

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND UMWELT UND RECYCLINGTECHNIK GMBH,

Petitioner,

v.

DUESENFELD GMBH,

Patent Owner.

Case No. PGR2025-00037

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

**DECLARATION OF VANI DANTAM
IN SUPPORT OF DUESENFELD GMBH'S
PATENT OWNER PRELIMINARY RESPONSE**

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

I, Vani Dantam, of Fishers, Indiana, declare that:

I. ASSIGNMENT

1. I have been retained by Robins Kaplan LLP on behalf of Duesenfeld GmbH (“Duesenfeld”) as an expert with regard to this matter. I understand that Petitioner Ascend Elements, Inc. (“Ascend” or “Petitioner”) is requesting that the Patent Trial and Appeal Board (“Board”) institute a *post grant review* (“PGR”) of U.S. Pat. No. 12,119,463 (“the ’463 patent”) (Ex. 1001).

2. In my capacity as an expert, I have been asked to provide my independent analysis and opinions regarding the ’463 patent, the prosecution history of the ’463 patent and related applications as applicable, the alleged prior art relied upon by Petitioner, the meaning of various claim terms from the ’463 patent from the perspective of a person of ordinary skill in the art (“POSITA”), and the opinions offered by Petitioner’s expert, Marc Juzkow, in his declaration (“Juzkow Declaration”) (Ex. 1003). My opinions and conclusions are fully discussed in later sections of this declaration.

3. I am an independent consultant, and I am not, and have never been, an employee of Duesenfeld or Ascend. I received no compensation for this declaration beyond my normal hourly compensation (\$500/hr) based on my time actually spent analyzing the ’463 patent, the prosecution history of the ’463 patent and related

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applications, the prior art publications relied upon by Petitioner, the Juzkow Declaration, and other related materials. I will not receive any added compensation based on the outcome of any PGR or other proceedings involving the '463 patent.

II. BACKGROUND AND QUALIFICATIONS

4. My Curriculum Vitae (“CV”) is attached as **Appendix A**. I highlight here a few experiences in my career that are particularly germane to my opinions discussed herein, which give a basis of my opinions of a person of ordinary skill in the art at the time of invention (*i.e.*, approximately 2016).

5. In 1979, I obtained a Bachelor of Technology degree with a focus in Metallurgical Engineering from the Indian Institute of Technology – Banaras Hindu University (Varanasi, Uttar Pradesh, India), graduating with high honors at the top of my class.

6. In 1982, I obtained a Master’s of Science (MS) degree in Mechanical Engineering from Vanderbilt University, under a U.S. Navy Scholarship.

7. In 1987, I obtained a Master’s in Business Administration (MBA), specializing in Finance and International Business from Kelley School of Business, Indiana University, under a GM Fellowship.

8. I have certifications and continuing education, including QES Quality Engineering Certification, GM Quality Institute, Kettering University (Flint, MI).

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9. From 2008 - 2010, I worked as the Director of Global Sales at Remy Electric, managing sales of Hybrid/EV motors/generators. These motors/generators operated using energy supplied by lithium ion batteries. Through my work at Remy Electric, I became familiar with the performance characteristics of different lithium ion batteries. Lithium ion batteries had just begun to proliferate in the industry.

10. From 2010 - 2012, I worked with the Indiana-based company EnerDel as their VP of Sales. EnerDel is a company that pioneered Lithium ion battery technologies. Through my capacity as VP of sales, I developed a thorough understanding of lithium ion battery technology and the materials that went into these batteries. I managed the design of battery modules and packs for different applications, based on customer inputs. Because of my technical background, I was able to talk to a customer, and translate those needs into a proposed module and pack design. I also worked as a team member scaling up the production of cells/modules/packs from the pilot plant in Fishers, IN to a GWh scale production plant in Greenfield, IN.

11. From 2012 - 2015, I worked for Axion Power as its Senior Vice President of Sales, Business Development, and Marketing. Axion Power is a company that specialized in manufacturing lead-carbon batteries, which is a technology that competed with lithium ion batteries. At Axion Power, I supervised Application Engineering and Module and Pack Development to reflect the customer

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needs. As I competed for business, my work at Axion Power helped me understand the tremendous advantages lithium ion batteries have, how advanced the material and process technology was set to become, and the areas where additional work was needed—from a customer perspective. Customers would show us their lithium ion battery packs, and asked us to design a lead-carbon battery that could outperform the lithium-ion battery, and I would supervise the application engineering personnel. Through this experience I became increasingly well-versed in both kinds of battery technologies.

12. In 2015, I joined Landis+Gyr (a division of Toshiba, Japan) as their V.P. of North American Sales. I managed the sales of LTO batteries (LTO batteries use Lithium Titanate anodes and LFP or NMC cathodes). During my five-year employment with Landis+ Gyr, I often visited Toshiba headquarters in Tokyo and their plant in Kashiwazaki (north of Tokyo) and received coaching and training from my colleagues in Japan on different battery chemistries and material preparation as well as production line design. One area of my focus was understanding the electrode preparation and how the plant prepared the rejects for recycling by recruiting special material recyclers for plant waste and returned battery packs.

13. Starting in 2019, I worked for Lucas TVS (Chennai, India) and 24m Technologies (Cambridge, MA) as their Chief Project Consultant, focusing on

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feasibility, finance, Engineering, Procurement, and Construction (“EPC”), operations, and customer development. In this role, I managed plant feasibility studies regarding production of semi-solid state lithium ion battery technology conducive to Indian ambient conditions. Through this capacity I helped design a plant directed to produce new cell formats for batteries using LFP/NMC chemistries, BMS integration and module/pack/charging infrastructure design and architecture.

14. From 2022 - 2023, I served as the Chief Operating Officer of Nextech Batteries in Carson City, Nevada. I was responsible for all functional areas, including logistics, engineering, and production, which included setting up global manufacturing facilities for lithium sulfur chemistry-based cells.

15. From 2023 - 2024, I was Chief Executive Officer and Chairman of the Board for Nevada Technology Corporation, which specializes in lithium ion battery recycling, including repurposing used batteries into second life batteries and developing advanced cell technologies to overcome current rechargeability, cost, and life limitations.

16. From 2022 - 2024, I was the Chief Advisor to Lohum Americas, which is a provider of advanced recycling technologies for lithium ion batteries using principles of Hydrometallurgy. They currently operate a recycling plant in India with a capacity of 800MWh. This will be scaled up to over 2GWh in the next

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2-3 years. They also signed agreements to establish recycling facilities in the Middle East, Eastern Europe and Africa.

17. In March 2025, I became the Vice President of Operations at Fractal Energy Storage Consultants, for which I serve as a consultant to a variety of companies in the energy sector. I am currently providing my consulting services to Duesenfeld through Fractal.

III. LEVEL OF SKILL IN THE ART AND BASIS FOR OPINIONS

18. For purposes of this Declaration, I do not dispute the level of skill for a person of ordinary skill in the art (“POSITA”) as set forth on page 10 of the Petition and in ¶¶31-34 of the Juzkow Declaration (*i.e.*, a B.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).

19. I believe that I am qualified to render opinions regarding the technology described and claimed in the ’463 patent, based on my experience and education. Based on my expertise and qualifications, I believe that I am qualified to provide opinions as to the state of the art and what a POSITA would have understood, known, or concluded as of the filing date of the ’463 patent (*i.e.*, October 20, 2016). I have been working in the lithium battery field, including supervising the processing of lithium ion batteries, since 2012. My career has

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continued in the battery recycling field, and I have participated in various industry organizations relating to battery recycling technologies. I have familiarized myself with the state of the art at the time of invention as it relates to battery recycling technology, as set forth herein.

20. I have provided my declaration herein from the perspective of a person of ordinary skill in the art in the time frame of the invention of the '463 patent, *i.e.*, as of October 20, 2016.

21. In reaching my opinions and conclusions, I have relied upon my education, my work experience in the relevant field, and my training, and considered and relied upon my review and analysis of the materials listed in **Appendix B.**

IV. RELEVANT LEGAL PRINCIPLES

22. For the purposes of this declaration, I have been informed about certain aspects of the law that are relevant to my analysis and opinions. I have applied these legal principles in rendering my opinions below.

A. Claim Construction

23. I understand that the ordinary and customary meaning of a claim term is the meaning that the term would have to a POSITA at the time of the invention.

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24. In the absence of an express intent on the part of the inventor to give a special meaning to the claim terms, the words are presumed to take on the ordinary and customary meanings attributed to them by a POSITA.

25. I understand that it is the use of the words in the context of the written description, and as customarily used by those skilled in the relevant art, that accurately reflects both the ordinary and the customary meaning of the terms in the claims.

26. I understand that the basis for a term's ordinary and customary meaning may be derived from a variety of sources, including the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art at the time of the invention.

27. I have been instructed that dictionary definitions or definitions from technical references can be used to inform or confirm the ordinary and customary meaning of words found in a claim, but that in construing claim terms, the general meanings gleaned from reference sources, such as dictionaries, must always be compared against the use of the terms in the context of the claim itself.

28. I understand that a patent applicant is entitled to be his or her own lexicographer (in other words, provide his or her own meaning to a word or phrase) and may rebut the presumption that claim terms are to be given their plain and

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ordinary meaning. To do so, the applicant must clearly set forth a definition of the term that is different from its ordinary and customary meaning. Where the applicant provides an explicit definition for a term, that definition will control interpretation of the term as it is used in the claim in which it appears. I understand that the specification can also be relied on for more than just explicit lexicography to determine the meaning of a claim term. For example, I understand that the meaning of a particular claim term may also be determined by implication, that is, according to the usage of the term in the context of the specification.

B. Obviousness

29. I understand that under U.S. patent law, 35 U.S.C. §103, a claim is invalid as obvious if the differences sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

30. I am informed that an obviousness analysis requires an assessment of the scope and content of the prior art, the differences between the art and the claims at issue, and the level of ordinary skill in the art. I am told that it is against this backdrop that obviousness is assessed.

31. I am informed that a POSITA is a hypothetical person who is presumed to be aware of all the pertinent prior art. I am also informed that an

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obvious analysis may take account of the inferences and creative steps that a POSITA would employ.

32. I am informed that assessing which prior art references to combine and how they may be combined to match the challenged claim may not be based on hindsight reconstruction or *ex-post* reasoning. Hindsight reconstruction is using the challenged patent itself as a road map for recreating the invention. In assessing obviousness, only what was known before the invention was made can be considered. I also understand that a guard against such hindsight reconstruction is a determination whether a person of ordinary skill in the art would have been motivated, taught, or suggested to combine the relevant teachings of the prior art to duplicate the challenged claim at the time of the filing of the application on the patented invention.

C. Indefiniteness

33. I am informed that under U.S. patent law, a claim is invalid for indefiniteness under 35 U.S.C. § 112(b) if the claim, read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

34. I understand that the purpose of this requirement is to ensure that the public is put on clear notice of what is and is not claimed, such that others may

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avoid infringement and the patentee may not later broaden the scope of the claim through interpretation.

35. I am informed that absolute precision is not required, but that a claim must be sufficiently definite so that a POSITA can understand the boundaries of the claim when read in light of the intrinsic evidence.

36. I also understand that the determination of indefiniteness is made from the perspective of a POSITA at the time the patent was filed.

V. BACKGROUND OF THE '463 PATENT

A. Technology overview: EV batteries

37. The technology at issue in this case relates to the recycling of electric vehicle “EV” batteries by rendering the batteries safe for recycling through inactivation. At the time of the '463 patent invention, safely recycling lithium batteries posed serious technical and logistical challenges. Understanding these challenges is key to appreciating the advance of the '463 patent, which offers a clean, additive-free method for inactivating shredded battery material through low-pressure, low temperature drying—solving a long-standing safety and logistics problem in lithium battery recycling.

38. To appreciate the state of the art at the time of invention, an understanding of the structure of EV batteries is important.

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39. Figure 1 below is an image of an EV battery, as published in 2009. Ex. 2017 at 5. At the bottom right of this diagram is a cutaway cross-section of a battery cell, showing the layers of electrodes and separators making up the cell. To the left is an illustration of the primary components of the cell.

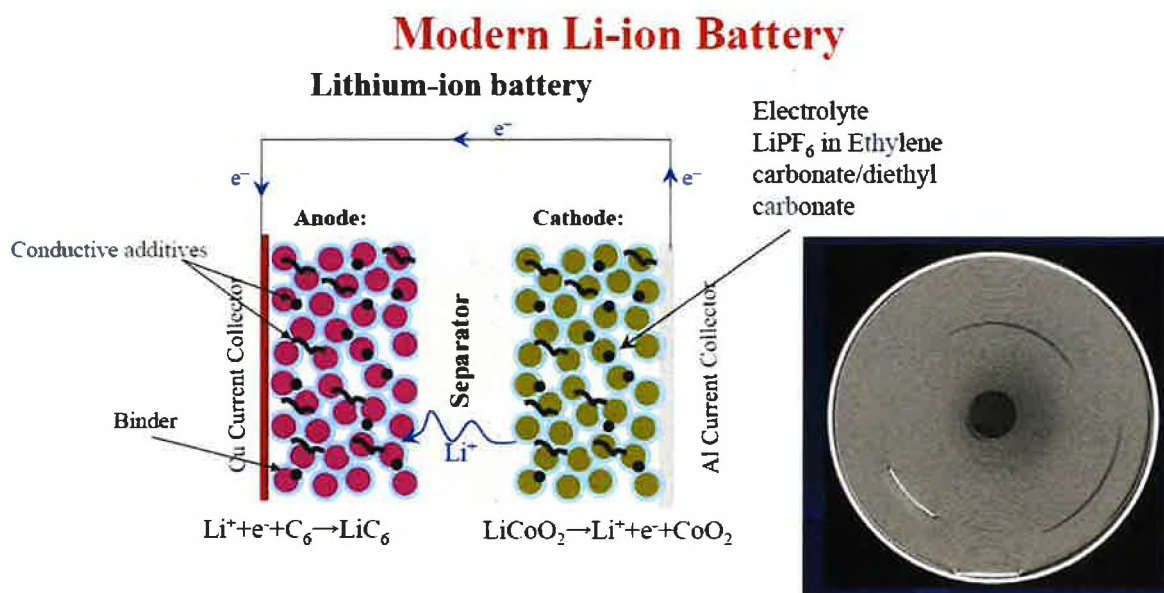


Figure 1: Diagram of lithium ion battery components.

Ex. 2017 at 5.

40. Lithium-ion batteries contain electrochemically active materials—including lithium ions dissolved in flammable organic solvents—housed between layered electrodes separated by a thin porous membrane. *See* Ex. 2017 at 5. The positive electrode, or cathode, typically comprises metal oxides such as lithium cobalt oxide (“LCO”), lithium nickel manganese cobalt oxide (“NMC”), or lithium iron phosphate (“LiFePO₄”), pasted onto an aluminum foil. During discharge, the

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cathode support is typically aluminum foil (which reverses during recharging). The negative electrode is the anode, which is usually made from copper foil (which also reverses during recharging).

41. The negative electrode, or anode, typically comprises graphite on a copper foil. *Id.* A polymer binder such as polyvinylidene fluoride ("PVDF") is used to adhere the active materials to the foil supports. *Id.*

42. Between the cathode and the anode there is a thin membrane called a "separator." Ex. 2017 at 5. This separator is porous, allowing lithium ions to pass back and forth between the anode and cathode. *Id.* Without the separator, there would be a short circuit from contact between the anode and cathode. The lithium ions need to be dissolved in a liquid solvent in order to be able to flow between the electrodes during discharging and recharging processes.

43. During battery operation, lithium ions shuttle between the cathode and anode via a separator membrane soaked in electrolyte. Ex. 2017 at 5. The electrolyte typically includes lithium hexafluorophosphate ("LiPF₆") dissolved in one or more organic carbonates such as ethylene carbonate ("EC"), dimethyl carbonate ("DMC"), or diethyl carbonate ("DEC"). Ex. 2017 at 5. This combination enables reversible ion exchange but also presents substantial hazards once the battery is damaged or comminuted.

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44. The most valuable components of the battery are the metal oxides in the cathode. 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). The binder affixes the precious metal oxides onto the surface of the foils, thereby maintaining the structural integrity of the electrodes. The binder is chemically stable.

45. To retrieve the metal oxides from the cells, the binder must be decomposed. Ex. 1021 at 3 (“The invention is based on the finding that heating the cell fragments to the decomposition temperature would theoretically have to be sufficient to destroy the binder to such an extent that the active material is released, but that the active material is still difficult to remove from the support.”). Because of the stability of the binder, a high heat furnace/oven may be used to decompose the binder. Temperatures on the order of 350°C to 800°C may be sufficient to decompose the binder. Ex. 1021 at 5 (“The decomposition temperature is preferably at least 350°C and at most 800°C. It has been found that the binder is reliably decomposed at these temperatures.”). Once the binder is decomposed, the metal oxides in shredded material are reduced to black powder along with pieces of metal foil substrate pieces.

46. The high temperatures of these furnaces/ovens can generate unwanted by-products. For example, LiPF_6 and PVDF may decompose into a toxic gas,

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including hydrogen fluoride (“HF”). Ex. 1010 at 1:22-27 (“In addition, when LiPF_6 reacts with water, LiPF_6 is hydrolyzed and generates toxic hydrogen fluoride.”). Hydrogen fluoride may corrode glass, break seals on industrial machinery, and if inhaled, can be fatal.

47. In order to facilitate the breakdown of these batteries, it is advantageous to comminute them. Comminution refers to the mechanical reduction of the battery into smaller fragments—shredding or crushing the battery into unstructured bulk material. Ex. 1012 at 177 (noting as a part of the discussion on cell disassembly that, “[a]fter excluding the alternatives, one possible process path remains, which includes mechanical destruction of the cells using a shredding process and physio-mechanical electrode separation”). This process is desirable because it exposes valuable materials (*e.g.*, cathode metal oxides) embedded within the foil and binder layers, facilitating downstream recovery. *Id.* Comminuting the batteries also makes it easier to remove electrolyte by increasing the surface area exposed to treatment. Ex. 1001 at 3:28-38 (“It is thus often more beneficial and represents a preferred embodiment of the invention for the batteries to be mechanically comminuted, for example through cutting, cropping, impact, cutting and/or crushing. This means that a larger interface is available for the transition of materials into the gas phase.”). The shredders break down the batteries into a heterogeneous mixture of fragments, resulting in a stew of various chemical

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compounds all mixed together. However, comminution of batteries that still contain electrolyte creates multiple hazards: the release of flammable solvent vapors, short circuits due to exposed electrodes, and generation of toxic decomposition products such as HF. *See* Ex. 1005 at [005] & [0088]; Ex. 2015 at 1:29-31; Ex. 2021 at 2:[0004] (“When crushing electrolytic cells under normal atmosphere, the electrolyte or a solvent containing electrolyte can easily ignite due to released electrical charges and associated arcing. In the case of lithium-ion cells, such a fire is accompanied by a release of hydrogen fluoride.”).

48. A fundamental problem with the recycling process is the difficulty of transporting batteries to a central facility for processing. To extract the metal oxides and other materials from the batteries, high heat furnaces/ovens have conventionally been used, and these high heat furnaces/ovens make sense to build in centralized locations. Thus, there is a logistics problem of getting these used batteries transported to a centralized facility for processing.

49. The transportation problem is heightened by the toxic nature of the used batteries (whether shredded or whole). Ex. 2021, 2:[0002] (“However, if electrolytic cells are damaged, chemical compounds with high environmental and health hazards can develop from the electrolyte in interaction with the electrodes, the housing, and/or ambient air.”); *see id.* (“Similar hazards can

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emanate from aged electrolytic cells."). Thus, there was a need to "inactivate" the batteries prior to transportation or further processing.

50. Many companies had experimented with techniques to inactivate spent or shredded batteries. These prior art techniques typically relied on adding foreign substances to the batteries as a way to neutralize their chemical hazards, such as using fire retardants, brines, pressurized fluids, etc. These prior art approaches include the following:

51. **Ecobat.** In 2007, Ecobat LLC filed for patent protection on a technique for safely handling shredded lithium-ion batteries. Ex. 2024. Ecobat focused on flushing the electrolyte out of the batteries using a pressurized solvent. *Id.* at 3:3-5. According to this invention, batteries are sealed in a high-pressure extraction container, which is then filled with an extraction fluid, such as CO₂. *Id.* at 5:41-45. Various additives are then added to the fluid to enhance extraction of electrolyte. *Id.* at 6:1-14. The pressure and temperature of the fluid are then increased until the battery casings are breached. *Id.* at 6:39-46. The fluid then enters the breached cell and begins to dissolve the electrolyte. *Id.* at 7:10-15. Once the electrolyte is dissolved, the solution is moved to a precipitation vessel for Ascendher extraction of electrolyte components. *Id.* at 8:3-10.

52. **LiMotive.** In 2009, LiMotive Company Ltd. filed for patent protection on a method for safely preparing batteries for disposal. Ex. 2025 at 2:23-

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25. A true and correct copy of the LiMotive patent (in German) is attached hereto as Exhibit 2026. A certified English translation of the LiMotive patent is attached hereto as Exhibit 2025, upon which I rely for my opinions. LiMotive's technique teaches comminuting the batteries in the presence of a metal flame retardant and one binding agent. Ex. 2025 at 3:6-8. According to the invention, lithium-ion batteries are shredded through a stream of high-pressurized water containing abrasive materials. *Id.* at 6:7-10. Adding water is used in conjunction with fire retardant agents to prevent, suppress, reduce, or extinguish fire during the shredding process. *Id.* at 3:6-20. Fire retardants are used to put out localized fires in order to prevent thermal runaway (explosion). Ex. 2025 at 3:9-11. In view of the likelihood of HF formation, the method discloses sequestering the emerging HF with a binding agent (*i.e.*, calcium oxide (CaO), calcium chloride (CaCl), and/or calcium hydroxide (Ca(OH)₂). *Id.* at 3:11-15. Any hydrolyzed discharge from the shredding process is filtered off to remove the insoluble components of the discharge of the liquid components during the shredding process. *Id.* at 12:11-13. The filtrate is then dried to reduce the weight of the filtrate before transport. *Id.* at 12:16-18.

53. **Electrocycling.** In 2009, Electrocycling GmbH filed for patent protection on a technique for safely processing batteries. Ex. 2021. A true and correct copy of the Electrocycling patent (in German) is attached hereto as Exhibit

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2020. A certified English translation of the Electrocyling patent is attached hereto as Exhibit 2021, upon which I rely for my opinions. The Electrocyling patent disclosed two alternative embodiments for deactivation of batteries: one by aqueous solution, another via a deactivating powder. Ex. 2021 at 5:0034-0035. According to the first embodiment of the invention, crushed lithium-ion battery cells fragments are filled into a plastic drum pre-filled with aqueous lithium hydroxide (LiOH) solution. *Id.* at 3:0017; 5:0034. In another embodiment of the invention, shredded cells are dusted with deactivation powder before they reach the collection drum. *Id.* at 3:0018; 3:0035.

54. **Hayashi.** In 2013, Hiroshi Hayashi, Koichiro Hirata, Hidenori Tsurumaki, and Hisashi Hoshina filed for patent protection on a method for processing fluorine-containing electrolyte solution in lithium-ion batteries. Ex. 1010. According to Hayashi's method, a whole battery is first depressurized and immersed in an oil heater for 2 hours. Ex. 1010 at 11:13-17. The organic components of the battery are then volatilized by heating the electrolyte past the boiling point of the organic ingredients. Ex. 1010 at 4:38-45. Hayashi's method purposefully decomposes and gasifies lithium hexafluorophosphate to release the hydrogen fluoride gas. Ex. 1010 at 4:45-47. The method teaches adding water or mineral acids (such as sulfuric acid) to the electrolyte before heating to accelerate the gasification and the decomposition reactions. Ex. 1010 at 5:18-52. The

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released gases are then captured and separated: the organic solvent components are recovered while the fluorine compound is immobilized as calcium fluoride. Ex. 1010 at 5:64-67. Hayashi does not teach filling processed battery materials into containers for transport and does not address any of the challenges associated with transporting hazardous battery waste.

55. **Dunagan.** In 2014, Dennis Dunagan and Teague Ostrander filed for patent protection for a system for recycling volatile battery sources. Ex. 2015. Dunagan's process teaches neutralization of comminuted lithium batteries in a neutralizing brine solution. Ex. 2015 at 5:4-11. The comminuted material must remain in the neutralizing brine for at least 24 to 48 hours, until the "chemical reactions are substantially neutralized." *Id.* at 5:18-25; *id.* at 5:31-34. The wet comminuted material is then air dried before the second round of comminution. Ex. 2015 at 5:31-34; *id.* at 5:40-42. The second comminution step transforms the shredded batteries into a homogenous material, which allows workers to take a sample of the material to identify the potential value of the precious metal oxides in the material. Ex. 2015 at 5:63 – 6:5. The homogenous material is then transported to a processing plant for reclamation of battery components. *Id.*

56. There was a drawback to using foreign substances to inactivate the batteries. Adding these additional compounds introduced contaminants into the battery material, thus complicating the recycling process. *See* Ex. 1001 at 2:16-19

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(teaching that avoiding the addition of foreign substances has great benefits because it “decreases the complexity of the battery processing, reduces the weight of the deactivated comminuted material and increases the purity in the subsequent separation and recycling steps.”); *see also id.* at 2:20-22 (“In particular, in potential subsequent hydrometallurgical processing steps, a high degree of product purity without foreign ions is advantageous.”). Additional hazards could result; for instance, treatment with aqueous solutions risks partial electrolysis, which could lead to the formation of hydrogen fluoride gas.

B. The advance of the '463 patent

57. The '463 patent describes an important advance for safely inactivating comminuted batteries. Instead of introducing foreign substances to inactivate the comminuted batteries, the '463 patent is directed to inactivating the comminuted batteries by simply drying them under vacuum, particularly at a maximum pressure of 300 hPa and at a temperature “not more than 80°C.” Ex. 1001. The method of the '463 patent avoids the use of high temperatures during the drying process as a way to avoid the formation of toxic gases, especially HF. Ex. 1001 at 2:5-12.

58. Through this drying process, the technique of the '463 patent results in dried, shredded battery material, which is chemically inert and safe for storage and transport. The comminuted material is dried until its electrolyte content is low enough to prevent any electrochemical reactions. Ex. 1001 at 7:7-9. Shredded

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material is rendered “deactivated” (or “inactivated”) after the drying process is complete. Ex. 1001, 13:56-57 (“The drying of the comminuted material results in deactivated comminuted material.”). Once inactivated, the inactivated comminuted material can be filled into transport containers under vacuum or inert gas and safely shipped. Ex. 1001, 13:58-60.

59. 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 or further processing by inactivating the comminuted battery material using a vacuum drying process at a low temperature.

60. 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 the treatment of used 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 solvent, the solvent including organic carbonate;

1[b] comminuting the used lithium batteries, by comminuting device, and obtaining comminuted material as a result; and

1[c] inactivating the comminuted material and obtaining inactivated comminuted material as a result,

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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.

61. Claims 2–14 of the '463 patent depend from claim 1. *Id.* at 17:36-18:57.

C. Related District Court litigation

62. I am aware of a related District Court case involving the same parties, and where the '463 patent has been asserted.

VI. OVERVIEW OF ASSERTED PRIOR ART

A. Overview of Tomioka

63. I have reviewed Japanese Patent Application Publication No. JPH10255861, which is published in the name of Yoshiki Tomioka (“Tomioka”). See Ex. 1005.

64. Tomioka discloses techniques for processing batteries for recycling.

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65. Tomioka acknowledges the risks of processing batteries. Tomioka notes the “significant risk of ignition and explosion” when processing lithium-containing batteries. Ex. 1005 at [0004]. Tomika emphasizes the need for safety in the processing of batteries.

66. Ex. 1005 at [0005] (“When the disposal item is a battery pack, it is crucial to first efficiently separate and remove the resin package so that the internal battery units can be extracted safely, enabling the recovery of useful resources.”).

67. To mitigate risks, Tomioka notes that batteries can be processed through “manual disassembly,” but recognizes that this is “not suitable for large-scale disposal processing.” Ex. 1005 at [0005].

68. Tomioka also notes that batteries could be processed by “mechanically crushing the disposal battery backs collectively,” but counsels against this approach because “there is a risk of sparking due to residual voltage if the battery units are damaged in the process.” Ex. 1005 at [0005].

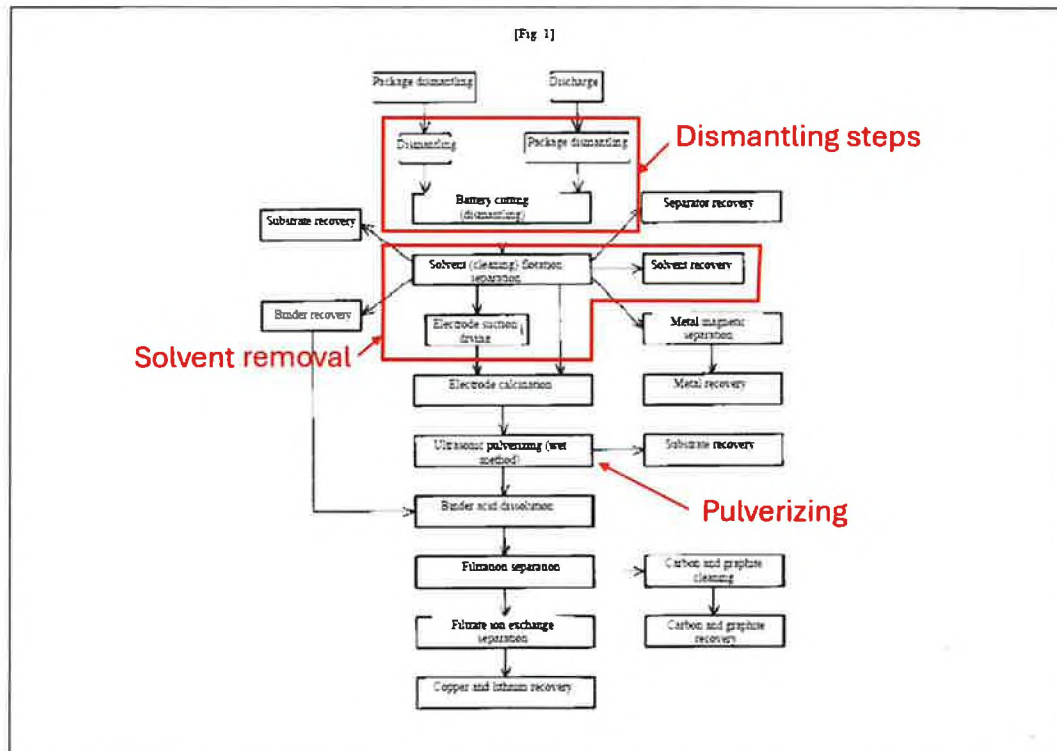
69. Instead of “manual disassembly” and instead of “mechanically crushing” the batteries, Tomioka teaches a technique for processing of batteries that involves automated dismantling of the batteries.

70. Tomioka defines dismantling as follows: “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

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electrode, and separator, and if necessary, cutting them into strip-like pieces.” Ex. 1005 at [0012].

71. Tomioka provides a flowchart, annotated below, that teaches dismantling the batteries, followed by removal of the solvents, and thereafter pulverizing the batteries:

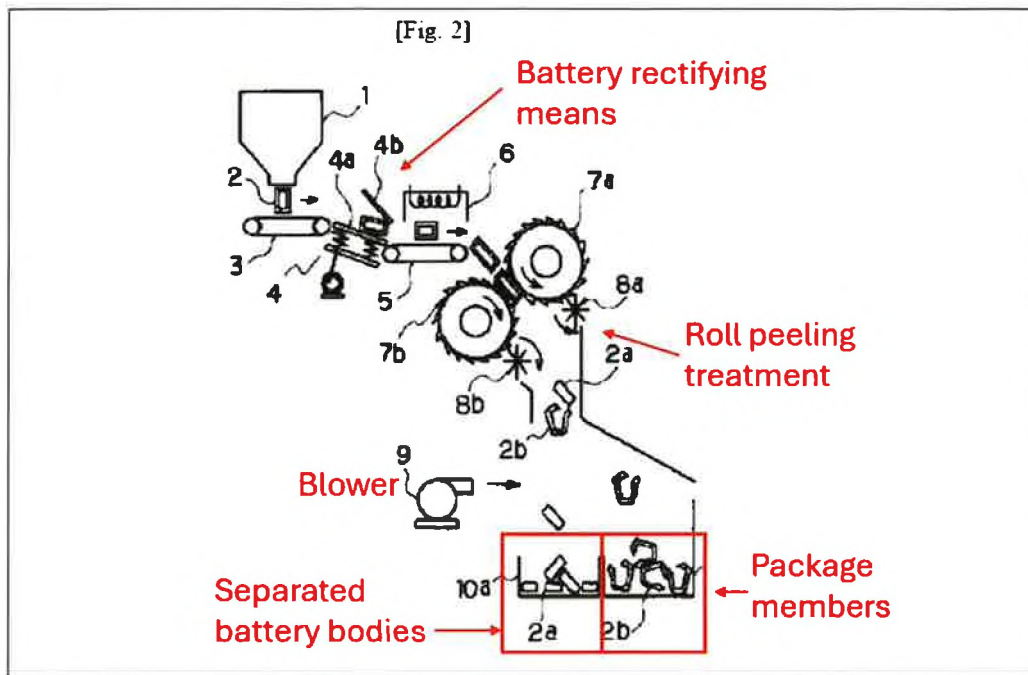


Ex. 1005, Figure 1 (annotated)

72. Tomioka teaches an automated process for dismantling the batteries, which allows the battery elements to be extracted. Tomioka discloses the following device, which contains a “battery rectifying means” to guide the batteries into a

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“pair of rollers.” *Id.* at [0044]. The rollers are precisely spaced, and rotate at different speeds, to conduct a “roll peeling process” that will “selectively destroy” the battery package. *Id.* at [0046]. The intact battery bodies fall down, while the packages are blown aside by a “air classification blower.” *Id.* at [0046].



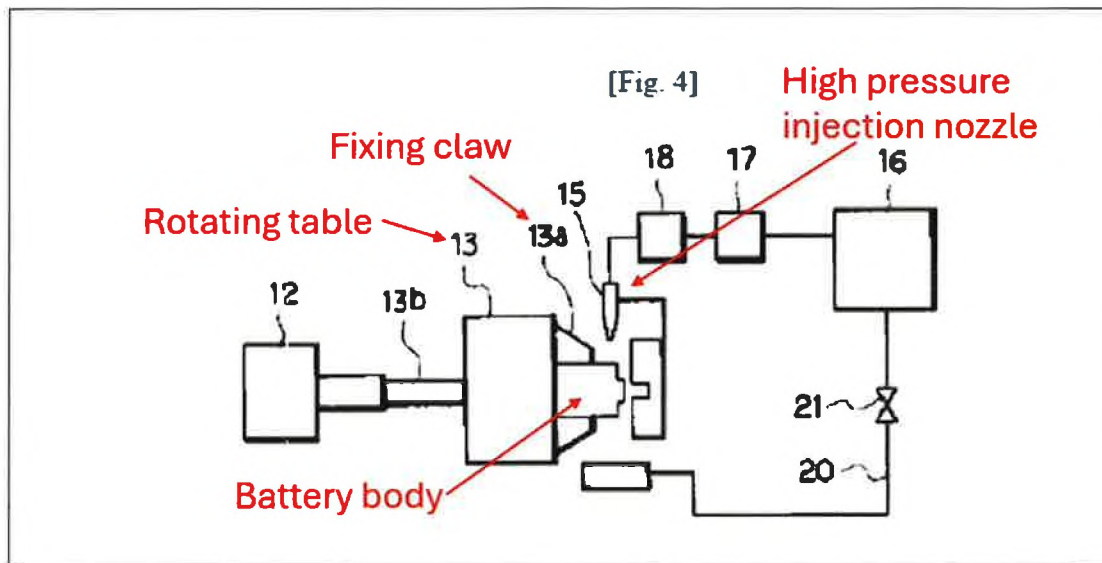
Ex. 1005 at Fig. 2 (annotated).

73. This device is structured to avoid 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”).

74. Tomioka teaches then that the separated batteries should be further dismantled to allow removal of the battery elements. As shown below in an

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annotated version 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”:



Ex. 1005 at [0048] & Fig. 4 (annotated).

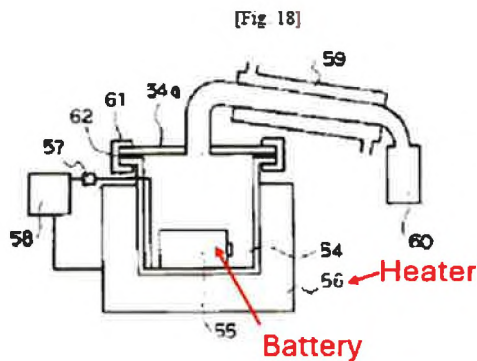
75. Following this dismantling, the “battery element part is removed through the cutting/opening section of the battery body.” *Id.* at [0049]. The removed battery elements are then “immersed in isopropyl alcohol for approximately 10 minutes of shaking cleaning,” and then dried under vacuum. *Id.* at [0049].

76. Tomioka teaches that batteries can be heated in a chamber until they rupture, as a way to remove the solvents. Figure 18 shows placing a battery in a chamber which is heated to 350°C. Tomioka describes that “[t]hrough this heat treatment, the safety valve opens under high pressure inside the aforementioned

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recovered battery 55.” *Id.* at [0091]. The released vapors are then condensed and collected.



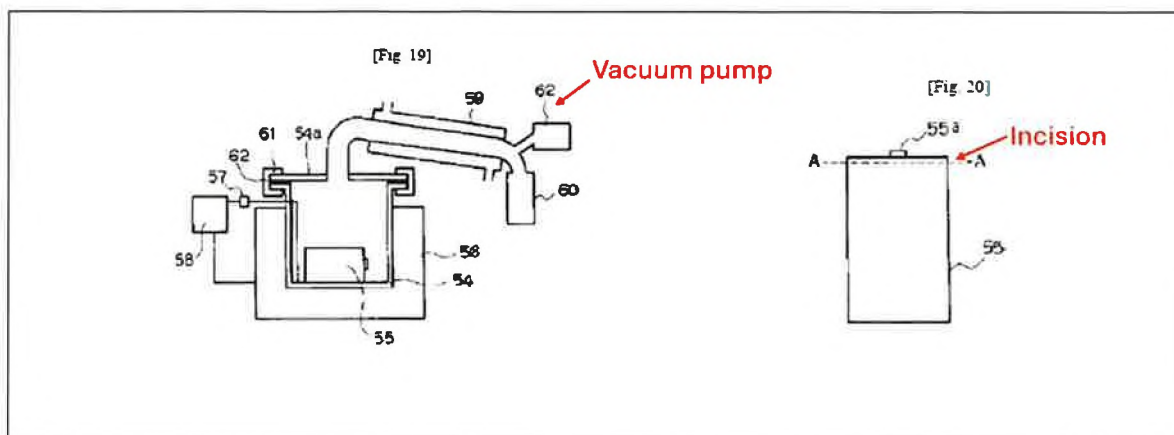
See Ex. 1005 at Fig. 18 (annotated).

77. Alternatively, Tomioka proposes another approach by making an “incision” in the battery, or whereby the battery is cut to remove the battery element, and the solvents are evaporated through vacuum drying. *See id.* 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.”). This cut serves to dismantle the battery to open the top. *Id.* 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]

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(“Furthermore, ‘dismantling’ means cutting the outer casing of the individual battery or the battery pack to extract the electrode element components....”).



Ex. 1005 at Figs. 19-20 (annotated).

78. Once this incision, or cut, is made, the battery is introduced into a chamber as shown in Figure 19, applying vacuum. *Id.* at [0092-93]. The solvents are condensed and recovered.

79. Tomioka teaches that the solvents should be removed prior to further steps for processing of the battery, 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.

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Ex. 1005 at [0094].

B. Overview of Hanisch '438 publication

80. I have reviewed Petitioner's reliance on United States Patent Application Publication No. 2014/0290438, which was published to Christian Hanisch ("Hanisch," or "the Hanisch '438 Publication") (Ex. 1021). I understand that the Hanisch '438 Publication is from the same application that was issued as U.S. Patent No. 9,780,419 ("the Hanisch '419 Patent") (Ex. 2018).

81. The Hanisch '419 Patent is the basis of the challenge that Ascend Elements, Inc. ("Ascend") has already made against claims of Duesenfeld's U.S. Patent No. 11,050,097 ("the '097 Patent") in co-pending IPR2024-00948. I have already submitted opinions about the Hanisch '419 patent in IPR2024-00948. *See* IPR2024-0098.

82. Hanisch recognizes a problem in the art of incomplete separation of the active material from its support material. Ex. 1021 at [0003]. In particular, Hanisch notes that while it was known to shred a cell into fragments and then heat those fragments to decompose the binder that bonds the active material to the support, the active material was difficult to remove from the support. Ex. 1021 at [0011]. Hanisch is directed to solving this problem of incomplete removal, and it

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teaches doing so by “air jet sieving”: smashing the heat-treated cell fragments into an air jet sieve at high speeds to separate the active material from the support. *Id.*

83. Given the problem that Hanisch seeks to solve, the patent publication focuses on techniques for achieving a more complete separation of active material from the support. To achieve separation, Hanisch teaches heating the crushed battery material to extremely high temperatures—350°C to 800°C—to decompose the binder that binds the active material to the support. Ex. 1021 at [0028]. The high temperature oven is operated “under inert gas or in a vacuum” to prevent the aluminum and copper supports from oxidizing. *Id.* at [0026]. Hanisch teaches that by preventing aluminum and copper oxidation, the anode and cathode can be processed together, resulting in copper recovery “with a high degree of purity” (*id.* at [0026]) as well as reducing the cost of subsequent processing of the active material due to lower aluminum oxide contamination. Thus, Hanisch discloses using inert gas or vacuum for ventilation purposes to reduce the amount of oxygen to avoid oxidizing the material. *Id.*

84. Hanisch then teaches an air-jet sieving step, in which “the support, with the active material still adhered to it, powerfully impacts upon the sieve.” Ex. 1004 at [0011]. According to Hanisch, the impact “removes the active material hitherto adhered to the support so that it can be retrieved.” *Id.*

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85. In addition to the decomposition and air-jet sieving steps, Hanisch teaches an optional pre-drying step, which is set up “behind the cell crushing device and before the oven.” Ex. 1021 at [0046]. According to Hanisch, the purpose of the pre-drying step is to retrieve additional electrolyte. As the published application explains, “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.” Ex. 1021 at [0025].

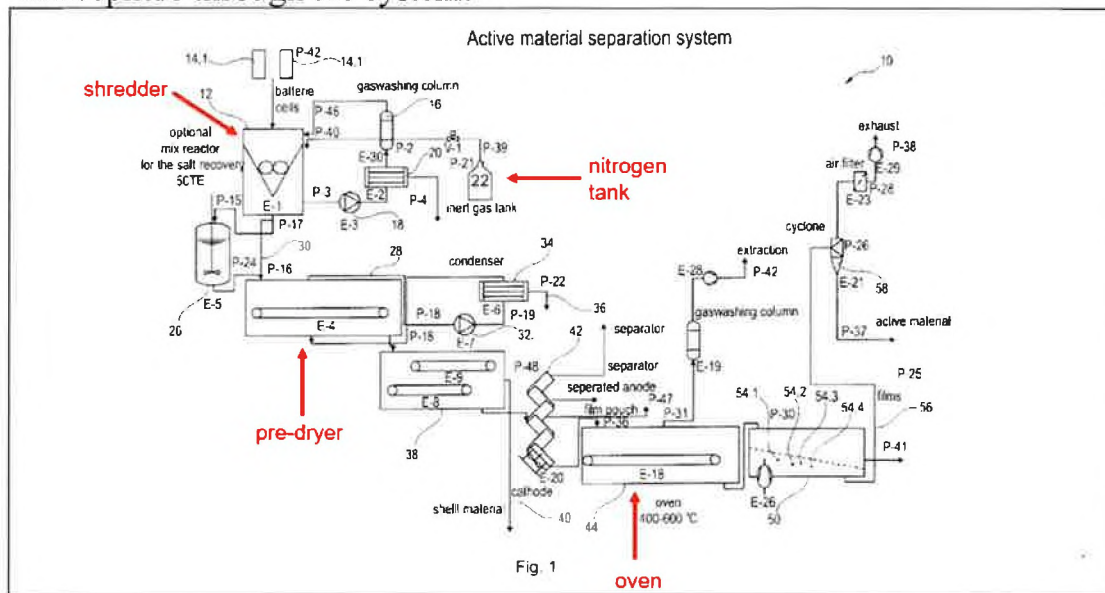
86. Hanisch is therefore concerned with improved techniques for separating active material from carrier films. As I discuss further below, Hanisch is not concerned with, and does not even address, drying comminuted battery material for the purpose of inactivating it and rendering it safe for transport or further handling or processing.

87. These processes in Hanisch are preferably done through a continuous process and not in batches. Ex. 1021 at [0020] (“The method according to the invention is preferably performed as a continual process and not in batches”). Shredded battery material is toxic, and Hanisch apparently sought to avoid accumulation of this toxic material, which could undergo various undesired reactions, and could potentially catch fire, or explode, or release toxic hydrogen fluoride gas. Hanisch sought to minimize the hazard, by promptly removing

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electrolyte and sending the material to the pyrolytic furnace as fast as possible. This approach reduces the risk of explosions because it ensures that only small quantities of undried, comminuted batteries are present in the pre-dryer.

88. Hanisch's process is illustrated in Figure 1, annotated below, to show the shredder, the pre-dryer, the oven, and the nitrogen tank which provides an inert atmosphere through the system:



Ex. 1021 at Fig. 1 (annotated).

89. Hanisch does not show any vacuum pump connected to either the pre-dryer or the decomposition oven and there is no discussion about how strong the vacuum in any step of the disclosed process would be. Ex. 1021 (Figure 1). Hanisch does not show any condenser coupled to the high temperature oven (*id.*), which confirms that electrolyte solvents are not recovered from that oven.

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C. Overview of Yosuke

90. 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 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; [0004]-[0008]. Yosuke is directed to battery manufacturing, not battery recycling. Ex. 1008 at [0001]. As such, Yosuke does not address the hazards inherent to the battery recycling field.

D. Overview of Hayashi

91. Hayashi discloses techniques for removing the fluorine from within intact lithium batteries, so that the remaining electrolyte solvent and the other battery materials can thereafter be more safely recovered. Ex. 1010, 11:59-12:11.

92. Hayashi deliberately forms hydrogen fluoride by adding water to the cells of a lithium battery. *See id.*, 5:33-35. Once the hydrogen fluoride forms, it is captured either in a “water cooling trap” as calcium fluoride (*i.e.*, wet processing), or the hydrogen fluoride passes through a solid, layered calcium-containing structure, by which the hydrogen fluoride is sequestered in the form of calcium fluoride (*i.e.*, dry processing). *See id.*, 6:1-8:3 (esp. 6:27-31) & 8:5-49 (esp. 8:5-17).

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93. Hayashi teaches processing a single cell of a battery at a time (*i.e.*, in a batch process, not in a continuous process). Ex. 1010, 9:37-40. Each cell being treated is about 1.6 kg. *Id.*, 11:38-39. The single cell is heated as a whole by immersing it in an oil bath. *Id.*, 9:40-44. The safety valve of the cell is removed, water is added, and a pipe is placed on top of the opening for ventilating the generated vapors. *Id.*, 4:31-33; *see also id.*, 9:37-47.

94. To promote the volatilization and exhaust of the fluorine and other solvents, the heated battery cell is subject to vacuum pressures. Ex. 1010, 4:60-5:21. In Hayashi's examples, the pressures employed ranged from 1 hPa to 200 hPa, with a preference for lower pressures. *Id.*, 4:48-5:18; 9:34-10:60

95. Contrary to Hanisch '419, Hayashi teaches that batteries must be detoxified first before the battery materials can be recycled, such as by comminution. Ex. 1010, 11:58-12:11.

E. Overview of LithoRec

96. LithoRec – Recycling Lithium Ion Batteries (“LithoRec”) is a report of a two-year study of EV battery recycling techniques by a group of researchers from TU Braunschweig, along with several EV industry partners (“LithoRec Partners”). Ex. 1012.

97. LithoRec arose from a project funded by the German government to consider better ways to recycle EV batteries. When the project began in about 2009,

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the EV battery recycling industry was in its infancy, as the market for electric vehicles was just beginning to emerge. There were very few EV batteries available to experiment with, in order to develop methods for their recycling. Ex. 1012 at 112 (“no materials from recycled batteries were available at the start of the project”); *see id.* at 2 (“Recycling of automotive lithium-ion (Li-ion) batteries is more complicated and not yet established because few end-of-life batteries will need recycling for another decade.”).

98. LithoRec investigated fundamental questions about the feasibility of EV battery recycling, including economic and scientific considerations. Some of the areas of focus of LithoRec are the following:

- **Supply and demand.** The LithoRec Partners considered whether they could obtain an adequate number of batteries to be recycled, and whether there would ultimately be a demand for the recycled materials. Ex. 1012 at 21-23.
- **Storage and transport.** The LithoRec Partners investigated the concept of centralized versus decentralized end of life battery collection, with an eye toward compliance with the local regulations on hazardous chemicals. Ex. 1012 at 32-33.

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- **Disassembly.** The LithoRec Partners considered how to discharge the batteries to strip off the casing materials before the cells could be recycled. Ex. 1012 at 1-2.
- **Separation of the metal foils from the active material.** The LithoRec Partners experimented with methods of removing the precious metal oxides from the collector foils – a precursor step to hydrometallurgical recovery of valuable materials. Ex. 1012 at 101.
- **Hydrometallurgical processing.** The LithoRec Partners investigated whether they could use solvent-based (*i.e.*, hydrometallurgical) methods, as opposed to thermal (*i.e.*, pyrolytic) methods, for extracting the precious metal oxides from the foils. The researchers concluded that a hydrometallurgical process was a promising approach for recovering the metal oxides. Ex. 1012 at 110-124.
- **Synthesis of new electrodes from recycled materials.** The LithoRec Partners investigated whether they could synthesize new electrodes from metal oxides recovered through the hydrometallurgical process. They concluded that it would be possible to manufacture new electrodes from recycled materials. Ex. 1012 at 143-150.
- **Comparison of electrodes from recycled materials versus those manufactured from virgin materials.** The LithoRec Partners ran tests

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to determine whether electrodes made from recycled materials were as functional as those that were manufactured from virgin materials. They were satisfied that the electrodes manufactured from the recycled materials were just as high performance (and in some instances more so).
Ex. 1012 at 155.

99. 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.

F. Overview of Perry

100. Perry's Chemical Engineers' Handbook is a reference book comprised of over 2,500 pages. Ex. 1015. The section of Perry cited in the Petition is entitled "Psychrometry, Evaporative Cooling, and Solids Drying." Ex. 1015 at 12-1; *id.* at 12-36 & 12-64 to 12-76. The sections of Perry cited by Petitioner do not address EV battery recycling, nor evaporating the kind of solvents addressed in Tomioka, nor the comminution or shredding of batteries.

VII. GROUNDS 1-5: TOMIOKA DOES NOT TEACH COMMINUING BATTERIES THAT CONTAIN ELECTROLYTE SOLVENT

A. Tomioka does not disclose comminuting batteries containing electrolyte solvent

101. I understand that Petitioner contends that claims 1-14 of the '463 patent would have been obvious over Tomioka, including in view of other prior art

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references. I disagree, because Petitioner fundamentally mischaracterizes Tomioka. Tomioka does not disclose comminuting batteries that still contain electrolyte solvent.

102. A person of ordinary skill in the art would understand the distinction between dismantling batteries and comminuting batteries.

103. “Comminution” refers to a variety of techniques for breaking down batteries into small pieces. The ’463 patent contains the following description:

The comminution unit should be understood especially to mean a device which, when operating, comminutes the batteries. For example, the comminution unit (i) is a pressure comminution unit whereby the batteries are crushed between two tool surfaces, (ii) a striking comminution unit whereby the batteries lie on a tool surface and are smashed by striking them with a second moveable tool, (iii) a cropping comminution unit whereby the batteries are comminuted by two tool surfaces that move in opposite directions, (iv) a cutting comminution unit whereby the batteries are cut into two parts by means of two blades and/or (v) an impact comminution whereby the batteries are thrown against a wall, impact against a moving tool or two particles collide. Of course, the comminution unit may also work by way of two or more of the named comminution mechanisms.

Ex. 1001 at 2:62-3:9.

104. In all these examples of comminution units, comminution is destructive. By crushing, smashing, cropping, cutting, or impacting the batteries, the battery is damaged and destroyed.

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105. This understanding from the patent is consistent with the way a person of ordinary skill in the art would understand the term “comminuting.” Indeed, dictionary definitions reflect this same understanding. Exhibit 2002 is a collection of dictionary definitions, and these definitions are all consistent with the way the patent describes comminution. *See* Ex. 2002. That is, comminution is a destructive approach whereby the batteries are broken down into smaller pieces.

106. The term “dismantling,” by contrast, is used to describe the careful disassembly of a battery. *See* Ex. 1005 at [0012] (quoted above). In particular, Tomioka describes “dismantling” as a cutting of the outer casing of a battery “to extract the electrode element components such as the positive electrode, negative electrode, and separator.” Ex. 1005 at [0012]. Dismantling is a way to harvest the individual components within a battery.

107. The ’463 patent recognizes the distinction between comminution and dismantling. The ’463 patent uses the term “dismantling” to refer to separating out the smaller subcomponents of a battery:

Prior to being comminuted, the used batteries are preferably dismantled. This means that larger battery systems are dismantled into their smaller subcomponents, the modules or stacks, or even that the cells which contain the electrochemically active material are separated from the control electronics.

See Ex. 1001 at 4:2-8

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108. The way that the term “dismantling” is used in the ’463 patent and in Tomioka is consistent with the way a person of reasonable skill in the art would understand this term.

109. With this understanding of the meaning of the terms “comminuting” and “dismantling,” it is clear that Tomioka does not teach comminuting the batteries while the batteries still contain electrolyte solvent.

110. To the contrary, Tomioka expressly counsels against comminuting the batteries while they contain solvent. 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).

111. Figure 20 depicts dismantling a battery, not comminuting it. This is confirmed by Tomioka, itself, which expressly describes 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; *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 such as the positive electrode, negative electrode, and separator, and if necessary, cutting them into strip-like pieces.”).

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112. Tomioka describes Figure 20 as simply removing the outer casing of the battery so that the internal components can be extracted. *See id.* 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.”). Unlike the acts of comminution described by the ’463 patent (*see* Ex. 1001 at 2:62-3:9), the dismantling of the top of the battery as shown in Figure 20 does not destroy the components of the battery.

113. Rather, the battery components are extracted, with only the outer casing cut away. A person of ordinary skill would understand that this is an act of dismantling, not of comminution.

114. Cutting the top off a battery casing is dismantling, not comminution, as confirmed by the expert from Petitioner’s supplier. I have reviewed the Uchida reference cited in the co-pending inter partes review (IPR2024-00887) filed by URT, a supplier of Petitioner. Uchida describes, in step S232, “a method in which the lid body 24 of the container 20 is cut off (severed).” *See* Ex. 2010 at [0090]; Fig. 1. This step does not disclose or suggest comminution of the battery or its internal components. My understanding is consistent with the testimony of URT’s expert in that IPR, Dr. Spies, who confirmed during his deposition that he could identify no comminution in step S232 of Uchida. *See* Ex. 2009 at 93:21–95:15. The

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lack of comminution in Uchida further reinforces my opinion that similar disclosures in Tomioka likewise fail to teach or suggest comminution as required by the challenged claims.

B. The Petition does not demonstrate any claim is more likely than not unpatentable based on Tomioka in combination with Yosuke (Ground 2)

115. I understand that Petitioner is attempting to combine Tomioka with Yosuke in order to argue that these prior art references, in combination, would have rendered the challenged claim 4 of Ground 2 obvious. I disagree.

116. A person skilled in the art would not be able to practice Claim 4 of the '463 patent based on the combined disclosures of Tomioka and 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. 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.

117. For all the reasons set forth above, *supra* ¶¶ 63-114, Tomioka simply does not disclose a system of claim 1. 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 VII.A.

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C. The Petition does not demonstrate any claim is more likely than not unpatentable based on Tomioka in combination with Hayashi (Ground 3)

118. I understand that Petitioner is attempting to combine Tomioka with Hayashi in order to argue that these prior art references, in combination, would have rendered the challenged claims 5 and 9 of Ground 3 obvious. I disagree.

119. A person skilled in the art would not be able to practice claims 5 and 9 of the '463 patent based on the combined disclosures of Tomioka and Hayashi. Claims 5 and 9 recite the methods of claim 1 with additional specific requirements related to low temperatures and low pressures.¹ Ex. 1001, 18:1-4, 18:21-24. Petitioner asserts that Hayashi discloses these additional requirements for low temperature or low pressure, and does not argue that Hayashi discloses any element of claim 1. Pet. at 48-49.

120. For all the reasons set forth above, *supra* ¶¶63-114, Tomioka does not disclose a system of claim 1. Regardless of whether Hayashi discloses the particular drying 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 VII.A.

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

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D. The Petition does not demonstrate any claim is more likely than not unpatentable based on Tomioka in combination with LithoRec (Ground 4)

121. I understand that Petitioner is attempting to combine Tomioka with LithoRec in order to argue that these prior art references, in combination, would have rendered the challenged claims 6 and 7 of Ground 4 obvious. I disagree.

122. A person skilled in the art would not be able to practice claims 6 and 7 of the '463 patent based on the combined disclosures of Tomioka and LithoRec. 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).

123. For all the reasons set forth above, *supra* ¶¶63-114, Tomioka does not disclose a system of claim 1. Regardless of whether LithoRec discloses the particular drying requirements recited by claims 6 and 7, it does not make up for any of the voids in Tomioka as to the various limitations of claim 1. *See supra*, Section VIIA.

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F. The Petition does not demonstrate any claim is more likely than not unpatentable based on Tomioka in combination with Perry (Ground 5)

124. I understand that Petitioner is attempting to combine Tomioka with Perry in order to argue that these prior art references, in combination, would have rendered the challenged claims 13 and 14 of Ground 5 obvious. I disagree.

125. A person skilled in the art would not be able to practice claims 13 and 14 of the '463 patent based on the combined disclosures of Tomioka and Perry. Claims 13 and 14 recite further specifics of the drying process of claim 1 that includes an agitator. Petitioner asserts that Perry discloses that agitator. Pet. at 52-56. Petitioner does not assert that Perry discloses any element of claim 1 and relies fully on Tomioka.

126. For all the reasons set forth above, *supra* ¶¶63-114, Tomioka does not disclose a system of claim 1. Regardless of whether Perry discloses the agitator recited by claims 13 and 14, it does not make up for any of the voids in Tomioka as to the various limitations of claim 1. *See supra*, Section VIIA.

VIII. GROUNDS 6-9: HANISCH DOES NOT TEACH INACTIVATING COMMINUTED BATTERY MATERIAL, AND DOES NOT TEACH THE REQUIRED PRESSURE CONDITIONS

A. Hanisch does not teach inactivating the comminuted material in the low-temperature pre-dryer

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127. A POSITA would not have understood the “pre-drying” step in Hanisch to teach “inactivating the comminuted material and obtaining inactivated comminuted material as a result,” as claimed in the ’463 patent. Hanisch explains 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. *This has the advantage that the electrolyte solvent can be retrieved.*” Ex. 1021 at [0025] (emphasis added). In view of this disclosure, a POSITA would have understood that the purpose of the pre-drying step in Hanisch is not to inactivate the comminuted material, but rather to condense out additional electrolyte for recovery. Ex. 1021 at [0025] (“This has the advantage that the electrolyte solvent can be retrieved.”). Hanisch does not teach inactivating the material in this pre-drying step, and Hanisch provides no guidance as to how much of the electrolyte solvent to retrieve. As I explain below, a POSITA would not have understood Hanisch to teach drying the comminuted material for long enough to remove a sufficient amount of the electrolyte solvent to achieve inactivation.

128. To the contrary, a POSITA would have understood Hanisch to be concerned with speed and more particularly with maintaining a high throughput in extracting electrolyte and separating the active material from the support. Hanisch expressly teaches that the method is “preferably performed as [sic] continual process and not in batches.” Ex. 1021 at [0020]. Consistent with this disclosure,

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Figure 1 of Hanisch (reproduced above) 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.

129. As I explained above, the conveyor belt system described by Hanisch is advantageous to avoid the accumulation of shredded battery material, which is toxic and a fire and explosion risk.

130. That Hanisch refers to the dryer 28 as a “pre-dryer” would also have indicated to a POSITA that comminuted material is not dried for a sufficiently long time to inactivate it. Rather, a POSITA would have understood the pre-dryer to perform a short treatment step prior to decomposition.

131. Further, Hanisch teaches that the battery material goes from the pre-dryer to the decomposition oven, where it will be subjected to temperatures of at least 350°C. Ex. 1021 at [0028]. A POSITA would have understood that whatever solvent remains in the comminuted battery material through the pre-dryer will be destroyed in this furnace. Thus, a POSITA would understand that there is no need to take the caution and incur the cost to dry the material to the endpoint result of inactivation.

132. Hanisch does not include the necessary technical detail to instruct how to achieve inactivation of battery material using the pre-dryer. Specifically, the reference lacks any disclosure regarding the duration of time the material must

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spend in the pre-dryer or the pressure conditions required to achieve inactivation. Additionally, Hanisch does not provide any guidance on how to assess whether the material has reached a sufficiently dry state. Furthermore, it fails to address the variability in electrolyte solvents that would be encountered depending on the types of batteries being processed, nor does it include any discussion of the specific drying conditions needed to ensure the complete evaporation of these solvents. A POSITA would have understood that this lack of detail renders the pre-dryer unsuitable for achieving inactivation, as it fails to address the fundamental parameters and conditions necessary to ensure the material is adequately processed to become inactivated.

133. Hanisch does not teach mechanisms for maintaining vacuum pressure levels, particularly in the conveyor system disclosed. Conveyor systems such as taught by Hanisch are prone to leaks at interfaces and junctions, which can result in fluctuations in pressure and inconsistencies in temperature regulation. A POSITA would have understood that these limitations make the pre-dryer unsuitable for reliably achieving inactivation of the comminuted material. Hanisch teaches no controls to ensure that the comminuted battery material is inactivated; to the contrary, by sending the comminuted material to the decomposition oven, there would be no need to implement such controls.

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134. Further, a POSITA would have understood that the rate of electrolyte extraction is inversely proportional to the volume of electrolyte extracted. In other words, as more electrolyte is extracted in the pre-drying process, it takes longer and longer to extract additional electrolyte. Given these indications that Hanisch is concerned with speed at the pre-dry stage — describing a “pre”-dryer rather than a dryer and recommending a continuous, rather than batch, process — a POSITA would not have understood Hanisch to teach leaving the comminuted battery material in the pre-dryer for the substantial amount of time required to evaporate enough electrolyte to achieve inactivation. A POSITA would have understood Hanisch to teach, at most, partial removal of the electrolyte in this low-temperature, pre-drying process. A POSITA would not have understood Hanisch to teach removing a sufficient amount of electrolyte in the pre-drying process to inactivate the comminuted battery material and make it safe for transport. Hanisch was concerned with energy consumption, and it would have run counter to this goal to extract electrolyte solvent to the point of inactivation. Ex. 1021 at [0033].

135. Therefore, a POSITA would not have understood Hanisch to teach “inactivating the comminuted material and obtaining inactivated comminuted material as a result” in the pre-dryer. And Hanisch’s high-temperature oven, which operates at a temperature of at least 350°C, is far in excess of the temperature range of the claims of the ’463 patent (*i.e.*, not more than 80°C).

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B. Hanisch does not teach using a pressure of less than 300 hPa

136. Hanisch does not disclose what pressure to conduct any of the drying operations, either in the pre-dryer or in the decomposition furnace. I have reviewed Mr. Juzkow's declaration, and I note that he does not contend that Hanisch discloses the 300 hPa limitation of the '463 patent. *See* Ex. 1003 at ¶¶195-197.

137. There are unspecified references to a "vacuum" in Hanisch. Hanisch does not have any disclosure of the strength of the vacuum.

138. A person of skill would recognize that the vacuum level in Hanisch's system would have to be weak. In the context of a conveyor system like that taught by Hanisch, it is possible to maintain a vacuum, but only a slight vacuum. This is because chunks of shredded battery material are moving into, through, and out of the process outlined in Hanisch. In order for such comminuted material to move through the system, there would need to be mechanisms in place to maintain a vacuum while these chunks of shredded material enter and exit the system.

139. Such mechanisms are taught by the Meador reference, which Petitioner originally relied upon in the co-pending IPR2024-00948. Meador uses a weather seal and teaches that a slight underpressure—specifically, 12 to 34 hPa below ambient pressure—could be applied in a system of the type described by Hanisch. *See* Ex. 2016; Ex. 2005 at 43-46; Ex. 1019 at 31–35. Based on deposition testimony from Dr. van Schalkwijk, it was confirmed that the pressure values

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disclosed in Meador represent a negative pressure relative to ambient. *See* Ex. 2016 at 68:1–73:4; Ex. 1019 at 31–35. Accordingly, even the prior art relied upon by Petitioner confirms that, in the context of a conveyor-based drying system like Hanisch’s, the application of a slight vacuum corresponds to an absolute pressure in the range of approximately 979 hPa to 1001 hPa at sea level.

140. Moreover, as Dr. van Schalkwijk previously testified, a slight vacuum of about 18 hPa would be sufficient to create a “considerable breeze” such that “everything that’s generated is moved on out of the – out of the chamber...” Ex. 2004 at 70:5-19. As he testified, a stronger vacuum would be disadvantageous, because it could mobilize particulate matter that could damage the seals of the system. Ex. 2004 at 107:5-19.

141. Petitioner does provide any explanation of how the stronger vacuum levels of Hayashi could be applied to the conveyor system of Hanisch. A person skilled in the art would understand those two systems to be incompatible and would not have been motivated to apply the pressure levels in Hayashi’s closed chamber system to the conveyor system of Hanisch, particularly when Hanisch is not attempting to neutralize hazards like in Hayashi. 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.

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142. I note that Petitioner relies on Hayashi to teach the 300 hPa and 80°C portions of claim 1. Pet., 61-63. Petitioner does not rely on Hayashi to teach the “inactivating” aspects of claim 1. *Id.*

143. The opinions above are directed to claim 1. They apply equally to the remaining dependent claims 2, 3, 5, and 9-12 addressed in Ground 6.

144. I note that Petitioner also attempts to combine teachings from Yosuke, LithoRec, and Perry. However, Petitioner is not relying on these additional references to address the 300 hPa limitation of the ’463 patent. Accordingly, for the purposes of this declaration it is sufficient to show that this combination is unworkable.

IX. GROUND 10 – CLAIM LANGUAGE IS NOT INDEFINITE

145. I understand that Petitioner contends that three separate claim terms render some or all the claims of the ’463 patent indefinite. I disagree.

146. I understand that in a co-pending IPR involving the closely related ’097 patent, the Board has already considered and rejected Petitioner’s argument that a person of ordinary skill in the art would not have understood the scope of the “inactivating” claim terms. *Ascend Elements, Inc. v. Duesenfeld GmbH*, IPR2024-00948, Paper 37 at 15-16 (June 11, 2025) (Ex. 2020). Specifically, in IPR2024-00948, the Board preliminarily determined that the “inactivating” terms were not indefinite, noting that although they are terms of degree, they are supported by the

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specification and provide sufficient guidance to a skilled artisan. *Id.* at 16-17. In my opinion, the Board’s conclusion aligns with how a POSITA would interpret the claim language, given the disclosures in the specification and the context of the invention.

147. In my opinion, the term “inactivating” (and the related phrases containing this term) are not indefinite.

148. The specification of the ’463 patent provides a detailed explanation of inactivation and its relationship to drying, in a manner that would allow a person of ordinary skill in the art to understand how inactivation is achieved. Drying is the means (the operative process) by which inactivation (the result) is accomplished. For example, the specification states that “[t]he drying of the comminuted material results in deactivated comminuted material 42, which is fed into a filling device 44.” Ex. 1001 at 13:56–58. The claim language further reinforces this point, stating that “inactivating” includes a drying process. *Id.* at 17:26–28. Based on these disclosures, a POSITA would understand that inactivation is the result of sufficient drying, and that the claim term “inactivating” reflects that process-result relationship.

149. I disagree with Petitioner’s assertion that the specification fails to explain how a POSITA would know when inactivation has occurred. On the contrary, the patent describes in detail what inactivation looks like in practical

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terms, and it identifies physical, chemical, and performance-based indicators that would signal to an operator that the material has reached the desired endpoint. For example, the specification teaches the following:

- “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

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- “[T]he drying is conducted until the dimethyl carbonate content is lower than 4% by volume....” *Id.* at 7:39-42 (teaching additional parameters).

150. 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. They reflect the same underlying goal: ensuring that the material has been sufficiently dried such that it no longer poses the risks associated with residual electrolyte, such that the material can be transported or further processed or handled.

151. 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. 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**.”)

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152. With respect to claim 7, I do not agree that the term “the agitator” is indefinite. Although the claim does not introduce “an agitator” in prior limitations, the agitator is clearly and consistently described in the specification. A POSITA reviewing the patent would understand “the agitator” to refer to the stirring or mixing component disclosed in Figures 1 and 4 and described at length in the text, including its structure, energy input, and functional role in the drying process. Ex. 1001 at 7:54–10:13; *see also 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).

153. The agitator is described as a critical component of the drying system, responsible for promoting vaporization and preventing thermal gradients or localized overheating. It is discussed in the context of both anchor and rod-type designs, and its operational parameters, such as energy input per unit volume, are specifically disclosed. Based on this, a POSITA would have had no difficulty understanding the reference to “the agitator” in claim 7 as referring back to the agitator described in the drying apparatus.

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154. Finally, with respect to claim 10, I do not consider the phrase “components of comminuted material” to be indefinite. In my opinion, this phrase would be readily understood by a POSITA to mean the physical fragments or particles resulting from the shredding or comminution of spent lithium-ion batteries. This understanding is supported by the language of the claim itself, which describes the particle size distribution (e.g., “at least 90% by weight...not more than 50 mm”), and by the surrounding disclosures in the specification.

155. The patent refers to these materials as “battery fragments” or “crushed components” and provides a clear description of how they are processed, handled, and characterized. Ex. 1001 at 2:8–3:9, 4:61–5:3. In my experience, the term “component” is often used to refer to the constituent physical elements of a heterogeneous material stream, particularly in recycling, milling, and powder-handling applications. A POSITA would have understood this usage in the context of the ’463 patent without ambiguity.

156. In sum, it is my opinion that none of the terms identified by Petitioner render the claims of the ’463 patent indefinite. The patent provides sufficient disclosure to inform a POSITA of the scope of the claimed invention, and the claim terms in question are used in a manner that is consistent with their technical meaning in the field.

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Date: July 14, 2025

Signed by:
Vani Dantam
F748B581987D4D6
Vani Dantam

Appendix A

VANI K. DANTAM

Ph: (765) 617-0658 | vanidantam@gmail.com | LinkedIn: <https://www.linkedin.com/in/vani-dantam>

EXECUTIVE SUMMARY

Accomplished global C-suite executive with 40+ years of strategic leadership experience in Energy Generation (SMR/MMR Nuclear, Renewables), Storage, Utilities, Smart Grid, Data Center and Electric Vehicle (EV) Infrastructure, and Defense industries. Managed multinational operations with substantial growth in highly complex and regulated sectors. Extensive expertise in managing large teams, design, construction and launch of global plants, and executing global mergers, acquisitions, and joint ventures. Proven ability to scale operations, increase profitability, and implement innovative technologies such as advanced energy storage solutions. Deeply involved in setting global industry standards for battery technologies as a member of SAE and UL committees. Fluent in Spanish, Portuguese, Hindi, and Telugu, with a strong international proficiency in key markets including North America, South America, Europe, and Asia. U.S. Navy veteran, recognized for public speaking and guest lectures at prestigious institutions.

CAREER HIGHLIGHTS

- **Global Leadership & Strategy:** Over 15 years of experience as VP and at C-Suite level and Board Member/Advisor to leading global companies in the energy, materials, and defense sectors. Built a career on operational excellence, growth strategy, and business transformation across diverse geographies and industries.
- **IPO Experience:** Played a key role in leading the Initial Public Offerings (IPOs) for industry leaders like Landis+Gyr, Axion Power, and Remy International, raising significant capital.
- **Advanced Storage and Generation Technology Expertise:** Decades of experience in Renewables, lead acid batteries, multiple lithium-ion chemistries and other advanced battery technologies. Successfully managed the full lifecycle of energy storage projects including project financing, feasibility studies, plant construction, and operations.
- **Global Operations/Partner Management:** Directed joint ventures and acquisitions in China, Brazil, Mexico, and India, managed OEM partnerships, manufacturing, and global energy storage/generator/motor plant (10) construction/launch in Mexico, Brazil, South Korea, France, Hungary, Poland and India. Deep expertise in energy management including, data centers, EV infrastructure, SMR/MMR reactors, smart grid technologies in utility sector.
- **Revenue Growth & Business Development:** Demonstrated success in building and managing business pipelines worth over \$200 million. Achieved a 670% increase in global sales at Remy Electric, growing international annual revenue from \$18M to \$120M in six years.
- **Leadership & Industry Recognition:** Frequent speaker at major global conferences on advanced battery technologies, EV infrastructure, and energy storage solutions. Active member of global technical committees (SAE, UL) responsible for developing and implementing industry standards. Advisor and guest lecturer at multiple universities, including Purdue University and Harvard University.

PROFESSIONAL EXPERIENCE

- **Fractal Energy Storage Consultants, Austin, TX** **Present**
Vice President Operations
- Manage over 12GWh/8GW Global Energy Projects (Generation, Renewables, Energy Storage, Management & Cyber Security), Modular/Micro Nuclear reactors, Data Centers, Plant Construction, Commissioning, and Operational Support, Patent & IP Analysis
- **Vanderbilt University, Nashville, TN** **Present**
Advisor – School of Engineering
- Provide advice on undergraduate & graduate curricula in Energy (Generation, Storage, & Management) Engineering and recruiting doctoral and post-doctoral candidates.
- **Robins & Kaplan LLP (Global Law Firm)** **Present**
Duesenfeld (Li-ion Battery Recycling Firm)
Industry Expert/Advisor
- Provide advice on lithium-ion battery recycling technology related intellectual property (IP) and patent infringement. Appraise technical documentation and prepare expert declarations.
- **SAE & UL Committees** **Present**
Committee Member
- Develop global standards for EV battery packs, recharging protocols, and second-life applications for energy storage technologies. Curricula development for engineering institutions and technical colleges, focused on EV infrastructure and battery technologies.
- **NanoX (Rare-earth Materials Firm, Netherlands),**
B.K. Batteries (Non-Li-ion Battery firm, South Korea) **Present**
Chief Strategic Consultant & Board Member
- Provide technical advice on rare earth and magnetic materials. Advise on market entry/plant construction and financing strategies, global partnerships to drive innovation and commercialization of new battery technologies.
- **Capattery (Advanced Lithium-Graphene Materials/Battery Manufacturer)** **2024-25**
Chief Strategic Advisor & Board Member
- Provide advice on financing, partnerships, development of new applications and market expansion strategies.
- **Quantum Copper (University of Nevada, Las Vegas Startup)** **2023-24**
Chief Advisor - Testing, Standardization & Certification
- Lead initiatives to develop testing and certification protocols for advanced separator materials in energy storage applications. Collaborate with university researchers and industry stakeholders to standardize new technologies.
- **UTILTYX - Cybersecurity software provider to utilities, (Milpitas, CA)** **2021-Present**
Chief Advisor - Financing & Business Development, Strategic Planning & Global Partnerships
- **Nevada Technology Corporation (Battery Recycling & Repurposing Company)** **2023-24**
CEO & Chairman of the Board
- Managed technology providers, investor relations and strategic partnerships for the company's expansion.

- **Lohum CleanTech - Noida, India** **2022-24**
 - Provider of Advanced Recycling Technologies of Lithium-ion batteries
Chief Advisor - Strategy
- **NexTech Batteries (Carson City, NV)** **2022-23**
Chief Operating Officer
 - Responsible for managing all operational functions, including HR, procurement, logistics, engineering, production, business development and pilot projects with CAISO
 - manage manufacturing facility design & development for lithium-sulfur battery technology.
 - Collaborated with external partners such as IBM to develop hybrid electrode technology and raised funding for research projects.
- **Canadian Storage & Solar (Edmonton & Toronto, Canada)** **2020- 21**
 Developer and converter of Natural Gas PPPs to solar and storage
Chief Project Consultant
 - Acquire Midwest PPP's (MISO territory), convert them to solar and storage-based units for smart grid integration with long term financing and PPAs
- **Lucas TVS (Chennai, India) & 24m Technologies (Cambridge, MA)** **2019-21**
Chief Project Consultant
 - Managed plant feasibility and project/product viability studies to develop semi-solid-state Li-ion battery technology in India on behalf of Lucas-TVS under license from 24m.
 - Led the financing, design, and construction of pilot and commercial-scale manufacturing plants for energy storage systems.
- **Landis+Gyr (Toshiba), Alpharetta, GA** **2015-19**
Vice President, Partner Relations & Strategic Planning **2017-19**
 - Member - IPO Team (Landis+Gyr divestiture). Rationalized and managed over 130+ partnerships with utilities and vendors across all product lines and services worldwide
 - Oversaw development of scalable grid connected and islanded microgrid design and development, predictive and prescriptive analytics, integrating these into NOCs and coaching Sales Managers to develop multiyear service and maintenance contracts with utilities.
- Vice President, Business Development & Sales** **2015-17**
 - Managed grid energy storage, smart grid analytics & control system project design, development, pricing, financing and installation for utilities and private/institutional investors for energy arbitrage, with and without renewable integration with LTO (from Toshiba), LFP and NMC chemistries as appropriate in different ISO regions.
 - Recruited, managed, and mentored Regional Sales managers, engineers, and analysts.
 - Led partner development for lithium-ion batteries and power electronics.
- **Axion Power International (Start-up Manufacturer of Lead-Carbon Batteries)** **2012-15**
Senior Vice President, Business Development & Sales
 - Led business development, sales, and marketing efforts for grid energy storage, controls and analytics systems, company's IPO, capital raises from PE and venture capital firms.
 - Developed revenue and cash flow models for large-scale energy storage arbitrage projects in different ISO/RTO territories, including integration with renewable energy sources.

- **Ener1 (Lithium Ion Battery Manufacturer), Indianapolis, IN** **2010-12**
Vice President, Business Development & Sales
(EV/Hybrid Transportation, Renewables, & Smart Grid Networks)
- Directed business development and sales for lithium-ion battery systems in electric vehicles (EV), hybrid electric vehicles (HEV), and utility-scale energy storage projects.
- Managed relationships with major automakers and utility companies.
- **Remy International - Global Manufacturer of EV Motor/Generators, Starter Motors & Alternators (Anderson, IN)** **1994-2010**
Global Director - EV/Hybrid & Traction Motor Sales and Business Development **2008-10**
Global Director - Heavy Duty Sales & Marketing (Daimler, Volvo & PACCAR) **2003-08**
Global Director - Automotive Motor/Generator Sales & Marketing **2000-03**
Director - International Sales, Engineering & Operations **1994-2000**
- **Delco Remy (Division of General Motors)** **1991-94**
Operations Director
- **General Motors Truck & Bus** **1989-91**
Chief Resident Electrical Engineer
- **Delco Remy (Division of General Motors)** **1984-89**
Senior Product Manager **1987-89**
Test & Development Engineer **1984-87**
- **U.S. Navy & Reserves** **1982-91**
Lieutenant (Junior Grade)
- **Vanderbilt University, Nashville, TN** **1979-82**
Civilian Researcher
- **Tata Iron & Steel, Jamshedpur, India** **1978**
Summer Intern
- **Kolar Gold Fields, Kolar, India** **1977**
Summer Intern

EDUCATION

- **MBA - 1988 (Finance & International Business), Indiana University, USA**
- **MS - 1982 (Mechanical Engineering), Vanderbilt University, USA**
- **B.Tech - 1979 (Metallurgical Engineering), Indian Institute of Technology (IIT-BHU), India**
- **Churchill Scholar - Trinity College, University of Cambridge, UK**

CERTIFICATIONS & CONTINUING EDUCATION

- **APQP Quality Engineering Certification - GM Quality Institute, Kettering University**
- **Mercosur/NAFTA and Eurozone Certifications - Indiana University & Purdue University**
- **Continuing education in Contracts, Corporate Taxation, and Export/Import Classifications, Wharton School of Business**

VOLUNTEER EXPERIENCE

- **Board Member – Chirala(my native place in India) Medical & Educational Trust** **2018-Present**

- **Advisor & Primary Benefactor** - Our Children Our Planet (501c3) **2016-Present**
- **Organic/Non-GMO Farmer** - promoting sustainable farming practices through an agricultural cooperative **2014-Present**
- **Board Member** - Thrive Solar Private Ltd. **2016**
- **Guest Lecturer** - Indiana University, Harvard University, Purdue University & other institutions
- **Board Member** - YMCA of Madison County, IN **2003-2008**

Materials Considered

- Ascend Element, Inc.’s Petition for Post-Grant Review (PGR2025-00037), including all materials attached thereto.
- The Deposition of Volker Spies, taken June 13, 2025.
- U.S. Published Patent Application No. 2008/0050295 to Uchida.
- Dictionary definitions of “comminution,” as referenced herein.
- Ascend Elements, Inc.’s Initial Invalidity Contentions in Duesenfeld GmbH v. Ascend Elements, Inc., Case No. 23-1194-JFM (D. Del.).
- Petition for *Inter Partes* Review by Ascend Elements, Inc., Case No. IPR2024-00948, including all materials attached thereto.
- Petitioner’s Reply to Patent Owner’s Response by Ascend Elements, Inc., Case No. IPR2024-00948.
- Joint Claim Construction Chart in Duesenfeld GmbH v. Ascend Elements, Inc., Case No. 23-1194-JFM (D. Del.)
- PTAB Preliminary Guidance on Patent Owner’s Motion to Amend, Case No. IPR2024-00948.
- Declaration of Mark Juzkow, dated March 7, 2025.
- Patent Owner’s Discretionary Denial Brief, Case No. PGR2025-0037, including all materials attached thereto.

- Gao Liu et al., Binder Interactions in the Electrodes of the Lithium-ion Batteries, TFUG Conference, February 17, 2009 (“Gao”) (Ex. 2017).
- U.S. Patent No. 9,780,419 (“Hanisch” or “Hanish ’419”) (Ex. 2018)
- DE 102012024876 A1 to Electrocyling GmbH (“Electrocyling”) (English) (Ex. 2021).
- U.S. Patent No. 7,198,865 to Sloop (“Ecobat”) (Ex. 2024).
- WO 2010/149611 A1 to LiMotive Company Ltd. (“LiMotive”) (Ex. 2025).
- WO 2010/149611 A1 to LiMotive Company Ltd. (“LiMotive”) (German) (Ex. 2026).
- Institution Decision, *Ascend Elements, Inc. v. Duesenfeld GmbH* (IPR2024-00948), dated November 22, 2024 (Ex. 2020).
- U.S. Patent No. 9,450,277 (“Dunagan”) (Ex. 2015).
- U.S. Patent No. 5,632,863 (“Meador”) (Ex. 2016).

Any other materials referenced in my Declaration.