

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Chongqing Yanmei Technology Co., LTD,

Petitioner,

v.

Terves, LLC,

Patent Owner.

IPR2023-00521
U.S. Patent No. 10,689,740

PATENT OWNER'S RESPONSE TO PETITION

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EXHIBIT LIST

Exhibit	Description
2001	Declaration of Mark Cohen
2002	Cohen Resume
2003	EO13817
2004	EO13953
2005	EO14017
2006	Komesaroff, Make the Foreign Serve China
2007	Declaration of Andrew Sherman
2008	Disclaimer in Patent under 37 CFR 1.321(a)
2009	Electronic Acknowledgement Receipt of Ex. 2008.
2010	<i>Terves, LLC v. Yueyang Aerospace New Materials Co. Ltd. et al.</i> , Case No. 1:19-cv-1611 (N.D. Oh.), ECF 134, Terves Motion for Summary Judgment
2011	<i>Terves, LLC v. Yueyang Aerospace New Materials Co. Ltd. et al.</i> , Case No. 1:19-cv-1611 (N.D. Oh.), ECF 134-21, Ecometal Invalidity Contentions
2012	<i>Terves, LLC v. Yueyang Aerospace New Materials Co. Ltd. et al.</i> , Case No. 1:19-cv-1611 (N.D. Oh.), ECF 144, Defendants Response to Motion for Summary Judgment
2013	<i>Terves, LLC v. Yueyang Aerospace New Materials Co. Ltd. et al.</i> , Case No. 1:19-cv-1611 (N.D. Oh.), ECF 178, Summary Judgement Order
2014	<i>Terves, LLC v. Yueyang Aerospace New Materials Co. Ltd. et al.</i> , Case No. 1:19-cv-1611 (N.D. Oh.), ECF 203, Judgment.
2015	<i>Terves, LLC v. Yueyang Aerospace New Materials Co. Ltd. et al.</i> , Case No. 1:19-cv-1611 (N.D. Oh.), ECF 219, Permanent Injunction Memorandum Opinion
2016	<i>Terves, LLC v. Yueyang Aerospace New Materials Co. Ltd. et al.</i> , Case No. 1:19-cv-1611 (N.D. Oh.), ECF 220, Permanent Injunction
2017	Medlin Declaration during Reexamination
2018	Swanger Declaration during Reexamination
2019	Redline from '653 patent to '740 patent
2020	Application Data Sheet for '740 patent
2021	Specification for '740 patent
2022	IDS for '740 patent
2023	IDS signed for '740 patent

Exhibit	Description
2024	IDS signed (second time) for '740 patent
2025	First Amendment for Ex Parte Reexamination
2026	'740 patent application as originally filed
2027	'838 Doud patent application as originally filed
2028	'838 Doud provisional application as originally filed

I. INTRODUCTION

The Petition for *Inter Partes* Review (Paper 2, “Petition” or “Pet.”) filed by Petitioner Chongqing Yanmei Technology Co., LTD (“Petitioner”) that challenges the patentability of claims of U.S. Patent No. 10,689,740 (the “’740 patent”) is moot.

As the Board recognized in its Institution Decision (Paper 14, p.2 (“Inst. Dec.”)), Patent Owner Terves, LLC (“Terves” or “PO”) has properly disclaimed claims 1-18 and 62; thus, only claims 19-61 and 63-81 (the “Remaining Claims”) are at issue. Of the Remaining Claims, only claim 19 is independent.

Terves is filing a Motion to Amend the Remaining Claims (“MTA”) concurrently with this Response. Notably, Terves has narrowed claim 19 to include (1) specific ranges of additives (as opposed to open ended); (2) a limitation that “said dissolvable magnesium cast composite includes in situ galvanically-active intermetallic precipitate to enable controlled dissolution of the magnesium alloy”; and (3) a specific dissolution rate range (as opposed to open ended). These limiting amendments specifically address the Board’s concerns when instituting. For example, these added limitations are fully supported by the parent and grandparent applications and, therefore, Doud is not prior art. And even though the Board was not persuaded that Xu and/or Xu/Xiao rendered the Remaining Claims unpatentable, the amended claims remove any doubt whatsoever. As fully explained in the MTA, the amended claims are adequately supported (Doud is not prior art), and Xu or

Xu/Xiao do not render the amended claims obvious. The Board should grant the MTA in full, which would render the Petition and this Response moot.

Alternatively, even if the Board does not grant the MTA, original claims 76-81 would be patentable. Indeed, the Board already recognized these claims were adequately supported in the prior applications and were not obvious based on Xu or Xu/Xiao. As explained herein, Petitioner falls far short of proving those claims are unpatentable; thus, there is no reason for the Board to reverse course on those findings.

II. BACKGROUND

A. Terves is the market leader in the U.S. for dissolvable magnesium alloys.

Terves is a small company in Euclid, Ohio with roughly 45 employees. Terves built the first secondary magnesium processing plant in 50 years in the United States, dedicated to manufacturing, among other things, the claimed invention of the '740 patent. Ex. 2007 ¶¶1-2, 4. Terves produces numerous magnesium finished commercial products, including products for frack ball/plugs and other oil and gas tool components. *See, e.g.*, Ex. 2007 ¶2; Ex. 2013, at 2; Ex. 2015, at 3.

Here's how fracking works: a fracking company drills a well miles below ground, segments the well with tools called "frac plugs" and "frac balls," pressurizes the well to create fractures in the ground, and then extracts the oil that seeps from the fractures. Prior to Terves' patented invention, companies had used either

thermoplastic plugs or powder metallurgy to construct such tools. Thermoplastic plugs were undesirable because workers had to grind those plugs into small pieces and push large amounts of water into the holes to flush out those pieces. This is a significant reason fracking has a negative environmental view: the use of thermoplastic plugs requires significant amounts of water pumped into the wells to remove the small pieces of thermoplastic.

Powder metallurgy, which for example is the Xu reference, was known. However, powders were not a suitable solution in the industry because magnesium powder is dangerous to handle, powder metals are cost prohibitive, and when compacted to form fracking tools, those tools were brittle and could break under pressure while used for fracking.

Terves turned the fracking industry on its head in 2014. Through research, hard work, and ingenuity, Terves' metallurgists invented novel formulations for cast magnesium alloys. The cast magnesium is melted to form billets, and machine shops can then machine them into frac plugs or frac balls. Terves' inventors discovered that by melting magnesium or magnesium alloys, mixing them with certain additives (nickel, copper, and/or cobalt) at certain amounts, and then cooling the material into a cast creates in situ particles in the cast. Those in situ particles provide the billets – and ultimately frac balls and plugs – greater strength and ductility than brittle powder metals formed from compaction.

Terves was the first company in the world to develop dissolvable cast magnesium formulations that formed better fracking tools than any other tool in the market. Ex. 2007 ¶4. Terves' patented cast magnesium also provided more controlled dissolution rates while the frac tools are in the fracking well than do powder metallurgy tools. Best of all, Terves' superior cast magnesium fracking plugs and balls are less expensive than powder (less than half the cost), and cheaper than thermoplastics especially when accounting for all of the water wasted in removing thermoplastic from out of the ground versus the dissolution the tools with salt water that occurs with Terves' tools.

Terves has filed for and received from the USPTO and patent offices around the world patents protecting its novel and inventive dissolvable cast magnesium composites. Unfortunately, Terves' competition in the market are cheap, knock-off dissolvable magnesium imported from China that infringe Terves' patents, which has caused serious harm to Terves' business. In fact a district court already has granted a permanent injunction against a Chinese company that was importing dissolvable cast magnesium into the U.S. that infringes the '740 patent. Ex2015; Ex. 2016.

B. Terves never heard of Petitioner, and Petitioner has no known U.S. presence.

While Terves knows the magnesium and oil/gas markets well, Terves never knew or heard of Petitioner until Petitioner filed this IPR. The U.S. Importation

Records do not bear Petitioner’s name for any product imported into the United States. Terves never accused Petitioner of infringement. Petitioner appears to be a non-practicing Chinese corporation without any known U.S. presence.¹

C. The ’740 patent claims priority back to April 18, 2014.

To protect its investment and position in the market, Terves has expended significant resources to patent its inventions. On April 18, 2014, Terves filed provisional application 61/981,425, and then application 14/689,295 on April 17, 2015, which published as **Doud** (Ex. 1005) and issued as U.S. Patent No. 9,903,010 (“’010 patent”). On July 5, 2017, Terves filed divisional application 15/641,439, which has the same substantive specification as Doud and issued as U.S. Patent No. 10,329,653 (“’653 patent”).

¹ As ***Petitioner*** identified, Terves has been involved in a dispute with another Chinese corporation, Yueyang Aerospace New Materials Co. Ltd. (“Yueyang”). Terves prevailed at trial, and in prior IPRs (IPR2020-01620 & IPR2020-01621) and reexamination on the ’740 patent’s parent on similar claims. It is not clear whether Petitioner is tied into Yueyang (or other parties Terves has enforced against), and Petitioner is fighting its battle for it, or Petitioner is simply an independent Chinese corporation seeking to independently avail itself of the United States patent system.

The '740 patent is a CIP application claiming priority to all of these applications. The '740 patent discloses a “dissolvable magnesium cast composite” See, e.g., Ex. 1001, claim 19. Exemplary environments where the invention may dissolve are “salt water, brine, [and] fracking liquids.” *Id.* at 5:59. Embodiments of the alloy are suited for use to make “a ball or other tool component in a well drilling or completion operation such as, but not limited to, a component that is seated in a hydraulic operation that can be dissolved away after use so that no drilling or removal of the component is necessary.” *Id.* at 2:19-24.

Claim 19 is independent; Claims 76-81 depend (directly or indirectly) on it.

D. Terves previously litigated and prevailed on validity of the '740.

On July 15, 2019, Terves sued several defendants for importing dissolvable magnesium from China that infringed the '740 patent and two related Terves patents: the '010 and '653 patents. Terves sued Nick Yuan (the Chinese importer), Ecometal Inc. (Mr. Yuan's importation company), and Yueyang Aerospace New Materials Co. Ltd. (the Chinese manufacturer). Yueyang never responded and was dismissed without prejudice. *Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.*, No. 1:19-cv-01611-DCN. Ex. 2013; Ex. 2015; Ex. 2016.

Terves sued on the '010 and '653 patents, and amended its complaint to add the '740 patent after it issued. Ecometal and Yuan (collectively, “Ecometal”) asserted anticipation and obviousness claims against all three patents.

Ecometal relied primarily upon Xiao, making the nearly identical argument that Petitioner makes in Ground IV: Xiao’s statement in paragraph [0026] that “Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles” equates to the “said additive forming metal composite particles or precipitant in said magnesium composite, said metal composite particles or precipitant forming in said in situ precipitation of said galvanically-active intermetallic phases.” Ex. 1001, 26:62-65.

Although Ecometal obviously was aware of Xu and Doud as both were cited during prosecution of the ’740 patent, and Terves was suing Ecometal for infringement on Doud (which issued as the ’010 patent), Ecometal did not view those references as invalidating and did not raise either reference. Instead, Ecometal confirmed the ’740 patent claims benefited from the April 18, 2014 priority date of the provisional application. Ex. 2011, at 3.

Ecometal engaged a metallurgical expert to offer invalidity opinions against the ’740 patent based on Xiao. The district court entered summary judgment of no invalidity on many claims of the ’740 and ’653 patents, including many of the claims challenged by Petitioner here. Ex. 2013. A jury awarded Terves lost profit damages of \$707,207 on various claims of the ’740 and ’653 patents. Ex. 2014. Ecometal appealed to the Federal Circuit, appellate briefing is complete, and oral argument is scheduled for December 8, 2023.

E. The USPTO’s Reexamination.

Prior to trial, Ecometal also petitioned the USPTO on an *ex parte* reexamination against the parent ’653 patent. As in litigation, Ecometal submitted a 151-page petition (Ex. 1008) and a 144-page, 408-paragraph expert declaration (Ex. 2017).

Ecometal again argued Xiao’s paragraph [0026] teaches the use of iron, copper, and nickel as additive materials to create the in situ precipitant that drives dissolution—the same theory in Ground IV here.

Terves responded with a rebuttal report by expert metallurgist Dr. Lee Swanger. Dr. Swanger explained that Xiao uses aluminum—and not iron, copper, or nickel—as the additive material to form the precipitates that drive the dissolution of the material. Ex. 2018 ¶¶37-38, 49-51, 53-54.

The USPTO agreed with Dr. Swanger’s opinions, rejected Ecometal’s Xiao-based challenge, and upheld validity. The USPTO reiterated that Xiao teaches the use of aluminum to form the precipitates that drive dissolution. Ex. 1009. The USPTO determined that Xiao’s [0026] mentioning the possibility of iron, copper, and nickel forming micro-particles does not suggest that those materials could be substituted for the primary element of aluminum used in all Xiao-disclosed examples:

Xiao is the closest prior art and it fails to teach a magnesium alloy that includes in situ galvanically-active intermetallic phases or intermetallic

particles to enable controlled dissolution of the magnesium alloy as claimed. The phases of Xiao taught to be involved in galvanic activity contain aluminum instead of the secondary/additive materials required by the claims. There is no suggestion from Xiao to substitute copper, nickel, iron or cobalt for the aluminum in the galvanically-active intermetallic.

(Ex. 1009, 4 (emphasis added).) Thus, the USPTO twice decided that Xiao does not invalidate,² and the district court ruled the same when it granted summary judgment of no invalidity.

F. The prior art cited in the Petition were all part of the '740 patent prosecution history and vetted in litigation or in reexamination.

1. Doud (Ex. 1005)

Doud is the grandparent application from which the '740 patent claims priority. Since the filing date for the '740 patent application, Terves identified Doud as a priority application. *See* Ex. 2020, at 3 and Ex. 22021, at 1.

2. Xiao (Ex. 1006)

Xiao is a Chinese application exhaustively considered. Its formulation requires a high amount of aluminum, which is completely different from the claimed formulations. Ironically, Petitioner provided the Board a copy of the Xiao translation used in litigation and reexamination where Xiao already failed to invalidate.

² Terves also cited Xiao during the '740 patent prosecution, which the examiner issued over Xiao.

3. Xu (Ex. 1007)

Xu is an application issuing as U.S. Patent No. 9,016,363 that Terves cited during prosecution of the '740 patent. Not surprisingly, the USPTO did not cite Xu as part of a rejection against any of the '740 patent claims. That is because Xu teaches a completely different – and inferior – *powder* alloy that the industry disliked. Because a POSITA would readily recognize Xu's very different and inferior powder chemistry from the *cast* magnesium alloy recited in the claims, Xu does not come close to invalidating.

G. The Board's Institution Decision

The Board recognized that only claim 19 and dependent claims 20-61 and 63-81 remained after the disclaimer. (*See, e.g.*, Inst. Dec. 5, n.1.) The Board instituted this proceeding because it believed certain claims (Claims 19, 20-61 & 63-75) were not entitled to the earlier priority date of Doud, and therefore, Doud was anticipatory prior art. The Board's decision hinged on the open ended ranges of the additives in Claim 19 that also permeated those dependent claims. However, the Board stated that Claims 76-81 were entitled to the earlier priority date because of the presence of an upper boundary on the additives. Further, the Board explained that Xiao and/or Xu would likely not render any claims unpatentable.

However, because the Board must institute on all challenged claims (except the Disclaimed Claims), the Board instituted as follows:

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
I	19-61, 63-81	102	Doud
II	19-61, 63-81	103	Xu
III	19, 21, 29, 49-52, 58, 64, 76, 77	103	Xiao, Xu

(Inst. Dec. 5.)

III. TERVES' MOTION TO AMEND NARROWS THE REMAINING CLAIMS TO ADDRESS THE BOARD'S CONCERNS RAISED IN THE INSTITUTION DECISION.

Terves' MTA narrows all of the Remaining Claims to address the Board's concerns raised in the Institution Decision. Granting said motion would render the Petition moot and there would be no need to consider this Response, or further briefing and oral argument, related to the Petition.

IV. ALTERNATIVELY, CLAIMS 76-81 ARE PATENTABLE.

Although the Board should grant the concurrently filed MTA; alternatively, the Board should conclude original claims 76-81 are patentable.³

³ While Terves believes all of the Remaining Claims are patentable over the prior art identified, as noted above, Terves is a small Ohio company without unlimited resources to exhaustively litigate matters with unknown Chinese companies. Thus, in the alternative to the MTA, Terves seeks to uphold the patentability of claims 76-81 only.

A. Petitioner has the burden of proof and must prove unpatentability by preponderance of the evidence.

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). That burden *never shifts* to the PO. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

While the Board has instituted *inter partes* review here, the Federal Circuit has explained petitioner has a higher burden to win the proceeding at trial:

[T]here is a significant difference between a petitioner’s burden to establish a ‘reasonable likelihood of success’ at institution, and actually proving invalidity by a preponderance of the evidence at trial. *Compare* 35 U.S.C. §314(a) (standard for institution of *inter partes* review), with 35 U.S.C. §316(e) (burden of proving invalidity during *inter partes* review).

Trivascular, Inc. v. Samuels, 812 F.3d 1056, 1068 (Fed. Cir. 2016). Petitioner has fallen far short of actually proving invalidity here.⁴

⁴ Terves does not oppose Petitioner’s contentions of the level of ordinary skill in art as put forth in the Petition. Terves does not believe any arguments raised herein rise or fall based on the proper level of ordinary skill in the art. (*See* Inst. Dec. 6-7.) Similarly, Terves does not believe any claim terms are required to be construed to

B. Ground I—Claims 76-81 are fully supported by Doud; Doud is Not Prior Art.

Doud is the grandparent application from which the '740 patent claims priority. Petitioner argues that the claims of the '740 patent are not entitled to Doud's priority date because they fail to satisfy the written description requirement.

Written description support is viewed from a POSITA's perspective and is separate from enablement. To satisfy the written description requirement of 35 U.S.C. §112(a), the description "must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed." *Ariad Pharm., Inc. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) (citing *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562–63 (Fed. Cir. 1991). The test for written description support is whether the disclosure "conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.* "[T]he test requires an objective inquiry into the four corners of the specification." *Id.*

1. Claims 76-81 claim specific ranges of additives.

Dependent Claims 76-81 generally limit the range of additives to 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel, and 0.1-20 wt. % cobalt:

adjudicate claims 76-81. Moreover, no arguments raised herein related to claims 76-81 rise or fall based on claim construction.

76. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

77. The dissolvable magnesium cast composite as defined in claim 29, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

78. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

79. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

80. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

81. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

2. The additive ranges in Claims 76-81 are expressly disclosed in Doud.

The additive ranges as recited in Claims 76-81 are clearly supported by the plain language of Doud; therefore, Doud is not prior art to these claims.

As the Board explained in its Institution Decision, “Claims 76–81 depend, directly or indirectly, from independent claim 19, and further restrict the amount of

copper, nickel, and cobalt in the cast composition.” (Inst. Dec. 13.) The Board further explained:

As there appears to be no dispute that Doud provides written description support for the recited levels of copper, nickel, and cobalt in claims 76–81, and the claims may not literally read on a composition having levels of copper, nickel, and cobalt that are outside the recited ranges, we determine that these claims are entitled to the benefit of the filing date of Doud. As such, we do not apply Doud as prior art to claims 76–81.

(Inst. Dec. 15.)

The Board was correct. Claims 76-81 recite upper limits for the additive ranges in claim 19 that are fully supported by Doud. Claims 76-81 recite ranges for the “said additive material includ[ing] one or more metals selected from the group consisting of...” that further narrow the corresponding ranges in claim 19. Moreover, the ranges in claims 76-81 include upper boundaries of 35 wt. %, 24.5 wt. %, and 20 wt. % for copper, nickel, and cobalt, respectively. These upper boundaries are supported in the disclosure of Doud because, at minimum, paragraph 13 discloses copper up to 35%, paragraph 12 discloses nickel up to 35%, and paragraph 14 discloses cobalt up to 20%. *See* Ex. 1005 [0012]-[0014].

Notably, both Petitioner and the Petitioner’s expert admit that these ranges upper limits are “literally” supported by Doud. Pet. 22-24; Ex. 1016 ¶¶41-42; *see also* Pet. 39-40 (citing Doud ¶¶ [0045], [0046], [0053], [0047], [0014], [0015], [0019]-[0022]). Indeed, Petitioner’s own expert explains:

40. In claim 19, the concentration weight percentages for copper, nickel, and cobalt are recited as being "at least 0.01 wt% ... "

41. I have carefully reviewed the disclosure of the '653 patent. **The upper range boundary disclosed** for copper is 35 weight%. '653 patent col. 5 line 16. **The upper range** for nickel is 35 weight%. '653 patent col. 4 lines 58. **And the upper range** boundary for cobalt is 20 weight%. See '653 col. 5 line 41.

42. Further, the disclosure of the '653 patent discusses a more generic embodiment using secondary metal where the secondary metal may be copper, nickel, cobalt, titanium, silicon, or iron). See '653 patent col. 6 lines 15-20 and col. 8 lines 25-30. However, even here the secondary metal is disclosed as being below 35 weight%. See '653 patent col. 6 line 16.

Ex. 1016 ¶¶41-42 (emphasis added). Petitioner's expert continues:

43. The '653 patent does not disclose any values above 35 weight% for the copper, nickel, or cobalt.

44. So in my opinion, **to the extent that claim 19 covers** embodiments of a magnesium composite where the copper, nickel, or cobalt are present in **amounts over 35 weight %**, these embodiments are **not disclosed** in the disclosure of the '653 patent.

Ex. 1016 ¶¶43-44 (emphasis added).

The necessary corollary to Petitioner's expert's opinion in ¶44, is that Doud fully supports values up to and including 35%. Because Claims 76-81 include an upper boundary for the ranges that fall within the ranges admitted by the Petitioner and its expert as supported in Doud, Petitioner has not met—and cannot meet—its burden to show that these claims are lacking written description support. Therefore,

Petitioner fails to meet its burden of establishing that Doud is prior art, and therefore, Doud cannot anticipate Claims 76-81.

3. Petitioner's claim construction for Claims 76-81 is a nonissue here.

Neither Petitioner nor its expert provided any meaningful analysis or argument as to how or why Claims 76-81 are not supported by Doud. Indeed, the Board already recognized that “Petitioner does not make any specific lack of written description arguments with respect to dependent claims 76–81.” Inst. Dec. 13. Because Petitioner has the burden of proof on this issue, this should end the Board’s inquiry.

However, because, during institution on this issue, the Board stated that “the proper construction of claims 76–81 is an open question that the parties are encouraged to further address during trial” (Inst. Dec. 15), Terves will address here.

This claim construction is a non-issue as to whether Doud is prior art for these claims. For starters, Petitioner raised the claim construction issue with respect to Claims 76-81 at the beginning of its Petitioner, but never explained or argued that its construction has any bearing on patentability, let alone written description. For example, Petitioner never contends that whether Doud is prior art has any relation to its proposed construction and the hypothetical it posed on page 13 of the Petition. It does not. Petitioner’s failure to use its proposed construction in any analysis means it’s a non-issue. To the extent Petitioner’s argument rises or falls based on its

construction, its failure to present that explanation, or any competent evidence supporting that explanation, means that Petitioner has failed to carry its burden of proof.

Moreover, this is not even a claim construction issue as opposed to how a Markush group works. *See* MPEP §2117; *In re Harnisch*, 631 F.2d 716, 719-20 (CCPA 1980); *Ex parte Markush*, 1925 Dec. Comm'r Pat. 126, 127 (1924). But regardless, the Board's analysis is whether Claims 76-81 are supported by Doud under the proper written description legal standards articulated above. Whether the hypothetical composition Petitioner concocted on page 13 of the Petition "meet[s] the limitation" is not at issue and appears to be adjudicating a hypothetical infringement issue. In any event, as explained above, because Claims 76-81 are fully supported by Doud, Doud is not prior art and Ground I fails.

C. Ground II—Claims 76-81 are not Obvious over Xu.

The burden of proof for obviousness is on Petitioner, and that burden never shifts. *Magnum Oil*. 829 F.3d at 1375. Obviousness is a question of law. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). However, whether a reference teaches away is a question of fact, and a reference that teaches away "preclude a determination that the reference renders a claim obvious." *In re Mouttet*, 686 F.3d 1322, 1333 (Fed. Cir. 2012). During examination, "claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art." *In re Am.*

Academy of Science Tech Ctr., 367 F.3d 1359, 1364 (Fed. Cir. 2004) (quoting *In re Bond*, 910 F.2d 831, 833 (Fed. Cir. 1990)).

Claims 76-81 are not obvious to a POSITA based on Xu. This is not close. Xu teaches a **powder** compact, not the dissolvable magnesium **cast** composite of the claimed invention. Ex. 1007 [0059]. This should end the Board's inquiry (although there are other reasons why Petitioner failed to meet its burden to prove obviousness based on Xu).

1. Xu teaches away from the magnesium cast composite in [19pre] and [19b] (and therefore, claims 76-81).

Petitioner alleges that “Xu '185 [0031] discloses a magnesium alloy and [0028], and [0054] discloses the metal composite is dissolvable, and [0059] a cast material is taught.” Pet. 55.

Petitioner ignores the elephant in the room: claim 19 (and, thus, Claims 76-81) repeatedly recites a “dissolvable magnesium **cast composite**” in both [19pre] and [19b]. In fact, [19b] recites that cast limitation **three** times in the body of claim 19. The Board acknowledged that this term “is limiting.” Inst. Dec. 20.

Xu instead teaches a **powder** compact metal composite having a cellular nanomatrix and a metal matrix. Ex. 1007 at [0031]. The composite is formed from a combination of powder constituents. *Id.* at [0041]. “These powder constituents can be selected and configured *for compaction and sintering* [*not* melting a cast] to provide the metal composite.” *Id.* Furthermore, “when compacted and sintered” the

metal nanomatrix forms a “cellular nanomatrix” coating material disposed on the metal matrix powder. *Id.* at [0049]. The term “cellular nanomatrix” describes “the extensive, regular, continuous and interconnected nature of the distribution of nanomatrix material” within the metal composite. *Id.* at [0044].

Because Xu teaches a POSITA that to compact and sinter the powder to form that cellular nanomatrix, *it teaches a POSITA against a cast composite*: “[m]oreover, metal alloys (formed by, e.g., casting from a melt or formed by metallurgically processing a powder) without the cellular nanomatrix also do not have the selectively tailorable material and chemical as the metal composites herein.” *Id.* at [0059].

Incredibly, Petitioner’s analysis of claim 19 does not cite to [0059] of Xu which teaches a POSITA not to cast from a melt. Pet. 55-56. Instead, Petitioner makes the improperly biased and empty “routine experimentation” attorney argument without any scientific or engineering explanation or evidence that a POSITA would have tried to form a composite by casting from a melt, when Xu and his fellow inventors explicitly stated it would not work. *Id.* at 46-47. Because Xu explicitly stated that forming a composite by casting a melt will “not have the selectively tailorable material and chemical properties as the metal composites herein”, and because Petitioner ignored that evidence to argue the contrary without evidence, Petitioner’s obviousness argument against claim 19 based on Xu fails.

Therefore, because Xu teaches a POSITA a powder configured for compaction and sintering to form a desirable cellular nanomatrix that has “selectively tailorable material and chemical properties as the metal composites herein”, Xu teaches away from the magnesium cast composite in [19pre] and [19b]. As such, it would not have been obvious to a POSITA to apply the teachings of Xu to form the cast composite recited in claim 19 (or dependent Claims 76-81).

In fact, even though the Board instituted mainly on Ground I, the Board agreed:

The invention recited in the '740 patent is to a ‘magnesium cast composite’ containing in situ precipitates of copper, nickel, and/or cobalt. Ex. 1001, 40:14–28. The requirement for a “magnesium cast composite” is found in both the preamble and body of claim 19 and neither party disputes that the term “magnesium cast composite” is limiting. *Id.*

Petitioner’s only support for a disclosure of ‘a magnesium cast composite’ in this ground is its citation to paragraph 59 of Xu. Pet. 55. Paragraph 59, however, appears to specifically distinguish Xu’s compacted powder compositions from metal alloys that are formed by casting from a melt. Ex. 1007 ¶ 59. Thus, on this record, Patent Owner appears to have a strong argument that Xu does not in fact teach or suggest a ‘cast composite’ containing the constituents recited in claim 19. Prelim. Resp. 44–45.

Inst. Dec. 19-20; *see also id.* at 20 (“Patent Owner also raises a significant question as to whether one of ordinary skill in the art looking to form a magnesium cast composite would look to the disclosures of Xu, which specifically differentiates the

properties of its compacted powder products from cast magnesium composites that lack a nanomatrix”).)

The Board should likewise conclude now that Petitioner failed to meet its burden of proof on Ground II.

2. Xu does not teach the dissolution rate based on the conditions (in 3 wt. % KCl water mixture at 90° C) recited in [19e].

[19e] identifies a very clear solution, temperature and dissolution rate based on that solution and temperature: the cast composite dissolves at a rate of at least 5 mg/cm²/hr in 3 wt. % KCl water mixture at 90° C.

Xu does not teach these three limitations (solution, temperature, and dissolution rate) together to a POSITA as required in [19e] (and, therefore, claims 76-81). Petitioner cites to Xu [0052] & [0054], which teaches literally hundreds of thousands of possibilities for solutions, temperatures and dissolution rates – but not the specific solution, temperature or dissolution rate together as recited in claim 19.

For the solution, Xu teaches literally dozens of different potential salts or acids to dissolve the powder composite. Ex. 1007 [0052]-[0053]. In fact, Xu teaches a POSITA away from the solution in claim 19 stating to a POSITA the desirability of “*increas[ing]* the density of the brine, such as 10.6 pounds per gallon of CaCl₂ brine.” *Id.* at [0052]. Using what Xu teaches, a POSITA would understand that to mean using a dense **56 wt. %** CaCl₂ water mixture. Petitioner and its expert provide no explanation – let alone the necessary motivation evidence required by the law to

establish obviousness – of how it would have been obvious to a POSITA to read that 56 wt. % teaching in Xu for CaCl_2 and use 3 wt. % KCl.

Once again, Petitioner ignores the evidence teaching against obviousness in paragraph 53 of Xu, which teaches a POSITA not to use a salt but rather an acid to dissolve that powder composite. Petitioner gives no explanation whatsoever on why a POSITA would have been motivated based on reading Xu to use a salt over an acid listed in Xu, to pick KCl out of all the salts listed, and to use only 3% KCl, when Xu teaches using much higher weight percentages to increase the density of the brine. Petitioner did not and cannot establish obviousness based on these contrary teachings to a POSITA.

Likewise, Petitioner does not address the fact that Xu teaches a POSITA to use incredibly high dissolution temperatures of 800°, 1000°, or 1200° F (427°, 537°, or 649° C), to achieve dissolution rates of 50-500 mg/cm²-hr. Pet. 55-56. Petitioner makes the incorrect conclusory attorney argument that “[b]ecause the disclosed ranges overlap and/or embrace the range and/or values in the ’740 patent *the POSA would consider them obvious as overlapping ranges or through routine optimization.*” Pet. 56. Xu [0052] teaches that the metal composite have a temperature rating up to about 1200° F, specifically up to about 1000° F, and more specifically about 800° F. Xu '185 does not teach a temperature of 90° C (or 194°

F), which is significantly less than 800° F. That unsupported argument is not evidence of teaching a POSITA to use 90° C to achieve the claimed dissolution rate.

The same lack of teaching or motivation also goes to the dissolution rate itself. Xu [0054] teaches an incredibly broad dissolution rate of 1 mg/cm²/hr to about 10,000 mg/cm²/hr. That range, however, is completely dependent on the composite, the dissolving agent used, and the temperature. Petitioner, its expert, and Xu do not explain what factors cause a dissolution rate of 1-5, greater than 5, greater than 100, greater than 1,000, or up to 10,000 per that range. A POSITA would not have been taught or motivated to use the dissolution rate with the conditions set forth in [19e] based on the incredibly broad teachings in Xu.

The Board previously found these arguments persuasive:

With respect to dissolution rates, Patent Owner raises a significant question as to whether one of ordinary skill in the art would have understood from the various broad ranges disclosed in Xu that any particular composite of Xu could achieve the claimed dissolution rate in 3 wt. % KCl brine at 90° C.

(Inst. Dec. 20.) There is no evidence to depart from this analysis.

D. Ground IV—Claims 76-81 are not Obvious over Xiao in view of Xu.

Claims 76-81 are not obvious over Xiao in view of Xu. The Board explained at institution:

Ultimately, however, we agree with Patent Owner that there is a significant question as to why one of ordinary skill in the art seeking to form a magnesium cast composite would have looked to particle sizes

in a reference directed to sintered magnesium *powder composites*. Prelim. Resp. 54. This is especially pertinent because Xu appears to disclose that metal alloys formed by casting from a melt “do not have the selectively tailorable material and chemical properties” of the disclosed powder-based composites. Ex. 1007 ¶ 59.

(Inst. Dec. 24-25 (emphasis added).) In other words, the Board noted that there would be no motivation or reason to combine the teachings of Xiao and Xu.

The Board is correct. In fact, Petitioner falls far short of its burden to prove unpatentability on these grounds because Petitioner presented *no evidence whatsoever suggesting a rationale or motivation to combine these references*. See Pet. 65-74. This is dispositive at this stage of proceedings.

Indeed, Petitioner needs to demonstrate with evidence an “‘articulated reasoning with some rational underpinning for combining [prior art] elements in the manner claimed’ and not merely a hindsight reconstruction of the claimed invention.” *United Labs. Int’l, LLC v. Refined Techs., Inc.*, IPR2019-01544, Paper 11, at 10 (PTAB June 12, 2020) (confirming decision not to institute IPR) (citation omitted); *see also Supercell Oy v. Gree, Inc.*, IPR2020-00513, 2020 WL 3455515, at *7 (PTAB June 24, 2020) (“The ‘Motivations to Combine the Prior Art References’ section of the Petition simply asserts that the references are analogous, the references provide well understood teachings regarding social games, and the references do not teach against their combination ... We are persuaded that is insufficient to establish obviousness here.”)

To successfully assert obviousness, a party must avoid “*ex post* reasoning” and “hindsight.” *DirecTV, LLC v. Qurio Holdings, Inc.*, IPR2015-02006, Paper 6 at 13 (PTAB Apr. 4, 2016). This is because “[o]ften the inventive contribution lies in defining the problem in a new revelatory way,” *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1377 (Fed. Cir. 2012), or “the recognition of a problem itself.” *Leo Pharm. Prods., Ltd. v. Rea*, 726 F.3d 1346, 1353 (Fed. Cir. 2013).

Thus, one “must not pick and choose isolated elements from the prior art and combine them so as to yield the invention in question if such combination would not have been obvious at the time of invention.” *Abbott Labs. v. Sandoz, Inc.*, 544 F.3d 1341, 1348 (Fed. Cir. 2008) (quoting *Dennison Mfg. Co. v. Panduit Corp.*, 475 U.S. 809, 810 (1986)). Instead, assertions of obviousness “must be supported by a ‘reasoned explanation.’” *In re Nuvasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016). “The obviousness inquiry does not merely ask whether a skilled artisan ***could combine the references***, but instead asks whether ‘they ***would have been motivated to do so.***’” *Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 (Fed. Cir. 2020) (emphasis added). “Fundamental differences between the references are central to this motivation to combine inquiry.” *Id.*; see *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1359 (Fed. Cir. 2019) (reversing Board’s obviousness finding because party “fail[ed] to explain why a person of ordinary skill in the art would have combined elements from specific references in the way the claimed invention does.”)

Here, Petitioner presented zero evidence demonstrating a motivation or rationale to combine these references. And as explained above, Xu does not in fact teach or suggest a magnesium cast composite, and actually teaches against it. Nor does it teach the dissolution rate based on the conditions (in 3 wt. % KCl water mixture at 90° C) recited in [19e]. With no evidence to the contrary, the Board cannot, on its own initiative, make the leap to suggesting Xu's teachings against a cast composite would lead a POSITA to form a cast composite with it. Thus, Petitioner's hindsight pick and choose method with no explanation, let alone evidence, to support it cannot satisfy Petitioner's burden of proof at this stage of the proceedings.⁵

V. CONCLUSION

Based on the foregoing reasons, the Board should concluded that original Claims 76-81 are patentable.

⁵ A "motivation 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." *Plantronics, Inc. v. Aliph, Inc.*, 724 F.3d 1343, 1354 (Fed. Cir. 2013). Petitioner presented no arguments, let alone evidence, suggesting any of these reasons to combine Xu and Xiao. Petitioner, therefore, has failed to meet its burden of proof to prove unpatentability.

Dated: November 22, 2023

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that this response was served to lead and back-up counsel for Petitioner by e-mail on November 22, 2023, as follows:

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CERTIFICATE OF COMPLIANCE

Patent Owner, Terves, LLC, certifies the following:

1. This brief complies with the type-volume limitation of 37 C.F.R. § 42.24(b)(2) (referring to 42.24(a)(1)(i)). Specifically, this brief contains 6,466 words, excluding parts of the brief exempted by 37 C.F.R. § 42.24(a)(1), according to the word count function of Microsoft Word; and

2. This brief complies with the typeface requirements of 37 C.F.R. § 42.6(a)(2)(ii) and the type style requirements of 37 C.F.R. § 42.6(a)(2)(iii). Specifically, this brief has been prepared in a proportionally spaced typeface using Microsoft Word in a 14 point Times New Roman font.

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