IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND ELEMENTS, INC.,
Petitioner,

v.

DUESENFELD GMBH,
Patent Owner.

IPR2024-00948
Patent 11,050,097

Before MEREDITH C. PETRAVICK, CHRISTPHER M. KAISER, and KEVIN W. CHERRY, *Administrative Patent Judges*.

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

TABLE OF CONTENTS

LISTING OF EXHIBITS..... III

I. INTRODUCTION.....1

II. CLAIM CONSTRUCTION 1

III. HANISCH ALONE OR IN VIEW OF DUNAGAN AND THE KNOWLEDGE OF A POSITA RENDERS OBVIOUS THE CHALLENGED CLAIMS [GROUND 1].....4

A. Hanisch discloses "inactivating the comminuted material such that an inactivated comminuted material is obtained" (claim 1[b]), "wherein the inactivating step is performed by drying the comminuted material" (claim 1[d]), and "an inactivation device" (claim 12[b])..... 5

1. PO does not dispute that Hanisch's high temperature decomposition oven discloses elements 1[b], 1[d], and 12[b]..... 5

2. Hanisch's low-temperature dryer also discloses elements 1[b], 1[d], and 12[b] 6

B. Hanisch in view of the knowledge of a POSITA renders obvious "wherein the drying occurs at a maximum pressure of 300hPA" (claims 1[e], 12[d]) 11

C. Hanisch discloses "wherein drying occurs at a temperature of less than 80° C" (claim 9)..... 15

IV. HANISCH ALONE OR IN VIEW OF DUNAGAN, AND IN FURTHER VIEW OF THE TEACHINGS OF HAYASHI AND/OR SHIN RENDERS OBVIOUS THE CHALLENGED CLAIMS [GROUND 2] 16

A. Hanisch alone or in view of Hayashi and/or Shin renders obvious "wherein the drying occurs at a maximum pressure of 300 hPa" (claim 1[e])..... 17

1. A POSITA Would Have Been Motivated to Apply Hayashi's Teachings to Hanisch..... 17

2. A POSITA Would Have Been Motivated To Apply Shin's Teachings to Hanisch..... 20

B. Claim 12[d]: Hanisch '419 alone or in view of Hayashi, Meador, or Shin render obvious "a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device" 20

V. SECONDARY CONSIDERATIONS.....21

A. Duesenfeld Cannot Show Commercial Success 21

1. Duesenfeld Omitted [redacted] 21

2. Duesenfeld's Licensing Fails to Establish Nonobviousness 22

3. PO Fails to Demonstrate The Required Nexus 24

B. Long-felt but unmet need and unexpected results 25

VI. CONCLUSION.....25

LISTING OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 11,050,097 ("'097 Patent")
1002	Patent Prosecution History for U.S. Patent No. 11,050,097
1003	Declaration of Dr. Walter van Schalkwijk
1004	U.S. Patent No. 9,780,419 ("Hanisch")
1005	U.S. Patent No. 6,447,669 ("Lain")
1006	U.S. Patent No. 9,843,077 ("Hayashi")
1007	PCT Application Publication No. WO 2010/102377 ("Stevens II")
1008	U.S. Patent No. 4,357,215 ("Goodenough")
1009	Dorella G. & Mansur M.B., A study of the separation of cobalt from spent Li-ion battery residues, 170 J. Power Sources 210 (2007) ("Dorella")
1010	U.S. Patent No. 10,396,408 ("Shin")
1011	U.S. Patent No. 5,632,863 ("Meador")
1012	*Duesenfeld GMBH v. Ascend Elements, Inc.*, Civ. A. No. 1:23-cv-01194-JFM, Scheduling Order, ECF No. 22 (D. Del. Jan. 26, 2024)
1013	Federal Court Management Statistics–Comparison Within Circuit (Dec. 31, 2023), *available at* https://www.uscourts.gov/statistics/table/na/federal-court-management-statistics/2023/12/31-3
1014	U.S. Patent No. 9,509,025 ("Iida")
1015	U.S. Patent No. 3,671,318 ("Moe")
1016	U.S. Patent No. 4,118,219 ("Elmore")
1017	U.S. Patent No. 6,524,737 ("Tanii")
1018	U.S. Patent No. 9,450,277 ("Dunagan")
1019	U.S. Patent No. 8,210,456 ("Stevens I")
1020	Declaration of Josef B. Schenker in Support of Motion for *Pro Hac Vice* Admission
1021	Declaration of Conor McDonough in Support of Motion for *Pro Hac Vice* Admission
1022	Declaration of Darlena Subashi in Support of Motion for *Pro Hac Vice* Admission
1023	Declaration of Walter van Schalkwijk
1024	Deposition transcript of Vani Dantam dated March 24, 2025

Exhibit	Description
1025	Deposition transcript of Lydia Grote dated April 18, 2025
1026	*Duesenfeld GMBH v. Ascend Elements, Inc.*, Civ. A. No. 1:23-cv-01194-JFM, Declaration of Lydia Grote, ECF No. 93 (D. Del. Jan. 26, 2024) (FILED UNDER SEAL)
1027	DUESENFELD_IPR00000131-153
1028	DUESENFELD_IPR00000154
1029	*URT Umwelt und Recyclingtechnik GmbH v. Duesenfeld GmbH*, IPR2024-00887, Paper 18 (Patent Owner Response [REDACTED])
1030	Furushima et al., Thermal stability and kinetics of delithiated LiCoO2, J. Power Sources, 196:4 (2011), 2260–2263
1031	*URT Umwelt und Recyclingtechnik GmbH v. Duesenfeld GmbH*, IPR2024-00887, EX2025 (Dantam Declaration)
1032	Julien, C.M.; Mauger, A.; Zaghib, K.; Groult, H. Comparative issues of cathode materials for Li-ion batteries. *Inorganics* **2014**, *2*, 132–154
1033	U.S. Patent No. 3,448,857
1034	Georgi-Maschler, T.; Friedrich, B.; Weyhe, R.; Heegn, H.; Rutz, M. Development of a Recycling Process for Li-ion Batteries., *J. Power Sources* 2012, *207*, 173–182
1035	Zhang T., He Y., Ge L., Fu R., Zhang X., Huang Y., *J. Power Sources* 2013, 240, 766
1036	https://icma.org/sites/default/files/305268_www.nfpa.org_~_media_Files_Research_Research Foundation_Research Foundation reports_Hazardous materials_RFLithiumIonBatteriesIIB.pdf
1037	https://www.usfa.fema.gov/a-z/lithium-ion-batteries/risks-and-response-strategies/
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I. INTRODUCTION

The Petition sets forth two theories of invalidity for the Challenged Claims'. Specifically, that Hanisch's low-temperature "pre-dryer" process and Hanisch's high-temperature oven both inactivate, and both do so at pressures under 300 hPa. The Board preliminarily determined that there was insufficient evidence from which to conclude the low-temperature "pre-dryer" inactivates shredded battery material but agreed that the decomposition oven would inactivate the battery material. Paper 10, ("DI"), 13. As discussed here, Hanisch's disclosure confirms that material is sufficiently dried in its pre-dryer to be considered inactivated under any proposed construction.

PO's Response (Paper 19, "POR") repeat the Board's error, and largely rely on a flawed assumption that Hanisch is limited to a preferred embodiment. PO's arguments as to Ground 2 additional rely on the wrong legal standard regarding "teaching away".

Finally, PO's arguments that secondary considerations preclude a finding of obviousness are also based on irrelevant evidence and a misapplication of the law.

II. CLAIM CONSTRUCTION

As explained in Petitioner's concurrently filed Opposition to PO's Contingent Motion to Amend, PO's own claim construction arguments for "inactivat[ion],"

demonstrate the indefiniteness of that term, such that a person of ordinary skill in the art ("POSITA") would not understand with reasonable certainty the outer bounds of the term. But PO's arguments notwithstanding, the prior art meets the claims under both the Board's preliminary construction and PO's alternative, and cancellation of the claims is therefore appropriate. *See Hilti Aktiengesellschaft v. Specified Techs. Inc.*, IPR2024-00192, pap. 16, at 12-13 (P.T.A.B. May 14, 2024) (instituting IPR despite alleged indefiniteness because "we do not discern an indefiniteness issue that renders it logically impossible to adjudicate the prior-art challenges in the Petition"); *Intel Corp. v. Qualcomm Inc.,* 21 F.4th 801, 813 (Fed. Cir. 2021) (citing *Samsung Electronics America, Inc. v. Prisua Eng'g Corp.*, 948 F.3d 1342, 1353 (Fed. Cir. 2020)) ("it is not always impossible to adjudicate a prior-art challenge, one way or the other, just because some aspect of a claim renders the claim indefinite," rather indefiniteness "precludes a patentability determination only when the indefiniteness renders it logically impossible for the Board to reach such a decision").

Here, the Board rejected PO's preliminary response arguments and preliminarily concluded that inactivation means "the removal of sufficient amounts of dimethyl carbonate and/or ethyl methyl carbonate from the comminuted material to make an electrochemical reaction either no longer possible or only possible to a negligibly small extent." (DI 12.) In response, PO argues (different than its response

in other IPR proceedings on the same patent)[1] that the Board's construction is too limiting by choosing a single metric for inactivation, "to the exclusion of the other". (POR 9-10.) PO contends that inactivation is merely "the endpoint result of drying, but not specific [to] the particular metric of drying that must be reached." (POR 10.) PO means there is no limitation on how one knows material has been inactivated other than whether it is finished drying.[2] Given all the inconsistencies in PO's positions before the Patent Office, and the '097 Patent's specification's lack of meaningful guidance, a POSITA would have no reasonable certainty as to the outer bounds of "inactivat[ion]."

This ambiguity, however, does not restrict the Board's ability to apply the prior art here and find the claims unpatentable. *See Hilti*, IPR2024-00192, pap. 16, at 12-13; *Intel Corp.,* 21 F.4th at 813. As detailed below, Hanisch unambiguously discloses forming "***dry*** cell fragments" (in contrast to some unknown partly dry

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[1] In *URT Umwelt und Recyclingtechnik GmbH v. Duesenfeld GmbH*, PO argues that drying should *not* be defined synonymously wit drying but should instead mean "safe for transport." IPR2024-00887, paper 18 at 9.

[2] To be sure, the patent's lexicography of the active verb "drying" as used in the claims does not and should not change the plain and ordinary definition of the term adjective "dry" as used throughout the prior art.

condition) as the endpoint of its low-temperature drying process and, accordingly, meets the claims under each of the Board's and PO's constructions. *See* § II.A.2, *infra*.

III. HANISCH ALONE OR IN VIEW OF DUNAGAN AND THE KNOWLEDGE OF A POSITA RENDERS OBVIOUS THE CHALLENGED CLAIMS [GROUND 1]

As the Petition sets forth, Hanisch discloses and at minimum renders obvious all the Challenged Claims' limitations. *See* Pet. 22-41; EX1003, ¶¶83-139. PO does not dispute that Hanisch discloses most limitations, as described in the Petition. In fact, other than dependent claim 9, PO's arguments are limited to three related elements found in the independent claims: elements 1[b], 1[e], and 12[d]. Moreover, even as to 1[b], PO does not dispute that at least one embodiment in Hanisch discloses this limitation. *See, infra*, III.B. Finally, despite challenging whether Hanisch discloses the "inactivation" of claim 1[b], PO does not in its Response challenge Petitioner's argument that Hanisch's "pre-dryer" is the "inactivation device" of claim 12[b] and has therefore waived that argument. Paper 11 at 9; *see also In re Nuvasive, Inc.*, 842 F. 3d 1376, 1380-81 (Fed. Cir. 2016) (POPR arguments waived if left out of POR).

A. Hanisch discloses "inactivating the comminuted material such that an inactivated comminuted material is obtained" (claim 1[b]), "wherein the inactivating step is performed by drying the comminuted material" (claim 1[d]), and "an inactivation device" (claim 12[b])

Under any proposed construction for "inactivat[ion]," Hanisch discloses the claimed inactivation (and "inactivation device") both through its low-temperature drying process (in its "pre-dryer") and through its high-temperature decomposition process (in its "oven").

1. PO does not dispute that Hanisch's high temperature decomposition oven discloses elements 1[b], 1[d], and 12[b]

PO no longer appears to dispute that Hanisch's high-temperature decomposition oven discloses inactivation through drying. (POR, *generally*.) The Board agreed that this high-temperature decomposition results in inactivation because the "decomposition oven would destroy the electrolyte solvent such that 'none would remain.'"[3] (DI 15 (citing EX2001 ¶83).) And this is true under both the Board's construction and PO's alternative. Accordingly, Hanisch's high temperature decomposition indisputably discloses this limitation.

[3] In other words, the Board and parties are in agreement that material with no more liquid electrolyte is considered inactive.

2. Hanisch's low-temperature dryer also discloses elements 1[b], 1[d], and 12[b]

There is also no dispute that Hanisch's low-temperature "pre-dryer" heats and evaporates, and thereby removes electrolyte solvent. EX1004, 3:65-4:1; Pet. 18, 24; EX1003, ¶¶ 87-30. PO admits as much in conceding that "[t]he pre-dryer of Hanisch '419 is configured to remove some quantity of electrolyte solvent." POR 15. But PO effectively asks the Board to ignore the fact that Hanisch expressly discloses the ***output*** of its pre-dryer: the formation of "***dry cell fragments***" and instead assume that "dry" cell fragments are not actually dry. EX1004, 3:65-4:1. But there is no basis to ignore the plain disclosure in Hanisch in view of PO's amorphous standard of unspecified degrees of drying required for inactivation. Rather, under both the Board's preliminary construction and PO's proposed construction, Hanisch's pre-dryer results in inactivated comminuted material because it results in fully ***dry*** material.

First, the Board's preliminary findings on Hanisch's low-temperature drying are based on a misapprehension of Hanisch. DI 13. The Board questioned whether evidence was presented that Hanisch's low-temperature drying "removes sufficient vapor to make electrochemical reactions impossible," (*id.*) but the Board did not appear to consider the relevance of Hanisch's disclosure that "cell fragments are dried at a drying temperature, ***so that dry cell fragments*** and drying vapours are formed." EX1004, 3:67-4:1; *see also id.*, 8:3-10. As a POSITA would have

understood, the fact that "***dry***" cell fragments are formed necessarily means all the volatile electrolyte has been removed. EX1023, ¶¶9-18. There is no suggestion in Hanisch that its pre-dryer forms only "partially" dry material,[4] and PO's argument to the contrary—that "Hanisch is not concerned with inactivation at the pre-dryer . . . [because] the battery material goes from the pre-dryer to the decomposition oven" (POR 16)—contradicts the plain reading of Hanisch's specification.

Figure 1 of Hanisch and the disclosed flow of material confirms that ***dry*** and electrochemically safe material exits the low-temperature "pre-dryer" and undergoes several processing steps *before* reaching the decomposition oven. Specifically, after Hanisch's low temperature drying phase comes "the step of treating the ***dry cell fragments*** by means of magnetic separators, so that iron-free cell fragments are formed. It is favourable for these iron-free cell fragments to be classified, for example by a zigzag classifier." EX1004, 4:19-24. Hanisch further discloses that the separator "comprises a magnetic separator and, if necessary, an eddy flow separator also," EX1004, 5:65-66. A POSITA would have understood that the

[4] This contrasts with Hanisch's "active material separation system" which only "at least ***partly*** removes the liquid fraction." EX1004, 4:63-67. Likewise, Hanisch discloses "drying vapours are at least ***partly*** condensed." *Id.*, 4:1-2. Hanisch knows to specify when a process is only "partly" complete and did not do so here.

separators and zigzag classifiers are typically designed to work with ***dry*** material. EX1023, ¶¶10-18. For example, a zigzag classifier relies on airflow to separate particles based on size and density, and inserting still-wet material could change the particle behavior in the air. EX1023, ¶11. Likewise, an eddy separator relies on magnetic eddy currents at the end of a conveyor belt to separate metallic components; introducing damp battery material could both interfere with the magnetic fields and cause clumping of particles, resulting in ineffective material separation. EX1023, ¶12. Moreover, putting electrochemically active material into the separators and zigzag classifier could result in dangerous explosions and/or fires. *Id.* A POSITA would have understood as much, recognizing that liquid electrolyte material still present in wet material could ignite under friction or heat. EX1023, ¶16. Thus, a POSITA would have understood that the purpose of forming "dry cell fragments" in Hanisch is to ensure that the material going through the subsequent processing steps is, in fact, safe. *Id.*

Because it results in "dry cell fragments," Hanisch's pre-dryer meets this limitation under both the Board's preliminary and PO's proposed constructions for "inactivat[ion]." Under PO's construction—that inactivation is merely the "endpoint of drying" without resorting to any particular metric—Hanisch's pre-dryer plainly discloses this limitation because "dry cell fragments" are, by definition, the endpoint of Hanisch's drying process. EX1023, ¶10. Indeed, having eschewed any metric for

when drying is complete, there is no basis for PO to argue that "dry cell fragments" formed in a dryer are not the "endpoint result of drying." Similarly, the Board rejected the notion that drying requires a particular degree of drying, recognizing instead that—when a sufficient amount of electrolyte has been removed—comminuted battery material is inactivated. DI, 12. The Board criticized the Petition for not demonstrating that "sufficient" electrolyte was removed, but again, this criticism misapprehends the resulting output of the low-temperature dryer. A POSITA would have understood that, to form "dry cell fragments" (in contrast to partly dry fragments), the dryer must have removed ***all*** the liquid electrolyte. Moreover, as even the '097 patent acknowledges, for purposes of "inactivat[ion]," the material need not be fully dry; rather, the preferred embodiment allows for up to 3% of liquid electrolyte remaining. EX1001, 4:28-32. But, in any event and as noted above, the subsequent processing steps confirm the material must have been rendered electrochemically safe.

Second, PO's reliance on Hanisch's continuous process embodiment is irrelevant. POR, 15 (citing EX1004, 3:27-28). Regardless of whether the pre-dryer is run on a continuous basis or as a batch process, Hanisch's disclosure is unambiguous—the material fed into the pre-dryer is "dried at a drying temperature, ***so that dry cell fragments*** and drying vapours ***are formed***." EX1004, 3:65-4:1. This disclosure is not limited to either embodiment and accordingly, applies to both.

Further, PO fails to acknowledge that the continuous process embodiment is merely a ***preferred*** embodiment, but not the sole disclosed embodiment. EX1004, 3:27-28. Hanisch thus implicitly acknowledges that its system could be run as a batch process. *See Cont'l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 796 (Fed. Cir. 2019) (disclosure of even just one embodiment is not limiting, absent clear intent shown by 'words or expressions of manifest exclusion or restriction.'") (internal citations omitted); *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) ("Mere criticism of a particular embodiment" does not establish clear disavowal). Likewise, PO's argument—that running Hanisch as a continuous process is necessary to "avoid build-up of piles of comminuted battery material" is a red-herring. POR, 15. PO does not explain why Hanisch could not just as easily "avoid build-up" by waiting to shred the next batch of used batteries.[5]

Third, PO argues that the low-temperature drying is run on overpressure and not under vacuum. POR, 15. But this argument, too, is irrelevant—elements 1[b] and 12[b] say nothing about a vacuum. Rather, the vacuum/pressure requirement

[5] Notably, PO offers no evidence that Hanisch "calls for" battery material "continually enter[ing]" any chamber beyond the *ipse dixit* of its own expert. POR, 54. Hanisch has no such disclosure.

stems from elements 1[e] and 12[d]. Moreover, PO is wrong; Hanisch very much discloses running the low-temperature dryer under vacuum. EX1004, 3:6-8.

Finally, PO argues that Hanisch does not provide sufficient detail to know the duration or pressure of drying in order to reach inactivation. POR, 16. But this too is a red-herring because PO neither acknowledges what Hanisch *does* teach—namely that "cell fragments are dried at a drying temperature, ***so that dry cell fragments*** and drying vapours are formed" (EX1004, 3:67-4:1)—nor suggests that a POSITA would not have been able to accomplish this without undue experimentation. POR 16. Indeed, "[i]t is well-established that prior art patents and printed publications . . . are presumed enabling. *Apple Inc. v. Corephotonics, Ltd.*, 861 F. App'x 443, 449 (Fed. Cir. 2021). PO has provided nothing to overcome that presumption.

Thus, when viewed in light of Hanisch's disclosure of "dry cell fragments," Hanisch discloses inactivation through drying.

B. Hanisch in view of the knowledge of a POSITA renders obvious "wherein the drying occurs at a maximum pressure of 300hPA" (claims 1[e], 12[d])

As set forth in the Petition, Hanisch discloses that "heating up takes place under inert gas or in a vacuum." EX1004, 3:6-8. A POSITA would have understood that, to meet the requirements of Hanisch's pre-dryer and decomposition oven, it would have been desirable to set the vacuum pressure levels to less than 300 hPa.

EX1023, ¶¶19-27. Contrary to PO's arguments, this understanding is not based on the hindsight review of the '097 patent but is based on the teachings of Hanisch and a POSITA's understanding of basic scientific principles.

For example, Hanisch is explicit that prior to decomposition, "the cell fragments are dried at a drying temperature," and "[i]t is advantageous for the drying temperature to be below 100° C, in particular below 80° C." EX1004, 3:67-4:5. As the explained in the Petition, "it has been well-known for decades, if not longer, that the evaporation of gases, including volatile compounds and gases formed during drying, can be facilitated at lower temperatures when ambient pressure is reduced from normal pressure, because of the reduction in boiling point that occurs." POR, 31 (citing EX1003, ¶¶68-70, 114). PO's expert also agrees that the '097 patent does not purport to have invented the scientific principle that liquids evaporate at lower temperatures under partial vacuum pressure. EX2022, 12-18. Given these known scientific principles, a POSITA would have appreciated that, to quickly vaporize the volatile electrolytes and produce "dry cell fragments" at 80° C or lower, vacuum pressures below 300 hPA are desirable. EX1004, 3:67-4:5.

First, PO's attempt to reject entirely the use of common knowledge of a POSITA is based on inapposite case law. *See* POR 17-18. PO cites *K/S Himpp v. Hear-Wear Techs., LLC*, but that case rejected a party from asserting what was known in the art *without any evidence whatsoever*. 751 F.3d 1362, 1365 (Fed. Cir.

2014). Here, in contrast, Petitioner has put forth persuasive evidence—the testimony of its expert, Dr. van Schalkwijk. Pet. 31 (citing EX1003 ¶¶ 68-70, 113-116). Likewise, in *Unified Pats. Inc. v. Velose Media, LLC*, No. IPR2019-00883, 2019 WL 6999079, at *5 (P.T.A.B. Nov. 15, 2019), the Board rejected PO's expert's testimony because there was no teaching in the prior art relating to that core element. Here, in contrast, Hanisch already provides the drying temperature and the motivation to dry under vacuum. EX1004, 3:6-8; 4:4-5; 4:6-18. And given the known scientific principles involved, and the desire to seek lower pressure levels, a POSITA would have had a reasonable expectation of success in implementing vacuum pressure levels far below 300 hPA in Hanisch's low-temperature dryer and Hanisch's decomposition oven.

Second, PO's arguments with respect to the low-temperature dryer are wrong and are based on limiting Hanisch to a preferred embodiment while ignoring other disclosed embodiments. POR 15-16. PO argues that the low-temperature pre-dryer is necessarily at overpressure because the crushing device must be at overpressure. *Id.* But Hanisch explicitly includes embodiments with its crushing device operated under vacuum: "[t]he method includes the following steps: (a) crushing the cells, in particular under inert gas ***or in a vacuum***, so that solid cell fragments are also formed…" EX1004, Abstract; *see also id.*, claim 1. And PO's expert admits that, in the case where Hanisch's cell crushing device is operated under vacuum, its low-

temperature pre-dryer also would be under vacuum. EX1024, 160:13-19 ("Q: Okay, it's possible. So in the scenario where the operator chooses to run the shredder under vacuum then ***the predryer also would be under vacuum***? A: If it's a continuous process, ***yes***.").

Finally, PO complains that Hanisch doesn't specify the type of seals used to maintain a vacuum in the decomposition oven (POR, 18-19), but this is irrelevant. PO admits that such seals exist and were known in the art, and does not suggest that a POSITA could not easily implement such a seal. POR, 18-20. Rather, PO argues that a POSITA would not have bothered with a vacuum (or at least not a vacuum at the levels claimed) because a later part of Hanisch's process—the jet sieve—mentions keeping energy consumption low. POR, 20. But PO fails to explain why that disclosure—relating to the operation of a jet sieve—has any relevance to whether a POSITA would have found it obvious to use a vacuum at pressure levels below 300 hPa.

PO also notes that allowing oxygen to enter the pyrolysis chamber "would run counter to the goals of Hanisch '419 to exclude oxygen, to avoid oxidizing the copper and aluminum foils." POR, 41; EX2022, ¶¶68, 146, 158, 169; Ex. 1004, 4:6-18. This is consistent with Hanisch's disclosures (as noted in the Petition) of heating to decomposition temperatures under vacuum (EX1004, 4:6-8, claim 6; Pet. 30-32), and that the use of reduced air pressure would facilitate lower heating energy needs,

making the system more efficient. Pet. 32, EX1003, ¶115. As PO notes, Hanisch teaches that the use of vacuum during the decomposition heating prevents copper oxidization, which is useful because it means that "copper can thus be retrieved with a high degree of purity as a valuable element." EX1004, 4:6-18. A POSITA would have understood from these disclosures that it was desirable to use pressures lower than 300 hPa in the decomposition oven because minimizing the atmospheric oxygen in the chamber would promote the best chances of avoiding this oxidization, and a pressure of 300 hPa would have on the order of 3-4 fold less oxygen than 1 atmosphere, whereas a stronger vacuum pressure of 0.0000133 hPa would be predicted to have up to nearly eight orders of magnitude less free oxygen than 1 atmosphere, and thus the vacuum of less than 300 hPa would be much preferred. EX1023, ¶¶19-27.

C. Hanisch discloses "wherein drying occurs at a temperature of less than 80° C" (claim 9)

As set forth in the Petition, Hanisch discloses two drying steps—a low-temperature "pre-dryer" process and a high-temperature decomposition step. Pet. 24-27; EX1003, ¶¶74-75, 85-93, 103, 108-09, 127-28. The low-temperature drying is disclosed as taking place "in particular below 80° C." EX1004, 3:65-4:5. Accordingly, claim 9 is unpatentable under any of the proposed grounds. Pet. 36-37, 47.

PO's sole argument with respect to this claim—its incorrect assumption that the "pre-dryer" process does not result in inactivated material (POR 21-22)—is irrelevant. Notably, claim 9 ***does not*** use a definite article, limiting the claim to "***the*** drying" of claim 1. Rather, claim 9 simply specifies that some, unspecified "drying occurs at a temperature of less than 80° C." Accordingly, regardless of whether Hanisch's pre-drying process results in inactivated material, Hanisch indisputably discloses drying [that] occurs at a temperature of less than 80° C, as required by claim 9.

IV. HANISCH ALONE OR IN VIEW OF DUNAGAN, AND IN FURTHER VIEW OF THE TEACHINGS OF HAYASHI AND/OR SHIN RENDERS OBVIOUS THE CHALLENGED CLAIMS [GROUND 2][6]

PO's response to Ground 2 presumes that Hanisch does not teach low-temperature drying to inactivate comminuted material and focuses on Hanisch's high-temperature drying embodiment. *See* POR, 31. If the Board agrees that Hanisch's low-temperature drying results in inactivated battery material, PO has waived all of its Ground 2 arguments relating to this embodiment. PO's arguments with respect to the high-temperature decomposition embodiments also fail.

[6] To streamline the proceeding, Petitioner limits its argument in this Reply to PO's contentions regarding Hanisch alone, or in combination with Hayashi and Shin, and does not present arguments with respect to Meador.

A. Hanisch alone or in view of Hayashi and/or Shin renders obvious "wherein the drying occurs at a maximum pressure of 300 hPa" (claim 1[e])

1. A POSITA Would Have Been Motivated to Apply Hayashi's Teachings to Hanisch

PO frames its criticism as Hayashi (and Shin) "teaching away" from the proposed combination with Hanisch. But PO never identifies a disclosure criticizing a batch process. *Depuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)) (no teaching away absent "criticiz[ing], discredit[ing], or otherwise discourag[ing]" investigation into the claimed invention). PO's expert admitting applying the wrong standard in assessing whether the prior art taught away from the claimed invention. EX1024, 109:14-19 (opining that teaching away is “basically guiding away”), 112:3-16 ". PO's teaching away arguments should therefore be rejected. *See Olin Corp. v. Lamorak Ins. Co.*, 2018 WL 1901634, at *21 (S.D.N.Y. Apr. 17, 2018) ("Expert testimony [] should be excluded when it applies the wrong legal standard").Hanisch Is Not Limited to a Continuous Process

Contrary to PO's repeated suggestion (e.g., POR 38-44), Hanisch's disclosure is *not* limited to a continuous process; rather, the "continual process" is only a *preferred* embodiment, thus implicitly acknowledging that its process *could* be performed in batches, similar to Hayashi and Shin. EX1004, 3:27-28. Hanisch's teaching of a preference for a continuous process over a batch process does not limit

Hanisch's disclosure to a continuous process. *See Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) ("[m]ere criticism of a particular embodiment" does not establish clear disavowal); *Spine Solutions, Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010). And PO presents no evidence of clear disavowal that would so limit Hanisch. Hanisch thus discloses a method that can be carried out either as a continuous *or* a batch process.

a) Even Treating Hanisch as A Continuous Process, a POSITA Would Have Had A Reasonable Expectation of Success in Using Vacuum Seals to Achieve the Levels of Vacuum Disclosed in Hayashi

Even if the method in Hanisch were performed as a continuous process, a POSITA would nonetheless have had a reasonable expectation of success in using vacuum seals during drying to achieve the pressure of "no more than 300 hPa" disclosed in Hayashi. EX1023, ¶¶28-33.

PO admits that rotary airlocks were known and would work with Hanisch's method when performed as a continuous process (POR, 19-21, 41), but complains that it might be difficult. POR, 41. Challenges in implementing a combination, however, do not make the combination non-obvious. *See Novartis Pharms. Corp. v. West-Ward Pharms. Int'l Ltd.*, 923 F.3d 1051, 1059 (Fed. Cir. 2019) (proving obviousness "does not require that a particular combination must be the preferred, or the most desirable") (quoting *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004));

Juniper Networks, Inc. v. Correct Transmission, LLC, 2024 WL 3517862, at *6 (Fed. Cir. July 24, 2024).

PO presents no evidence or testimony that it would have been "beyond the skill level" of a POSITA to use rotary airlocks in the method of Hanisch when performed as a continuous process, nor that doing so would "lead to unpredictable results." For example, Mr. Dantam asserts without evidentiary support that "the battery material is coarse, and so the material would not fill the pockets of the rotary valve fully, leading to high displacement leakage." EX2022, ¶157. Yet Mr. Dantam never explains why a POSITA would be incapable of otherwise addressing the risk of leaks, or why it would have been "beyond the skill" of a POSITA to do so. EX1023, ¶¶28-33.

PO's remaining argument against the motivation to combine (s*ee* POR, 45) ignores Hanisch's disclosure that "heating up", including in the "pre-dryer", can occur "in a gas-proof container" and "in a vacuum." EX1004, 3:4-8.

b) Hayashi's Treatment of HF Gas Does not Teach Away

PO (ignoring the low temperature pre-drying stage in Hanisch) contends that Hayashi teaches away from Hanisch because it manages HF risks by permitting the production of HF and using various means to neutralize it. POR, 46-50. But this merely demonstrates that Hayashi recognizes that one must manage the risks associated with $LiPF_6$ undergoing hydrolysis to form HF, and that Hayashi selects

one possible approach of controlled production and neutralization. EX1006, 2:4-12; 2:24-33. Critically, Hayashi and Hanisch both recognize that organic solvents in the electrolyte can be removed by drying at temperatures under 80° C, when done under vacuum. EX1006, 2:24-33; EX1004, 3:4-8.

2. Shin's Teachings Are Compatible with Hanisch

PO's arguments ignore that Claim 1 of Shin covers a process involving a vacuum generally, without limitation to replacement with inert gas before heating. EX1010, claim 1. Claim 2 of Shin introduces the limitation of replacing the vacuum with inert gas. EX1010, claim 2. Shin discloses that the use of a vacuum during heating of the batteries is advantageous to avoid the risk of explosion. EX1010, 6:33-50; 8:4-15.

B. Claim 12[d]: Hanisch '419 alone or in view of Hayashi, Meador, or Shin render obvious "a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device"

PO's argument ignores the embodiments (discussed in the Petition and above) in Hanisch that expressly allow for shredding and pre-drying under vacuum. EX1004, claim 1, 3:4-8. And PO admits that Hanisch seeks to limit oxygen in the pyrolysis chamber to avoid oxidation of copper and aluminum foils. POR, 41; EX1004, 4:6-18. As discussed above at III.B, the use of vacuum levels below 300 hPa for Hanisch's pyrolysis oven minimize the problems of oxidization that would reduce the purity of copper that could be retrieved. EX1023, ¶¶19-27.

V. SECONDARY CONSIDERATIONS

A. Duesenfeld Cannot Show Commercial Success

PO's commercial success arguments fail because it has not provided evidence either of "significant" revenue in this market, or of its process having considerable market share, or growth in its market share. Indeed, PO's own expert spent years in this field, contracting with battery recycling companies, yet never heard of Duesenfeld until he was retained for this litigation. EX1024, 38:6-13.

1. Duesenfeld Omitted [redacted]

Mere evidence of revenue and profitability is not sufficient to show commercial success; rather, PO must provide evidence that sales are a "substantial quantity in th[e] market" or "evidence of market share, growth in the market share, or that the accused products replaced earlier products sold by others." *Two Moms & a Toy, Ltd. Liab. Co. v. Int'l Playthings, Ltd. Liab. Co.*, No. 10-cv-02271-PAB-BNB, 2012 U.S. Dist. LEXIS 152840, at *70-72 (D. Colo. Oct. 24, 2012) (rejecting evidence of more than $2 million in additional revenue and profitability as insufficient for commercial success). [redacted]

PO's declarant, [redacted]

[redacted] that fraction of profits was. EX1025, 49:16-54:13. Ms. Grote admits that she provided no estimate of PO's market share, nor does she elaborate on the definition of "market" beyond [redacted] EX2040, ¶ 2; EX1025, 54:14-56:13. In sum, for the period 2019-2024 for which PO has been selling the output of its recycling process, [redacted]

2. Duesenfeld's Licensing Fails to Establish Nonobviousness

PO's licenses are insufficient to demonstrate commercial success and/or nonobviousness of the '097 patent because they do not cover the '097 patent. *See, e.g.*, [redacted] Licenses alone, in particular where they do not include rights to the U.S. Patent at issue, do not establish commercial success. *See R.H. Murphy Co. v. Ill. Tool Works, Inc.*, 409 F. Supp. 2d 53, 75-76 (D. Mass. 2006).

Further, there is no evidence to "demonstrate that the licensing program was successful because of the merits of the claimed invention as opposed to business decisions to avoid litigation, [] prior business relationships, or for other economic reasons." *Cole Kepro Int'l, LLC v. VSR Induss.*, 695 F. App'x 566, 572 (Fed. Cir. 2017) (internal quotations omitted). Indeed, PO does not provide any evidence of the reasons these licenses were taken. *See R.H. Murphy Co.*, 409 F. Supp. 2d at 75-76.

In fact, PO's testimony in the related district court proceeding suggests these licenses were taken merely to avoid litigation. [redacted] (c) PO saw litigation pressure as leverage for its licensing program, [redacted]

Where PO has failed to prove commercial success, it is not entitled to a rebuttable presumption of nexus. *See Crocs, Inc. v. U.S. Int'l Trade Comm'n*, 598 F.3d 1294, 1310–11 (Fed. Cir. 2010). And reliance on little more than sales or revenue fails to prove nexus. *In re DBC*, 545 F.3d 1373, 1384 (Fed. Cir. 2008).

3. PO Fails to Demonstrate The Required Nexus

Even if it had shown commercial success, PO fails to prove a nexus to the claimed invention because PO makes no showing that its "battery recycling process" (POR, 60) both "embodies the claimed features ***and is coextensive with them***." *Volvo Penta of the Ams., LLC v. Brunswick Corp.*, 81 F.4th 1202, 1211 (Fed. Cir. 2023). PO fails to address any alleged coextensiveness, thus its request for a presumption fails as a matter of law. *Id*.

Nor could PO demonstrate the requisite coextensiveness where its battery recycling process involves at least three different stages, two of which do not implicate the '097 Patent. *See* EX2053, 3 (process broken into "discharging", "mechanical process[ing,]" and "hydrometallurgical process[ing]" stages). Ms. Grote admits that the '097 Patent is related only to the second "mechanical process" stage (EX1025, 17:22-18:6; 32:2-8), and that the "discharging" and "hydrometallurgical" stages are not covered by the '097 Patent. EX1025, 17:10-21; 22:10-24:4; 27:15-29:11.

Finally, as shown throughout the Petition, the features of the claimed invention were known in the prior art, rendering any purported commercial success irrelevant. *See Ormco Corp. v. Align Tech., Inc.,* 463 F.3d 1299, 1312 (Fed. Cir. 2006).

B. Long-felt but unmet need and unexpected results

Duesenfeld fails to provide *objective* evidence that others tried and failed to safely recycle used batteries, instead parroting the '097 Patent's assertion that prior art techniques had disadvantages. POR, 55-56, citing EX1001, 1:26-30, 2:6-12. Duesenfeld provides no evidence that using low-temperature, low-pressure drying had unexpected results; as demonstrated in the Petition, such results and advantages of using low-pressure and low-temperature drying were well-known in the prior art. *See, e.g.*, Pet., 6-7, 16-22; EX1003, ¶¶64-81.

VI. CONCLUSION

For the reasons set forth in the Petition and in this Reply, the Challenged Claims are unpatentable.

Respectfully submitted,

Dated: May 9, 2025

/s/*Andrew D. Gish*

Attorney for Petitioner, Ascend Elements, Inc.

CERTIFICATE OF WORD COUNT UNDER 37 C.F.R. § 42.24(d)

I, the undersigned, do hereby certify that the attached petition contains 5,586 words, as measured by the Word Count function of Microsoft Word. This is less than the limit of 5,600 words as specified by 37 C.F.R. § 42.24(c)(1).

Dated: May 9, 2025

/s/*Andrew D. Gish*

Attorney for Petitioner, Ascend Elements, Inc.

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE was served by filing these documents through the Patent Trial and Appeal Board End to End (PTAB E2E) as well as providing a courtesy copy via e-mail to the following attorneys of record for the Patent Owner listed below:

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