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 CEPCOR LTD., and
CMS CEPCOR AMERICAS LLC,
Petitioners,

v.

SANDVIK INTELLECTUAL PROPERTY AB,
Patent Owner.

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

PETITIONERS' SUR-REPLY TO PATENT OWNER'S REPLY TO PETITIONER'S OPPOSITION TO REVISED CONTINGENT MOTION TO AMEND

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EXHIBIT LIST

Ex. 1001	US Patent 11,014,090
Ex. 1001-1	File History for US Patent 11,014,090
Ex. 1002	Declaration of David Smith MSME, MBA, PE, CSP
Ex. 1002-1	*Curriculum Vitae* of David Smith MSME, MBA, PE, CSP
Ex. 1002-2	Deposition and Trial Testimony of David Smith MSME, MBA, PE, CSP
Ex. 1002-3	Documents considered by David Smith MSME, MBA, PE, CSP in creating Declaration
Ex. 1003	https://www.linkedin.com/in/mikael-k-larsson-12728827
Ex. 1004	https://www.linkedin.com/in/patric-malmqvist-19bb3110
Ex. 1005	https://www.linkedin.com/in/anders-hallberg-3bba713a
Ex. 1006	https://www.nature.com/articles/d41586-021-02612-5
Ex. 1007	https://www.driveasphalt.org/why-asphalt
Ex. 1008	https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-stone-crushed.pdf
Ex. 1009	https://i.ytimg.com/vi/vQCgnGrSz7M/hqdefault.jpg
Ex. 1010	https://aggregates.seprosystems.com/history-of-rock-crushers/
Ex. 1011	https://ogden_images.s3.amazonaws.com/www.miningga-zette.com/images/2022/04/01160835/4-2-CCPP.gj-.jpg
Ex. 1012	U.S. Patent Publication No. 3,813,047
Ex. 1013	https://aggregates.seprosystems.com/history-of-rock-crushers/
Ex. 1014	https://savree.com/en/encyclopedia/gyratory-crusher
Ex. 1015	https://savree.com/en/encyclopedia/gyratory-crusher
Ex. 1016	International patent publication WO2014/019765
Ex. 1017	U.S. Patent Publication No. 4,410,143
Ex. 1018	U.S. Patent Publication No. 6,270,026
Ex. 1019	U.S. Patent Publication No. 4,060,205
Ex. 1020	https://pbase.com/mainecruising/fitting_a_prop
Ex. 1021	https://www.surpluscenter.com/Hydraulics/Hydraulic-Pumps/Clutch-Pumps-Hydraulic/2-32-cu-in-Hydraulic-Pump-w-Tapered-Shaft-for-Electric-Clutch-Rexroth-AZPN10036RXR12MA-9-1738-P.axd
Ex. 1022	https://img.directindustry.com/images_di/photo-g/20030-2339083.jpg
Ex. 1023	https://www.brandnewengines.com/cdn/shop/prod-ucts/SAM_3681_1024x.jpg

Ex. 1024	https://ashdowntooling.co.uk/products/1-5mm-13mm-lathe-tail-stock-drill-chuck-morse-taper-3-mt3-to-b16-arbor
Ex. 1025	Machine Design Data Handbook, K. Lingaiah, c1994
Ex. 1026	https://www.cgtk.co.uk/metalwork/data/morse
Ex. 1027	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3779551/
Ex. 1028	SAE J755
Ex. 1029	SAE J1419
Ex. 1030	ASME B18.8.2
Ex. 1031	U.S. Patent Publication No. 4,019,344
Ex. 1032	U.S. Patent Publication No. 3,343,376
Ex. 1033	U.S. Patent Publication No. 2,840,399
Ex. 1034	U.S. Patent Publication No. 3,228,102
Ex. 1035	U.S. Patent Publication No. 4,829,718
Ex. 1036	U.S. Patent Publication No. 2,764,437
Ex. 1037	"Accurate mounting of bearings, propellers and gears has never been quicker…" by SKF (3603e_skf_hydraulic_bearing_techniques.pdf)
Ex. 1038	"Hydraulically Fitted Hubs, Theory and Practice" by Michael M. Calistrat (T91-10.pdf)
Ex. 1039	"Hydraulic Removal of Coupling Hubs – Keyed and Keyless" by Michael Calistrat and Robert Parker (T22153-160)
Ex. 1040	U.S. Patent Publication No. 8,302,754
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Ex. 1052	U.S. Patent No. 3,813,047 (Torrence)
Ex. 1053	U.S. Patent No. 4,037,800 (Coxhill)

Ex. 1054	U.S. Patent No. 3,343,376 (Carman)
Ex. 1055	Revised Claim Chart
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Ex. 1057	U.S. Patent No. 2,381,697 (Shepard)
Ex. 1058	Supplemental Ex. 1012
Ex. 1059	Supplement Ex. 1032
Ex. 1060	Supplemental Ex 1040
Ex. 1061 [NEW]	REMOVED
Ex. 1062 [NEW]	REMOVED
Ex. 1063 [NEW]	Kytömaa 2nd Deposition
Ex. 1064 [NEW]	REMOVED
Ex. 1065 [NEW]	REMOVED

I. INTRODUCTION

This Amended Sur-Reply is presented to replace Paper 47 to remove the fourth declaration of Mr. Smith since it was improperly included, at the request of the Patent Owner, resulting in only the second deposition of Dr. Kytömaa being a new exhibit (though his prior declarations were allowed to be referenced/reviewed during his second deposition at Patent Owner's request).

Petitioners, CMS Cepcor Limited and CMS Cepcor America LLC ("CMS Cepcor"), submits that Patent Owner, Sandvik Mining and Construction USA LLC's Revised Non-Contingent Motion to Amend (the "Revised Motion to Amend") the claims of U.S. Patent No. 11,014,090 (the "'090 Patent") under 37 C.F.R. § 42.121 remain unpatentable despite the belated arguments made in Patent Owner's Reply (Paper 38). As discussed below, not only is the prior art analogous art, but there is also motivation to combine.

II. THE PRIOR ART MEETS THE LEGAL STANDARD FOR ANALOGOUS PRIOR ART

Patent Owner has taken a position that, although both the '090 Patent (Ex. 1001) and U.S. Patent No. 6,270,026 to Piepho (Ex. 1018) relate to crushing rocks, Piepho is not analogous art because it should be limited only to coal pulverizers. This narrow distinction is not supported by legal standards.

As is well settled, two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the invention is involved. *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986); *see also In re Wood*, 599 F.2d 1032, 1036 (CCPA 1979). It is further well established that: "[i]n a simple mechanical invention a broad spectrum of prior art must be explored and it is reasonable to permit inquiry into other areas where one of ordinary skill in the art would be aware that similar problems exist." *See Stevenson v. Int'l Trade Comm*., 612 F.2d 546, 550, 204 USPQ 276, 280 (CCPA 1979). For example, a predecessor of this Board previously concluded that clutches and brakes were analogous prior art. *See Ex parte Goodyear Tire & Rubber Co*., 230 USPQ 357 (Bd. Pat. App. & Inter. 1985). Hence, analogous art is simply that which is not too remote to be treated as prior art; labeling it merely connotes that it is relevant to a consideration of obviousness under §103. *In re Sovish*, 769 F.2d 738, 226 USPQ 771 (Fed. Cir. 1985).

Furthermore, a requirement during patent application examination directs patent examiners to consider fields of invention that are related to the claimed invention, even if they are not directly within the same classification. *See* MPEP 904.01(c) ("Not only must the art be searched within which the invention claimed is

classifiable, but also all analogous arts must be searched regardless of where the claimed invention is classified.").

In view of the established legal standards, Piepho is analogous art to the '090 Patent. As further support, both the '090 Patent and Piepho have the same section, class, and subclass Cooperative Patent Classification ("CPC") identifier of B02C which represents "**CRUSHING, PULVERIZING** OR DISINTEGRATING IN GENERAL." (emphasis added). Even though the specific sub-groups are different, the same main classification supports that Piepho and the '090 Patent are in the same field of endeavor.

Also of note is the fact that Piepho has been cited by Petitioners since the initial Petition initiating this action in August 2024. *See* Paper 2 citing Ex. 1018. Then, Piepho was continuously cited throughout this action, such as in Petitioners' Response in Opposition to Patent Owner's Contingent Motion to Amend and Request for Preliminary Guidance (Paper 19) and in Petitioners' Response to Patent Owner's Revised Contingent Motion to Amend (Paper 33). Yet, only now, over a year since Piepho was first raised in these proceedings as analogous prior art by Petitioners, is Patent Owner attacking Piepho as being non-analogous prior art.

Both the '090 Patent and Piepho are related to main shaft assemblies for rock crushers. This is further readily apparent considering that the '090 patent is titled "Gyratory Crusher Main Shaft and Assembly" and Piepho is titled "Strain Relief

Main Shaft Assembly." (Ex. 1001 at 1; Ex. 1018 at 1) wherein both patents are used in the crushing, pulverizing or disintegrating of rocks.

Additionally, both the '090 Patent and Piepho address the same problems. For example, one shared problem is preserving the main shaft i.e. preventing it from needing to be replaced, which is expensive as well as difficult and time consuming to remove. Ex. 1001, 1:42-59 and Ex. 1018, 1:45-65. The second problem, related to the first, is how to minimize the down time, thus, minimizing the opportunity cost of not running the rock crushing machines. The '090 Patent addresses these problems by using a wear sleeve on the shaft, which can be replaced when worn out. Replacing the wear sleeve is less expensive, easier, and faster than replacing the entire main shaft.

In the '090 Patent, the main shaft and sleeve are formed with a tapered interference fit to further increase the speed with which the wear sleeve can be replaced. Piepho addresses the problem by using a coating for the shaft that reduces fretting, stress, fatigue, and, ultimately, the failure of the main shaft. It is evident that fewer main shaft failures, means fewer main shafts needing to be replaced. Fretting is also a consideration for the design of the shaft and wear sleeve of the '090 Patent. Ex. 1043, at Pp. 20-21. The main shaft of Piepho on which the coating is applied can be cylindrical, but Piepho points out that it is preferably tapered with a tapered

bearing interference fit on the end. Ex. 1018, 3:29-30. This reality is a fact that Patent Owner and its expert continue to dismiss.

Though Piepho is not a tapered interference fit on the end of the main shaft, Piepho highlights what was already well known in the art – that tapered shafts with tapered bushings/wear sleeves were known and preferable. *See* Ex. 1018, 1:66-2:8. Non-limiting examples of prior art that show tapered shafts with tapered interference fit bushings include the following: US 4,019,344 (Ex. 1013); US 3,343,376 (Ex. 1032); US 2,840,399 (Ex. 1033); US 3,228,102 (Ex. 1034); US 4,829,718 (Ex. 1035); SAE J755 (Ex. 1028); SAE J1419 (Ex. 1029); ASME B18.8.2 (Ex. 1030); Machine Design Data Handbook, K. Lingaiah, c1994 (Ex. 1025); https://www.cgtk.co.uk/metalwork/data/morse (Ex. 1026); https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3779551/ (Ex. 1027): https://web.archive.org/web/20101027092713/https://pbase.com/mainecruising/fitting_a_prop (Ex. 1020); https://www.surpluscenter.com/Hydraulics/Hydraulic-Pumps/Clutch-Pumps-Hydraulic/2-32-cu-in-Hydraulic-Pump-w-Tapered-Shaft-for-Electric-Clutch-Rexroth-AZPN10036RXR12MA-9-1738-P.axd (Ex. 1021); https://img.directindustry.com/images_di/photo-g/20030-2339083.jpg (Ex. 1022); https://www.brandnewengines.com/cdn/shop/products/SAM_3681_1024x.jpg (Ex. 1023); and https://ashdowntooling.co.uk/products/1-5mm-13mm-lathe-tailstock-drill-chuck-morse-taper-3-mt3-to-b16-arbor (Ex. 1024).

Furthermore, Patent Owner and Dr. Kytömaa previously agreed that tapered friction fit shafts and sleeves were known in the comminution field (rock crushing field) as well as generally in the mechanical arts. *See* Ex. 1063, 19:1-20:22.

Both the ’090 Patent and Piepho are rock crushers. Dr. Kytömaa agreed that coal is a specific kind of rock. *See* Ex. 1063, 7:4-25. He acknowledges that the purpose of the coal crusher references in Piepho is to reduce the size of coal from .075- 1” diameter rocks to a 0.003-0.012 inch rock powder. *See* Ex. 2022, ¶ 17. As a side note, Dr. Kytömaa stated that he has worked on coal pulverizers and b[all] mills, as well as a crusher—two or three projects associated with coal mines and coal fired power plants. Kytömaa 1st Deposition, Ex. 2029, at 5:3-8. He did not testify that he had direct experience with gyratory crushers.

It is well known that rock crushing and pulverizing is a multi-stage process. There are primary crushers, of which a gyratory crusher may be one, and there can be secondary and tertiary crushers or pulverizers that are used, of which the pulverizer referenced in Piepho would be one. Dr. Kytömaa testified that “depending on the mining operation, you’ll start with a broad range of sizes, and there may be sort of a, let’s say, a coarse size classification that allows smaller components to – let’s say, smaller pieces of rock to move on, and larger ones may get crushed by some kind of crusher that accommodates large rocks.” *See* Ex. 1063, 26:9-18. Dr. Kytömaa continued to testify that “ultimately, the coal has to be reduced in size small enough

for the pulverizer to accept … [s]o there will be multiple steps, typically two or three, that also includes a classification of size. So larger rocks will need to be crushed by a different kind of equipment than the smaller rocks, and the classification will direct different sizes to different pieces of equipment." *See* Ex. 1063, 26:9-27:6.

In the Fifth Kytömaa Declaration, Dr. Kytömaa explains that the "Sandvick CH440 cone crusher accepts rocks up to 9.8 inches wide and has an adjustable output size of 0.3 to 1.8 inches." *See* Ex. 2022, ¶ 19. This is not uncommon for a primary crusher. Dr. Kytömaa further explains that the input for the coal pulverizer "should ideally be 0.75 to 1 inch." *See* Ex. 2022, ¶ 17. It follows that the output from the gyratory cone crusher could be appropriately sized to be fed into the coal pulverizer.

While primary crushers may have different designs and operate differently than other crushers in the stream of production (Dr. Kytömaa highlights these differences in his Fifth Declaration, See Ex. 2022 relied on during his Second Deposition, Ex. 1063), as suggested by Dr. Kytömaa it is evident that a POSITA would be aware of and understand the different machines, the different types of crushers that are used at different stages of processing rocks and coal, and be able to incorporate teachings, designs and principles from one type of crusher into another crusher. Thus, it is evident that a POSItA would recognize this is true even if there are differences in how the crushers operate, how the crushers are loaded, if the wear environment is different and how often and in what ways the different crushers are

assembled and disassembled. Further, as suggested by Dr. Kytömaa, it is evident that Piepho and the ’090 Patent can be used sequentially while processing coal and, thus, are in the same field of endeavor.

Accordingly, it is evident that both sides agree that a POSITA would be aware of tapered shafts with tapered interference fit bushings both generally in the mechanical arts, as well as in the specific field of rock crushing equipment. As taught in prior art, tapered shafts are preferable (like Piepho) as they improve the ease of removal and prevent damage to the shaft (Ex. 1035 Behm, 1:13-15, 1:35-42), they are able to be used in more locations as they do not require presses and gear pullers (Ex. 1034 Sillett, 1:15-24), and they make removing components on a tapered shaft particularly easy (Ex. 1033 Harless, 3:15-22.) - particularly when combined with known hydraulic systems for making and breaking the interference fit. As mentioned above, Piepho teaches that a tapered shaft and bushing are preferable. All of these known benefits directly relate to the problem of reducing down time of rock crushing machinery.

In light of the foregoing, Piepho and the ’090 Patent are directed to solving the same problems and are analogous art.

III. THE MOTIVATIONS TO COMBINE ARE EVIDENT

Dr. Kytömaa notes that when an invention is directed to a different purpose, the inventor would accordingly have less motivation or occasion to consider it in an

obviousness analysis. Ex. 2022, ¶ 36. However, Piepho - similar to the ’090 Patent - is directed to increasing the life of the main shaft of a rock crusher and would lend itself to consideration in solving that problem. Further, Piepho teaches that a tapered shaft is preferable. For that reason, Piepho also lends itself to consideration and solving the problem addressed by the ’090 Patent. Meanwhile, Yagi (Ex. 1060) is directed to using hydraulics to seat and unseat bushings on tapered shafts and lends itself to consideration in solving the problem addressed by the ’090 Patent. These patents may likewise be combined to solve the problem addressed by the ‘090 Patent.

"[M]otivation to combine may be found explicitly or implicitly in market forces; design incentives; the ‘interrelated teachings of multiple patents’; ‘any need or problem known in the field of endeavor at the time of invention and addressed by the patent’; and the background knowledge, creativity, and common sense of the person of ordinary skill." *See* MPEP 2143.01. Trying to increase the life of a main shaft, and/or reduce down time when performing maintenance on a main shaft assembly would be motivated to combine the straight shaft and wear sleeve of Torrence with the preferable tapered shaft and tapered sleeve of Piepho as tapered shafts improve the ease of removal and prevent damage to the shaft (Ex. 1035 Behm, 1:13-15, 1:35-42) they are able to be used in more locations as they do not require presses and gear pullers, (Ex. 1034 Sillett, 1:15-24), and they make removing components on a tapered shaft particularly easy (Ex. 1033 Harless, 3:15-22)

particularly when combined with known hydraulic systems for making and breaking the interference fit.

Patent Owner and Dr. Kytömaa argue that cutting grooves into the Coxhill shaft could increase the risk of catastrophic failure. *See* Paper 38 at 8 - 10; Ex. 2022, ¶ 38. Analyzing and designing the main shaft of a crusher to have sufficient strength even with a groove cut into the shaft is generally what mechanical engineers are capable of doing considering that shafts with grooves have been used in multiple scenarios as shown in the prior art. *See, e.g.,* Ex. 1060 US 8,302,754 (Yagi); Ex. 1031 US 4,019,344 (Calistrat); Ex. 1033 US 2,840,399 (Harless); and Ex. 1035 US 4,829,718 (Behm).

Further, Dr. Kytömaa notes that Polinski criticizes the shaft design of Coxhill. Polinski issued in 1983, and Coxhill issued in 1977. However, in the years between 1983 and 2010, technology has advanced, such as, there were significant improvements in analysis technology, specifically in Finite Element Analysis (FEA) software. Therefore, Dr. Kytömaa's analysis of what a POSITA would know and be capable of appears to be outdated and, thus, inaccurate.

IV. OIL PATH OF CLAIMS 16 AND 24 ARE NOT PATENTABLE

Patent Owner argues that claims 16 and 24 are not obvious because the precise oil path specified in these claims are not taught in Yagi (Ex. 1060); however, Patent Owner did not argue that Yagi did not teach oil paths. Instead, Patent Owner is

attempting to claim that by stated" consisting of" narrows these claims to where prior art teachings are not relevant. (Paper 38 at 11).

A claim with "consisting of" is much narrower and therefore easier to invalidate against prior art, whereas "comprising" offers broader protection, as seen in MPEP 2111.03. While the use of "consisting of" may defeat anticipation, such claims may still be obvious if obvious to omit or modify the extra elements. Yagi teaches grooves in the shaft. Modifying the number of grooves is an obvious change.

Based on the disclosures of Yagi, the precise oil path described in claims 16 and 24 are not novel, rather, they reflect an obvious modification of what is taught in Yagi and is well within the ordinary skill of a POSITA. For example, Yagi teaches multiple possible oil paths including an oil path starting at the end of a shaft and extending to a single groove (Fig. 3); an oil path starting at the end of a shaft extending to a near groove and a far groove (Fig. 4); an oil path starting at the end of the shaft extending to a far groove and then continuing back to the near groove via an external groove in the tapered shaft (Fig. 5); and an oil path starting at the end of the shaft and extending to the far groove. (Fig. 6). Though Patent Owner and Dr. Kytömaa state that there are additional benefits of the oil path described in claims 16 and 24, these benefits are not described in the '090 Patent itself and would be just as apparent (and motivating) to a POSITA as they are to Dr. Kytömaa. This supports

obviousness as opposed to demonstrating any novelty as Dr. Kytömaa suggests without any support.

The path claimed in the ’090 Patent would be obvious to try as it is one of a specific number of options for feeding two grooves. Additionally, an argument can be made that there is a motivation to feed oil internally to the near groove as the internal oil passage does not need to be as long and is therefore easier and less expensive to drill.

V. 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.

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CERTIFICATE OF SERVICE

I hereby certify that, on January 12, 2026, 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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