” Ex. 1048 ¶ 35.

Dr. Kytömaa also states that fretting wear can occur and provide still more potential initiation sites for fatigue cracks. *Id.* ¶ 35. However, fretting is another issue that a POSITA would be aware of from textbooks and prior art, such as Shigley Section 6-9 Endurance Limit Modifying Factors and Piepho. Ex. 1044 Table pp. 27-28. Piepho teaches that fretting issues occur in rock crushers, as well as how these high stress interactions have been mitigated and often do not produce stress concentrations. *Id.*

“In addition, the coating should resist cracking or Separation at Surface Strains up to approximately ± 65 micro inches/inch (corresponding to +20,000 psi stress) **for essentially unlimited number of cycles.**” Ex. 1018 (Piepho) 3:55-59 (emphasis added). Piepho further discloses that some of the advantages of the

present invention include the following: (1) **the existing shaft and yoke geometries need not be changed**; (2) the application of an intervening layer of coated material allows the use of Surface treatments like shot peening which can mutilate the Surface, but the final Surface is refined with the coating material while leaving the treated Surface undisturbed; (3) the intervening layer is of high hardness for maximum resistance to fretting and wear; (4) **minor fretting does not produce Stress concentrations in the Shaft material**; and (5) the coating provides protection from mechanical and corrosion damage in the area outside the fitted joint. Another advantage with the present invention is the ability to use lubricants, such as tungsten disulfide, on the bushing and the coated tapered end. Ex. 1018 4:23-36; Ex. 1044 at Table pp. 28-29.

Thus, a POSITA would not be dissuaded from combining Polinski with Piepho due to any of the concerns opined on, and discussed above, by Dr. Kytömaa.

Finally, specific to the term “indented at the external surface,” Dr. Kytömaa attempts to justify a reading of “at least one groove indented at the external surface and positioned at the tapered axial region...” Ex. 1048 at ¶ 18. Such a narrow reading by Patent Owner is impermissible.

B. There Is Sufficient Intrinsic Evidence Supported By Extrinsic Evidence To Determine The Terms “End” And “Indented At The External Surface”

Patent Owner, by way of Dr. Kytömaa’s Declaration, contends that the terms “end” and “indented at the external surface” need construction as a POSITA would not understand these terms. Petitioner respectfully disagrees with this assessment. First, there is sufficient intrinsic evidence from which a POSITA can determine both the meaning of “end” and the meaning of “indented at the external surface.” Next, if extrinsic evidence is required, there is sufficient extrinsic evidence that further supports the intrinsic evidence. Therefore, the Board does not need to construe the term “end” or the term “indented at the external surface.”

Patent Owner proposed construction of “end” as “an extremity of a shaft body or sleeve.” Ex. 1044 at ¶ 9. However, the intrinsic evidence does not support this opinion. “End” is used multiple times in the ‘090 patent where at least two meanings are identified. *See, generally*, Ex. 1044 at ¶ 10. For example, as identified by Mr. Smith, there are many examples of where “end” denotes a region, and not “an extremity of a shaft body or sleeve.” Ex. 1044 at ¶¶ 11-13. On some occasions, “end” is used to denote “an extremity of a shaft body or sleeve.” Ex. 1044 at ¶¶ 14-15.

Thus, when considering the specification as a whole, it is clear that the patent drafters intended “end” to include additional regions beyond the extreme end surface. There is no intrinsic evidence to differentiate between the two uses of “end,”

thus, supporting the position that “end” should have its broadest possible meaning, which includes both “end region” and “an extremity of a shaft body or sleeve.” Ex. 1044 at ¶ 16.

If extrinsic evidence is to be considered, all of the cited prior art references in the field of rock crushers use the term “end.” Ex. 1044 at ¶ 17. For example, Piepho (Ex. 1018) provides for a “yoke” end (20), top end (25), tapered end (25), shaft end (25), and cylindrical end (25) where “end” is used to denote a region. Ex. 1044 at ¶ 18. Similarly, Polinski also uses “end” to denote a region. *Id.* at ¶ 19.

While Dr. Kytömaa cites a dictionary definition for end, he omits the fact that “end” does not always mean “an extreme or last part lengthwise” as other definitions are also reflected in dictionaries. Ex. 1044 at ¶¶ 21-22. Hence, even in view of different definitions for “end,” a POSITA would not rely on any one definition but would rely on the intrinsic evidence to identify “end.” *Id.* at ¶¶ 23-24. Even though Dr. Kytömaa appears to acknowledge this fact, despite the inconsistencies with his analysis of the intrinsic evidence, he still maintained his narrow definition for “end.” *Id.* at ¶¶ 25-26.

Dr. Kytömaa submits that “indented at the external surface” should be “properly construed as a depression or recess in an external surface—specifically, the external facing surface of the shaft body.” Ex. 1048 at ¶ 18 (emphasis added). Here, Dr. Kytömaa attempts to construe a narrower definition for a term rather than

using its broadest reasonable construction consistent with the specification. Ex. 1044 at ¶ 28. Interestingly enough, the use of the words “in,” “on,” and “within” are used interchangeably in the specification in place of “at.” *Id.* at ¶¶ 29-30. Even though “at” is used in the patent claims, there is no delineating between these terms or any reason given why one word is used as opposed to another in the specification. *Id.*

Turning to the extrinsic evidence, a POSITA would recognize that, by choosing the word “at,” the claims convey that the groove could be on the shaft, in the shaft, or even near the shaft. *Id.* at ¶¶ 31-32.

Thus, considering the state of the art, a POSITA would appreciate that sometimes it is advantageous for an oil groove to be located in the shaft and at other times located in the sleeve, both of which would conform to the claim term using “at.” *Id.* at ¶ 33. Furthermore, a POSITA would be aware of the use of a single groove and multiple grooves, both in the shaft and in the sleeve. *Id.* For example, there are numerous prior art references that teach having more than one groove in either a shaft and or sleeve. *See id.* at ¶¶ 34-39.

C. THE SUBSTITUTE CLAIMS ARE OBVIOUS

Polinski in view of Harless (EX. 1033) and/or Yagi (Ex. 1040) and the knowledge of a POSITA render substitute claims 15-26 obvious. Ex. 1044 ¶¶ 47-59 and Invalidity Chart pp. 36-64. The combination of this prior art is because a

POSITA, as described by Mr. Smith, would be motivated to combine such prior art.
Ex. 1044 ¶¶ 52-57.

The following “Invalidity Chart addresses each element of the substitute claims wherein the Second Declaration of David Smith (Ex. 1044 Table pp. 36-64), incorporated herein by reference, provides more detailed analysis as to why the substitute claims are invalid.

Challenged Claim 15 (Substitute for Claim 1)	Obvious by Prior Art?
15P. A gyratory crusher main shaft of a crusher comprising:	YES: Although the preamble is generally not considered limiting, d Polinski discloses a gyratory crusher main shaft of a crusher. “The present invention relates to gyratory crushers...” ¹
15a. a shaft body having a radially outward facing external surface, and a first end and a second end;	YES: As shown my First Declaration, as shown in the figures below, Polinski discloses a shaft body having a radially outward facing external surface, and a first end and a second end.
15b. 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;	YES: As shown in the figures below, Polinski in view of Harless, discloses 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 section area of the shaft body at the tapered axial region
15c. a shaft sleeve mounted on the tapered axial region; and	YES: As shown in the figures below, Polinski in view of Harless discloses a

¹ Polinski 1:44

	shaft sleeve mounted on the tapered axial region.
15d. a plurality of grooves indented at the external surface and positioned at the tapered axial region, the plurality of grooves being arranged to receive a pressurised (sic) fluid to facilitate mounting and dismounting of the shaft sleeve at the shaft body,	YES: As shown in the figures below, Polinski in view of Harless OR Polinski in view of Harless and Yagi disclose a plurality of grooves indented at the external surface and positioned at the tapered axial region. The grooves in Harless and Yagi are arranged to receive pressurized fluid to make mounting and dismounting of the shaft sleeve on the shaft easier.
15e. wherein the plurality of grooves comprise a first groove and a second groove, wherein the first groove is positioned closer to the second end relative to the second groove; and	YES: As shown in the figures below, Polinski in view of Harless OR Yagi discloses a first groove closer to the second end of the shaft relative a second groove.
15f. a fluid inlet conduit extending axially from the second end and provided in fluid communication with the first groove, wherein the fluid inlet conduit extends internally within the shaft body only to the first groove,	YES: Polinski in view of Harless and in further view of Yagi discloses a fluid inlet in communication with only one groove.
15g. wherein the first groove and the second groove are coupled in fluid communication.	YES: Polinski in view of Harless and Yagi discloses a first and second groove coupled in fluid communication.
16P. The main shaft as claimed in claim 15,	YES: As shown above, Polinski in view of Harless and Yagi discloses the main shaft as claimed in claim 15.
16a. wherein the first groove is positioned on a first side of a cross-sectional area center of the shaft sleeve relatively closer to the second end and the second groove is positioned on a second side of a cross-sectional area center of the shaft sleeve relatively further from the second end.	YES: As shown below, Polinski in view of Harless and Yagi disclose two grooves which are on opposing sides relative to the cross-sectional area center of the shaft sleeve with the first groove being positioned closer to the second end of the shaft with the second groove being further from the second end.

17P. The main shaft as claimed in claim 16,	YES: As shown above, Polinski in view of Harless and Yagi discloses the main shaft as claimed in claim 16.
17a. wherein the first groove and the second groove are positioned at an equal distance from the cross-sectional area center of the shaft sleeve such that when the pressurised (sic) fluid is supplied to the first groove and the second groove, an expansion force is distributed substantially uniformly along the axial length of the sleeve.	YES: As shown above, Polinski in view of Harless and Yagi discloses a first and second oil groove positioned equal distance from the cross-sectional area center of the shaft sleeve. As the positioning is the same as that described in the claim the expansion force would be distributed the same as the structure disclosed in the '090 patent, described as being distributes substantially uniformly along the axial length of the sleeve.
18P. The main shaft as claimed in claim 15,	YES: As shown above, Polinski discloses the main shaft as claimed in claim 15.
18a. wherein the plurality of grooves extend in a circumferential direction around the tapered axial region shaft body.	YES: Polinski in view of Harless and Yagi disclose that the plurality of grooves extend in a circumferential direction around the shaft body.
19P. The main shaft as claimed in claim 18,	YES: As shown above, Polinski in view of Harless and Yagi discloses the main shaft as claimed in claim 18.
19a. wherein the plurality of grooves extend substantially or completely circumferentially around the shaft body.	YES: As shown and described above, Polinski in view of Harless and Yagi disclose that the plurality of grooves extends completely around the shaft body.
20P. The main shaft as claimed in claim 15,	YES: As shown above, Polinski in view of Harless and Yagi discloses the main shaft as claimed in claim 15.
20a. wherein at least a part of the fluid inlet conduit is indented and extends axially at the external surface as a channel to couple the first and second grooves in fluid communication.	YES: As shown below Yagi discloses an axial external channel that couples the first and second grooves in fluid communication.

21P. A gyratory crusher main shaft assembly for a crusher comprising:	YES: While the preamble to a claim is generally not considered limiting, see claim element 15P.
21a. a shaft body having a radially outward facing external surface, and a first end and a second end, 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,	YES: See element 15a and 15b. No change to original claim element. See previous discussion regarding “end”.
21b. a shaft sleeve mounted on the tapered axial region, and	YES: See element 15c. No change to original claim element.
21c. at least one groove indented at the external surface and positioned at the tapered axial region, the at least one groove being arranged to receive a pressurised (sic) fluid to facilitate mounting and dismounting of the sleeve at the shaft body;	YES: See element 15d. No substantive change to original claim element (the “plurality of grooves” in 15d would certainly satisfy the instant limitation of “at least one groove.”)
21d. wherein the shaft sleeve is fitted over the tapered axial region, the shaft sleeve having a tapered wall thickness, such that the wall thickness at a second end of the shaft sleeve is greater than the wall thickness at a first end of the sleeve; and	YES: Harless discloses 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.
21e. an end retainer releasably mounted at the second end of the shaft body and having a perimeter region extending radially outward beyond the external	YES: Polinski in view of Harless discloses a main shaft assembly further comprising an end retainer releasably mounted at the second end of the shaft

surface at the tapered axial region, the perimeter region positioned to radially overlap the shaft sleeve at the second end of the sleeve to inhibit axial separation of the shaft sleeve from the shaft body,	body and having a perimeter region extending radially outward beyond the external surface at the tapered region.
21f. wherein the end retainer includes a recess extending circumferentially at the perimeter region to allow axial movement of the shaft sleeve into the recess,	YES: Harless discloses that the end retainer includes a recess extending circumferentially at the perimeter region to allow axial movement of the sleeve into the recess.
21g. wherein the recess defines an annular gap between the end retainer and the second end of the shaft sleeve when an underside surface of the end retainer is positioned in contact with the second end of the shaft body.	YES: Harless teaches a gap between an end retainer and the sleeve to both allow the sleeve to move axially to release the press fit and yet be retained so as not to become a projectile and cause safety issues. A POSITA would be motivated to make a simple substitution of an end retainer that has such a gap so as not to rely on a user to back off the bolts the correct amount. If the bolt were to be backed off too much, the additional velocity of the sleeve and the lack of thread engagement could cause the end retainer to fail. It would be obvious for a POSITA to try such an end washer. It would be a predictable solution to eliminate these issues and there would be more than a reasonable expectation of success.
22P. The assembly as claimed in claim 21,	YES: As shown above, the combinations have all the limitations of claim 21.
22a1. wherein the end retainer comprises a first plurality of bores distributed circumferentially around the end retainer and configured to align with a plurality of sleeve bores in the second end of the shaft sleeve such that	YES: Polinski discloses several pluralities of holes distributed circumferentially to attach one part to the other. It is a known technique to use bolts with aligned bores to attach two separate parts together. This technique

the end retainer can be attached to the shaft sleeve.	is ubiquitous in the mechanical arts and would be well known to a POSITA.
23P. The assembly as claimed in claim 22,	YES: As shown above, the combinations disclose all the limitations claim 22.
23a1. wherein the end retainer comprises a surface opposite the underside surface of the end retainer configured to mate against the second end of the shaft sleeve when the end retainer is inverted, and	YES: Harless discloses an end retainer configured to mate against the second end of the shaft sleeve when the end retainer is inverted.
24P. The assembly as claimed in claim 21,	YES: As shown above, the combinations have all the limitations of claim 21.
24a. further comprising a fluid inlet conduit extending axially from the second end of the shaft body in fluid communication with the at least one groove to allow a fluid to be supplied to the at least one groove from the second end of the shaft body.	YES: Polinski in view Harless and/or Yagi discloses that the main shaft further comprises a fluid inlet conduit extending axially from the second end and provided in fluid communication with the at least one groove to allow a fluid to be supplied to the at least one groove from the second end.
25P. The assembly as claimed in claim 21,	YES: As shown above, the combinations have all the limitations of claim 21.
25a. further comprising a fluid inlet conduit extending radially through the wall thickness of the sleeve in fluid communication with the at least one groove to allow a fluid to be supplied to the at least one groove through the sleeve.	YES: Polinski in view of Harless and the knowledge of a POSITA. A POSITA would recognize an optional ordinary design choice of including a fluid inlet conduit extending radially through the wall thickness of the sleeve in fluid communication with the at least one groove to allow a fluid to be supplied to the at least one groove through the sleeve.
26P. A gyratory crusher comprising;	YES: While the preamble is generally not considered limiting, Polinski discloses a gyratory crusher.

26a. a main shaft including a shaft body having a radially outward facing external surface, 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;	YES: See element 15a above and 14a in my First Declaration.
26b. 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, the tapered axial region being configured to mount a shaft sleeve;	YES: See element 15b above and 14b in my First Declaration.
26c. 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; and	YES: See element 15c above and 14c in my First Declaration.
26d. at least one groove indented at the external surface and positioned at the tapered axial region, the at least one groove being arranged to receive a pressurized fluid to facilitate mounting and dismounting of the sleeve at the shaft body,	YES: See element 15d above and 14d in my first declaration.
26e. wherein the shaft sleeve is configured such that when positioned on the shaft body, the shaft sleeve is independent of a crushing head and a crushing shell.	YES: Polinski discloses a sleeve that is independent of the crushing head and a crushing shell.

Therefore, as stated above and addressed and in more detail in Ex. 1044, despite amending several of the original claims and including new claims, the combination of Polinski in view of Harless and/or Yari and the knowledge of a

POSITA renders obvious all of the substitute asserted claims of the '090 patent. Ex. 1044 ¶ 58. More specifically, the '090 patent merely describes the use or ordinary and highly predictable design elements used for tapered interference fits. *Id.*

IV. CONCLUSION

For all of the reasons stated above, the substitute claims of the '090 patent are obvious by prior art under 35 U.S.C. § 103, according to a person of ordinary skill in the art.

Date: September 16, 2025

/Terry M. Sanks/

Terry M. Sanks, Esquire

Reg. No. 45,069

BEUSSE SANKS, PLLC

612 E. Colonial Drive, Suite 250

Orlando, Florida 32803

Tel: (407) 644-8888

tsanks@firstiniplaw.com

litigation@firstiniplaw.com

CERTIFICATE OF SERVICE

I hereby certify that, on September 16, 2025, a true and correct copy of the foregoing Petition (and accompanying exhibits) was served on the Patent Owner via electronic means (by agreement of the parties) at the addresses listed below:

Mehran Arjomand
MArjomand@mofo.com

Alex S. Yap
AYap@mofo.com

MORRISON & FOERSTER LLP
707 Wilshire Blvd., Suite 6000 Los Angeles, CA 90017
Tel: 213-892-5200

- and -

Aaron G. Fountain
afountain@mofo.com
MORRISON & FOERSTER LLP
200 Clarendon Street, 21st Floor
Boston, MA 02116
Tel: 617-648-4700

-and-

Jeffrey G. Young
JeffreyYoung@mofo.com
MORRISON & FOERSTER LLP
2100 L Street, NW Suite 900
Washington, DC 20037
Tel: 202-877-1500

Attorneys for Patent Owner
Sandvik Intellectual Property AB

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/Terry M. Sanks/

Terry M. Sanks

Reg. No. 45,069

