

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. IPR2024-01380
Patent No. 9,827,568

**PETITIONERS' RESPONSE IN OPPOSITION TO PATENT OWNER'S
REVISED NON-CONTINGENT MOTION TO AMEND**

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PETITIONER'S EXHIBIT LIST

Exhibit	Description
Ex. 1001	U.S. Patent No. 9,827,568
Ex. 1001-1	File History for U.S. Patent No. 9,827,568
Ex. 1002	Declaration of David Smith MSME, MBA, PE, CSP under 37 C.F.R. § 1.68.
Ex. 1002-1	<i>Curriculum Vitae</i> 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/niklas-åberg-0a30a116b/
Ex. 1004	https://www.linkedin.com/in/fredrik-rosdahl-431b91219/
Ex. 1005	https://www.nature.com/articles/d41586-021-02612-5
Ex. 1006	https://www.driveasphalt.org/why-asphalt
Ex. 1007	https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-stone-crushed.pdf
Ex. 1008	https://i.ytimg.com/vi/vQCgnGrSz7M/hqdefault.jpg
Ex. 1009	https://aggregates.seprosystems.com/history-of-rock-crushers/
Ex. 1010	https://ogden_images.s3.amazonaws.com/www.mininggazette.com/images/2022/04/01160835/4-2-CCPP.gj-jpg
Ex. 1011	U.S. Patent No. 3,813,047
Ex. 1012	https://aggregates.seprosystems.com/history-of-rock-crushers/
Ex. 1013	https://savree.com/en/encyclopedia/gyratory-crusher
Ex. 1014	https://savree.com/en/encyclopedia/gyratory-crusher
Ex. 1015	U.S. Patent No. 4,410,143 (Polinski)
Ex. 1016	U.S. Patent No. 6,270,026 (Piepho)
Ex. 1017	U.S. Patent No. 4,060,205 (Pollack)
Ex. 1018	https://pbase.com/mainecruising/fitting_a_prop
Ex. 1019	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. 1020	https://img.directindustry.com/images_di/photo-g/20030-2339083.jpg
Ex. 1021	https://www.brandnewengines.com/cdn/shop/products/SAM_3681_1024x.jpg

Ex. 1022	https://ashdowntooling.co.uk/products/1-5mm-13mm-lathe-tail-stock-drill-chuck-morse-taper-3-mt3-to-b16-arbor
Ex. 1023	Machine Design Data Handbook, K. Lingaiah, c1994
Ex. 1024	https://www.cgtk.co.uk/metalwork/data/morse
Ex. 1025	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3779551/
Ex. 1026	SAE J755
Ex. 1027	SAE J1419
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Ex. 1029	U.S. Patent No. 4,019,344 (Calistrat)
Ex. 1030	U.S. Patent No. 3,343,376 (K.K. Carman)
Ex. 1031	U.S. Patent No. 2,840,399 (C.A. Harless)
Ex. 1032	U.S. Patent No. 3,228,102 (R.E. Stillett)
Ex. 1033	U.S. Patent No. 4,829,718 (Behm)
Ex. 1034	U.S. Patent No. 2,764,437 (A.E. Bratt)
Ex. 1035	“Accurate mounting of bearings, propellers and gears has never been quicker...” by SKF (3603e_skf_hydraulic_bearing_techniques.pdf)
Ex. 1036	“Hydraulically Fitted Hubs, Theory and Practice” by Michael M. Calistrat (T91-10.pdf)
Ex. 1037	“Hydraulic Removal of Coupling Hubs – Keyed and Keyless” by Michael Calistrat and Robert Parker (T22153-160)
Ex. 1038	U.S. Patent No. 1,402,255 (Sanborn)
Ex. 1039	U.S. Patent No. 4,037,800 (Coxhill)
Ex. 1040	U.S. Patent Pub. No. 2011/0006143 (Gunnarsson)
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Ex. 1044	Kytömaa Declaration
Ex. 1045	Shigley Reference
Ex. 1046	Munsun Reference
Ex. 1047	Shigley Reference (Full)
Ex. 1048	Munsun Reference (Full)
Ex. 1049	Smith 3 rd Declaration [NEW]
Ex. 1050	U.S. Patent No. 3,813,047 (Torrence) [NEW]
Ex. 1051	U.S. Patent No. 8,302,754 (Yagi) [NEW]
Ex. 1052	U.S. Patent No. 2,833,486 (MacLeod) [NEW]
Ex. 1053	Deposition Transcript of Dr. Kytömaa [NEW]
Ex. 1054	Revised Amended Claim Chart [NEW]

I. INTRODUCTION

Petitioners, CMS Cepcor Ltd. and CMS Cepcor America LLC (herein “CMS Cepcor”), oppose Patent Owner’s, Sandvik Mining and Construction USA LLC, Revised Non-Contingent Motion to Amend (herein the “Revised Motion”) (Paper 20) regarding the claims of U.S. Patent No. 9,827,568 (herein the “‘568 Patent”) under 37 C.F.R. § 42.121. As discussed below, the revised substitute claims are still substantively defective. The amendments embodied therein fail to distinguish these new claims from the prior art. Petitioner therefore requests that the Board deny the Revised Motion. This Response along with the supporting Third Declaration of David Smith (Ex. 1049) demonstrate that the substitute claims 11–19 are not patentable.

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.” *Toyota Motor Corp. v. American Vehicular Sciences LLC*, No. IPR2013-00419, Paper 32 at 4–5 (P.T.A.B. 2014).

Furthermore, to meet this burden, a patent owner should address both 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, in order to render the claimed subject matter as a whole allegedly and 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).

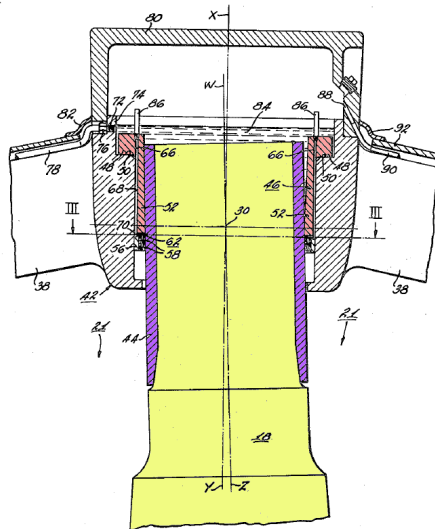
III. THE REVISED SUBSTITUTE CLAIMS ARE UNPATENTABLE OVER THE PRIOR ART

A. The Revised Substitute Claims Use Ordinary, Well-Known Design Elements

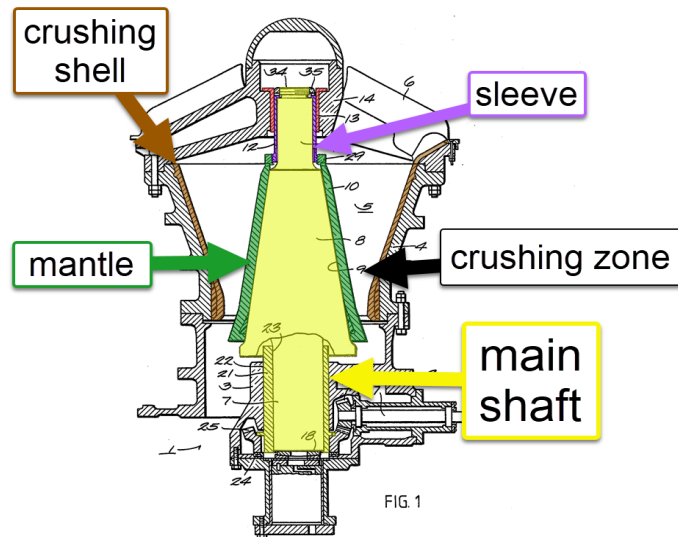
The revised substitute claims do not present a novel and non-obvious invention. More specifically, the revised substitute claims merely claim a gyratory crusher with wear sleeves, a tapered friction fit shaft and sleeve arrangement, pressured fluid grooves for mounting and dismounting components, and rotating eccentrically and freely rotatable—all elements which are known in this technology field.

1. Wear Sleeves are Well Known in the Prior Art

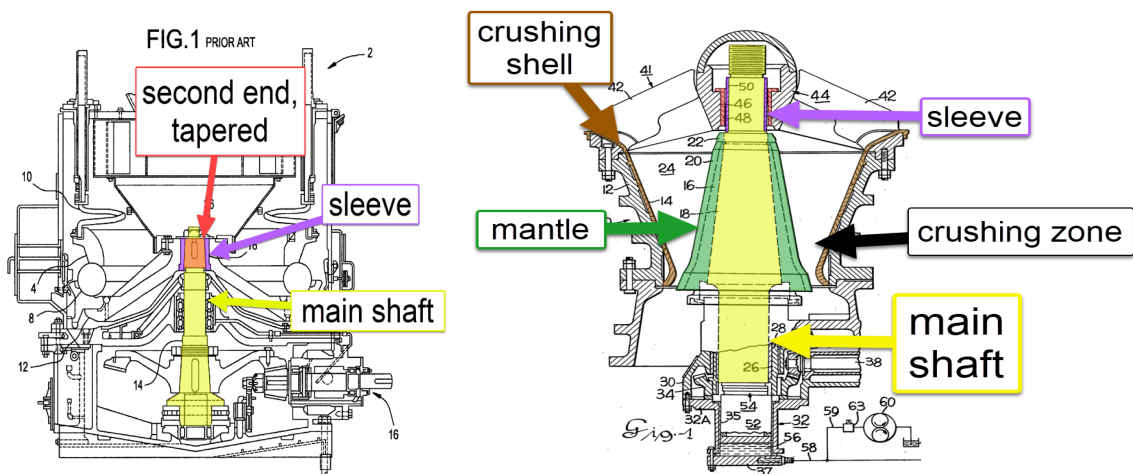
Examples of prior art that teach gyratory crushers with wear sleeves include U.S. Patent No. 3,813,047 (herein “Torrence”) (Ex. 1050), which teaches gyratory crushers with wear sleeves. Ex. 1050, 3: 48–67. For illustration purposes, Torrence has a protective bearing sleeve on the upper end of the shaft as highlighted in purple below. Its sleeve is tapered near the bottom of the sleeve and extends to the extreme end of the shaft. Ex. 1050, FIG. 2; Ex. 1049 ¶ 28.



U.S. Patent No. 4,410,143 to Polinski teaches having a bearing sleeve fitted over an upper region of the main shaft. Ex. 1015, FIG. 1 (annotated); Ex. 1049 ¶ 30.



Similarly, U.S. Patent Nos. 6,270,026 to Piepho (Ex. 1016), annotated and illustrated to the left, and 4,060,205 to Pollack (Ex. 1017), annotated and illustrated to the right, also teach having a wear sleeve. Ex. 1016, FIG. 1; Ex. 1017, FIG. 1; and Ex. 1016, 4:65.



2. TAPERED FRICTION FIT SHAFT AND SLEEVE ARRANGEMENTS ARE WELL KNOWN IN THE PRIOR ART

As a non-limiting example, U.S. Patent No. 4,019,344 to Calistrat teaches a dual tapered interference joint setup, with a fluid pathway which is used to help

break the tampered interference joints. Ex. 1029, 3:36–43; Ex. 1049, p. 20. U.S. Patent No. 2,840,399 to C. A. Harless discloses a tapered interference joint setup as well as a fluid pathway which is used to help make or break the tapered interference points. Ex. 1031, 2:44-51; Ex. 1049, p. 21. A person of ordinary skill in the art (herein “POSITA”) would recognize that the tapered interference fit may be used in more locations as they do not require presses and gear puller. Ex. 1031, 3:15–22.

Other patent prior art references that include tapered interference joints include the following: (1) U.S. Patent No. 3,228,102 to R.E. Stillet (teaching a tapered interference joint setup; a fluid pathway which is used to help make or break the tapered interference joints) Ex. 1032, FIG. 1; (2) U.S. Patent No. 3,343,376 to K.K. Carman (showing two tapered interference joints which use hex bolts to apply the preload). Ex. 1030, FIG. 8, and Ex. 1049 p. 20; and (3) U.S. Patent No. 4,829,718 to Behm. Ex. 1033.

Considering Stillet, a POSITA would recognize that the tapered interference fit may be used in more locations as they do not require presses and gear pullers. Ex. 1032, 1:15–24.

Turning to Behm, for example, there is support in this prior art reference to motivate a POSITA to implement a tapered interference fit as it is recognized for the ease of removal and ability to prevent damage. Ex. 1033, 1:13-15, 1:35–42.

3. PRESSURIZED FLUID GROOVES FOR MOUNTING AND DISMOUNTING COMPONENTS ARE WELL KNOWN IN THE PRIOR ART

Harless describes using pressurized oil for attachment of gears and bearings to tapered shaft ends. Harless discloses grooves being indented on both the shaft and the sleeve and also discloses multiple grooves for a sleeve on a tapered section. The oil is supplied through a conduit that extends axially within the shaft and then radially towards the surface of the shaft. Ex. 1031, FIG. 1; Ex. 1049 ¶ 41.

U.S. Patent No. 8,302,754 to Yagi describes a tapered coupling structure for mounting a hub to a tapered shaft. Yagi teaches a fluid conduit within the tapered shaft that extends axially and radially. Yagi further teaches a conduit on the external surface of the shaft to feed oil to the circular grooves that extend around the shaft. Ex. 1051, FIG. 5A; Ex. 1049 ¶ 42.

Behm teaches a fluid passage “for directing pressurized fluid to a point within the confines of the area of contact so that the pressure of such fluid may exert both radial and axial forces on the adaptor to effect its release from the shaft.” Ex. 1033, Abstract and Ex. 1049 ¶ 43. Behm further teaches a removal fitting proportioned to permit only loosening of the object mounted to the shaft until the fitting itself is removed. This provides a “safety factor in that the pulley 26 cannot fall from the shaft 10 until the removal fitting 61 is removed from the shaft.” *See* Ex. 1033, 4:57–62; *see also* Ex. 1033 FIG. 2 and Ex 1049 ¶ 43.

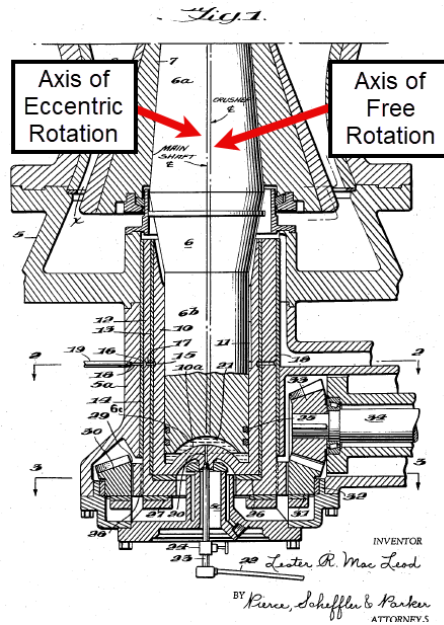
4. ROTATING ECCENTRICALLY AND FREELY ROTATABLE ARE KNOWN

As discussed below, the shaft being “freely rotatable” is not taught in the ‘568 patent. Notwithstanding this reason to find claim 11 improper, having a freely rotatable shaft is known in the prior art.

With respect to being known in the prior art, Dr. Kytömaa, Patent Owner’s expert, agreed during his deposition, that:

“I would expect this to be a design feature that exists in other gyratory crushers but I have not, let’s say undertaken the exercise of studying, let’s say gyratory crushers manufactured by other entities other than the parties in this matter.”

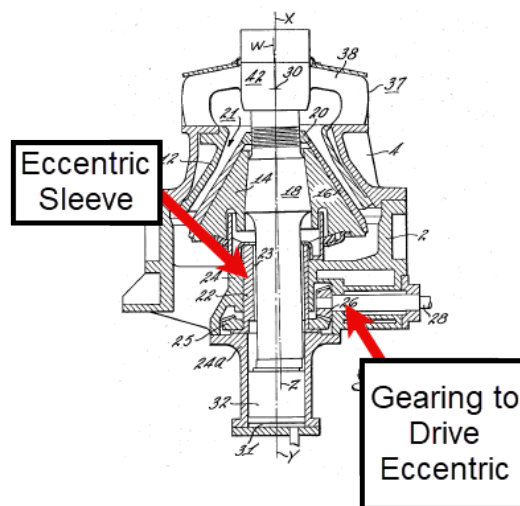
See Ex.1053, p. 35:2–3 and p. 35:5–9. As suggested by Dr. Kytömaa, prior art references teaching freely rotatable exist. For example, U.S. Patent 2,833,486 to MacLeod (hereinafter “MacLeod”) teaches that the main shaft is rotated eccentrically about an axis and freely rotates about the axis of the shaft. Ex. 1052, 2: 57–69; Ex. 1052, FIG. 1; and Ex. 1049 ¶ 52.



Furthermore, Torrence teaches:

“[e]ccentric 22 is cylindrical and is supported for rotation by pedestal-like inner frame portion 24 and base portion 24a. Eccentric 22 is rotated by the engagement of ring gear 25 on the eccentric 22 with a mating pinion gear 26 mounted on a drive shaft 28. Rotation of eccentric 22 by gears 25, 26 imparts a gyratory movement to crusher head 14 as is well known in the art about a fulcrum on a vertical axis X-Y ventral of crushing chamber 21 and hub 42.”

See Ex. 1050, 3:19-27; Ex. 2049 ¶ 54.

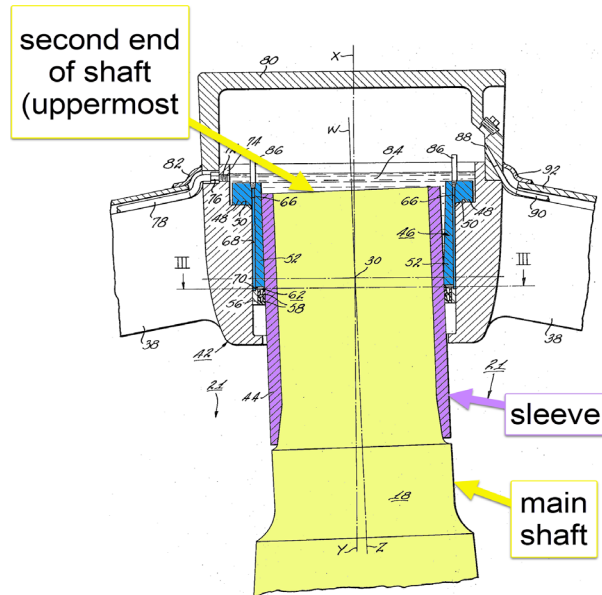


B. Claim 11 is Unpatentable Over Torrence in View of Piepho

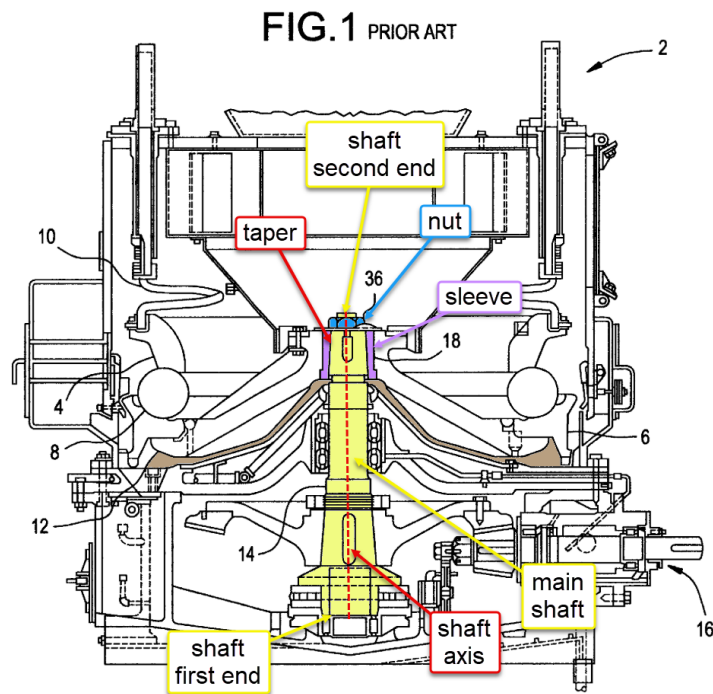
Attached hereto as Exhibit 1054 is a chart illustrating all claim elements showing the original claims, the original amendments made, and the second amendment made. Pursuant to the Preliminary Guidance (Paper 20), the amended limitations in the second amendment claim set, as presently presented for examination, are being addressed herein.

Part of element 11a has been revised to read “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.” Torrence, in view of Piepho, discloses 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 decrease in cross-sectional area. Ex. 1049, p. 46.

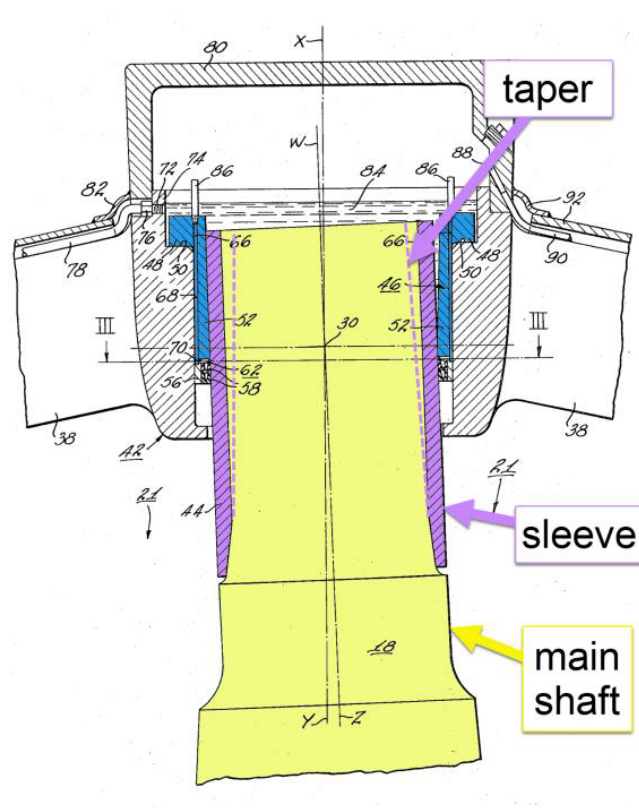
Combining the tapered region of Piepho with the shaft of Torrence, the tapered region would extend from an uppermost extremity of the shaft. As shown below, the main shaft of Torrence has a first and second end. The protective sleeve covers this second end and extends from the uppermost extremity of the shaft. As with all coloring on the figures contained here, FIG. 2 of Torrence, annotated, is provided below for illustrative purposes. Ex. 1050, FIG. 2



Piepho also has a first and second end. The second end of Piepho is tapered. Further, the taper is in an axial direction. Due to this taper, the cross-sectional area of the shaft body decreases as shown by the orange highlighted area above. Ex. 1016, FIG. 1, annotated. See also Ex. 1016, 3;23-31

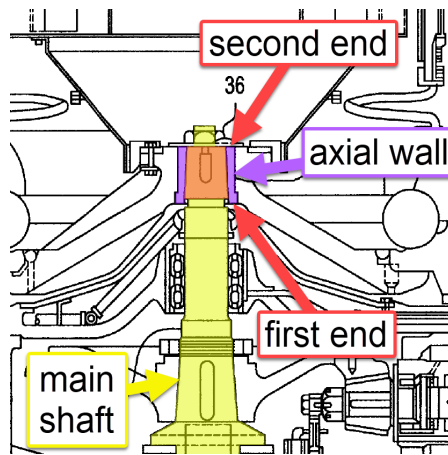


The tapered region of Piepho does not extend to the extreme end of the shaft due to the nut retainer which interacts with other components of the crusher. A POSITA modifying Torrence with Piepho would implement the taper to the very extremity of the shaft, where the sleeve contacts the shaft as shown below. Ex. 1049, P. 48.



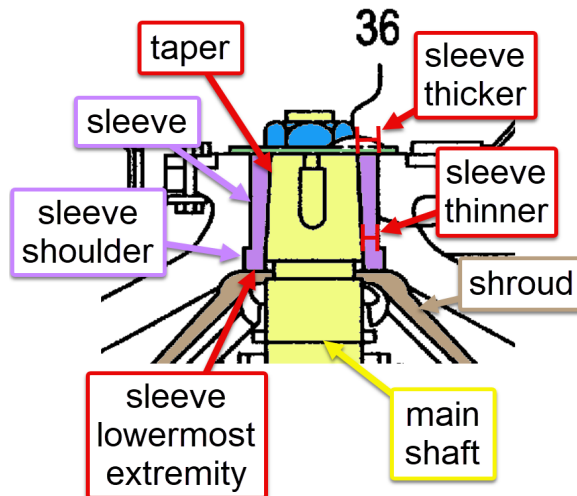
A POSITA would have been motivated to combine the tapered end on the main shaft of Piepho with the main shaft on Torrence. This combination would have been nothing more than combining known elements according to known methods to yield predictable results. A POSITA would be further motivated, as Piepho describes, as the tapered shaft aids in accurate alignment which is notoriously more

region of the main shaft and a second end at an upper region of the main shaft. Ex. 1016, FIG. 1.

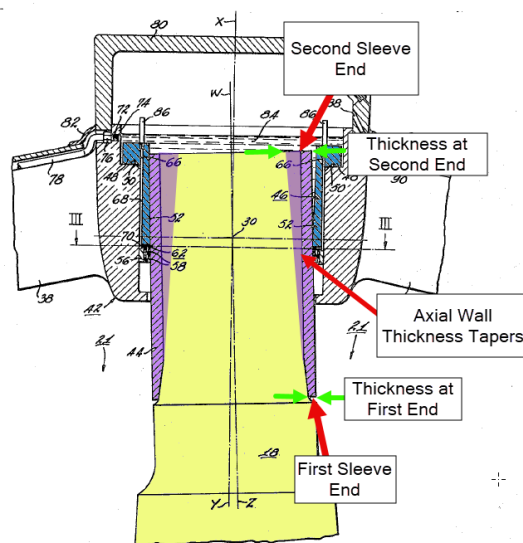


Part of element 11c has been revised to provide for “wherein a thickness of the axial wall at a region between the first and second sleeve ends tapers and decreases in a direction from the second sleeve end to the first sleeve end, wherein the first sleeve end is a lowermost extremity of the sleeve.” Torrence, in view of Piepho, discloses that the thickness of the axial wall at a region between the first and second ends decreases in a direction from the second end to the first end. Ex. 1050.

Piepho utilizes a tapered sleeve for ease of assembly and disassembly. Piepho’s sleeve tapers from a second sleeve end toward a first sleeve end and has a flange at the first sleeve end. If an internally tapered sleeve has a constant outer diameter, the wall thickness will vary. This is seen in the annotated Figure 1 of Piepho below. The sleeve thickness then increases to accommodate the sleeve shoulder. This shoulder interacts with the shroud of Piepho. Ex. 1016.



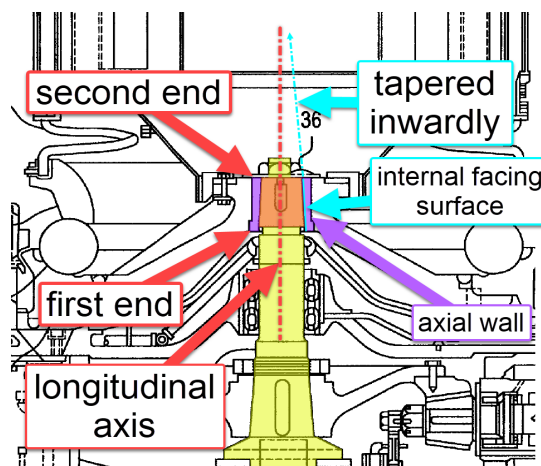
The sleeve of Torrence does not interact with the shroud or crushing shell, thus, Torrence does not require the shoulder on the sleeve. A POSITA combining Torrence with the tapered sleeve and shaft of Piepho would naturally alter only the internal surface and leave the external surface a simple cylinder. This modification, annotated, is shown below. Ex. 1050, FIG. 2.



The sleeve of Torrence has a uniform cross section, apart from the chamfers

on the ends of the cylinder. A POSITA would naturally continue the adopted taper of Piepho to the lowermost extremity of the shaft sleeve, or the full axial length of the sleeve. Torrence, in view of Piepho, would have a tapered sleeve wall thickness such that the wall thickness at a second end of the shaft sleeve would be greater than the wall thickness at a first end of the sleeve. Ex. 1050; Ex. 1016.

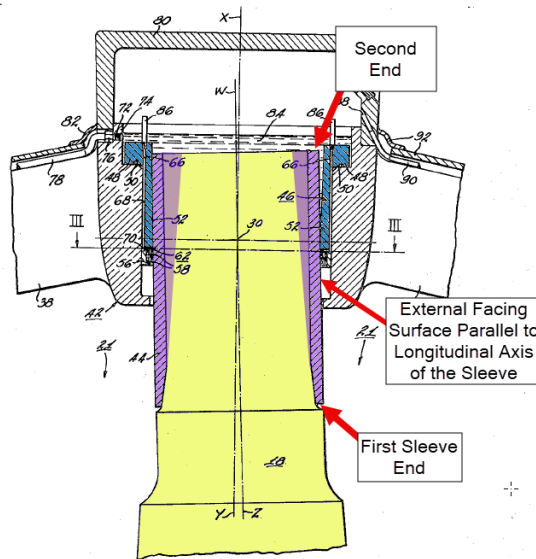
Part of element 11d was amended to provide for “in the axial direction the internal facing surface at said region between the first and second sleeve ends extending transverse to the longitudinal axis so as to taper inwardly towards the longitudinal axis of the sleeve in the direction from the first sleeve end to the second sleeve end.” Piepho discloses that 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. Ex. 1016, FIG. 1 (annotated).



As shown above, the internal facing surface at the region between the first and second sleeve ends of the axial wall tapers inwardly towards the longitudinal axis in the direction from the first end of the sleeve to the second end of the sleeve. This is because the sleeve bushing (18) is tapered to match the tapered portion of the main shaft.

A POSITA would have been motivated to combine the tapered shaft and sleeve (including the tapered internal surface that mates with the shaft) of Piepho with the main shaft of Torrence. This combination would have been nothing more than combining known elements according to known methods to yield predictable results. A POSITA would be further motivated, as Piepho describes, as the tapered shaft aids in accurate alignment which is notoriously more difficult with purely cylindrical shafting. Piepho further teaches that a tapered joint is preferable to a cylindrical joint. Ex. 1049, p. 59.

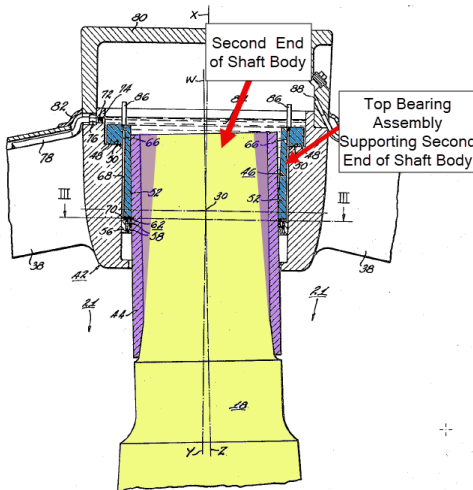
Element 11e was previously added to provide “wherein the external facing surface from the first sleeve end to the second sleeve end is parallel to the longitudinal axis of the sleeve such that the external facing surface of the sleeve when viewed externally has a cylindrical geometry.” Torrence discloses that 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.



Then, element 11f has been added by way of this revised claim to provide for “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.”

First, the ‘568 Patent does not state “freely rotatable” anywhere in the specification. Therefore, to now claim “freely rotatable about a longitudinal axis of the shaft within the bearing assembly” is not supported by the specification.

Next, Torrence discloses a crusher where 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.



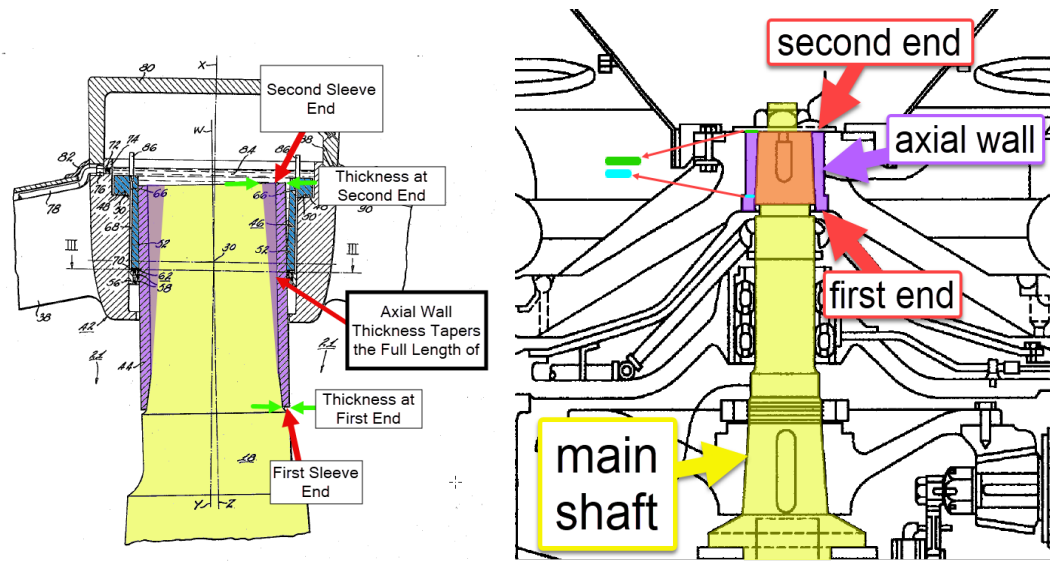
As illustrated above, Torrence discloses bushing 46 (top bearing assembly). The bushing 46 is shown in blue above. Torrence further discloses a shaft with a second end that is rotatable eccentrically and freely rotatable about a longitudinal axis of the shaft within the bearing assembly. Torrence teaches that “drive shaft 28 rotates the eccentric sleeve 22 and shaft 18 gyrates about fulcrum 30.” Ex. 1050, 5:1–3. Torrence teaches that the lower end of shaft 18 is supported by piston 32, which can raise and lower the shaft. Ex. 1050, 3:31. Further, “the lower portion of shaft 18 is journaled within the eccentric vertical bore of an eccentric 22 by means of a bearing sleeve or liner 23 positioned within the eccentric bore.” Ex. 1050, 3:15–18. Thus, a POSITA would understand that just as the shaft of the ‘568 patent is rotated eccentrically and can rotate freely, the shaft of Torrence is rotated eccentrically and can rotate freely. and can rotate freely, the shaft of Torrence is rotated eccentrically and can rotate freely.

A POSITA would be motivated to combine the tapered joint of Piepho with

the sleeve and shaft of Torrence as Piepho teaches it is preferable. In addition to this, a POSITA would understand that a tapered joint is preferable to a cylindrical joint at least because they are easier to install and remove. A POSITA would have reasonable expectations of success in making the combination as both cylindrical and tapered interference fit joints were common in the prior art and both had been used for decades. This combination is nothing more than a simple combination of known elements according to known methods to yield predictable results. Ex. 1049, ¶ 61.

C. Claim 12 is Obvious Over Torrence in view of Piepho

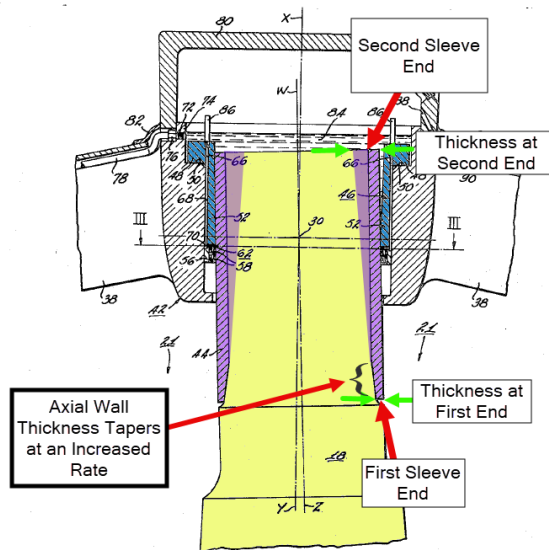
Claim 12 has been revised to read in part “wherein the region over which the thickness of the axial wall tapers and decreases extends ~~substantially~~ the full axial length of the sleeve.” As discussed above, Torrence, in view of Piepho, discloses that the region over which the thickness of the axial wall tapers and decreases extends the full axial length of the sleeve. Furthermore, the internal taper of Piepho extends the full axial length of the sleeve. The external facing surface of the sleeve of Torrence cylindrical and parallel with the longitudinal axis of the sleeve the full length of the sleeve.



Implementing the internally tapered surface of the sleeve of Piepho in the sleeve of Torrence would naturally yield a taper axial wall, where the thickness decreases over the full axial length of the sleeve.

D. Claim 18 is Obvious Over Torrence in view of Piepho

Claim 18 is revised to teach “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.~~” Torrence, in view of Piepho, discloses wherein 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.



Torrence discloses a portion of the sleeve where the thickness of the sleeve decreases at an increased rate, relative to the portion of the sleeve proximal to the second end of the sleeve. In Torrence alone, the portion of the sleeve proximal the second end does not decrease so any decrease in the thickness would be at an increased rate. In Torrence - in view of Piepho - the thickness of the sleeve would decrease slowly in the portion near the second end, as necessary to fit on the tapered shaft of Piepho and faster in the portion proximal the first end as shown in Torrence.

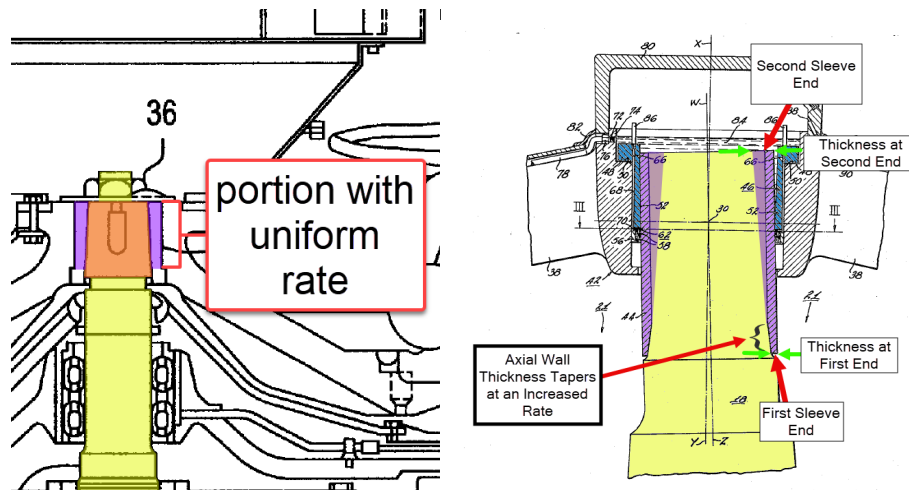
A POSITA would be motivated to combine Torrence's shaft and sleeve with Piepho's teachings of a tapered shaft end and tapered sleeve fitted over the tapered section of second end of the main shaft. A POSITA would have a reasonable expectation of success in making the combination, as it is nothing more than combining prior art elements according to known methods to yield predictable results. A POSITA would be further motivated to use a tapered sleeve on a tapered

shaft as it aids in alignment and makes it easier to install and detach as the distance the sleeve needs to travel while expanded is smaller compared to a sleeve with a cylindrical interference fit. A POSITA would also be motivated to reduce the thickness of the wall at an increased rate near the first end to properly mate with the shaft as shown in Torrence. Ex. 1049, p. 74.

E. Claim 19 is Obvious Over Torrence in view of Piepho

As previously amended, claim 19 teaches “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.” Torrence, in view of Piepho, discloses 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.

Shown below, Torrence, in view of Piepho, discloses a portion of the axial wall (the entire portion other than the portion near the first end) that reduces in thickness at a uniform rate as shown by the cone-shaped internal facing surface and cylinder-shaped external facing surface. Ex. 1049, p. 75.



A POSITA would be motivated to combine Torrence's shaft and sleeve with Piepho's teachings of a tapered shaft end and tapered sleeve (with an internal facing surface that defines a section of a cone) fitted over the tapered section of second end of the main shaft. A POSITA would have a reasonable expectation of success in making the combination, as it is nothing more than combining prior art elements according to known methods to yield predictable results. A POSITA would be further motivated to use a tapered sleeve on a tapered shaft as it aids in alignment and makes it easier to install and detach as the distance the sleeve needs to travel while expanded is smaller compared to a sleeve with a cylindrical interference fit.

IV. CONCLUSION

In view of the above, Patent Owner's Revised Non-Contingent Motion to Amend should be denied.

Dated: November 25, 2025

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CERTIFICATE OF SERVICE

I hereby certify that, on November 25, 2025, a true and correct copy of the foregoing Response (and accompanying exhibits) was served on the Patent Owner via electronic means (by agreement of the parties) at the address listed below:

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