

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

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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' REPLY
TO PATENT OWNER'S RESPONSE**

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EXHIBIT LIST

Exhibit	Description
Ex. 1002	Smith 1 st Declaration
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. 1045	Kytömaa 2 nd Declaration
Ex. 1046	Shigley Reference
Ex. 1047	Munsun Reference

1. INTRODUCTION

Petitioners, CMS Cepcor Limited and CMS Cepcor America LLC (“CMS Cepcor”), replies to Patent Owner, Sandvik Mining and Construction USA LLC’s Response to *Inter Partes* Review of U.S. Patent No. 11,014,090 (the ‘090 patent) under 37 C.F.R. § 42.121. As discussed below, the claims in the ‘090 patent are substantively defective. Petitioner therefore requests that the Board invalidate the ‘090 patent.

I. THE 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. 1045 at ¶ 20.

However, Shigley, a book that Dr. Kytömaa acknowledges a POSITA would be aware of (Ex. 1045 at ¶ 51-52), 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. 1045 at ¶ 20. 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 28 because this would significantly increase the likelihood that the connection between the sleeve and mantle would fail. Ex. 1045 at ¶ 50. 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. 1045 at ¶ 48. 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.*

Dr. Kytömaa further claims:

“[c]utting oil grooves into the Polinski shaft in the bearing journal 11 would introduce stress raisers and corresponding stress concentrations into the shaft, thus increasing the chance of fracture, precisely what Polinski aims to prevent by removing threads from the shaft.”

See Ex. 1045 ¶ 52. 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. 1045 at ¶ 54. 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. 1045 at ¶ 52.

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 a 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 a groove would increase the likelihood of fretting wear and fretting induced fatigue failure.” Ex. 1045 ¶ 57-58. 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.*

Dr. Kytömaa next attempts to argue a lack of motivation to combine Piepho with Polinski (Ex. 1017) due to the threat of fretting wear and fatigue failure. Again, fretting is another issue that a POSITA would be aware of from textbooks and prior art, such as Shigley’s Section 6-9 Endurance Limit Modifying Factors and Piepho. Interestingly, 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. Furthermore, Polinsky teaches that:

“[a]dditionally, **to abate fretting corrosion** of the main shaft in the normally high stressed portion of the shaft at the base of the bearing journal 11, the sleeve is counterbored as indicated at 28' to prevent engagement between the sleeve and the main shaft in the proximity of the threaded annular shoulder 28.”

See Ex. 1015; Ex. 1017 3:9-14 (emphasis added); Ex. 1044 at Table p. 28.

“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 fretting concerns as fretting is another well-known mechanism that a POSITA would be aware of and able to solve. Ex. 1044 at Table p. 29.

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. 1045 at ¶ 40-43. Such a narrow reading 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. 1045 at ¶ 33 (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 ‘090 Claims Are Obvious.

Despite Patent Owner’s attempt to narrow claim terms “end” and “indent at the external surface” by providing a biased opinion regarding a POSITA as a basis to nullify Mr. Smith’s First Declaration (Ex. 1002), Petitioner submits that Mr. Smith’s first Declaration, incorporated herein by reference in its entirety, is still valid. Ex. 1044 ¶ 46. In other words, the lack of motivation that Patent Owner claims to combine the previously cited prior art is not lacking when considering a POSITA, as defined by Mr. Smith which results in the ‘090 claims being obvious.

II. CONCLUSION

For all of the reasons stated above, CMS Cepcor requests the cancellation of claims 1-10 and 12-14 of the ’090 patent because such claims are unpatentable as anticipated by prior art under 35 U.S.C. § 102 and rendered obvious by prior art under 35 U.S.C. § 103, according to a person of ordinary skill in the art.

2. CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that this Petition complies with the type-volume limitation of 37 C.F.R. § 42.24(a). The word count application of the word processing program used to prepare this Reply indicates that the Petition contains 2784 words, excluding the parts of the brief exempted by 37 C.F.R. § 42.24(a).

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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:

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