

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND ELEMENTS, INC.

Petitioner,

v.

DUESENFELD GMBH.

Patent Owner.

Inter Partes Review No. PGR2025-00037

U.S. Patent No. 12,119,463

**PATENT OWNER PRELIMINARY RESPONSE
UNDER 35 U.S.C. § 323 AND 37 C.F.R. §42.207**

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PATENT OWNER’S EXHIBIT LIST

Exhibit Number	Description
Ex. 2001	Declaration of Vani Dantam in support of Patent Owner’s Discretionary Denial Brief
Ex. 2002	Collection of dictionary definitions
Ex. 2003	Ascend Elements, Inc.’s Initial Invalidity Contentions, <i>Duesenfeld GmbH v. Ascend Elements, Inc.</i> C.A. No. 23-1194, dated May 29, 2024
Ex. 2004	Deposition Transcript of Walter van Schalkwijk, <i>Ascend Elements, Inc. v. Duesenfeld GmbH</i> (IPR2024-00948), dated February 6, 2025
Ex. 2005	Petition for Inter Partes Review of U.S. Patent No. 11,050,097, <i>Ascend Elements, Inc. v. Duesenfeld GmbH</i> (IPR2024-00948), dated May 21, 2024
Ex. 2006	Petitioner’s Reply to Patent Owner’s Response, <i>Ascend Elements, Inc. v. Duesenfeld GmbH</i> (IPR2024-00948), dated May 9, 2025
Ex. 2007	Joint Claim Construction Chart, <i>Duesenfeld GmbH v. Ascend Elements, Inc.</i> C.A. No. 23-1194, dated September 6, 2024
Ex. 2008	Merriam-Webster’s Collegiate Dictionary (Eleventh Edition 2012) (excerpt)
Ex. 2009	Deposition Transcript of Volker Spies, <i>URT Umwelt Und Recyclingtechnik GmbH v. Duesenfeld GmbH</i> (IPR2024-00887), dated June 13, 2025
Ex. 2010	United States Patent Application Publication 2008/0050295 (“Uchida”)
Ex. 2011	Declaration of Vani Dantam in support of Patent Owner’s Preliminary Response
Ex. 2012	Declaration of Jan Plöger

Ex. 2013	U.S. Patent No. 11,050,097 [USE ASCEND IPR EX. 1001]
Ex. 2014	Patent Prosecution History for U.S. Patent No. 11,050,097
Ex. 2015	U.S. Patent No. 9,450,277 (“Dunagan”)
Ex. 2016	U.S. Patent No. 5,632,863 (“Meador”)
Ex. 2017	Gao Liu et al., <i>Binder Interactions in the Electrodes of the Lithiumion Batteries</i> , TFUG Conference, February 17, 2009 (“Gao”)
Ex. 2018	U.S. Patent No. 9,780,419 (“Hanisch” or “Hanish ’419”)
Ex. 2019	<i>Duesenfeld GmbH v. Ascend Elements, Inc.</i> , D.I. 62, Order Entering Agreed-upon Claim Construction re: U.S. Patent No. 11,050,097.
Ex. 2020	Institution Decision, <i>Ascend Elements, Inc. v. Duesenfeld GmbH</i> (IPR2024-00948), dated November 22, 2024
Ex. 2021	DE 102012024876 A1 to Electro cycling GmbH (“Electro cycling”) (English)
Ex. 2022	DE 102012024876 A1 to Electro cycling GmbH (“Electro cycling”) (German)
Ex. 2023	Certification of Translation of the Electro cycling Patent
Ex. 2024	U.S. Patent No. 7,198,865 to Sloop (“Ecobat”)
Ex. 2025	WO 2010/149611 A1 to LiMotive Company Ltd. (“LiMotive”)
Ex. 2026	WO 2010/149611 A1 to LiMotive Company Ltd. (“LiMotive”) (German)
Ex. 2027	Certification of Translation of the Limotive Patent
Ex. 2028	Paper 37, <i>Ascend Elements, Inc. v. Duesenfeld GmbH</i> (IPR2024-00948), dated June 11, 2025

I. PRELIMINARY STATEMENT

Pursuant to 37 C.F.R. § 42.207, Patent Owner Duesenfeld GmbH (“Duesenfeld” or “Patent Owner”) submits this Preliminary Response to the Petition for Post Grant Review (“PGR”) of U.S. Pat. No. 12,119,463 (“the ’463 patent”). Paper 2 (“Petition”). Petitioner Ascend Elements, Inc. (“Ascend” or “Petitioner”) challenges the validity of claims 1-14 of the ’463 patent (“Challenged Claims”). The Petition has not established that any of the challenged claims are more likely than not unpatentable.

Petitioner’s challenges premised on Tomioka (Grounds 1-5) fail for the simple reason that Tomioka does not disclose inactivating comminuted material; to the contrary, Tomioka carefully dismantles battery components and removes the solvent hazards prior to any steps that could qualify as comminuting.

Petitioner’s challenges based on Hanisch fail (Grounds 6-9). Petitioner relies solely on the pre-dryer of Hanisch to show “inactivation” of comminuted materials. However, as the Board already preliminarily ruled, there is no evidence that Hanisch’s pre-dryer inactivates the comminuted material.

Petitioner’s indefiniteness challenges (Ground 10) have been preliminarily rejected by the Board. The ’463 patent gives ample guidance to determine when battery material has been “inactivated,” as the Board preliminarily found. The

other two challenged terms, which are specific to dependent claims, are also well-supported by the specification.

Accordingly, Patent Owner requests that the Board deny institution of post grant review. Further, as argued in Petitioner’s previously filed brief regarding discretionary denial (“Discretionary Denial Brief,” Paper 1029), the Board should exercise its discretion to deny the Petition under 35 U.S.C. § 324 and 35 U.S.C. § 325(d), in light of the United States Patent and Trademark Office’s March 26, 2025 Process Memorandum.

II. FACTUAL BACKGROUND OF THE ’097 PATENT

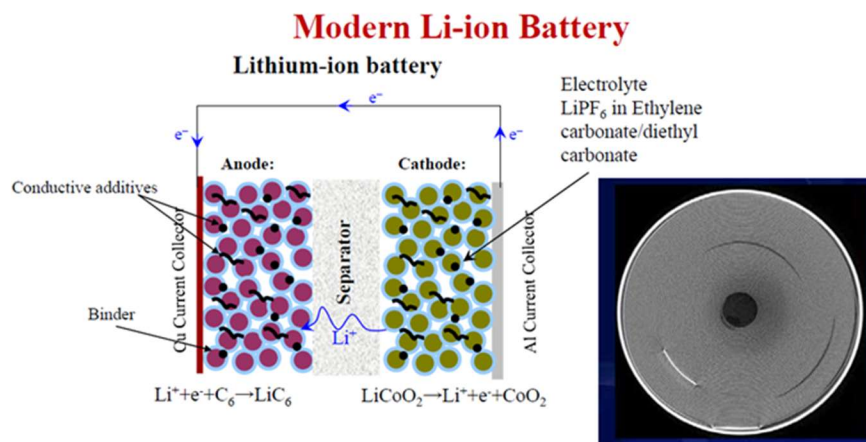
A. The growth of the electric vehicle market in the 2010’s spurred demand for battery recycling.

In the early 2010’s the growing market for electric vehicles (“EVs”) prompted the question of how to safely recycle EV batteries. *See, e.g.*, Ex. 1010, 1:18-21. It was well-understood that there would be ecological and economic benefits if parties could achieve efficient recycling of these batteries and the precious metals contained therein. *See, e.g.*, Ex. 2015, 1:23-25. But the complex design of the EV batteries and the toxic nature of active compounds therein posed challenges in designing a safe and effective EV battery recycling system. *See, e.g.*, Ex. 1010, 1:22-27; Ex. 2015, 2:37-40.

The process of stripping the most precious metals from the battery was energy-intensive and involved hazardous chemicals, calling for centralized recycling facilities. *See* Ex. 2011 (Dantam Decl.), ¶¶48-49; Ex. 2016, 1:16-26. There was a need to be able to safely transport the battery materials and to process the materials to allow the extraction of the metals. Ex. 2011, ¶48; *see also* Ex. 1010, 1:22-27; Ex. 2015, 2:37-40.

B. EV battery chemistry and its hazards.

Each EV battery contains a collection of cells, at the heart of which is a pair of electrodes between which electric current flows. Ex. 2011, ¶¶40-42; Ex. 2017 (Gao) at 5. Figure 1 below is an image of an EV battery. Ex. 2011, ¶¶39-43; Ex. 2017 at 5. At bottom right is a cutaway cross-section of a battery cell, showing the layers of foils and separators comprising the cell. Ex. 2011, ¶39; Ex. 2017 at 5. At left is an illustration of the primary components of the cell. Ex. 2011, ¶39; Ex. 2017 at 5.



Ex. 2017 at 5.

Electrodes. The positive electrode is the cathode, which is typically composed of lithium metal oxides such as lithium cobalt oxide, lithium iron phosphate, or nickel manganese cobalt oxide. Ex. 2011, ¶43; Ex. 2017 at 5. These metal oxides are mounted onto a support, with the aid of a binder, discussed below. During discharge, the cathode support is typically aluminum foil (which reverses during recharging). Ex. 2011, ¶43; Ex. 2017 at 5. The negative electrode is the anode, which is usually made from copper foil. Ex. 2011, ¶43; Ex. 2017 at 5.

Separator. The cathode and anode are separated by a thin, porous membrane called a separator. Ex. 2011, ¶44; Ex. 2017 at 5. Without the separator, the two electrodes would touch, causing a short-circuit. Ex. 2011, ¶44; Ex. 2017 at 5. The separator allows the lithium ions to pass freely between the cathode and anode. Ex. 2011, ¶¶42-43; Ex. 2017 at 5. In order for lithium to travel between the electrodes, the lithium must be dissolved in a liquid solvent. Ex. 2011, ¶42; Ex. 2017 at 5.

Solvent and lithium salt. The solvent typically consists of ethylene carbonate or dimethyl carbonate (among others). Ex. 2011, ¶43; Ex. 2017 at 5. Lithium is typically introduced in the form of lithium hexafluorophosphate (LiPF_6), which dissolves in the solvent, producing the lithium ions. Ex. 2011, ¶43; Ex. 2017 at 5. The lithium salt, dissolved in the solvent, is referred to as the electrolyte, which

transits back and forth between the cathode and the anode as the battery is charged and discharged. Ex. 2011, ¶43; Ex. 2017 at 5.

Binder. The binder, shown in blue in Figure 1 above, holds the metal oxides onto electrode support foils, and is typically a polymer like polyvinylidene fluoride (PVDF). Ex. 2011, ¶44; Ex. 2017 at 5. The binder affixes the precious metal oxides onto the surface of the foils, thereby maintaining the structural integrity of the electrodes. Ex. 2011, ¶¶44-45; Ex. 2017 at 5. The binder is chemically stable and designed to withstand the battery's chemical environment and mechanical stresses over its lifetime. Ex. 2011, ¶44.

Decomposition of binder. To retrieve the metal oxides from the cells during the recycling process, the binder must be decomposed. Ex. 2011, ¶45; *see* Ex. 2016 at Abstract. Due to the stable nature of the binder, a high heat furnace (with typical temperatures of 350-800°C) is used to decompose the binder. Ex. 2011, ¶45; *see* Ex. 2016 at Abstract. Once the binder decomposes, the shredded material is reduced to a black powder. Ex. 2011, ¶45.

The high-heat environment in the decomposition furnace can create unwanted byproducts. Ex. 2011, ¶46. For example, the LiPF_6 conducting salt and the PVDF binder may decompose into toxic gases, including hydrogen fluoride ("HF"), as well as an aqueous form, hydrofluoric acid. Ex. 2011, ¶46; Ex. 1010 at

1:22-27. These compounds can corrode glass and break seals on industrial machinery and can be fatal if inhaled. Ex. 2011, ¶46.

To make these batteries more amenable to storage, transport, and further processing, it was advantageous to comminute (*i.e.*, shred) them. Ex. 2011, ¶47; *see* Ex. 2015 at 3:11-20. Shredding grinds the structures of the cells, making them more compact and facilitating downstream processing. Ex. 2011, ¶47. The shredders break down the batteries into a heterogeneous mixture of fragments, resulting in a stew of various chemical compounds all mixed together. Ex. 2011, ¶47.

By the early 2010's, it was recognized that shredded batteries presented hazards of ignition, explosion, and other chemical reactions. Ex. 2011, ¶¶47-49; Ex. 2021, 2:[0004].

C. Prior attempts to provide for safe handling of battery materials

Many companies tried and failed to develop methods for inactivating lithium-ion batteries for safe storage and transport and further processing. Ex. 2011, ¶50. Companies proposed various additives to mix with the comminuted material to suppress the hazards, including:

- flame retardants; *see, e.g.*, Ex. 2025, 3:6-8;
- aqueous solution or a deactivating powder; *see, e.g.*, Ex. 2021, 5:[0034]-[0035];
- mineral acids; *see, e.g.*, Ex. 1010, 11:13-17;

- brine solutions; *see, e.g.*, Ex. 2015, 5:18-25; *id.*, 5:31-34;
- pressurized solvents; *see, e.g.*, Ex. 2024, 3:3-5.

Ex. 2011, ¶¶50-56.

All these prior art techniques proposed adding foreign substances to the shredded bulk for inactivation. Ex. 2011, ¶¶50-56. But adding foreign substances to the batteries negatively impacted the recycling process. Ex. 2011, ¶56; *see* Ex. 1016, 2:6-12. Moreover, treatment with aqueous solutions risked partial electrolysis, which could lead to hazards from gas formation. Ex. 2011, ¶56.

D. The '463 patent

A key advance of the '463 patent was recognizing that shredded batteries could be inactivated through the drying process itself, by vacuum drying at a maximum pressure of 300 hPa and at a temperature “not more than 80°C.” Ex. 2011, ¶57. The inventors further recognized that avoiding high heat during the drying process suppressed the formation of toxic gases, particularly HF. *Id.*; *see* Ex. 1001, 2:22-29.

The inventors employed this drying process to generate dried, shredded battery material, which was chemically inert and could be safely stored and shipped. Shredded material is rendered “deactivated” (or “inactivated”) after the drying process is complete. Ex. 2011, ¶58; *see* Ex. 1001, 13:56-57 (“The drying of the

comminuted material results in deactivated comminuted material.”); *see also* Ex. 2012 (“deactivated” and “inactivated” are equivalent translations from the same German word). The ’463 patent describes and claims methods and installations that provide an efficient, low-cost way of recovering spent battery material with high purity and rendering it safe for transport by inactivating the comminuted battery material using a vacuum drying process at a low temperature. Ex. 2011, ¶59.

The ’463 patent explains the goal of inactivating the battery material as follows:

The advantage of the invention is that the amount of electrolyte that can be obtained from the comminuted material through drying is such that an electrochemical reaction is no longer possible, or only to a negligibly small extent. In addition, no flammable or explosive gas phase forms above the battery fragments, as the organic carbonates of the electrolyte have been removed [from the fragments]. The comminuted material is therefore largely inert and can be transported safely, especially if it is packed under vacuum.

Ex. 1001, 2:5-14.

Claim 1 of the ’463 patent teaches a method for safely inactivating batteries for secure storage or transport for downstream processing, and recites:

1[pre] A method for treating used lithium batteries, comprising:

- 1[a]** receiving, into a comminuting device, used lithium batteries that include a cathode, anode, separator, and electrolyte comprising a fluorine salt and a solvent, the solvent including an organic carbonate;
- 1[b]** comminuting the used lithium batteries, by the comminuting device, and obtaining comminuted material as a result; and
- 1[c]** inactivating the comminuted material and obtaining inactivated comminuted material as a result,
- 1[d]** wherein the inactivating includes a drying process, comprising drying the comminuted material by removal of organic carbonate from the electrolyte by vaporizing the organic carbonate at a pressure-temperature above a boiling point of the organic carbonate,
- 1[e]** the pressure being not more than 300 hPa, and the temperature being not more than 80° C. and lower than a decomposition temperature of the fluorine salt.

Ex. 1001, 17:17-35.

Claims 2–14 depend from claim 1. *Id.* at 17:36-18:57.

The specification teaches how to obtain inactivated comminuted material that is suitable for storage, transport, and/or further processing. Ex. 2011, ¶¶149-151; Ex. 1001, 2:5-14. The specification emphasizes drying under low pressure, while avoiding high temperatures. Ex. 2011, ¶57; Ex. 1001, 4:11-22 (“The drying occurs under a vacuum. According to its most general configuration, the invention solves the problem by means of a method according to the preamble, wherein the vacuum is selected to be so large that the pressure is below the vapour pressure of dimethyl carbonate at 80° C., in particular at 70° C. However, it is especially beneficial if the drying occurs at a maximum pressure of 300 hPa, in particular a maximum of 100 hPa. At such low pressures, considerable parts of most electrolytes vaporise, especially dimethyl carbonate and ethyl methyl carbonate, and do so at temperatures of less than 80° C.”). These conditions contribute to safe inactivation of electrolytes and associated solvents without forming hydrogen fluoride. Ex. 2011, ¶¶57-60; Ex. 1001, 4:18-25.

The comminuted material is dried until its electrolyte content is low enough to prevent any electrochemical reactions. Ex. 2011, ¶¶58-59; Ex. 1001 at 7:7-9. The inactivated comminuted material is safe for storage, transport, and further processing. Ex. 2011, ¶60; Ex. 1001, 13:58-60.

III. LEGAL STANDARDS

The Board may not institute a post grant review unless the Petition demonstrates that it is more likely than not that at least one of the claims challenged in the petition is unpatentable. 35 U.S.C. § 324(a).

IV. PERSON OF ORDINARY SKILL IN THE ART

Petitioner contends that a person of ordinary skill in the art (“POSITA”) in the field of the ’463 patent would have at least a bachelor’s degree in electrical engineering, materials science, chemical engineering, or an equivalent field, as well as at least 2 to 3 years of academic or industry experience in the recycling or processing of lithium-ion batteries. *See* Pet. at 10-11; Ex. 1003, ¶¶31-35. Patent Owner does not contest this definition of a person of skill in the art. Ex. 2011, ¶¶18-21.

V. CLAIM CONSTRUCTION

Petitioner asks that “drying” have the same meaning as the District Court applied in the co-pending litigation regarding the ’097 patent. Patent Owner has no objection applying the same language that was ordered by the District Court (*i.e.*, that “drying the comminuted material” shall have its plain and ordinary meaning, which is removing at least one solvent from the comminuted material”). Ex. 2019.

Regarding “inactivation,” Petitioner has mischaracterized the record. Pet. at 11-12. Consistently, Patent Owner has contended that the term “inactivated” (and

related forms) should be governed by its plain and ordinary meaning. *See, e.g.*, Ex. 1029 at 9 (offering construction for “inactivated” as: “ordinary meaning, which is rendered safe for transport”).

Patent Owner notes the Board’s prior preliminary construction of “inactivating” to require “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.” Ex. 2020 at 12. Patent Owner respectfully disagrees with this construction because it improperly imports language from the specification to restrict the scope of this term.

For purposes of this POPR, it is sufficient to note that the ’463 patent distinguishes between the terms “drying” and “inactivation.”¹ Ex. 1001 at 13:56-57 (“The drying of the comminuted material results in deactivated comminuted material 44.”). The use of different terms generally connotes different meanings. *See, e.g., Comaper Corp. v. Antec*, 596 F.3d 1343, 1348 (Fed. Cir. 2010) (“There is an inference, however, that two different terms used in a patent have different

¹ The specification uses the terms “inactivated” and “deactivated” interchangeably. In fact, the original specification, in German, uses the word “inaktiviertes,” which was translated in the context of the related ’097 patent as “inactivated” but in the ’463 patent as “deactivated.” Ex. 2012. Because the difference in words is a matter of differing translation only, the word “deactivated” should be understood as “inactivated.” *Id.*

meanings.”). It is improper for Petitioner to seek to collapse the meaning of these two terms, and to suggest that some amount of “drying” should be equated with “inactivating” battery material.

**VI. THE PETITION DOES NOT ESTABLISH THAT ANY
CHALLENGED CLAIM IS MORE LIKELY THAN NOT TO BE
UNPATENTABLE**

The Petition does not establish that any challenged claim is more likely than not to be unpatentable. Grounds 1-9, based on prior art combinations, lack essential elements of the challenged claims, and a POSITA would not be motivated to combine the asserted references. Ground 10 is also unmeritorious, because a person of skill in the art would readily understand the scope of the claims, meaning they are not indefinite. The Board should not institute trial for reasons including, but not limited to:

1. The references, alone or in combination, do not teach “inactivating the comminuted material and obtaining inactivated comminuted material as a result, wherein the inactivating includes a drying process...” (all claims).

2. The references, alone or in combination, do not teach “the pressure being not more than 300 hPa, and the temperature being not more than 80° C. and lower than a decomposition temperature of the fluorine salt” (all claims).

3. In addition to the missing limitations above, no reference asserted for Grounds 1-5 discloses a “comminution device,” comminuting “used lithium

batteries that include... electrolyte,” or “inactivating the comminuted material and obtaining inactivated material as a result” (all claims).

4. No term or limitation of the claims of the ’463 patent is indefinite, as the scope of the claims would be readily understood by a person of skill in the art.

A. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable Based on Tomioka Alone or in Combination with Skill in the Art (Ground 1)

Ground 1 relies on Japanese Patent No. H 9 (1997) – 59530 to Tomioka et al. (“Tomioka,” Ex. 1004, and as translated, Ex. 1005) either alone or combined with skill in the art.

Ground	Claim	Statutory Basis	Prior Art
1	1-3, 8, 10-12	§ 103	Tomioka

But Tomioka is fundamentally different from the system claimed in the ’463 patent, lacking multiple essential elements of all challenged claims, particularly the requirement of *comminuting* the batteries and inactivating *comminuted* battery material.

1. Overview of Tomioka

Tomioka teaches a method of battery recycling, and acknowledges the hazards inherent to comminuting batteries that contain electrolyte solvent. Ex. 2011, ¶¶63-79. To avoid these hazards, Tomioka teaches *dismantling* the

batteries, then removing the solvents, and only then, crushing the remaining battery material, as detailed below. *Id.*, ¶¶69-71

This is in contrast to the method of the '463 patent, which teaches, among other steps, (1) crushing batteries (still containing electrolyte) in a comminution device; and then (2) inactivating that comminuted material to remove electrolyte by drying. *See, e.g.*, Ex. 1001 at claim 1. The core distinction is fundamental: where the '463 patent teaches comminuting batteries while they still contain electrolyte and then drying the comminuted material, Tomioka teaches the opposite approach—carefully removing electrolyte from intact batteries before any mechanical processing occurs. Ex. 2011, ¶¶101-114. Because of the differing order and the difference in the steps of each method, Tomioka and the '463 patent differ in fundamental ways.

a. Tomioka avoids the hazards associated with crushing batteries that contain electrolyte solvents

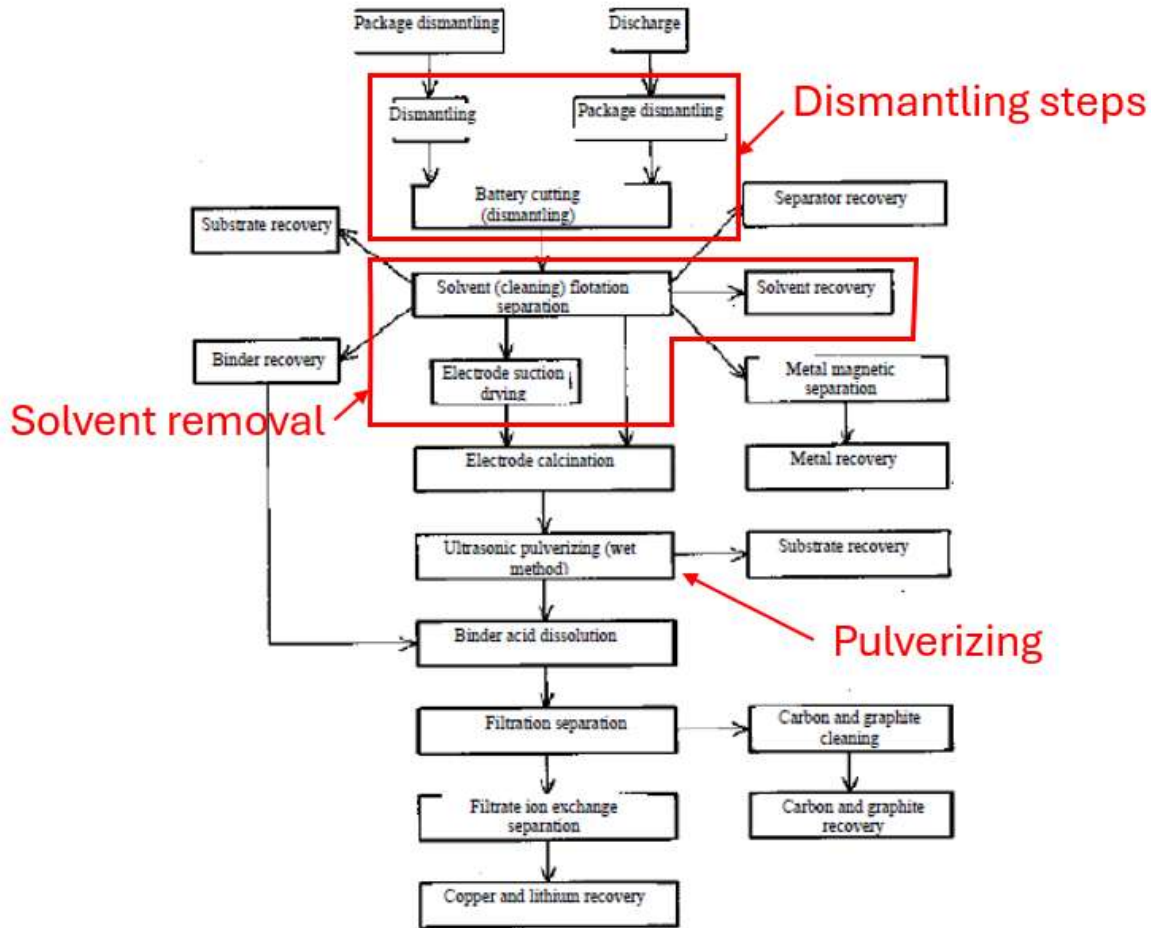
Tomioka recognizes the hazards of working with batteries that still contain electrolyte. Tomioka notes the “significant risk of ignition and explosion” when working with lithium-ion batteries. Ex. 1005 at [0005]; Ex. 2011, ¶65. Accordingly, Tomioka teaches the need to carefully remove the outer resin package and extract the battery materials safely. Ex. 1005 at [0005] (“it is crucial to first efficiently separate and remove the resin package so that the internal battery

units can be extracted safely”); Ex. 2011, ¶66. To do this, Tomioka considers the possibility of “manual disassembly” of the battery packs, but recognizes that “this approach is not suitable for large-scale disposal processing.” Ex. 1005 at [0005]; Ex. 2011, ¶67. Tomioka then considers a comminution-based approach, and *rejects* it as being too dangerous. *See* Ex. 1005 at [0005] (“Alternatively, ***mechanically crushing*** the disposal battery packs collectively, followed by wind separation and specific gravity sorting, could be considered as a mass producing method; however, there is also a ***risk of sparking*** due to residual voltage if the battery units are damaged in the process.”) (emphasis supplied); Ex. 2011, ¶68.

Rather than comminute the batteries, Tomioka devised a mechanical approach to ***dismantle*** the batteries, carefully avoiding damage to the internal components of the batteries. *See id.* at [0028] (setting parameters of dismantling device “in order to avoid damaging the battery body”); [0026] (configuring dismantling device “to be greater than the thickness of the battery body to avoid damaging it”).

Expressly, Tomioka does not comminute the battery body components until the solvents have been removed. Ex. 2011, ¶¶110-114. The following flowchart depicts Tomioka’s invention as comprising dismantling the batteries, followed by removal of the solvents, and thereafter pulverizing the batteries:

[Fig. 1]

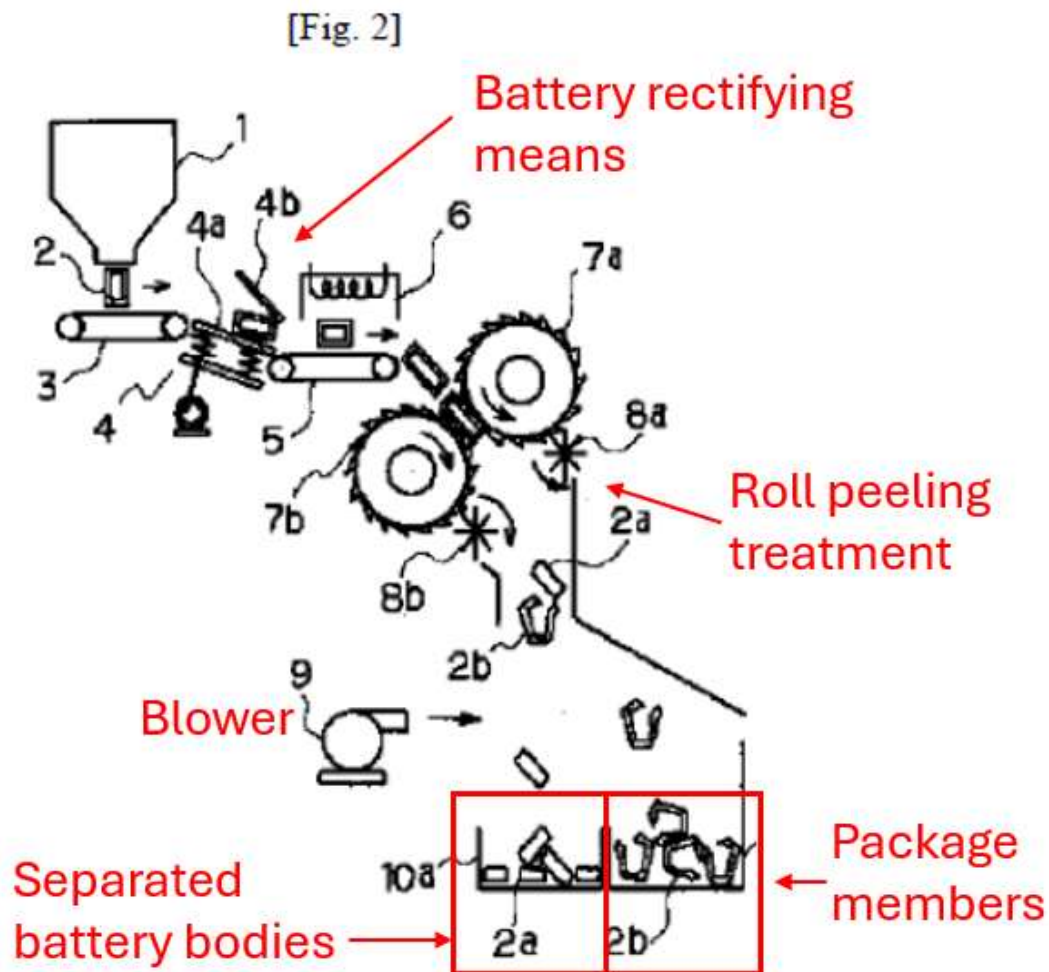


Ex. 1005, Figure 1 (annotated); Ex. 2011, ¶71.

In both independent claims of Tomioka, batteries are dismantled, the battery components are cleaned, and subsequently the batteries are processed either by crushing or peeling and separating the active components. *See* Ex. 1005 at Claim 1 & Claim 2. Throughout Tomioka, the solvents are removed first, prior to anything that could be called “comminuting.” Ex. 2011, ¶¶63-79.

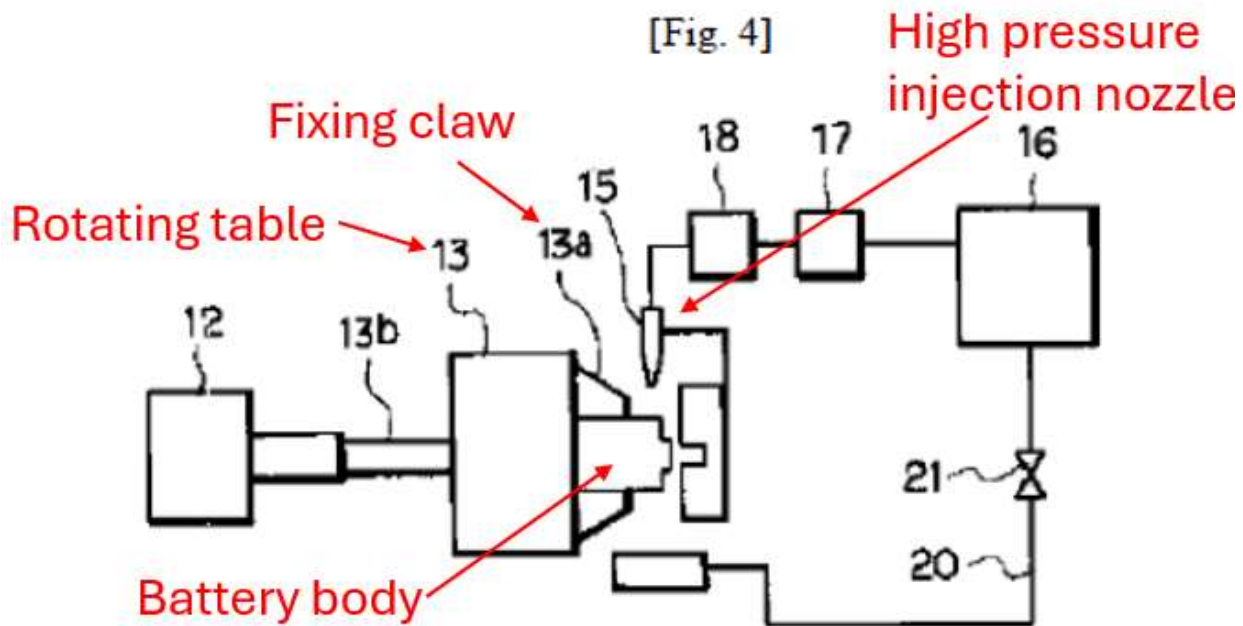
b. Tomioka discloses techniques for selectively destroying the outer casings to allow extraction of the battery bodies, and removal of solvents from the un-comminuted batteries

Rather than comminute the batteries while they contain solvent, Tomioka teaches a device that selectively removes the battery packaging and thereby allows the battery elements to be extracted. Tomioka discloses the following device, which contains a “battery rectifying means” to guide the batteries into a “pair of rollers.” Ex. 1005 at [0044]; Ex. 2011, ¶72. The rollers are precisely spaced, and rotate at different speeds, to conduct a “roll peeling process” that will “selectively destroy” the battery package. Ex. 1005 at [0046]; Ex. 2011, ¶72. The intact battery bodies fall down, while the packages are blown aside by a “air classification blower.” *Id.* at [0046]; Ex. 2011, ¶72.



Id. at Fig. 2 (annotated); Ex. 2011, ¶72.

The separated battery bodies are then carefully dismantled to allow removal of the battery elements. *Id.* at [0448]; Ex. 2011, ¶¶74-75. In the device of Figure 4, the separated battery bodies are mounted on a rotating table, and “an insulated oil is injected from a high-pressure injection nozzle” in order to “cut and open the terminal lead-out side of the battery body”:



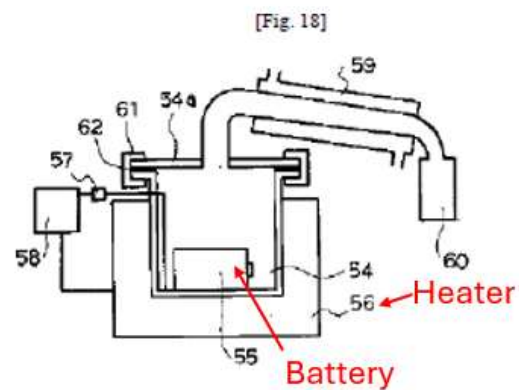
Id. at [0048] & Fig 4 (annotated); Ex. 2011, ¶74.

Following this dismantling, the “battery element part is removed through the cutting/opening section of the battery body.” *Id.* at [0049]; Ex. 2011, ¶75. The removed battery elements are then “immersed in isopropyl alcohol for approximately 10 minutes of shaking cleaning,” and then dried under vacuum. Ex. 1005 at [0049]; Ex. 2011, ¶75. Immersing the battery elements in a liquid is the opposite to drying as taught by the patent.

Tomioka offers alternative embodiments for removing the solvents from the batteries “to enhance the safety of the dismantling operation.” Ex. 1005 at [0088]; Ex. 2011, ¶79. Tomioka emphasizes the need to remove the solvents, to avoid the hazards of the electrolyte solvents causing short circuits during the disassembly

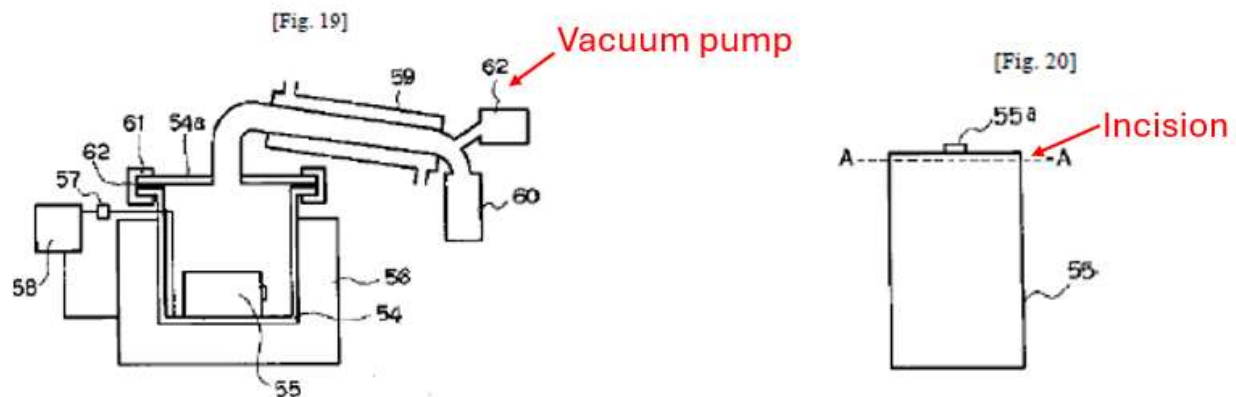
process. *See* Ex. 1005 at [0088] (“These flammable solvents may ignite due to short circuits between the positive and negative electrodes during the disassembly process or generate harmful gases such as hydrofluoric acid; thus, it is desirable to remove and recover them as much as possible.”); Ex. 2011, ¶79.

One of Tomioka’s embodiments to remove the solvents from the batteries is to heat the batteries in a chamber until they rupture. As shown in Figure 18, a battery is placed in a chamber comprising a heater. The chamber is heated to 350°C, and [t]hrough this heating treatment, the safety valve opens under high pressure inside the aforementioned recovered battery 55.” Ex. 1005 at [0091]; Ex. 2011, ¶76. The released vapors are then condensed and collected.



As an alternative to the high-heat treatment, Tomioka proposes a low-temperature embodiment whereby an “incision” is made in the battery, or the battery is cut to remove the battery element, and the solvents are evaporated through vacuum drying. *See* Ex. 1005 at [0093] (“As shown in Fig. 20 from a side view, in the case of a cylindrical secondary battery 55, an incision is made along the A-A line approximately 1 to 4 mm inward on the protruding surface of the positive terminal to partially open it, or the battery element can be extracted by

cutting it open.”); Ex. 2011, ¶. Tomioka is explicit that this cut serves to dismantle of the battery to open the top. Ex. 1005 at [0093] (“In addition, when a portion of the recovered battery is opened by cutting, and the liquid inside the battery is vaporized for condensation and recovery, it can be performed as follows.”); *see also id.* at [0012] (“Furthermore, ‘dismantling’ means cutting the outer casing of the individual battery or the battery pack to extract the electrode element components....”); Ex. 2011, ¶77.



Id. at Figs. 19 & 20 (annotated); Ex. 2011, ¶77. Once this incision, or cut, is made, the battery is introduced into a chamber as shown in Figure 19, applying vacuum. Ex. 1005 at [0092-93]; Ex. 2011, ¶77. The solvents are condensed and recovered.

In none of these embodiments is there a comminution of the battery when it contains electrolyte solvents. To the contrary, the next paragraph in Tomioka teaches that the solvents should be removed prior to further steps for processing of

the battery (*i.e.*, prior to cleaning the separated battery, and delaminating the active material layers), to promote safety:

Similarly to the aforementioned Embodiment 1, by carrying out the extraction and recovery of the solvent within the battery during the separation and recovery of the battery body as well as after the discharge processing and during the battery dismantling process, the working environment and safety for battery dismantling operations are significantly improved. Consequently, subsequent steps such as cleaning treatment of the separated battery dismantling products, heating treatment of the electrode elements, delamination processing of the active material layer, and treatment and recovery of the delaminated active material layer can proceed smoothly, leading to efficient waste processing with good productivity.

Ex. 1005 at [0094]; Ex. 2011, ¶79.

2. **Tomioka does not disclose “receiving, into a comminuting device, used lithium batteries that include... electrolyte comprising a fluorine salt and a solvent, the solvent including an organic carbonate” or “comminuting the lithium batteries, by the comminuting device and obtaining comminuted material as a result” (claim 1[a] and 1[b])**

- a. **The petition does not disclose the comminution steps in all challenged claims**

Petitioner concedes that these elements are not met by Tomioka, arguing only that “Tomioka renders this limitation obvious.” Pet. at 32, 35. But the Petition points to no evidence of a comminution of “used lithium batteries that include... electrolyte.” Instead, Petitioner can only identify that Tomioka discloses *dismantling*, a concept totally distinct from comminuting.

The evidence Petitioner points to in Tomioka only demonstrates dismantling—not comminuting. *See* Pet. at 33 (“Tomioka discloses dismantling batteries, where ‘dismantling means cutting the outer casing of the individual battery or the battery pack to extract the electrode element components...and, if necessary, cutting them into strip-like pieces.’”) (citing Ex. 1005, [0012], [0093]).

But dismantling is not comminuting. Ex. 2011, ¶¶101-114. As the ’463 patent teaches, “dismantling” “means that larger battery systems are dismantled into their smaller subcomponents, the modules or stacks.” Ex. 1001, 4:3-8; *see also* Ex. 2011, ¶¶104-109. According to the ’463 patent, this is a separate step that takes place “prior to [the used batteries] being comminuted.” *Id.* Comminution, on the other hand, means the batteries are “crushed” or “smashed,” or, most expansively, “cut into two parts by means of two blades.”² Ex. 1001 at 2:62-3:9; *see also id.* at 3:33-38 (“mechanically comminuted, for example through cutting, cropping, impact, cutting and/or crushing,” such that “a larger interface is available for the transition of materials into the gas phase.”).

Dictionaries are consistent with the ’463 patent, and offer definitions of “comminuted,” “comminute,” or “comminution” such as “broken into several

² To the extent that the ’463 patent discusses comminuting by “cut[ting] into two parts by means of two blades, it is in the context of a “comminution device” that achieves comminution via one or more methods. Tomioka discloses neither the comminution device, nor the achievement of comminution.

pieces,” “to reduce to minute particles,” “reduction of materials by grinding, cutting, shredding, chopping, etc.,” or “breaking up or grinding into small fragments, [a]lso known as pulverization,” etc. *See* Ex. 2002 (collection of dictionary definitions).

The prior art relied on by Petition also confirms the distinction between dismantling and comminution. LithoRec summarizes the battery recycling process it envisioned, including that “**dismantling** of the battery system follows the primary goal of freeing the cells for further processing,” and then that “[t]his is followed by mechanical **comminution** and separation of the cell and preparation of the active material.” Ex. 1012 at 239 (native page 223) (emphasis supplied).

Because, as Petitioner concedes, Tomioka does not disclose comminution, it relies on its expert to attempt to erroneously equate comminution with dismantling. Petitioner’s expert, Mr. Juzkow, opines that “Figures 19 and 20 show an embodiment of the invention in which the battery is dismantled by cutting, **such that it is comminuted**, and the electrolyte is dried under pressurized conditions.” Ex. 1003 at ¶121 (emphasis supplied).

But neither Petitioner nor Mr. Juzkow explain how Figures 19 and 20 amount to disclosing comminution. At most, Figure 20 shows dismantling the very top of the battery. *See* Ex. 1005 at [0093] (describing the cut being made “approximately 1 to 4 mm inward”) & Fig. 20; Ex. 2011, ¶¶111-114. But Figure

19 depicts that the intact bulk of the battery (potentially minus the dismantled top) is then placed in the vacuum drying chamber. *Id.*, ¶¶77-78. The intact battery, minus the dismantled top, is not “comminuted material.” *Id.*, ¶¶111-112. Neither Petitioner nor Mr. Juzkow supply any definition of “comminution” that would encompass leaving intact the entire body of the battery, minus the dismantled top—nor could they.

Tomioka itself confirms that removing the top off a battery does not amount to “comminution.” Rather, Tomioka correctly characterizes this act as “dismantling.” *See* Ex. 1005 at [0012] (“Furthermore, ‘dismantling’ means cutting the outer casing of the individual battery or the battery pack to extract the electrode element components such as the positive electrode, negative electrode, and separator, and if necessary, cutting them into strip-like pieces.”). Indeed, Tomioka characterizes Figure 20 as “an explanatory diagram to describe another embodiment of the **dismantling** and separation of recovered batteries.” Ex. 1005 at Brief Description of Drawings, RE Fig. 20 (emphasis supplied); *see also id.* at Fig. 1 (in third box down, characterizing step as “Battery cutting (dismantling)”). Petitioner’s strained reading of Tomioka cannot amount to the claim requirement of the ’463 patent of “inactivating the comminuted material ... wherein the inactivating includes a drying process, comprising drying the comminuted

material....” Ex. 1001 at Claim 1. In Tomioka, the thing being dried is the intact battery, potentially minus the dismantled top. Ex. 2011, ¶¶78-79.

Indeed, in the co-pending IPR brought by this Petitioner’s supplier URT, URT’s expert could not point to any comminution in a reference asserted in the URT IPR (Uchida) that, like Tomioka, involved “a method in which the lid body 24 of the container 20 is cut off (severed).” *See* Ex. 2009 (deposition of URT expert Dr. Spies) at 93:21-95:15 (expert testifying he could find no comminution in S232 of Uchida); *see also* Ex. 2010 (Uchida) at Fig. 1 (depicting S232 “Cut Battery Container”); [0090] (describing “step 232” as “a method in which the lid body 24 of the container 20 is cut off (severed)...”); Ex. 2011, ¶114.

This is consistent with the testimony of Patent Owner’s expert, Vani Dantam, who confirms that a person of ordinary skill in the art would not consider an intact battery, minus its dismantled top, to be “comminuted” material. Ex. 2011, ¶¶111-114. Indeed, the point of carefully dismantling the top of the battery in Tomioka is to be able “to extract the electrode element components such as the positive electrode, negative electrode, and separator.” Ex. 1005 at [0012]. Comminuting the batteries would destroy, rather than “extract,” these components, leaving no usable components behind. Ex. 2011, ¶112.

Because the Petition points to nothing more than dismantling, it does not demonstrate that Tomioka discloses any comminution, “comminuting device” or

“receiving, into a comminuting device, used lithium batteries that include... electrolyte comprising a fluorine salt and a solvent, the solvent including an organic carbonate.”

Without this essential limitation of claim 1, which is common to all challenged claims, Petitioner cannot demonstrate it is more likely than not that any challenged claim is unpatentable, and therefore, institution should be denied.

b. Tomioka teaches away from the claimed approach of comminuting batteries that still contain electrolyte solvent

In addition to lacking disclosure of key elements of the '463 patent claims, Tomioka *counsels against* comminuting batteries while they still contain electrolyte solvent. Tomioka considered, and specifically *rejected*, the approach of comminuting solvent-containing batteries in view of the hazards posed. Ex. 1005 at [0005] (“Alternatively, mechanically crushing the disposal battery packs collectively, followed by wind separation and specific gravity sorting, could be considered as a mass producing method; however, there is also a risk of sparking due to residual voltage if the battery units are damaged in the process.”).

Throughout, Tomioka emphasizes the need to avoid damaging the batteries. *See, e.g.*, Ex 1005 at [0029] (“avoid damaging the battery body”); *accord* at [0025]; Ex. 2011, ¶73. To avoid damaging the battery, Tomioka discloses devices to dismantle the batteries with surgical precision. *See, e.g.*, Ex. 1005, Fig. 4 &

[0048] (“Meanwhile, an insulated oil is injected from a high-pressure injection nozzle 15 set at a diameter of 0.35 mm and a stand-off distance of 2 mm, maintained at about 80°C, under a pressure of 3000 kfg/cm² to cut and open the terminal lead-out side of the battery body 2a almost horizontally, enabling the dismantling of the battery element part for removal.”); *see also id.* at Fig 20 & [0093] (“an incision is made along the A-A line approximately 1 to 4 mm inward on the protruding surface side of the positive terminal 55a to partially open it, or the battery element can be extracted by cutting it open.”); *see also id.* at [0012] (teaching the need to dismantle batteries “to extract the electrode element components”).

This careful dismantling of batteries is the opposite of comminution. *See* Ex. 1001 at 2:62-3:9 (explaining that comminution includes whereby “batteries are crushed between two tool surfaces,” or “smashed by striking them with a second movable tool,” or “the batteries are thrown against a wall”). Ex. 2011, ¶¶101-114. Even the most expansive disclosure of “comminuting” in the specification of the ’463 patent (*i.e.*, “a cutting comminution unit whereby the batteries are cut into two parts by means of two blades”) is a rough metal-on-metal treatment prone to the sparking that Tomioka says to avoid. *See* Ex. 1001 at 3:3-5; Ex. 1005 at [0005] (“risk of sparking”); Ex. 2011, ¶¶103 & 110.

Thus, by counseling against comminuting batteries that still contain solvent, Tomioka teaches away from the invention of the '463 patent. *See Pozen Inc. v. Par Pharm., Inc.*, 696 F.3d 1151, 1164–65 (Fed. Cir. 2012) (“A reference teaches away when ‘a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.’”) (quoting *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)). Ex. 2011, ¶¶108-110. Where Petitioner admits that Tomioka does not disclose this limitation, and rather only renders it obvious, the fact that Tomioka teaches away from the method claimed in the '463 patent makes even clearer that Tomioka cannot render obvious the comminution step of the '463 patent claims.

c. Tomioka does not disclose the claimed “comminuting device” [claim 1a]

Nor does Tomioka disclose the claimed “comminution device” of the '463 patent. The comminution unit of the '463 patent “crushes the battery between two tool surfaces” or otherwise reduces the batteries by “striking,” “cutting” or even by being “thrown against a wall”—all of which processes are destructive, and whereby the battery is damaged and destroyed. Ex. 1001 at 2:62-3:9; Ex. 2011, ¶¶103-104.

Petitioner argues, again, that the embodiments of Figures 19 and 20 render obvious the comminution device. But as explained above, these embodiments at most involve slicing off the top of the battery, and do not involve destruction or damage. *See supra*, Section VI.A.1.b; Ex. 2011, ¶¶111-114.

Nor do other examples of “dismantling” cited by the Petitioner, like “cutting the outer casing,” amount to comminuting. *See* Pet. at 33 (citing Ex. 1005 at [0012], [0093]); *see also supra*, Section VI.A.2.b; Ex. 2002.

Finally, the roller system of Tomioka also does not comminute, and therefore cannot be a comminuting device. Pet. at 34-35. That process merely separates the “battery body”—which remains whole and intact—from the “resin package enclosing the battery body.” Ex. 1005, [0025]. This method is designed to “avoid damaging the battery body.” *Id.*, [0026], [0029]; Ex. 2011, ¶¶72-73. This is not comminution, which is explicitly destructive. Ex. 2011, ¶¶103-104; Ex. 2002; Ex. 2011, ¶¶101-114. Thus, Petitioner points to no comminution device in Tomioka.

3. Tomioka does not disclose “inactivating the comminuted material and obtaining inactivated material as a result” (claim 1[c])

Each of the claims of the ’463 patent includes “inactivating ... comminuted material.” Petitioner attempts to provoke a claim construction dispute where there is none, as to the meaning of “inactivating.” Pet. at 11-12. However, the

construction of “inactivating” is not controlling here for the simple reason that Tomioka does not disclose performing any such process on *comminuted material*. As is clear from the plain language of claim 1 (along with the Board’s preliminary construction applied by Petitioner), the ’463 patent requires that inactivation be achieved *with comminuted material*. Ex. 2011, ¶¶102-109. As explained above, Petitioner does not identify comminuted material in Tomioka, but rather “dismantled” battery parts. See Section VI.A.1.b; VI.A.2.a & VI.A.2.b. Likewise, Petitioner only identifies an inactivation step (removing electrolyte) of dismantled, *not comminuted*, batteries. *Id.*

Petitioner’s entire discussion of the “inactivation” limitation describes removal of electrolyte, which it argues a POSITA would have understood as “inactivating.” Pet. at 35-37. Tellingly, it does not discuss at all the state of the material from which the electrolyte is removed, merely stating that the material is comminuted without describing it or explaining how the material meets any definition of comminuted. *Id.*

There is no basis to describe the treated battery material as being comminuted. Petitioner again relies on the combination of the embodiments in Figures 19 and 20. Pet. at 36-37 (citing Ex. 1005, Figs. 19, 20, [0090], [0092]). As explained above, Figure 20 depicts dismantling the very top of the battery, and Figure 19 depicts the result—an intact bulk of the battery less the dismantled top—

being placed the vacuum drying chamber. Section VI.A.1.b; VI.A.2.a & VI.A.2.b.

This material is not comminuted; it is not “ground,” “crushed,” or “pulverized.”

See Ex. 2002; Section VI.A.2.a – VI.A.2.b. Whereas all claims of the ’463 patent recite inactivating comminuted material, there is no disclosure in Tomioka of inactivating comminuted material.

4. Tomioka does not disclose “wherein the inactivating includes a drying process, comprising drying the comminuted material by removal of organic carbonate from the electrolyte by vaporizing the organic carbonate” (claim 1)

Claim 1 also requires that inactivation take place via a “drying process, comprising drying the comminuted material.” Again, this limitation requires that the inactivation (this time, by a specific drying process) be of “the comminuted material.” Again, Petitioner ignores that Tomioka does not teach inactivation (whether by drying or otherwise) of “the comminuted material.”

Petitioner continues to rely on the combination of Figures 19 and 20. Pet. at 37-38. But, as explained above, those embodiments cannot disclose comminuted material, since they relate to largely intact, and at most partially dismantled, battery parts. *See supra*, Section VI.A.1.b; VI.A.2.a & VI.A.2.b; Ex. 1005 at [0012]-[0014]; [0088]–[0093]; Ex. 2011, ¶¶63-79; 101-114. This limitation again specifies that the inactivation-by-drying must be of “the comminuted material.”

Ex. 1001, 17:26; Ex. 2011, ¶¶57-60. Without pointing to comminuted material, Petitioner has failed to show that Tomioka discloses this limitation.

5. Dependent claims 2, 3-8, and 10-12 are also not disclosed by Tomioka

a. Dependent claims 2, 3-8, and 10-12 fail because claim 1 fails

Claims 2-3, 8, and 10-12 depend from the independent claim 1. If an independent claim is not obvious then its dependent claims also cannot be obvious because they all depend from a nonobvious claim. *Ortho-McNeil Pharm., Inc. v. Mylan Lab 'ys, Inc.*, 520 F.3d 1358, 1365 (Fed. Cir. 2008). Thus, Ground 1 of the Petition also fails to disclose these dependent claims.

b. Tomioka does not disclose “comminuting... within a container” (Claim 8)

Petitioner points to nothing in the disclosure of Tomioka that discloses claim 8, where “comminuting ... is performed ... within a container.” Rather, Petitioner circles back to the same arguments it has made regarding claim 1—none of which demonstrates comminution. Pet. at 40-41 (reiterating arguments for limitation 1[a]). In fact, Petitioner explicitly acknowledges that these arguments relate to “dismantling the batteries” and not to comminution. *Id.* at 41. For all the same reasons Petitioners arguments regarding claim 1 fail, its claim 8 arguments fail as well. *See supra*, Section VI.2.

- c. **Tomioka does not disclose “the method of claim 1, wherein ...comminuted material includes components of comminuted material, and at least 90% by weight of the components of the comminuted material have a sieve size that is not more than 50 mm” (Claim 10)**

As to claim 10, Petitioner’s arguments again rely on disclosures in Tomioka that disclose “dismantling,” not comminuting. Pet. at 42. Further, Petitioner relies on testimony of its expert to attempt to fill in gaps in Tomioka, arguing “a POSITA would have understood ‘peeling and separating the active material layer’” to be comminution resulting in sufficiently small sized components. *Id.* (citing Ex. 1003, ¶¶146-147). But, in Tomioka, this step of “peeling and separating the active material layer” takes place long after electrolyte removal. *See* Ex. 1005, [0012] (electrolyte removal part of dismantling); [0016] (describing “peeling the active material layer” several steps later).

The “method of claim 1” involves comminuting “batteries that include ... electrolyte.” Ex. 1001, 17:19-25. To the extent the “peeling and separating the active material layer” step of Tomioka discloses comminution—and to the extent it discloses a small enough component size—there is no electrolyte included in the battery at that step. Ex. 2011, ¶¶63-79; 101-114. A person of skill in the art would not understand Tomioka to disclose comminution of batteries that contain electrolyte of any size, let alone the small size claimed by claim 10. *Id.*

B. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable Based on Tomioka in Combination With Yosuke (Ground 2)

1. Overview of Yosuke

Japanese Patent Application Pub. No. JP2016070284A to Yosuke

(“Yosuke,” Ex. 1007 and, as translated, Ex. 1008) is entitled “Vacuum drying device, vacuum drying system, vacuum drying method and manufacturing method of battery electrodes.” It is directed to battery manufacturing (not recycling), and specifically, to a vacuum drying device for battery electrodes inside a drying furnace with a system for pressure measurement that can control the period of time for drying. Ex. 1008 at Abstract; [0001], [0004]-[0008].

2. Gaps in Tomioka are not filled by Yusuke

Petitioner contends that claim 4 is obvious over Tomioka in view of Yosuke. Claim 4 recites “the method according to claim 1,” and further specifics of the drying process more generally recited there. *See* Ex. 1001, 17:47-58. Likewise, Petitioner relies on Yosuke for certain specifics of drying, including a “controller ... that continuously monitors the progress parameter of pressure interior to the drying device and does not terminate drying until pressure” has sufficiently decreased. Pet. at 46-47. Regardless of whether Yosuke discloses the particular drying requirements recited by claim 4, it does not make up for any of the voids in Tomioka as to the various limitations of claim 1. *See supra*, Section VI.A.A.2; Ex.

2011, ¶¶115-117. Therefore, for the same reasons Ground 1 fails to show any claim is more likely than not unpatentable, Ground 2 also fails.

C. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable Based on Tomioka in Combination With Hayashi (Ground 3)

1. Overview of Hayashi

U.S. Patent No. 9,843,077 to Hayashi (“Hayashi,” Ex. 1010), is entitled “Method for Processing Fluorine-Containing Electrolyte Solution” and is directed to processing an electrolyte solution containing a fluorine compound and an organic compound, and doing so in a way that enables recovery and reuse of the organic compound. Ex. 1010, 1:64-2:11; Ex. 2011, ¶¶54; 91-95. Hayashi teaches heating the electrolyte solution under reduced pressure, allowing the fluorine component to react with calcium so that the component is immobilized as calcium fluoride, and then collecting the organic solvent component left behind. Ex. 1010, 2:24-33; Ex. 2011, ¶¶54; 91-95. According to Hayashi, these teachings enable detoxifying the battery without the need to freeze it or heat it to very high temperatures. Ex. 1010, 9:3-8; Ex. 2011, ¶¶54; 91-95.

Hayashi is concerned with an entirely different problem than that addressed by the ’463 patent, that of with recovering a part of the electrolyte solution so that it can be reused. Ex. 2011, ¶¶54; 91-95. Hayashi is not concerned with, and does not

even address, drying comminuted battery material for the purpose of rendering it safe to transport. *Id.*

2. Gaps in Tomioka are not filled by Hayashi

Petitioner asserts that Tomioka, in view of Hayashi, discloses claims 5 and 9. Pet. at 48-49. Claims 5 and 9 recite the methods of claim 1 with additional specific requirements related to low temperatures and low pressures.³ Ex. 1001, 18:1-4, 18:21-24. Petitioner asserts that Hayashi discloses only these additional requirements for low temperature or low pressure, and does not argue that Hayashi discloses any other element of claim 1, such as the requirement for inactivating comminuted material. Pet. at 48-49. Regardless of whether Hayashi discloses the particular pressure and temperature requirements recited by claims 5 and 9, it does not make up for any of the voids in Tomioka as to the various limitations of claim 1. *See supra*, Section VI.A.2; Ex. 2011, ¶¶118-120. Therefore, for the same reasons Ground 1 fails to show any claim is more likely than not unpatentable, Ground 3 also fails.

³ Claim 9 depends from claim 3, which itself depends from claim 1. Ex. 1001, 17:42-46, 18:21-24.

D. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable Based on Tomioka in Combination With LithoRec (Ground 4)

1. Overview of LithoRec

LithoRec – Recycling Lithium Ion Batteries (“LithoRec,” Ex. 1012) is the “final report of the joint project” of various researchers in 2009-2011. Ex. 1012 at 1-5. This report summarizes considerations for recycling lithium ion batteries including supply and demand considerations (*id.* at 21-23); storage and transport constraints (Ex. 1016 at 32-33); disassembly techniques (*id.* at 1-2); separation of foils from active materials (*id.* at 101); hydrometallurgical processing (*id.* at 110-124); and synthesis of new electrodes from recycled materials (*id.* at 143-155). It also envisioned a future, conceptual pilot plant that discusses the possibility of drying, based on conceptual possibility, not data, since no drying manufacturers responded to their inquiries. *Id.* at 226-227.

2. Gaps in Tomioka are not filled by LithoRec

Petitioner asserts that Tomioka in view of LithoRec renders claims 6 and 7 obvious. Pet. at 49-52. Claim 6 recites further specifics related to the drying process of claim 1, claiming “feeding the comminuted material, through an airlock, into an interior of a drying device.” Petitioner relies on LithoRec to demonstrate the “airlock” of claim 6, but relies on it for nothing as to the “method of claim 1.” Pet. at 49-51. Claim 7 recites details related to the use of a vacuum during drying;

Petitioner appears to rely on nothing in LithoRec to satisfy claim 7 at all. Pet. at 51-52 (not mentioning LithoRec). In any event, Petitioner notes no elements of the “method of claim 1” that LithoRec discloses. Therefore, for the same reasons Ground 1 fails to show any claim is more likely than not unpatentable, Ground 4 also fails. *See supra*, Section VI.A.2; Ex. 2011, ¶¶121-123.

E. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable Based on Tomioka in Combination With Perry (Ground 5)

1. Overview of Perry

Perry’s Chemical Engineers’ Handbook is a reference book comprising over 2,500 pages. Ex. 1015; Ex. 2011, ¶99. While Perry discusses various methods for drying generally, Perry discloses nothing about EV battery recycling. Ex 1015 at Section 12 (“Psychrometry, Evaporative Cooling, and Solids Drying”); Ex. 2011, ¶100.

2. Gaps in Tomioka are not filled by Perry

Petitioner asserts that claims 13 and 14 are rendered obvious by Tomioka in view of Perry. Pet. at 52-56. Claims 13 and 14 recite further specifics of the drying process of claim 1 that includes an agitator, and Petitioner asserts that Perry discloses that agitator. *Id.* But Petitioner does not assert that Perry discloses any element of claim 1, relying fully on Tomioka. However, as explained above, Tomioka lacks essential elements of claim 1. *See supra*, Section VI.A.2; Ex. 2011,

¶¶124-126. Therefore, for the same reasons Ground 1 fails to show any claim is more likely than not unpatentable, Ground 5 also fails.

F. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable Based on Hanisch in Combination With Hayashi (Ground 6)

Ground 6 of the Petition relies on U.S. Patent App. Pub. No. US 2014/0290438 A1 (“Hanisch”) in combination with Hayashi, asserting Hanisch alone discloses certain elements of claim 1. But Hanisch, too, is missing essential elements of claim 1, and Petitioner therefore fails to show that any claim is more likely than not unpatentable.

1. Overview of Hanisch

Hanisch is directed to a multi-step, continuous process for recovery of active materials from lithium-based batteries. Ex. 1021, [0001], [0004]; Ex. 2011, ¶¶80-89. Hanisch teaches comminuting batteries with a “cell crushing device 12” (the “shredder”), where an inert gas tank 22 provides an inert atmosphere (e.g., nitrogen) in the shredder. Ex. 1021, [0044], Fig. 1; Ex. 2011, ¶¶88-89. The comminuted battery material is then fed into a “pre-dryer 28,” which is set to a low temperature, preferably below 80°C. Ex. 1021, [0045]-[0046], Fig. 1; Ex. 2011, ¶88. This pre-dryer evaporates some electrolyte solvents from the battery material. *Id.*, [0025], [0046]; Ex. 2011, ¶88. After the pre-dryer, the comminuted material is fed into a high temperature oven, where the material is heated to a temperature of “at least

350°C” to decompose the binder. Ex. 1021, [0028], [0048], Fig. 1 (#44); Ex. 2011, ¶¶45, 131 & 135. Hanisch does not disclose any vacuum pump connected to either the pre-dryer or the decomposition oven, and it does not disclose the vacuum strength to use in any step of the process. Ex. 1021, Figure 1; Ex. 2011, ¶89.

2. Hanisch in view of Hayashi does not disclose claim 1[c] or 1[d]: “inactivating the comminuted material and obtaining inactivated material as a result, wherein the inactivating includes a drying process...”

The Petition contends that the “first stage pre-dryer” of Hanisch discloses the requirement of “inactivating the comminuted material” and “obtaining inactivated material as a result, wherein the inactivating includes a drying process....”. Pet. at 59-60. The Board has preliminarily (and correctly) rejected this argument made by the same Petitioner in the co-pending IPR. Ex. 2020 at 13.

Petitioner argues that Hanisch discloses the relevant “inactivating” limitations of the claims of the ‘463 patent via “a first stage pre-dryer” that operates “at a temperature ‘below 80° C.’” *See* Pet. at 59-60 (arguing Hanisch discloses claim 1[c] “inactivating the comminuted materials and obtaining inactivated comminuted material as a result”); *id.* at 60-61 (arguing Hanisch discloses claim 1[d] “wherein the inactivating includes drying process, comprising drying the comminuted material by removal of organic carbonate from the

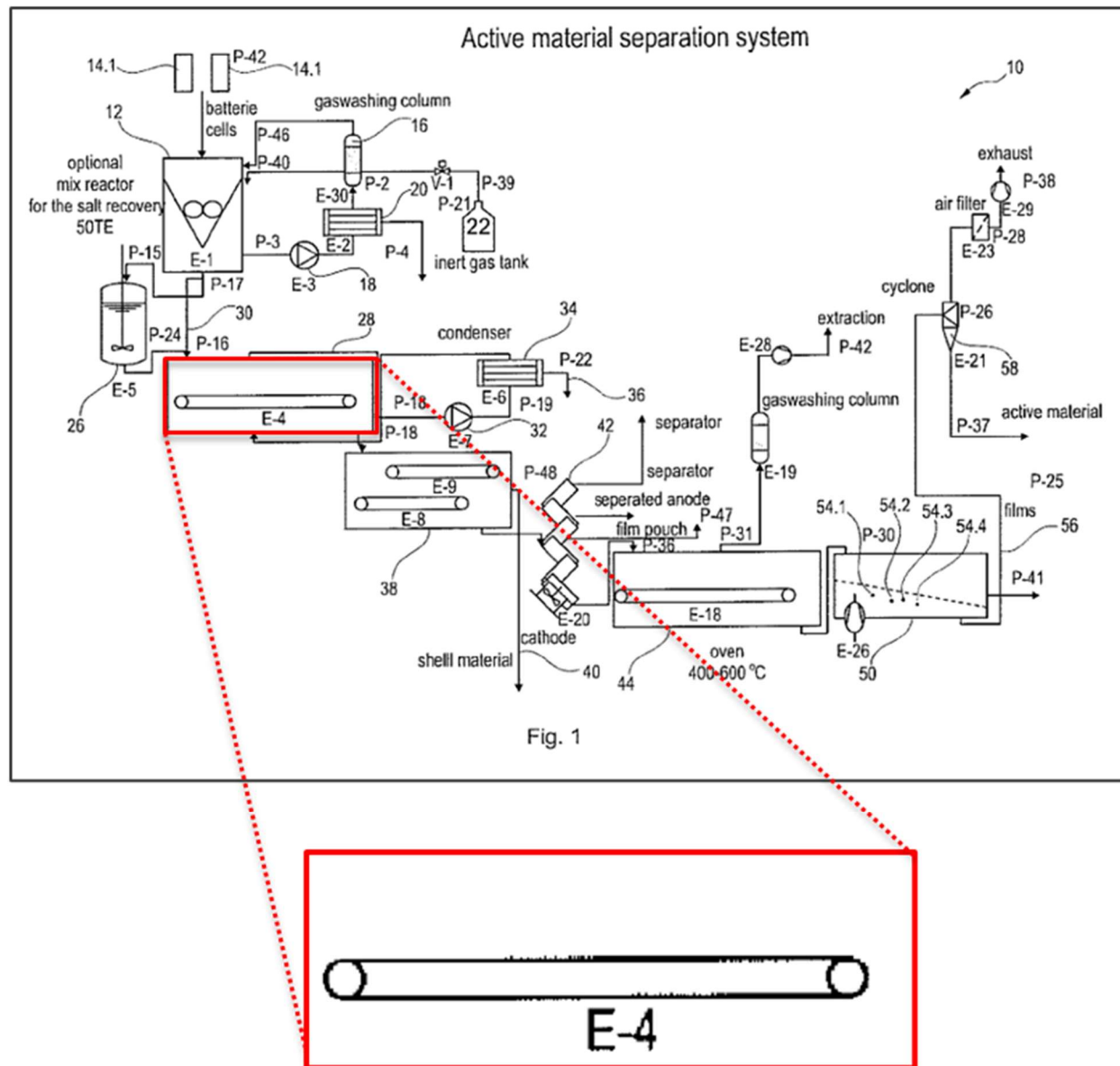
electrolyte by vaporizing the organic carbonate at a pressure-temperature above a boiling point of the organic carbonate”).

A POSITA would have recognized, however, that the pre-dry step taught by Hanisch is *not* intended to inactivate the comminuted material. Ex. 2011, ¶127. Regarding the pre-dry step, Hanisch discloses that “the cell fragments are dried at a drying temperature, so that dry cell fragments and drying vapours are formed, whereby the drying vapours are at least partly condensed,” and further that “[t]his has the advantage that the electrolyte solvent can be retrieved.” Ex. 1021, [0025]; Ex. 2011, ¶127. The focus of Hanisch is electrolyte *recovery*. Ex. 2011, ¶¶83 & 85. Hanisch ’419 is not focused on, and nowhere teaches, *inactivating* comminuted material, for instance to render it safe for transport. Ex. 2011, ¶¶127-130.

Hanisch includes other teachings that, as would have been understood by a POSITA, are inconsistent with drying comminuted material to inactivate it. Ex. 2011, ¶¶80-89 & 127-141. Inactivation is tedious: a POSITA would have understood that as more electrolyte solvent is extracted, the rate of extraction of the remaining solvent goes down. Ex. 2011, ¶134. Therefore, while *some* electrolyte solvent may be retrieved quickly, extracting enough to inactivate the comminuted material and render it safe to transport is both time- and energy-consuming. Ex. 2011, ¶134. The ’463 patent provides various metrics for determining when the inactivation condition is met, including that “[t]he drying is preferably conducted for so long that the

accumulated content of organic carbonates from the electrolyte that are volatile at 80° C. falls short of 3% by volume in the atmosphere above the comminuted material,” and that “it is beneficial if the comminuted material is dried until the electrolyte content of organic components that are volatile at 80° C. has a maximum value of 3% by weight, in particular a maximum of 2% by weight, especially preferably a maximum of 1.5% by weight.” Ex. 1001, 7:30-38; Ex. 2011, ¶149. A POSITA would have understood that these inactivation metrics would take substantial time and energy to achieve. Ex. 2011, ¶¶149-150.

Yet Hanisch, at its pre-dry step, is primarily concerned with speed, and particularly with maintaining a high throughput in extracting electrolyte and separating the active material from the support. Ex. 2011, ¶¶127-131. Hanisch expressly teaches that the method is “preferably performed as [*sic*] continual process and not in batches.” Ex. 1021, [0020]; Ex. 2011, ¶128. Consistent with this disclosure, Figure 1 of Hanisch illustrates the pre-dryer (28) as having a conveyer belt, on which comminuted material would pass through the dryer at a constant rate in a continuous manner:



Ex. 1001, Fig. 1 (annotations added); Ex. 2011, ¶88. A POSITA would have understood the conveyer belt to move material through the dryer continuously, again consistent with processing at high throughput. Ex. 2011, ¶¶128-141.

Finally, Hanisch refers to the device 28 not as a “dryer,” but as a “*pre-dryer*,” which, by its plain language, would have indicated to a POSITA that it was

not intended to thoroughly dry the comminuted material so as to inactivate it, but rather only to perform a short processing step prior to decomposition, intended to recover some amount of electrolyte solvent before that solvent was destroyed during decomposition as described further below. Ex. 2011, ¶¶130-131.

At most, Hanisch states that “dry cell fragments” exit the pre-dryer and enter the separators. Ex. 1004 at 4:19-24. But “dry” does not mean “inactivated.”

Ascend is improperly attempting to collapse the meaning of these two terms, which have distinct meanings in the patent, with inactivation being the result of drying.

Ex. 1001 at 13:56-57; *Comaper*, 596 F.3d at 1348. There are no controls proposed in Hanisch, such as drying times, that would ensure for the material exiting the pre-dryer to be sufficiently dry to quality as “inactivated.” Ex. 2011, ¶¶132-133. Mr.

Juzkow does not dispute that the rate of electrolyte extraction is inversely proportional to the volume of electrolyte extracted, such as that as more electrolyte is extracted in the pre-drying process, it takes longer and longer to extract additional electrolyte. Ex. 2011, ¶134. There would be no reason to incur the cost and complexity of inactivating the material in the pre-dryer, because the material is then transferred to the 350°C decomposition oven where all the solvents would be vaporized. Ex. 2011, ¶131. The description that material is “dry” when it exits the “pre-dryer,” and that it is able to pass through the optional classifiers, does not imply that inactivation is reached. Ex. 2011, ¶¶127-135.

The Petition fails to describe any disclosure in Hanisch of inactivation in the pre-dry step or any disclosure of how much of the electrolyte solvent is extracted in that step (which determines whether the comminuted material is inactivated). Ex. 2011, ¶¶132-133. Further, as shown above, a POSITA would have understood that the pre-dry step does *not* extract a sufficient amount of electrolyte solvent to inactivate the comminuted material. Ex. 2011, ¶¶132-135. The Petition therefore fails to establish that these claim elements are taught by the pre-dry step in Hanisch. Ex. 2011, ¶¶127-135.

Moreover, these arguments were already presented to the PTAB in a co-pending IPR between the same parties regarding a related patent, against which the '463 patent is terminally disclaimed. That proceeding, *Ascend Elements, Inc. v. Duesenfeld Gmbh*, IPR2024-00948, relates to U.S. Patent No. 11,050,097, which includes similar claim terms related to the terms “inactivate” or “inactivated.” Petitioner concedes these claim terms from the '097 patent are related to the “inactivate” terms in the '463 patent, citing to the claim construction proceedings for the '097 patent IPR for “inactivating” terms in its PGR petition related to the '463 patent. Pet. at 11-12, 72-73

In the IPR, as to the inactivating step of the '097 patent, the Board summarized and preliminarily rejected Petitioner's argument that Hanisch's pre-dryer inactivated the battery material. The Board noted that “Petitioner argues that

Hanisch⁴ discloses inactivating the comminuted material ... by teaching low-temperature drying. In particular, Petitioner argues that Hanisch teaches this by disclosing ‘pre-dryer 28’....” Ex. 2020 at 11-13. This is exactly the argument that Petitioner makes here—that “inactivation” takes place in the “first stage pre-dryer.” Pet. at 59-60.

The PTAB preliminarily rejected this argument, finding that the pre-dryer removed only some amount of electrolyte, but did not remove “sufficient vapor” to inactivate the battery material:

Petitioner argues that Hanisch discloses inactivating the comminuted material by drying in two of its process steps. First, Petitioner argues that Hanisch teaches this limitation by teaching low-temperature drying. Pet. 29-30 (citing Pet. 25-26). In particular, Petitioner argues that Hanisch teaches this by disclosing “pre-dryer 28 [that] comprises a circulation pump 32 and a condenser 34 for condensing electrolyte, which can be removed via the pipe 36.” AZ. at 26 (quoting Ex. 1004, 5:54-63). Petitioner also argues that Hanisch “claims this limitation in dependent claim 5,” which includes “the steps of: drying the solid cell fragments at a drying temperature to form dry cell fragments and drying vapours and at least partly condensing the drying vapours to retrieve electrolyte solvents.” *Id.* (quoting Ex. 1004, 8:3-10). ***On the present record, we do not find this argument persuasive. Although Hanisch teaches the removal of some volatile electrolyte through heating and condensing the resulting vapor in its low-temperature drying process, Petitioner does not direct us to evidence that tends to show that Hanisch’s low-temperature drying removes sufficient vapor to make electrochemical reactions impossible or only possible to a negligibly small extent.*** Ex. 1004, 5:54-63, 8:3-10.

⁴ The version of Hanisch cited in the IPR is the issued patent (“Hanisch ’419,” Ex. 2018), while the version of Hanisch cited in the PGR here is the application that issued into the patent cited in the IPR (Ex. 1004).

Ex. 2020 at 12-13 (emphasis added).⁵

Thus, in the IPR, the Board found that Petitioner had not presented evidence that Hanisch disclosed inactivation in the pre-dryer.⁶ Petitioner ignores this determination by the Board. Petitioner repeats the same argument, citing the same evidence, here, with no attempt to overcome the Board's own ruling in the IPR.

Petitioner presented the same evidence in both the IPR and the PGR. In the PGR, Petitioner relies on the published application, and in the IPR, on the issued patent. But the substance of the cited material in the Hanisch published application (¶0025) and in the issued Hanisch patent (5:54-63, 8:3-10) are entirely overlapping. *Compare* Pet. at 59-63 *with* Ex. 2020 at 12-13. As shown below, all of the material within that citation in Hanisch is directly represented within the evidence the Board cited to in the IPR—and which was unavailing to demonstrate

⁵ The exhibit 1004 in the quotation is Ex. 2018 in this proceeding.

⁶ The Board did find that Hanisch disclosed inactivation in a different structure—the “high temperature drying process.” *See id.* at 13-15 (IPR institution decision). There, the Board credited Petitioner's argument that inactivation might take place in the oven of Hansich with a decomposition temperature of between 400 and 600°C. *Id.* at 13. But Petitioner does not point to the decomposition oven here. *See* Pet. at 59-61. Nor could it, because that decomposition oven indisputably operates far above the required temperature claimed in the '463 patent of 80°C or lower. *See id.* at 60-61 (making arguments that inactivation takes place below 80°C); *see also* Ex. 1001, 17:33-34 (claim 1 reciting “the temperature not being more than 80°C”).

inactivation, with the color coding representing the three substantive points contained in the PGR citation:

Hanisch, Ex. 1021 (PGR)	Hanisch, Ex. 2018 (Ex. 1004 in related IPR)
0025. The method preferably comprises the step that, before heating the cell fragments up to the decomposition temperature, the cell fragments are dried at a drying temperature, so that dry cell fragments and drying vapours are formed, whereby the drying vapours are at least partly condensed. This has the advantage that the electrolyte solvent can be retrieved. It is therefore advantageous for the drying temperature to be below 100° C., in particular below 80° C.	5:54-63: A pre-dryer 28 is set up in the direction of material flow behind the cell crushing device 12, which is connected to the cell crushing device 12 via a pipe 30. During crushing of the galvanic cells 14, resulting cell fragments arrive at the pre-dryer 28 via the pipe 30. Here there is a dry temperature T_t of preferably $T_t=80^{\circ}\text{C}$. The pre-dryer 28 comprises a circulation pump 32 and a condenser 34 for condensing electrolyte, which can be removed via the pipe 36. The pre-dryer 28 is designed to be gas-proof and is flushed with inert gas by the circulation pump 32. 8:3-10: 5. The method according to claim 1, further comprising the steps of: drying the solid cell fragments at a drying temperature to form dry cell fragments and drying vapours and at least partly condensing the drying vapours to retrieve electrolyte solvents before heating the solid cell fragments up to the decomposition temperature.

Thus, the only argument that Petitioner makes for the two “inactivating” limitations of independent claim 1 (from which the remainder of the challenged

claims depend) relies on an argument not only already presented to the Office but one that was preliminarily (and correctly) rejected. Petitioner does not acknowledge that it already and unsuccessfully raised this argument with the Board.

Petitioner points to nothing in Hayashi that fills this gap. Petitioner points only to Hayashi's teaching regarding the "Atmospheric Pressure Conversion Temperature" for various pressures. Pet. at 60-61. This says nothing about whether a POSITA would understand Hanisch's pre-dryer to disclose inactivation. Ex. 2011, ¶¶127-135.

**3. Hanisch in view of Hayashi does not disclose claim 1[e]:
"the pressure being not more than 300 hPa, and the
temperature being not more than 80° C. and lower than a
decomposition temperature of the fluorine salt."**

There is no dispute that Hanisch lacks a disclosure of the vacuum pressure to be used in its system. Petitioner looks to Hayashi to fill that evidentiary gap, to suggest that a POSITA would understand that the system of Hanisch should be run at a pressure of below 300 hPa. However, this combination is improper.

Hayashi is directed to treating a single, un-comminuted battery cell at a time. Ex. 1010 at Fig. 1 & 4:24-36; Ex. 2011, ¶¶91-95. Hayashi deliberately provokes the release of HF by removing the safety seal of a

battery, and then adding water to hydrolyze the LiPF_6 . Ex. 1010 at 5:19-46; Ex. 2011, ¶¶54, 92. This toxic gas is generated in a closed chamber, and withdrawn by use of vacuum pressures to remove the hazard. Ex. 1010 at 4:24-5:3; the recited temperature and pressure values of Hayashi are directed at the withdrawal of the solvents and liberated HF in the context of this single-cell treatment chamber. Ex. 1010 at 4:24-5:3; Ex. 2011, ¶92.

Hanisch, by contrast, is a processing line that is preferably operated in a continuous manner. Ex. 1021 at [0020] (“The method according to invention is preferably performed as continual process and not in batches.”); Ex. 2011, ¶¶134, 138. Hanisch is not working with single battery cells, and is not a closed chamber, like in Hayashi. Ex. 1021 at [0046] & Fig 1. Hanisch’s pre-dryer is attempting to extract some quantity of electrolyte solvent from the shredded batteries before they are conveyed to the decomposition furnace. Ex. 1021 at [0046] & [0048]; Ex. 2011, ¶¶130-131. Hanisch discloses no mechanism that would allow for the shredded battery material to pass through the system while maintaining the pre-dryer under vacuum levels such as those taught by Hayashi. *Id.*, ¶138. There are no rotary valves or other mechanisms disclosed in Hanisch that would allow for vacuum levels as strong as those taught in Hayashi to be applied to the pre-dryer. Ex. 2011, ¶¶136-138.

In a system such as that disclosed by Hanisch, a slight vacuum could be applied and still allow material to enter and exit the pre-dryer. Ex. 2011, ¶138. In the co-pending IPR, Petitioner previously relied on the Meador reference, which taught that a slight underpressure of 12-34 hPa could be applied in a system such as Hanisch's. Ex. 2016; Ex. 2005; Ex. 1019 at 31-35. Discovery confirmed that Meador's pressure levels represented a negative pressure relative to ambient. Ex. 2004 at 68:1-73:4; Ex. 1019 at 31-35. Thus, the most pertinent prior art (and prior art relied on by Petitioner) confirmed that in the context of a conveyor system like Hanisch, a slight underpressure of only 12-34 hPa relative to ambient would be appropriate (*i.e.*, an absolute pressure of about 979 hPa to 1001 hPa, if at sea level). Ex. 2011, ¶¶136-143.

Petitioner does provide any explanation of how the stronger vacuum levels of Hayashi could be applied to the conveyor system of Hanisch. Ex. 2011, ¶141. Rather, the two systems are fundamentally incompatible. Ex. 2011, ¶¶136-141. A person of ordinary skill in the art would not have been motivated to apply the pressure levels from Hayashi's closed chamber system to the conveyor system of Hanisch, particularly when Hanisch is not attempting to neutralize hazards like in Hayashi. Ex. 2011, ¶¶141. Rather, if any underpressure would be applied to the pre-dryer of Hanisch, it would be

a slight underpressure, like that in Meador, in the range of about 12-34 hPa, relative to ambient. *Id.*

4. Dependent claims 2, 3, 5, and 9-12 are also not disclosed by Hanisch in view of Hayashi

a. Dependent claims 2, 3, 5, and 9-12 fail because claim 1 fails

Claims 2-3, 8, and 9-12 depend from the independent claim 1. If an independent claim is not obvious then its dependent claims also cannot be obvious because they all depend from a nonobvious claim. *Ortho-McNeil Pharm., Inc. v. Mylan Lab 'ys, Inc.*, 520 F.3d 1358, 1365 (Fed. Cir. 2008). Thus, Ground 6 of the Petition also fails to disclose these dependent claims.

b. Hanisch does not disclose claims 2, 3, or 5 because the method of claim 1 cannot take place in the pre-dryer

Petitioner asserts the claims 2, 3, and 5 are disclosed by Hanisch. Pet. at 63-65. In each case, those claims add further specifics to the method of claim 1, as related to inactivation and drying. Ex. 1001, 17:36-46, 18:1-4. In each case, the Petitioner argues that these claims are disclosed by the pre-dryer phase of Hanisch. Pet, 63-65. But, as explained above, and as previously determined by the Board, Hanisch does not disclose inactivation at the pre-dryer. *See, supra*, Section IV.F.2. Because Hanisch does not disclose the more general inactivation process at the pre-dryer, it cannot disclose a more specific type of that process either. Ex. 2011, ¶142-143. Thus, Petitioner has failed to show that Hanisch discloses claims 2, 3, or 5.

G. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable Based on Hanisch in Combination With Yosuke, Perry, and/or LithoRec (Grounds 7-9)

1. The Petition does not remedy gaps in claim 1 via Yosuke, Perry, and/or LithoRec

For Grounds 7-9, Petitioner builds on its combination of Hanisch and Hayashi by further adding Yosuke, LithoRec, and/or Perry to attempt to disclose certain dependent claims:

Ground	Claim	Statutory Basis	Prior Art
7	4	§ 103	Hanisch in view of Hayashi and/or Yosuke
8	6	§ 103	Hanisch in view of Hayashi and LithoRec
9	7, 13, 14	§ 103	Hanisch in view of Hayashi and LithoRec and/or Perry

In each case, Petitioner makes no further arguments as to claim 1, such that Yosuke, LithoRec, and Perry are only asserted to disclose the additional limitations of the various dependent claims. Pet., 67-71. Therefore, for the same reasons Ground 6 fails as to claim 1, Grounds 7-9 also fail; Ex. 2011, ¶144.

H. The Petition Does Not Demonstrate Any Claim Is More Likely Than Not Unpatentable for Indefiniteness (Ground 10)

Petitioner argues that three separate claim terms render some or all the claims of the '463 patent indefinite. But, as the Board has already preliminarily determined in the first case, none of these terms are indefinite, as it is abundantly clear that each of these three claim terms, “viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention

with reasonable certainty.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 910 (2014).

1. The Board has already determined that the “inactivating” claim terms are not indefinite

The first clause of the ’463 patent that Petitioner seeks to find indefinite is stated in independent Claim 1, which recites “inactivating the comminuted material and obtaining inactivated comminuted material as a result.” Ex. 1001 at Claim 1; Pet. at 71. This claim clause is nearly identical to the following claim phrase found in the ’097 patent: “inactivating the comminuted material such that an inactivated comminuted material is obtained.” Ex. 1016 at Claim 1. As Petitioner acknowledges, these two patents (and “inactivating” claim terms) are closely related, and the ’463 patent was terminally disclaimed back to the expiration date of the ’097 patent. Pet. at 72.

In co-pending IPR2024-00948, the Board has already evaluated Petitioner’s argument that “a POSITA would not have understood ... the outer boundaries of when comminuted material is considered ‘inactivated.’” Ex. 2028 at 15-16. The Board preliminarily determined that the “inactivating” terms of the ’097 patent are not indefinite. Additionally, the Board noted that it had preliminarily construed the “inactivating” terms in its prior institution decision (where no indefiniteness

argument had been raised)⁷ and that it maintained that preliminary construction, even given Petitioner's assertions of indefiniteness. *Id.* Further, the Board made clear that the fact that its construction was different from Patent Owner's proposal did not render the "inactivating" terms indefinite. *Id.* at 16. The Board specifically found that the "inactivating" terms were "term[s] of degree" that comported with Federal Circuit precedent and which "provide enough certainty to one of skill in the art" such that they are not indefinite. *Id.* at 16-17. The arguments Petitioner makes here in the PGR are the same as those it made in the co-pending IPR, and should again be rejected for the same reasons. Pet., 71-73.

Petitioner's argument is based on the expert's opinion alone that "[t]he meaning of this step is not reasonably clear because a POSITA would not understand from the claims or the specification the particular point at which the comminuted material is 'inactivated.'" Ex. 1003, ¶216. Petitioner's expert opines that the various metrics for completion of drying would be "confusing" to one of skill in the art. *Id.*, ¶218. Not only has the Board preliminarily rejected this unsupported opinion, it was right to do so under the law.

It is well established that patent claims must "inform those skilled in the art about the scope of the invention with reasonable certainty." *Nautilus*, 572 U.S. at

⁷ Petitioner also failed to press the indefiniteness issue in the district court, where it agreed to constructions of the "inactivating" terms of the '097 patent. Ex. 2007.

910. The definiteness of the claim language is to be evaluated “viewed in light of the specification and prosecution history.” *Tinnus Enters., LLC v. Telebrands Corp.*, 733 F. App’x 1011, 1020 (Fed. Cir. 2018). In *Tinnus*, the Federal Circuit reversed the PTAB’s finding of indefiniteness in a PGR proceeding, ruling that the term “substantially filled” was definite, particularly in view of the guidance provided by the specification. *Id.* at 1019 (“These embodiments serve to inform a person of ordinary skill of the objective boundaries of the claimed invention.”).

The term “inactivating” (and the related phrases containing this term) are not indefinite. The term “inactivating” is appropriately governed by its plain meaning, as Patent Owner has consistently maintained. Ex. 1029 at 22 (page 9); Ex. 2011, ¶¶145-156.

Moreover, the specification thoroughly describes inactivation, including its relationship to drying, in such a way that a person of skill in the art would understand how to determine inactivation. Ex. 2011, ¶¶145-156. The specification makes clear that drying is the means (a process) by which inactivation (a result) is achieved. *See, e.g.*, Ex. 1001 at 13:56-58 (“The ***drying of the comminuted material results in deactivated comminuted material 42***, which is fed into a filling device **44** (emphasis added)); *see also* Ex. 2012 (explaining that “deactivated” is the translation of the word “inaktiviertes,” which was translated in the context of the related ’097 patent as “inactivated” and should be read to mean “inactivated”

here); Ex. 2011, ¶151. Further, the claim language itself makes clear that "inactivating" (*i.e.*, obtaining a result of inactivated material) "includes a ***drying process***." *Id.* at 17:26-28; Ex. 2011, ¶149. The specification provides various metrics for determining if comminuted material has been sufficiently dried to become inactivated:

- "A method is preferred in which the drying of the comminuted material is only completed if, after the completion of the drying process, no flammable or explosive gas mixture can form above the comminuted material that has been filled [in the container]..." Ex. 1001 at 6:51-7:6 (teaching additional parameters for ascertaining completion of drying);
- "The comminuted material is preferably dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible." *Id.* at 7:7-20 (teaching additional parameters);
- "The comminuted material is preferably dried for so long that a 50 kg amount of comminuted material, which is contained in a compacted form in a 50 litre drum, does not experience a build-up of heat..." *Id.* at 7:21-29 (teaching additional parameters);
- "It is beneficial if the comminuted material is dried until the electrolyte content of organic components that are volatile at 50°C has a maximum value of 3% by weight..." *Id.* at 7:30-34 (teaching additional parameters);

- “The drying is preferably conducted for so long that the accumulated content of organic carbonates from the electrolyte that are volatile at 80°C falls short by volume in the atmosphere above the comminuted material.” *Id.* at 7:35-38; and
- “[T]he drying is conducted until the dimethyl carbonate content is lower than 4% by volume....” *Id.* at 7:39-42 (teaching additional parameters).

These metrics are illustrative to teach a person of skill parameters that may be observed to determine if comminuted material has been rendered inactivated through the drying process. Ex. 2011, ¶150-151. These metrics are not mandatory, and they are not limiting on the claim scope. *Id.*, ¶149. Patent Owner has consistently taken this position throughout all proceedings.

A person of skill in the art would understand “inactivation” to be achieved when a central problem addressed by the patent is solved—rendering the comminuted material safe for storage or transport or further processing, which each of the various metrics cited would do. *See, e.g.*, Ex. 1001 at 13:56-60; Ex. 2011, ¶149. That the specification describes multiple ways to identify inactivation does not mean that a POSITA could not understand when material is inactivated—rather, it helps clarify what inactivation means. Ex. 2011, ¶¶145-156. Petitioner complains that that the specification provides guidance on “how long to dry comminuted material but not how a POSITA would know that comminuted

material has reached a point of inactivation.” Pet. at 72. But, as explained, these are one and the same: how long to dry is in fact how to arrive at the point of inactivation. Ex. 2011, ¶¶148-151.

Petitioner attempts to argue that the teaching of these various metrics somehow renders the term “inactivating” indefinite. Pet. at 73. However, Petitioner ignores the governing standard. Petitioner has failed to show any inconsistency among these metrics that would render a POSITA unable to determine whether the comminuted material was sufficiently dry to be “inactivated.” *See Janssen Pharms., Inc. v. Teva Pharms. USA, Inc.*, 97 F.4th 915, 937 (Fed. Cir. 2024) (rejecting indefiniteness argument because “Teva did not present evidence that different measurement techniques would typically yield different particle-size measurements of paliperidone palmitate”) (citing *Takeda Pharm. Co. v. Zydus Pharms. USA*, 743 F.3d 1359, 1366–67 (Fed. Cir. 2014) for proposition that the “mere possibility of different results” is insufficient for indefiniteness).

Moreover, Petitioner complains that the term is indefinite because “‘inactivation’ is not limited to the drying process.” *Id.* at 71. But this attempts to create an issue where there is none. The specification makes clear that the result of inactivation is necessarily arrived at by drying, but that there might also be other steps attendant to the inactivation-by-drying process. *See, e.g.*, Ex. 1001 at 11:33-

35 (“The battery processing installation preferably has an airlock between the comminution unit and the deactivation device, especially the drying device”); 13:15:-17 (“Comminuted material **24** is produced during the comminuting; the material is fed into an inactivation device in the form of a drying device **26**.”); 13:56-58 (“The drying of the comminuted material results in deactivated comminuted material **42**, which is fed into a filling device **44**.”); Ex. 2011, ¶151.

A person of skill in the art would readily understand the scope of the “inactivation” terms and the Petitioner has failed to show it is more likely than not than any claim of the ’463 patent is unpatentable for indefiniteness.

2. There is sufficient antecedent basis for “the agitator” of claim 7 such that it is not indefinite

Petitioner argues that “the agitator” of claim 7 lacks an antecedent basis, since neither claim 1 nor claim 6 (from which claim 7 depends) recite “an agitator,” again based on disputed expert testimony and without citing any case law. Pet. at 74-75. But, applying the correct legal standard, even if Petitioner is correct that the agitator of claim 7 lacks explicit antecedent basis, “the lack of an antecedent basis does not render a claim indefinite as long as the claim ‘apprises one of ordinary skill in the art of its scope and, therefore, serves the notice function required by [§ 112 ¶2].’” *In re Downing*, 754 F. App’x 988, 996 (Fed. Cir. 2018) (quoting MPEP § 2173.05(e)). Instead, “[w]hether this claim, despite lack of

explicit antecedent basis for [the specific claim term], nonetheless has a reasonably ascertainable meaning must be decided in context”—and this contextual inquiry into indefiniteness “focuses on whether those skilled in the art would understand the scope of the claim when the claim is read in light of the specification.”

Energizer Holdings, Inc. v. Int’l Trade Comm’n, 435 F.3d 1366, 1370 (Fed. Cir. 2006). Here, the specification supplies sufficient antecedent basis by implication: “the agitator” of claim 7 is “the agitator” described in the specification. *See Slimfold Mfg. Co. v. Kinkead Indus., Inc.*, 810 F.2d 1113, 1116 (Fed. Cir. 1987) (antecedent basis may be supplied by implication including by reference to specification); Ex. 2011, ¶¶152-153.

A POSITA reading claim 7 would have no trouble understanding “the agitator” recited therein, since the specification describes in great detail the structure, attributes, and function of the agitator of the ’463 patent. *See* Ex. 1001 at 7:54-10:13 (describing the agitator of the preferred embodiment); Ex. 2011, ¶¶152-153. In particular, the specification makes clear what the purpose of the agitator is: “[t]he agitator serves in particular to prevent blockages and/or thermal energy from entering the comminuted material and/or to separate the layered foils, meaning that the vaporisation of the electrolyte is not sterically hindered.” *Id.* at 7:58-62; Ex. 2011, ¶152. .

The specification also describes the structure of the agitator: “[i]t is beneficial if the agitator has at least one stirring blade, which is arranged such that it moves the comminuted material upwards.” *Id.* at 8:1-3; *see also id.*, 10:50-54 (“It is beneficial if the drying device comprises an agitator, for example an anchor agitator or a rod agitator, whose stirring rods can be arranged transversely to an agitator shaft. Alternatively or additionally, the agitator is an external agitator that moves the dryer as a whole.”); *id.* at 13:51-55 & Fig. 1 (describing and depicting “agitating with an agitator **41**, such as an anchor agitator or a rod agitator with rods arranged perpendicular to the agitator shaft”); 15:5-28 & Fig. 4 (similar); Ex. 2011, ¶¶152. .

The specification further describes the metrics for the agitator’s power output: “[t]he agitator preferably exhibits a power output of at least 1 kW per cubic metre of drying volume.” *Id.* at 7:67-8:1; *see also id.* at 8:14-15 (“The agitator preferably has a power output of at least 1 kilowatt per cubic meter of volume of the drying device.”); Ex. 2011, ¶¶152-153.

Additionally, the specification describes the relationship of the agitator to the drying process: “The agitator is preferably used to supply at least 35%, in particular at least 50%, of a vaporisation heat required for the drying of the comminuted material. In other words, in an ideal situation, it is not necessary to provide an additional heater to heat the comminuted material. If such a heater is

provided, its power output is preferably smaller than the power output of the agitator.” *Id.* at 8:4-10; *see also* 15:5-28 & Fig. 4 (similar); Ex. 2011, ¶152-153.

Given the detail supplied by the specification as to “the agitator,” and given that the indefiniteness question examines the claims in light of the specification, it is clear that a POSITA reading claim 7 in light of the specification of the ’463 patent would understand the meaning of “the agitator.” *Slimfold Mfg. Co.*, 810 F.2d at 1116; *see also Tinnus Enters.*, 733 F. App’x at 1019-1020 (description of embodiments in specification can inform one of skill in the art of scope of claim such that claim is not indefinite); Ex. 2011, ¶153. There is no indefiniteness issue as to claim 7, and Petitioner has failed to show that claim 7 is more likely than not unpatentable for indefiniteness.⁸

3. “Components of comminuted material” is not indefinite based on its plain meaning

Ascend complains that the language in claim 10, “the comminuted material includes components of comminuted material,” is indefinite because a person of skill would not know what a “component” of comminuted material is. Pet. at 75-76 (citing Ex. 1003, ¶223). This again is based on unsupported expert testimony,

⁸ There is no indication that claim 7 was intended to depend from claims 13 or 14, as Petitioner speculates (Pet. at 74), and no need to do so—since the specification supplies sufficient information to inform a POSITA of the scope of claim 7. *See supra.*

where the expert relies solely on “my opinion.” Ex. 1003, ¶223. Meanwhile, elsewhere, Petitioner’s expert is clearly able to understand the meaning of “component” including how it is applied to claim 7. *See id.*, ¶¶146-148 (opining that a POSITA would have understood Tomioka to disclose claim 7 including because “it would have been obvious that at least 90% by weight of the components of the separated and pulverized material of Tomioka would have a sieve size that is not more than 50 mm”). Ex. 2011, ¶154.

Petitioner’s indefiniteness argument again seeks to create a problem where there is none. The claim language itself makes clear what it means. In full, claim 10 recites the following:

The method according to claim 1, wherein comminuting of the used lithium batteries is configured such that the comminuted material includes components of comminuted material, and at least 90% by weight of the components of the comminuted material have a sieve size that is not more than 50 mm.

The plain text of the claim makes clear that, in this permutation of the invention of the ’463 patent, the comminuted material (shredded batteries) is made up of components (fragments of crushed batteries) that are different sizes, and, by weight, 90% of those fragments of crushed batteries have a sieve size of 50mm or less. *See* Ex. 1001 at 4:61-5:3 (explaining that “this should be understood to mean that 90% by weight of the components fall through a sieve which has a mesh width of 50 mm.”); *see also id.* at 2:62-3:9 (describing crushing process within

comminution unit); *see also, e.g., id.* at 2:8-14 (describing comminuted material as “battery fragments”). Ex. 2011, ¶155.

A POSITA would thus readily understand that a “component” of comminuted material is simply a fragment of crushed battery among a larger amount of crushed battery. Ex. 2011, ¶154-155. This is consistent with dictionary definitions of “component.” *See, e.g.,* Ex. 2008 (defining “component” as “a constituent part: ingredient”). There is no indefiniteness issue whatsoever with this claim term.

VII. THE BOARD SHOULD DISREGARD PORTIONS OF THE PETITION WHICH RELY ON IMPROPER SUBSTITUTION OF DISCLOSURES IN THE PRIOR ART WITH EXPERT TESTIMONY.

As a further matter, the Board should disregard portions of the Petition which improperly rely on expert testimony to substitute for disclosures in the prior art.

Expert testimony is not “prior art” upon which an IPR may be based; instead, an IPR may be based only on prior art consisting of (1) patents or (2) printed publications. 35 U.S.C. § 311 (“[a] petitioner in an inter partes review may request to cancel as unpatentable 1 or more claims of a patent only on a ground that could be raised under section 102 or 103 and only on the basis of prior art *consisting of patents or printed publications.*”) (emphasis added).

A petitioner may rely on expert declarations as supporting evidence, 35 U.S.C. § 312, but only about (1) “teachings of the prior art and how they relate to the

patentability of the challenged claims,” and (2) “whether there would have been a reason to combine the teachings of references in a certain way, or if there may have been a reasonable expectation of success in doing so.” PTAB Consolidated Trial Practice Guide (2019) at 35. Expert testimony “is not a substitute for disclosure in a prior art reference itself.” *Id.* at 36; *Unified Pats. Inc. v. Velos Media, LLC*, IPR2019-00883, Paper 16 at 15 (PTAB Nov. 15, 2019) (“We, therefore, agree with Velos that expert testimony regarding the restricted placement limitation cannot take the place of disclosure from patents or printed publications.”); *Google LLC v. Videoshare LLC*, IPR2020-01631, Paper 14 at 16 (PTAB Apr. 7, 2021) (“expert testimony may explain ‘patents and printed publications,’ but is not a substitute for disclosure in a prior art reference itself.”).

Ascend’s use of Declaration of Marc Juzkow goes beyond what is allowed or contemplated by the Board’s rules and procedures. *See, e.g.*, Ex. 1003, ¶¶83, 85, 87, 91, 96-97, 100, 104, 106-107, 112-114, 117, 121-123, 126, 128, 129, 131, 139, 140, 142, 146-147, 149, 151-154, 158, 162, 166-167, 172, 175, 177-178, 181, 185, 188, 190, 192, 193, 198, 200, 205, 208, 211, 218 (testifying as to what a POSITA “would have understood” or what “would have been obvious” to a POSITA).

For instance, regarding claim element 1[e] (“the pressure being not more than 300 hPa, and the temperature being not more than 80° C. and lower than a decomposition temperature of the fluorine salt”), Mr. Juzkow opines:

- “A POSITA would have understood that 40°C is less than a decomposition temperature of a fluorine salt, which depends on the conditions in which the fluorine salt exists but in all cases is higher than 40°C. Common lithium ion electrolyte salts include: LiPF₆, LiBF₄, LiAsF₆, LiCF₃SO₃, LiC₄F₉SO₃, LiN(CF₃SO₂)₂, LiC(CF₃SO₂)₃. (EX1014, [0069].) The least thermally stable of the common lithium-ion electrolyte salts is LiPF₆ which is stable up to 80°C. (EX1023; EX1027; EX1014, [0079].) Accordingly, a POSITA would have understood that a minimum decomposition temperature for LiPF₆ is 80°C and that 40°C is less than a decomposition temperature of a fluorine salt.” Ex. 1003, ¶139.

Further, as to claim 10 (“The method according to claim 1, wherein comminuting of the used lithium batteries is configured such that the comminuted material includes components of comminuted material, and at least 90% by weight of the components of the comminuted material have a sieve size that is not more than 50 mm.”), Mr. Juzkow opines:

- “Tomioka renders this limitation obvious. Tomioka explains that its claim 9 “relates to the method for processing waste as described in Claim 1 or Claim 2, wherein the step of peeling and separating the active material layer of the electrode element part is on a mesh of 10

mm or smaller and involves applying vibration.” (EX1005 at [0041]).

Claim 1 of Tomioka discloses a method in which the batteries are dismantled, cleaned, heated, and then the active material layer of the electrode elements is peeled and separated. (EX1005, [0011].) A POSITA would have understood that ”peeling and separating the active material layer“ would result in comminuted material that includes components of comminuted material. A POSITA would have also found it obvious to look to Tomioka’s other disclosures of comminuting, including through dismantling and/or passing the battery material through rollers to crush the material. A POSITA would have found it obvious and advantageous to dismantle the material such that it had a sieve size of 10 mm or less, as smaller pieces of battery material would evaporate electrolyte faster.” Ex. 1003, ¶146.

In each of these opinions, Mr. Juzkow goes beyond providing any “teachings of the prior art and how they relate to the patentability of the challenged claims” or discussing any purported motivation to combine. Instead, Mr. Juzkow—through the veil of his opinion on what a “POSITA would . . . understand” *supplements the prior art*. Such supplementation is improper in these proceedings. Accordingly, Patent Owner respectfully requests the Board disregard any portion of the Petition which relies on this improper supplementation.

VIII. CONCLUSION

For the foregoing reasons, the Petition fails to establish a reasonable likelihood of rendering the Challenged Claims obvious. The Petition should be denied.

Date: July 15, 2025

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WORD COUNT CERTIFICATION

Pursuant to 37 C.F.R. § 42.24(d), Patent Owner certifies that this Patent Owner Preliminary Response has a total of 14,667 words as counted by Microsoft Word, exclusive of the cover page, table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, word count, appendix of exhibits or claim listing, and signature block (37 C.F.R. § 42.24(a)). The word count includes include all other text, including headings, footnotes, and quotations. This is within the 18,700-word limit allowed under § 42.24(a)(1)(ii).

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CERTIFICATE OF SERVICE

I hereby certify that on July 15, 2025, a copy of this Patent Owner Preliminary Response, including all accompanying attachments, appendices, and exhibits, has been served in its entirety via e-mail on Attorneys for Petitioner at the following e-mail addresses:

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PGR2025-00037
U.S. Pat. No. 12,119,463

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