

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND ELEMENTS, INC.,
Petitioner,

v.

DUESENFELD GMBH,
Patent Owner.

Case No. IPR2024-00948
U.S. Patent No: 11,050,097

DECLARATION OF VANI DANTAM

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U.S. Patent No. 11,050,097

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 is requesting that the Patent Trial and Appeal Board (“Board”) institute *inter partes* review (IPR) of U.S. Pat. No. 11,050,097 (“the ’097 patent”) (Ex. 1001).

2. In my capacity as an expert, I have been asked to provide my independent analysis and opinions regarding the ’097 patent, the prosecution history of the ’097 patent and related applications as applicable, the alleged prior art relied upon by Petitioner, the meaning of various claim terms from the ’097 patent from the perspective of a person of ordinary skill in the art (“POSITA”), and the opinions offered by Petitioner’s expert, Dr. Walter van Schalkwijk, in his declaration (“van Schalkwijk 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 (\$250) based on my time spent analyzing the ’097 patent, the prosecution history of the ’097 patent and

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related applications, the prior art publications relied upon by Petitioner, the van Schalkwijk Declaration, and other related materials. I will not receive any added compensation based on the outcome of any IPR or other proceedings involving the '097 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 2015).

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 Masters of Science (MS) degree in Mechanical Engineering from Vanderbilt University, under a U.S. Navy Scholarship.

7. In 1987, I obtained a Masters 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. Currently, I am 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 2-3

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

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

17. Dr. van Schalkwijk opined that a POSITA in the field of the '097 patent would have “at least a master’s degree in chemical engineering, mechanical engineering, materials science/engineering, or a related field, and three to five years of experience in design and implementation of battery recycling processes,” and I understand that Ascend has adopted that definition of a POSITA. Ex. 1003, ¶15; Petition at 15-16.

18. I disagree with Dr. van Schalkwijk’s definition, for at least two reasons. First, the field of battery recycling was still relatively nascent as of the 2015 effective filing date of the '097 patent. Few people in the world would have had “three to five years of experience” in that field by 2015. I note that Dr. van Schalkwijk himself, based on a review of his CV, does not appear to have had extensive experience in battery recycling processes as of 2015. In my opinion, however, experience in battery processing could substitute for experience with recycling, as a person with processing experience would understand battery chemistry and composition as well as processing steps such as discharge, comminution, and heating.

19. Second, in my opinion a person with a Bachelor’s degree and

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sufficient experience in either industry or academia would also qualify as a POSITA. I have been informed that some named inventors on the '097 patent were graduate students at Technical University of Braunschweig in Germany when they conceived of the inventions, and they would likely meet this condition as they would not yet have the advanced degree that the Petitioner argues for in its proposed definition of a POSITA.

20. In my opinion, a more appropriate definition for a POSITA would therefore be a Bachelor's degree in electrical engineering, materials science, chemical engineering, or an equivalent field, as well as at least 2 to 3 years of academic or industry experience in the recycling or processing of lithium-ion batteries.

21. I believe that I am qualified to render opinions regarding the technology described and claimed in the '097 patent under either party's proposed definition of a POSITA, 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 '097 patent (i.e., April 28, 2015). I have been working in the lithium battery field, including supervising the processing of lithium-ion batteries, since 2012. My career has continued in the battery recycling field, and I have participated in various industry organizations relating to battery

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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. I have provided my declaration herein from the perspective of a person of ordinary skill in the art, under either party's proposed definition, in the time frame of the invention of the '097 patent, i.e., as of April 28, 2015.

22. 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

23. 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

24. 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.

25. 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.

26. I understand that it is the use of the words in the context of the written

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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.

27. 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.

28. 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.

29. 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 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

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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

30. 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.

31. I am informed 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.

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

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V. BACKGROUND OF THE '097 PATENT

A. Technology Overview: EV Batteries

33. The technology at issue in this case relates to the recycling of electric vehicle “EV” batteries. To appreciate the state of the art at the time of invention, an understanding of the structure of EV batteries is important.

34. Figure 1 below is an image of an EV battery, as published in 2009. Ex. 2002 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.

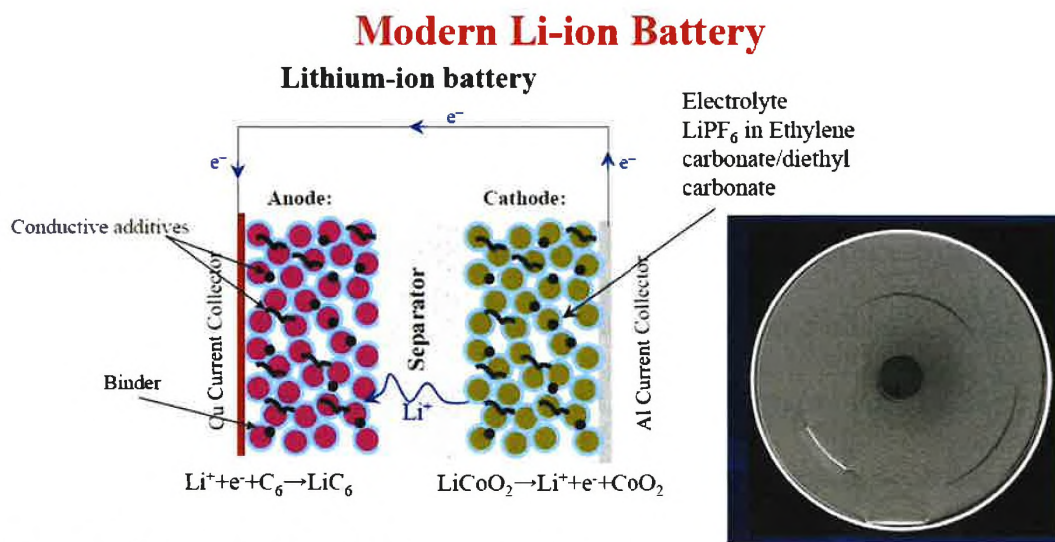


Figure 1: Diagram of lithium ion battery components.

Ex. 2002 at 5.

35. The cathode is the positive electrode. Ex. 2002 at 5. The cathode is formed on a support, which is typically aluminum foil. *Id.* Metal oxides are pasted

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onto the support foils. *Id.* These metal oxides include lithium cobalt oxide (LCO), lithium iron phosphate (LiFePO₄), or nickel manganese cobalt oxide (NMC) or nickel manganese aluminum oxide (NMA). Ex. 1004, 3:11-13 (“On the cathode side, for example, lithium nickel manganese cobalt oxide, lithium nickel aluminum oxide and lithium iron phosphate.”). A binder (light blue line shown in Figure 1) is used to affix the metal oxides onto the copper foil support. Ex. 2002 at 5.

36. The anode is the negative electrode. Ex. 2002 at 5. The anode is formed on a support, which is usually copper foil. *Id.* Onto the copper foil is pasted graphite, again using a binder. Ex. 2002 at 5.

37. Between the cathode and the anode there is a thin membrane called a “separator.” Ex. 2002 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.

38. The lithium ions are dissolved in a solvent, which is commonly one or more of the following: ethylene carbonate, dimethyl carbonate, ethyl methyl carbonate, propylene carbonate or diethyl carbonate. Ex. 2002 at 5. The form of lithium used is typically lithium hexafluorophosphate (LiPF₆). *Id.* When the lithium is dissolved in the solvent, the lithium is referred to as an “electrolyte.” The lithium

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ions in the electrolyte transit back and forth between the positive cathode and the negative anode as the battery is charged and discharged. *Id.*

39. The metal oxides are affixed onto the foils by means of a binder. Ex. 2002 at 5. The binder is a polymer, and frequently polyvinylidene fluoride (PVDF) is used. Ex. 1004, 3:17-18 (“The binder can, for example, be polyvinylidene fluoride (PVDF)”). The binder embeds the metal oxide particles and fixes them onto the foils, which provides for the structural integrity of the electrodes. Ex. 1004 at 1 (“The galvanic cell includes an active material, a support for the active material and a binder for bonding the active material and the support.”). The binder is chemically stable, and helps the battery maintain its durability over the battery’s chemical environment and the mechanical stresses undergone by the battery over its lifetime.

40. The most valuable components of the battery are the metal oxides in the cathode. However, these metal oxides are embedded in the binder, which must be dissociated in order to liberate the metal oxides. Ex. 1004, 2:31-36 (“The invention is based on the knowledge that the heating of the cell fragments up to the decomposition temperature would theoretically have to be enough to destroy the binder to the extent that the active material is set free, but such that the active material is nevertheless difficult to remove from the support.”). Because of the stability of the binder, a high heat furnace/oven may be used to decompose the

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binder. Temperatures on the order of 350° to 800°C may be sufficient to decompose the binder. Ex. 1004, 4:25-27 (“The decomposition temperature is preferably at least 350°C and at the most 800°C. It has been found that at these temperatures the binder is certain to decompose.”). Once the binder is decomposed, the metal oxides in shredded material are reduced to black powder along with pieces of metal foil substrate pieces.

41. The high temperatures of these furnaces/ovens can generate unwanted by-products. For example, LiPF_6 and PVDF may decompose into a toxic gas, including hydrogen fluoride (“HF”). Ex. 1006 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.

42. In order to facilitate the breakdown of these batteries, it is advantageous to shred them. The term “comminuting” is used to describe the shredding of batteries. By shredding the batteries, the individual components are exposed, to better allow the extraction of the underlying materials. Shredding the batteries yields an unstructured bulk of fragments of battery components. *Id.* A hazard arises when there are residual charges left in the batteries. Ex. 2003, 2:[0004] (“When crushing electrolytic cells under normal atmosphere, the electrolyte or a solvent containing electrolyte can easily ignite due to released

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electrical charges and associated arcing. In the case of lithium-ion cells, such a fire is accompanied by a release of hydrogen fluoride.”). These residual charges may spark, triggering a chemical reaction. Ex. 1018, 1:29-31 (“The danger lies in the charge that some of these cells may still contain, which could lead to causing a fire.”). Explosions and fires may result. Ex. 2003, 2:[0004].

43. 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.

44. The transportation problem is heightened by the toxic nature of the used batteries (whether shredded or whole). Ex. 2003, 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 emanate from aged electrolytic cells.”). Thus, there was a need to “inactivate” the batteries prior to transportation.

45. Many companies have experimented with techniques to inactivate spent or shredded batteries. These prior art techniques typically relied on adding

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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:

46. **Ecobat.** In 2007, Ecobat LLC filed for patent protection on a technique for safely handling shredded lithium-ion batteries. Ex. 2004. Ecobat focused on flushing the electrolyte out of the batteries using a pressurized solvent. Ex. 2004, 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. Ex. 2004, 5:41-45. Various additives are then added to the fluid to enhance extraction of electrolyte. Ex. 2004, 6:1-14. The pressure and temperature of the fluid are then increased until the battery casings are breached. Ex. 2004, 6:39-46. The fluid then enters the breached cell and begins to dissolve the electrolyte. Ex. 2004, 7:10-15. Once the electrolyte is dissolved, the solution is moved to a precipitation vessel for further extraction of electrolyte components. Ex. 2004, 8:3-10.

47. **LiMotive.** In 2009, LiMotive Company Ltd. filed for patent protection on a method for safely preparing batteries for disposal. Ex. 2005, 2:23-25. A true and correct copy of the LiMotive patent (in German) is attached hereto as Exhibit 2006. A certified English translation of the LiMotive patent is attached hereto as Exhibit 2005, upon which I rely for my opinions. LiMotive's technique teaches shredding the batteries in the presence of a metal flame retardant and one

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binding agent. Ex. 2005, 3:1-6. According to the invention, lithium-ion batteries are shredded through a stream of high-pressurized water containing abrasive materials. Ex. 2005, 6:10-13. Adding water is used in conjunction with fire retardant agents to prevent, suppress, reduce, or extinguish fire during the shredding process. Ex. 2005, 3:5-20. Fire retardants are used to put out localized fires in order to prevent thermal runaway (explosion). Ex. 2005, 3:24-27. 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). Ex. 2005, 9:10-14. 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. Ex. 2005, 12:2-8. The filtrate is then dried to reduce the weight of the filtrate before transport. Ex. 2005, 12:8-12.

48. **Electrocycling.** In 2009, Electrocycling GmbH filed for patent protection on a technique for processing batteries for transport. Ex. 2003. A true and correct copy of the Electrocycling patent (in German) is attached hereto as Exhibit 2007. A certified English translation of the Electrocycling patent is attached hereto as Exhibit 2003, upon which I rely for my opinions. The Electrocycling patent disclosed two alternative embodiments for deactivation of batteries: one by aqueous solution, another via a deactivating powder. Ex. 2003, 5:[0034]-[0035]. According to the first embodiment of the invention, crushed lithium-ion battery

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cells fragments are filled into a plastic drum pre-filled with aqueous lithium hydroxide (LiOH) solution. Ex. 2003, 3:[0017], 5:[0034]. In another embodiment of the invention, shredded cells are dusted with deactivation powder before they reach the collection drum. Ex. 2003, 3:[0018], 3:[0035].

49. **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. 2001. According to Hayashi's method, a whole battery is first depressurized and immersed in an oil heater for 2 hours. Ex. 1006, 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. 1006, 4:38-45. Hayashi's method purposefully decomposes lithium hexafluorophosphate to release the fluorine gas. Ex. 1006, 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. 1006, 5:18-52. The released gasses are then captured and separated: the organic solvent components are recovered while the fluorine compound is immobilized as calcium fluoride. Ex. 1006, 5:64-67.

50. **Dunagan.** In 2014, Dennis Dunagan and Teague Ostrander filed for patent protection for a system for recycling volatile battery sources. Ex. 1018. Dunagan's process teaches neutralization of comminuted lithium batteries in a

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neutralizing brine solution. Ex. 1018, 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.” Ex. 1018, 5:18-25, 5:31-34. The wet comminuted material is then air dried before the second round of comminution. Ex. 1018, 5:31-34, 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. 1018, 5:63-6:5. The homogenous material is then transported to a processing plant for reclamation of battery components. Ex. 1018, 5:63-6:5.

51. There was a drawback to using foreign substances to inactivate the batteries. Adding these additional compounds introduced further contaminants into the battery material, thus complicating the recycling process. *See* Ex. 1001, 2:6-12 (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 inactivated comminuted material and increases the purity in the subsequent separation and recycling steps”); *see also id.* (“In particular, in potential subsequent hydrometallurgical processing steps, a high degree of product purity that does not require the input of 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.

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B. '097 Patent Overview

52. The '097 patent describes an important advance for inactivating shredded batteries for transportation. Instead of introducing foreign substances to inactivate the shredded batteries, the '097 patent is directed to inactivating the shredded batteries by simply drying them under vacuum, particularly at a maximum pressure of 300 hPa. Ex. 1001. The method of the '097 patent avoids the use of high temperatures during the drying process as a way to inhibit the formation of toxic gases, especially HF. Ex. 1001, 2:5-12.

53. Through this process, the technique of the '097 patent results in dried, shredded battery material, which is chemically inert and safe for storage and transport. Ex. 1001 at 1:63-2:4 (“The comminuted material is therefore largely inert and can be transported.”).

54. Once inactivated, the shredded battery material can be shipped to a centralized facility for additional processing steps, like decomposing the binder and harvesting the metal oxides from the support foils. Ex. 1001, 6:27-31.

55. The '097 patent describes and claims methods and installations that provide an efficient, low-cost way of recovering spent battery material with high purity and rendering it safe for transport by inactivating the comminuted battery material using a vacuum drying process.

56. Claim 1 of the '097 patent is as follows:

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1. A method for the treatment of used batteries, comprising the steps:
 - (a) comminuting the batteries such that comminuted material is obtained;
 - (b) inactivating the comminuted material such that an inactivated comminuted material is obtained, wherein the inactivating step is performed during or after the comminuting step; and
 - (c) filling a transport container with the inactivated comminuted material;wherein the inactivating step is performed by drying the comminuted material, and
wherein the drying occurs at a maximum pressure of 300 hPa.

EX1001, 10:44-59.

57. Claim 12 of the '097 patent is as follows:

12. A battery processing installation for treatment of used batteries, comprising:
 - (a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;
 - (b) an inactivation device comprising a drying device configured to inactivate the comminuted material, wherein the inactivation device is configured to perform the inactivating step during or after the comminuting step of the comminution unit;
 - (c) a filling device configured to fill a test transport container with the

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inactivated comminuted material; and

(d) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device.

EX 1001, 11:50-62.

C. Related District Court Litigation

58. I am aware of a related District Court case involving the same parties, and where the '097 patent has been asserted and validity of the '097 patent claims has been challenged.

VI. ANALYSIS OF HANISCH '419 AND THE COMBINATION OF HANISCH '419 WITH DUNAGAN (GROUND 1)

59. Dr. van Schalkwijk opines that claims 1-3, 7, 8, 9, 10, 12-13, and 19 of the '097 patent are obvious in view of Hanisch '419 and the knowledge of a POSITA (Ground 1). I disagree with Dr. van Schalkwijk's conclusions regarding the combination of Hanisch '419 and the knowledge of a POSITA, for the reasons discussed below.

A. Overview of Hanisch '419

60. Hanisch '419 is directed to retrieving active material, such as lithium or lithium compounds, from a galvanic cell (a type of battery). Ex. 1004, 1:8-10. Hanisch '419 recognizes a problem in the art of incomplete separation of the active material from its support material. Ex. 1004, 1:32-36. In particular, Hanisch '419 notes that while it was known to shred a cell into fragments and then heat those

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fragments to decompose the binder that bonds the active material to the support, the active material was extremely difficult to remove from the support. Ex. 1004, 2:31-42. Hanisch '419 is directed to solving this problem of incomplete removal, and it 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. Ex. 1004, 2:39-55.

61. Given the problem that Hanisch '419 seeks to solve, the patent focuses on techniques for achieving a more complete separation of active material from the support. To achieve separation, Hanisch '419 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. 1004, 4:25-27. Hanisch '419 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, 2:39-40. According to Hanisch '419, the impact “removes the active material hitherto adhered to the support so that it can be retrieved.” Ex. 1004, 2:40-42.

62. In addition to the decomposition and air-jet sieving steps, Hanisch '419 teaches an optional pre-drying step, which is set up “behind the cell crushing device and before the oven.” Ex. 1004, 5:54-56. According to Hanisch '419, the purpose of the pre-drying step is to retrieve additional electrolyte. As the patent explains, “the cell fragments are dried at a drying temperature, so that dry cell

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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. 1004, 3:65-4:4.

63. Hanisch ’419 is therefore concerned with improved techniques for separating active material from carrier films. As I discuss further below, Hanisch ’419 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.

64. As I describe below, I disagree with Dr. van Schalkwijk that the teachings of Hanisch ’419 render obvious certain claim elements of the ’097 patent.

B. Hanisch ’419 Does Not Teach All Limitations of ’097 Claim 1

1. Hanisch ’419 Does Not Teach “inactivating the comminuted material such that an inactivated comminuted material is obtained” in the pre-dryer

65. Dr. van Schalkwijk opines that Hanisch ’419 teaches two examples of inactivating comminuted material: an electrolyte evaporation approach, and a decomposition heating approach. Ex. 1003, ¶88. I disagree with Dr. van Schalkwijk’s opinions for reasons I discuss further below, but I first address an error in Dr. van Schalkwijk’s characterization of the ’097 patent itself.

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a. The '097 patent does not disclose inactivating the comminuted material by heating it to a decomposition temperature

66. Dr. van Schalkwijk contends that a POSITA would have understood the '097 *patent* to disclose two examples of inactivating the comminuted material—an “electrolyte evaporation approach” and heating the comminuted material to a decomposition temperature. Ex. 1003, ¶87. I disagree. Dr. van Schalkwijk’s premise regarding the teachings of the '097 patent is fundamentally flawed. The '097 patent does not teach inactivation of the comminuted material by heating that material to a decomposition temperature. *See* Ex. 1003, ¶87. The '097 patent discloses inactivation by drying at low temperatures under vacuum.

67. The '097 patent specifically teaches drying the comminuted battery material at a temperature that is *lower than* the decomposition temperature:

The drying preferably occurs at a temperature that is lower than a decomposition temperature. The decomposition temperature should be understood particularly to mean the lowest temperature at which at least 80 percent by mass of the binder has decomposed into gaseous components after keeping the comminuted material at this temperature for an hour.

Ex. 1001, 3:18-24.

68. While the '097 patent discloses an optional high-temperature

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decomposition step, the patent makes clear that this step is separate from the inactivation drying step: “It is favourable if this drying step, which can also be described as high temperature drying, occurs in a separate space from a first drying step, described above.” Ex. 1001, 5:41-44. Further, the ’097 patent explains that the high-temperature step can be performed at normal, atmospheric pressure, rather than under vacuum: “It is possible that the high temperature drying and the low temperature drying occur at different pressures. For example, the high temperature drying can be executed at normal pressure.” Ex. 1001, 5:49-52.

69. Therefore, contrary to Dr. van Schalkwijk’s assertion, a POSITA would not have understood the ’097 patent to disclose inactivating the comminuted battery material by heating it to a decomposition temperature. Rather, a POSITA would have understood the ’097 patent to disclose decomposition as a separate step, performed after—and preferably in a separate space from—the vacuum drying step.

b. Hanisch ’419 does not teach inactivating as part of the pre-drying step

70. A POSITA would not have understood the “pre-drying” step in Hanisch ’419 to teach “inactivating the comminuted material.” Hanisch ’419 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

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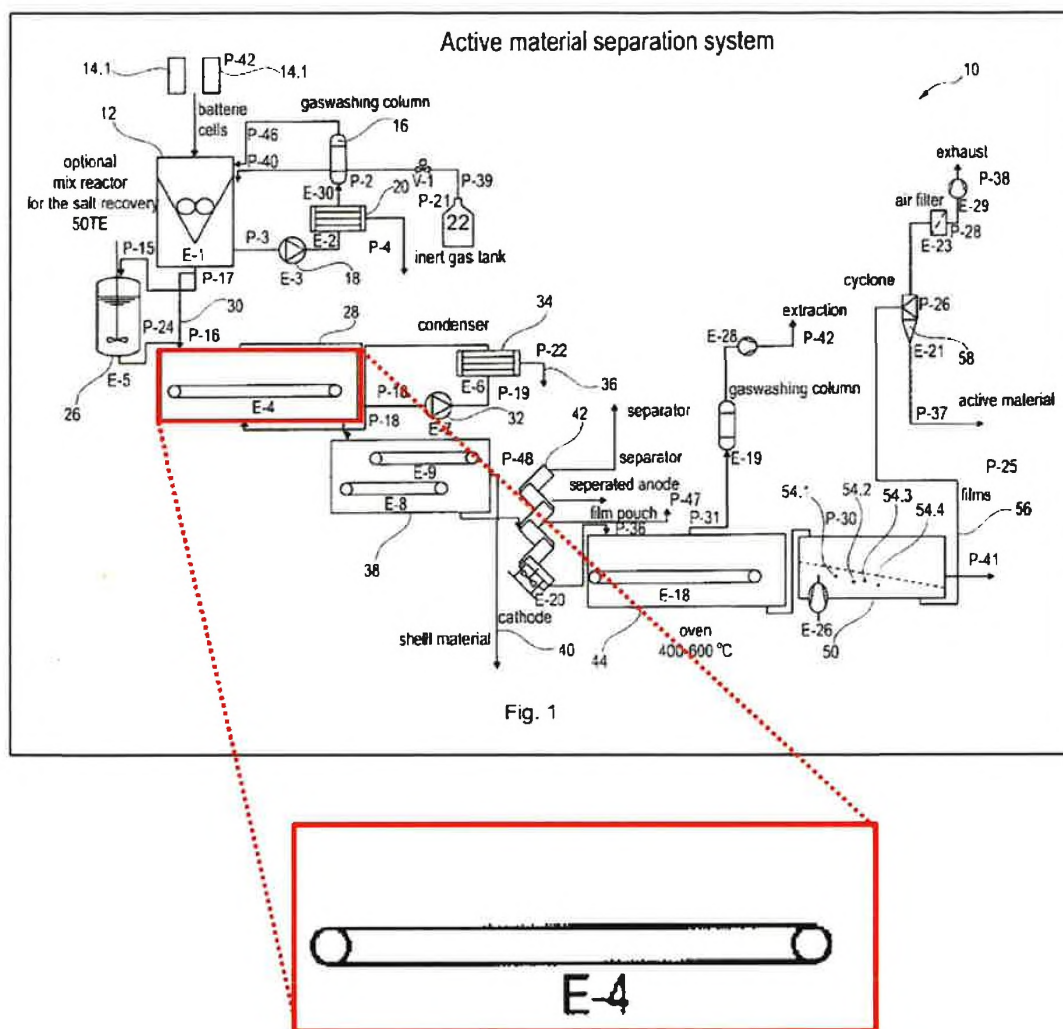
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partly condensed. *This has the advantage that the electrolyte solvent can be retrieved.*” Ex. 1004, 3:65-4:4 (emphasis added). In view of this disclosure, a POSITA would have understood that the purpose of the pre-drying step in Hanisch ’419 is not to inactivate the comminuted material, but rather to condense out additional electrolyte for recovery. Hanisch ’419 has no express teaching of inactivating the material in this pre-drying step, and it provides no guidance whatsoever as to how much of the electrolyte solvent to retrieve. As I explain below, a POSITA would not have understood Hanisch ’419 to teach drying the comminuted material for long enough to remove a sufficient amount of the electrolyte solvent to achieve inactivation.

71. To the contrary, a POSITA would have understood Hanisch ’419 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 ’419 expressly teaches that the method is “preferably performed as [*sic*] continual process and not in batches.” Ex. 1004, 3:27-28. Consistent with this disclosure, Figure 1 of Hanisch ’419 (reproduced below) 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. A POSITA would have understood the conveyer belt to move material through the dryer continuously, again consistent with processing at high throughput.

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Ex. 1001, Fig. 1 (annotations added).

72. That Hanisch '419 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.

73. Further, a POSITA would have understood that the rate of electrolyte

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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 '419 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 '419 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 '419 to teach, at most, *partial* removal of the electrolyte in this low-temperature, pre-drying process. A POSITA would not have understood Hanisch '419 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.

74. The '097 patent, by contrast, is not concerned with speed but rather with drying for a sufficiently long time that the comminuted battery material is rendered inert and safe for transport. A POSITA would have understood that inactivating the comminuted battery material at a temperature of 80°C (as used in the pre-dryer of Hanisch '419) is a time-consuming process. As the '097 patent expressly discloses, to inactivate the comminuted material, it should be dried “until an electrolyte content in the comminuted material is so low that an electrochemical

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reaction is impossible.” Ex. 1001, 4:5-7. The ’097 patent provides various metrics for determining when this condition is satisfied. For instance, the ’097 patent discloses that “[t]he drying is preferably conducted for so long that the accumulated content of organic carbonates from the electrolyte that are volatile at 80° C. falls short of 3% by volume in the atmosphere above the comminuted material.” Ex. 1001, 4:33-36. Further, the ’097 patent discloses that “it is beneficial if the comminuted material is dried until the electrolyte content of organic components that are volatile at 80° C. has a maximum value of 3% by weight, in particular a maximum of 2% by weight, especially preferably a maximum of 1.5% by weight.” Ex. 1001, 4:28-32.

75. Given the low temperature taught, a POSITA would have understood the pre-dry process of Hanisch ’419—the purpose of which, again, is *not* to inactivate the crushed battery material but rather to extract some of the electrolyte prior to heating—to be inconsistent with the inactivation benchmarks disclosed in the ’097 patent, each of which would require significant time to achieve. A POSITA would have understood that Hanisch ’419 does not teach exposing the comminuted material to the drying conditions in the pre-dryer for nearly long enough to inactivate it.

76. Therefore, a POSITA would not have understood Hanisch ’419 to teach “wherein the inactivating step is performed by drying the comminuted

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material” at the pre-dry step.

2. Hanisch '419 does not teach “wherein the inactivating step is performed by drying the comminuted material”

77. Dr. van Schalkwijk opines that Hanisch '419 discloses this limitation, citing back to ¶¶ 74–75 and 87–101 of his declaration and his discussion of both the pre-dryer and the decomposition oven in Hanisch '419. Ex. 1003, ¶ 107. I disagree with Dr. van Schalkwijk that Hanisch '419 teaches this claim element, for the reasons discussed below.

78. First, with regard to the pre-dryer taught in Hanisch '419, a POSITA would not have understood that step to teach drying for a sufficiently long time to inactivate the comminuted material. *See* § VI.B.1.b, *supra*. Therefore Hanisch '419 does not teach that an *inactivating* step is performed by drying the comminuted material in the pre-dryer, and Hanisch '419 does not teach this claim element through its teaching of a pre-dryer.

79. Second, with regard to the decomposition oven 44 taught in Hanisch '419, a POSITA would not have understood that decomposition step to teach “drying the comminuted material.” In opining that Hanisch '419 teaches this element through decomposition heating, Dr. van Schalkwijk incorrectly conflates the low-temperature drying actually disclosed and claimed in the '097 patent with a fundamentally different process taught by Hanisch '419: decomposition via

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pyrolysis.

80. In my opinion, a POSITA would understand the term “drying” as it is used in the ’097 patent to refer to removing a liquid substance by extracting a gaseous part of that substance. Consistent with this understanding, the ’097 patent explains that “the term drying should be understood particularly to mean the *removal* of at least one solvent in the conducting salt,” and further that “[i]n particular, the drying is executed such that dimethyl carbonate and/or ethyl methyl carbonate is *removed*.” Ex. 1001, 2:23-27, emphases added. The ’097 patent further discloses that the electrolyte solvent, including the DMC and EMC, should be recoverable by condensation—i.e., removed rather than decomposed—after drying. Ex. 1001, 5:11-22 (“The method comprises the steps of condensing components of the electrolyte by cooling and/or increasing the pressure such that an electrolyte condensate occurs . . . Electrolyte can be recovered in this way.”). The ’097 patent therefore uses the term “drying” in this ordinary sense.¹

¹ I am aware that the ’097 patent separately describes “high temperature drying,” as I discussed in § VI.B.1.a. But this high-temperature drying is not the same as the claimed drying. This distinction is evident to me (and would have been evident to a POSITA) because the high-temperature “drying” step follows the “first drying step” (Ex. 1001, 5:43), whose purpose is to remove at least one solvent in the conducting salt. *Id.*, 2:23-25. A POSITA would have understood that by the time the second, “high temperature drying” step is performed, the solvent is already removed, i.e., the claimed “drying” is complete. The purpose of the second, “high temperature drying” step is to decompose the binder. This second, “high

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81. By contrast, Hanisch '419 does not teach drying the comminuted cell fragments in the oven 44. Instead, it teaches heating cell fragments up to a very high “decomposition temperature” of “preferably at least 350° C and at the most 800° C,” noting that at those temperatures, “the binder is certain to decompose.” Ex. 1004, 4:25-27. At these temperatures, rather than being removed from the comminuted material by evaporation such that they could be collected and reused, e.g., the electrolyte and solvents will—like the binder—decompose into other, distinct compounds. A POSITA in 2015 would have understood that the LiPF₆ electrolyte salt present in the comminuted battery material would decompose into lithium fluoride (a solid) and PF₅ gaseous byproducts. *See* Ex. 2008, Yang (2006) at 1, 5-7. A POSITA in 2015 would further have understood that volatile electrolyte solvents such as DMC and EMC, in the presence of LiPF₆, would rapidly decompose into gases including carbon dioxide, ethane, fluoroethane, and dimethyl ether. *See* Ex. 2009, Gnanaraj (2003) at A1536.

82. Pyrolyzing the solvents at the decomposition temperatures taught by Hanisch '419 is therefore not “drying” at all because the solvents decompose and are not recoverable. The solvents are not *removed* through pyrolysis—they are

temperature drying” step is *not* intended to remove a solvent in the conducting salt, which is the purpose of the claimed drying.

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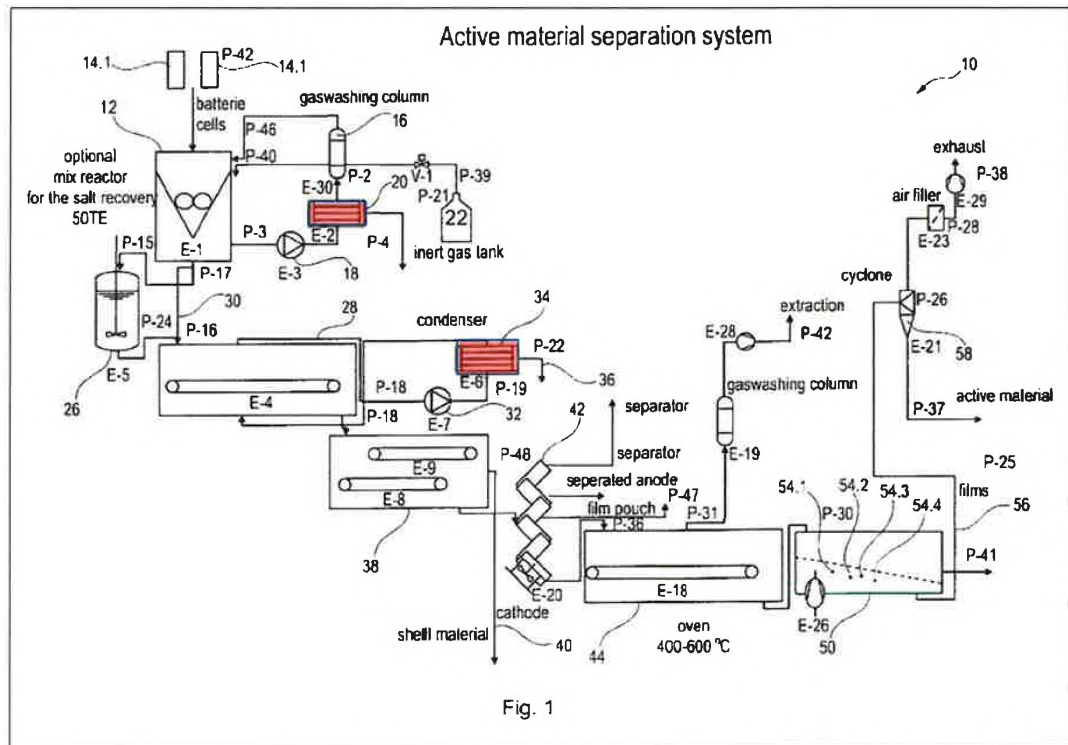
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destroyed. Hanisch '419 teaches the optional pre-dry step for precisely this reason: to collect some part of the electrolyte solvent for reuse before it is destroyed by pyrolysis in the decomposition step. Any other understanding would render the pre-dry step superfluous and unnecessary.

83. My opinion on this point—that the decomposition heating step in Hanisch '419 does not “dry” the comminuted material by removing the electrolyte solvents, but rather destroys those solvents through pyrolysis—is supported by the fact that Figure 1 of Hanisch '419 (below) shows condensers 20 and 34 connected to both the cell crushing device 12 and the pre-dryer 28, respectively, and Hanisch '419 describes condensing out and collecting electrolyte solvent during both the cell crushing and pre-drying steps. Ex. 1004, 5:46-47, 5:59-61.

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Hanisch '419 Fig. 1 (annotations added).

But Hanisch '419 does not show any condenser connected to the decomposition oven 44; only a gas washing column is connected to the oven. At the high oven temperatures taught by Hanisch '419 for decomposition, no electrolyte solvents would remain for collection and reuse: the solvents would rapidly decompose into non-electrolyte gases such as carbon dioxide and ethane. The gas washing column would filter and clean those gases, but unlike with a drying process, the electrolyte solvent would be destroyed by pyrolysis and none would remain.

84. I note that the '097 patent inventors themselves recognized and relied

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upon this distinction between pyrolysis and “drying” while prosecuting their patent application. In responding to an office action on January 10, 2020, the inventors distinguished both Hanisch ’419 and U.S. Patent No. 5,632,863 to Meador, which is Exhibit 1011 to Ascend’s petition.

85. Meador is directed to a pyrolysis process for reclaiming components of spent batteries. Ex. 1011, 3:11-16. Meador teaches crushing the used batteries in a hopper before passing them through a pyrolysis chamber. Ex. 1011, 4:30-47. Meador teaches operating the pyrolysis chamber at a temperature between 350° and 650° F, which is roughly 175° to 350° C. Ex. 1011, 5:59-60. According to Meador, the pyrolysis chamber includes a collector for retrieving “dry residue” following pyrolysis, which allows for recovery of “valuable components of the batteries and other wastes.” Ex. 1011, 3:31-36.

86. In distinguishing Meador, the inventors argued that it “discloses a battery reclamation system and method which centers around pyrolysis, in particular decomposition temperatures between 350° and 650° F,” and further that “[d]rying’ and ‘drying device’ as described in the disclosure at, e.g., page 4 of the specification, *is distinguished from Meador’s furnace 17*. Accordingly, Meador *fails to even have a ‘drying device’* much less a ‘comminution unit and . . . drying device [that] are arranged in a container’ as recited in claim 9.” Ex. 1002 at 258 (emphases added). They further argued, regarding Hanisch ’419, that “[l]ike

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Meador, Hanisch involves heating to extremely high decomposition temperatures. In Hanisch's case, the desired temperatures are 350 to 800°C. A combination of Stevens, Kellermann, and Hanisch fails to arrive at the subject matter of the claims as amended herein." Ex. 1002 at 258. The inventors then made nearly identical arguments about Meador and Hanisch '419 in responding to a final rejection on June 4, 2020. Ex. 1002 at 192. Those arguments were successful and the '097 patent was allowed in response. *See* Ex. 1002 at 65.

87. I agree with the '097 inventors that Meador's furnace 17 is not a "drying device" and does not perform "drying." I further agree that heating to the temperatures taught by Meador—350° and 650° F—would not result in drying, but rather would result in pyrolysis, which a POSITA would have understood as a distinct process from drying. The same reasoning applies to distinguish Hanisch '419, which teaches using substantially higher temperatures for the decomposition than Meador does. Meador's 350° and 650° F corresponds to approximately 175° to 350°C, a considerably lower range than the 350° to 800°C taught by Hanisch '419. Just as Meador's furnace is not a "drying device" and does not perform "drying," so too the decomposition oven 44 in Hanisch '419—which operates at much higher temperatures than Meador's furnace—is not a "drying device" and does not perform "drying." I agree with the inventors that "heating to extremely high decomposition temperatures," as taught by Meador and Hanisch '419, is not

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“drying.” The Patent Office apparently agreed as well, as it issued the patent in response to the inventors’ arguments.

88. Therefore Hanisch ’419 does not teach this claim element at all, as neither the pre-dry step nor the decomposition step teaches inactivation by *drying*.

89. To summarize, to the extent Hanisch ’419 teaches “drying” in the pre-dry step, it does not teach *inactivation* by drying as disclosed in the ’097 patent, because the comminuted material is not treated in the pre-dryer for a sufficiently long time to inactivate it. *See* § VI.B.1.b, *supra*. And to the extent Hanisch ’419 teaches “inactivation” in the decomposition heating step, it does not teach inactivation by *drying* as disclosed in the ’097 patent, because the comminuted material is treated at such a high temperature that the electrolyte solvents decompose rather than evaporating or boiling out into vapors that could be condensed and collected for reuse. Hanisch ’419 therefore fails to teach this limitation, whether at the pre-dry step or the decomposition heating step.

3. Hanisch ’419 does not teach “wherein the drying occurs at a maximum pressure of 300 hPa”

90. Dr. van Schalkwijk opines that the disclosure of a “vacuum” in Hanisch ’419 could apply to either the pre-dryer or the high-temperature decomposition oven (Ex. 1003, ¶ 111), but I disagree. Considering the disclosures on which Dr. van Schalkwijk relies in context, a POSITA would have understood

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the “vacuum” to refer only to the decomposition oven, and not to the pre-dryer.

91. First, I note that Hanisch ’419 nowhere expressly states that vacuum should be applied in the pre-drying step. The entire Hanisch ’419 disclosure contains only six instances of the term “vacuum,” and none describe the pre-drying step.

- The abstract teaches applying vacuum during the crushing step: “The method includes . . . crushing the cells, in particular under inert gas or in a *vacuum*.” Ex. 1004, p. 1.
- The abstract also teaches the option (along with inert gas) of using vacuum in the decomposition step: “heating the solid cell fragments up to the decomposition temperature (T_z), which is high enough to make the binder decompose so that it loses its binding properties, preferably under inert gas or in a *vacuum*.” Ex. 1004, pp. 1-2.
- The term “vacuum” also appears twice in the claims of Hanisch ’419, once in reciting the crushing step (“(a) crushing the galvanic cell, under inert gas or in a *vacuum*, to form solid cell fragments”) and once in reciting the decomposition heating step (“[t]he method according to claim 1, wherein the heating of the solid cell fragments up to the decomposition temperature takes place under

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inert gas or in a *vacuum*.”). Ex. 1004, 7:6-7, 8:11-13.

- The term “vacuum” also appears in the patent specification in describing the decomposition step: “The heating of cell fragments up to the decomposition temperature is preferably carried out under inert gas or in a *vacuum*.” Ex. 1004, 4:6-8.
- Finally, the patent includes the following disclosure: “The heating up of solid cell fragments is understood in particular to mean heating up in gas-proof container, so that oxygen, for example, is prevented from the entering. In particular, the heating up takes place under inert gas or in a vacuum.” Ex. 1004, 3:4-8.

92. Dr. van Schalkwijk makes much of this last disclosure and opines that the reference to “vacuum” there could apply to either the decomposition heating step *or* the “electrolyte evaporation” (pre-dry) step. Ex. 1003, ¶111. Properly read in view of the entire specification, however, a POSITA would have understood this disclosure of a “vacuum” to describe only the decomposition heating step.

93. First, this last disclosure to which Dr. van Schalkwijk points appears after disclosure in the specification of the decomposition step (at 2:31-42, e.g.) but well before any description of the pre-dry step, which is first addressed at column 4, line 55. Therefore, the only “heating” yet disclosed at column 3 of the specification is decomposition heating, and a POSITA would therefore naturally

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understand the “heating up of solid cell fragments” to refer to the decomposition heating.

94. Further, Hanisch '419 explains that the pre-dryer “is flushed with inert gas by the circulation pump 32.” Ex. 1004, 5:61-63. A POSITA would have understood that a chamber being flushed with gas would ordinarily not be under a strong vacuum, as the provision of the flushing gas would compromise the vacuum. A POSITA reading this disclosure would further have understood that a vacuum would be unnecessary and wasteful where the container was already being flushed with inert gas to prevent entry of oxygen and potential ignition.

95. Further, to the extent Hanisch '419 teaches operating the oven 44 under vacuum for the decomposition heating step, it does not teach “a maximum pressure of 300 hPa.” Further, even if that maximum pressure were obvious, the decomposition heating is not “drying.” See § VI.B.2. Therefore Hanisch '419 does not teach “wherein the drying occurs at a maximum pressure of 300 hPa,” whether in the pre-dry or decomposition heating steps.

C. Hanisch '419 Does Not Teach All Limitations of '097 Claim 12

1. Hanisch '419 does not teach “an inactivation device comprising a drying device to inactivate the comminuted material”

96. Dr. van Schalkwijk opines that Hanisch '419 discloses this limitation for reasons discussed as to claim limitation 1[b] and 1[d], citing back to ¶¶ 84-86

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of his declaration. Ex. 1003, ¶ 132. I disagree with Dr. Schalkwijk. Hanisch '419 does not teach this limitation for at least the reasons I discussed at above at §§ VI.B.1.b and VI.B.2. In particular, Hanisch '419 fails to teach “inactivation” as part of the pre-dry step, as I described at § VI.B.1.b, and (2) Hanisch '419 fails to teach “drying” at the decomposition heating step, as I described at § VI.B.2. Because Hanisch '419 fails to teach a single step in which both “inactivation” and “drying” occur, Hanisch '419 necessarily fails to teach “an inactivation device comprising a drying device to inactivate the comminuted material.”

2. Hanisch '419 does not teach “a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device.”

97. Dr. van Schalkwijk further opines that Hanisch '419 discloses this limitation of claim 12 for the same reasons he discussed for claim limitation 1[e], citing back to ¶¶ 110–116 of his declaration. Ex. 1003, ¶ 134. I have responded to ¶¶ 110–116 of Dr. van Schalkwijk's declaration already at § VI.B.3 above, pointing out where I disagree with his opinions.

98. Dr. van Schalkwijk offers additional reasons purportedly supporting his opinion that Hanisch '419 teaches this limitation, but I disagree that Dr. van Schalkwijk's additional reasons support his opinion. I address those reasons, and the flaws in Dr. Schalkwijk's conclusions, below.

99. First, Dr. van Schalkwijk notes that Hanisch '419 discloses a “pre-

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dryer” configured to heat the cell fragments to a “drying temperature,” and that Hanisch ’419 teaches that “heating up takes place under inert gas under vacuum.” Ex. 1003, ¶ 135. Dr. van Schalkwijk then opines that a POSITA would therefore conclude that Hanisch ’419 “discloses generating a vacuum in the drying device.” I disagree with Dr. van Schalkwijk. As I explained above at § VI.B.3, the “heating” that “takes place under inert gas or vacuum,” as taught in Hanisch ’419, refers to the decomposition heating step in the oven 44 and does not refer to the pre-dryer 28, which a POSITA would have understood to be operated either at or above atmospheric pressure.

100. Dr. van Schalkwijk also points to the circulation pump and condenser associated with the pre-dryer and opines that a POSITA would understand them to be a “vacuum installation.” Ex. 1003, ¶ 136. But Dr. van Schalkwijk’s opinion is flawed. First, I note that Dr. van Schalkwijk’s opinion concerning the function of the circulation pump and condenser is informed by his reading of the ’097 patent itself, which I understand to result in impermissible hindsight in an obviousness analysis. As Dr. van Schalkwijk himself puts it,

In my opinion, a POSITA would understand the circulation pump and condenser of Hanisch [’419] to be a “vacuum installation” *in view of the examples in the ’097 patent* describing that a “vacuum pump should be understood particularly generally to mean a device that creates a vacuum,” (EX1001, 8:23-25), a “vacuum pump is a compressor which sucks in and compresses gas 31 that is present in the drying device 26,” (EX1001, 8:29-31), that the “vacuum

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installation comprises a condenser . . . arranged in the direction of material flow in front of a vacuum pump, by means of which the dryer is evacuated,” (EX1001, 6:44-51), and that the “vacuum installation comprises an injector or venturi pump, i.e. a jet pump with a pump liquid that is used to generate negative pressure.” (EX1001, 7:4-6.).

Ex. 1003, ¶ 136, emphasis added. Dr. van Schalkwijk then opines that a POSITA would therefore “understand that where Hanisch discloses that the ‘pre-dryer 28 comprises a circulation pump 32 and a condenser’ (emphasis added), the circulation pump and condenser (i.e. a vacuum installation) would be ‘connected’ to the pre-dryer (a drying device), given the ‘comprising’ language used to modify ‘pre-dryer.’” Ex. 1003, ¶ 136. Dr. van Schalkwijk is therefore relying on the ’097 patent disclosure of a “vacuum installation” comprising a condenser and a pump to conclude that a POSITA would have understood the condenser and pump in Hanisch ’419 to be a “vacuum installation.” In other words, Dr. van Schalkwijk is relying on the ’097 patent disclosure *itself* in opining as to what a POSITA would have understood Hanisch ’419 to teach, rather than relying on any teaching in the prior art. I understand that this reliance on the invention itself in an obviousness analysis constitutes improper hindsight bias as, under a legally-proper analysis, a POSITA would be aware of the prior art but not the patent itself. Therefore a POSITA would not have concluded that Hanisch ’419 taught a vacuum installation connected to the pre-dryer.

101. Further, a POSITA would not have understood the oven 44 in

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Hanisch '419 to be a drying device at all. As I described above at § VI.B.2, Hanisch's oven carries out a decomposition process which is fundamentally different from "drying."

102. As there is no suggestion in Hanisch '419 of a vacuum installation connected to the pre-dryer, and as the oven does not perform "drying," Hanisch '419 does not teach this claim element.

D. Summary of Opinions Regarding Hanisch '419 and the Combination of Hanisch '419 with Dunagan (Ground 1)

103. To summarize, then, it is my opinion that Hanisch '419—whether by itself or in combination with Dunagan—fails to teach all of the elements of claim 1 and claim 12 of the '097 patent and therefore does not render those claims obvious.

104. With regard to claim 1, the pre-dry step of Hanisch '419 fails to teach "inactivating the comminuted material" (*see* § VI.B.1.b). The decomposition heating step, to the extent it teaches inactivating the material by pyrolyzing the electrolyte solvents, fails to teach "drying" the comminuted material (*see* § VI.B.2). Hanisch '419 therefore fails to teach "wherein the inactivating step is performed by drying the comminuted material."

105. Further, the pre-dry step of Hanisch '419 fails to teach "wherein the drying occurs at a maximum pressure of 300 hPa," not only because there is no express disclosure of this element, but also because a POSITA would have seen no

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need for a vacuum where the pre-dryer was being flushed with inert gas (*see* § VI.B.3). The decomposition heating step of Hanisch '419 likewise fails to teach “wherein the drying occurs at a maximum pressure of 300 hPa” at least because it fails to teach “drying” (*see* § VI.B.3). Hanisch '419 therefore fails to teach “wherein the drying occurs at a maximum pressure of 300 hPa.”

106. With regard to claim 12, Hanisch '419 does not teach “an inactivation device comprising a drying device to inactivate the comminuted material” for the same reasons I discussed at § VI.C.1 above. The pre-dry step of Hanisch '419 fails to teach “inactivation,” and the decomposition heating step of Hanisch '419 fails to teach “drying,” therefore Hanisch '419 fails to teach “an inactivation device comprising a drying device.”

107. And Hanisch '419 does not teach “a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device” for reasons similar to those I discussed at § VI.C.2 above. Hanisch '419 does not teach a vacuum installation connected to the pre-dryer, which a POSITA would have understood to be operated at or above atmospheric pressure. Further, to the extent a vacuum installation is connected to the oven 44 at all, the oven is not a “drying device” because it does not perform “drying.” Hanisch '419 therefore fails to teach “a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device.”

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108. I note that Dunagan, which Dr. van Schalkwijk alleges teaches the “filling a transport container” limitation, does not address these deficiencies of Hanisch ’419, and neither Dr. van Schalkwijk nor Ascend argues otherwise.

VII. ANALYSIS OF THE COMBINATION OF HANISCH ’419 WITH DUNAGAN, MEADOR, SHIN, AND/OR HAYASHI (GROUND 2)

109. Dr. van Schalkwijk further opines that Hanisch ’419 in combination with other alleged prior art references including Dunagan, Meador, Shin, and/or Hayashi render obvious claims 1-3, 7, 8, 9, 10, 12-13, and 19 of the ’097 patent (Ground 2). None of these references address the key deficiencies of Hanisch ’419, however, namely that it fails to teach “wherein the inactivating step is performed by drying the comminuted material” (claim 1) and further fails to teach “an inactivation device comprising a drying device” and “a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device,” and neither Dr. van Schalkwijk nor Ascend argues otherwise.

VIII. ADDITIONAL REMARKS

110. I reserve any right that I may have to supplement this declaration if further information becomes available or if I am asked to consider additional information or to submit an additional declaration if *inter partes* review is instituted. Furthermore, I reserve any right that I may have to consider and comment on any additional expert statements and testimony of Petitioners’ experts

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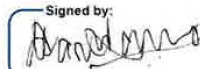
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in this matter.

111. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

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Dated: August 24, 2024

Signed by:


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Vani Dantam