

EXHIBIT 1023

URT EX1023
URT Umwelt und Recyclingtechnik v. Duesenfeld
IPR2024-00887

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

URT Umwelt und Recyclingtechnik GmbH,
Petitioner

v.

Duesenfeld GmbH,
Patent Owner

Case No. IPR2024-00887
U.S. Patent 11,050,097

**DECLARATION OF VOLKER SPIES, IN SUPPORT OF PETITIONER'S
REPLY TO PATENT OWNER'S RESPONSE**

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I. INTRODUCTION

I, Volker Spies, declare as follows:

1. I am over the age of twenty-one (21) years, of sound mind, and capable of making the statements set forth in this Declaration. I am competent to testify about the matters set forth herein. All facts and statements contained herein within my personal knowledge are true and correct, and I believe those items stated herein on information and belief to be true and correct.

2. I have previously provided a declaration for this matter filed as EX1003 (“first Declaration”) in support of Paper No. 1, Petition for *Inter Partes* Review of U.S. Patent No. 11,050,097 (“Petition”). I have also previously provided a declaration for this matter filed as EX1022 (“second Declaration”) in support of Paper No. 8, Petitioner’s Reply to Patent Owner’s Preliminary Response (“RPOPR”). My testimony from the first and second Declarations remain the same.

3. I have considered all materials cited herein. I confirm that to the best of my knowledge, the new exhibits are true and accurate copies of what they purport to be and that an expert in the field would reasonably rely on them to formulate opinions such as those set forth in this declaration.

4. I am being compensated at my customary rate of \$500 per hour for my work on this case. My compensation is not dependent upon my opinions, my testimony, or the outcome of this case.

II. UNDERSTANDING OF THE GOVERNING LAW

5. I have also relied upon various legal principles (as explained to me by Petitioner's counsel) in formulating my opinions. My understanding of these principles is summarized in my first declaration in paragraphs 17-37.

III. MATERIALS CONSIDERED

6. In formulating my opinions, I have relied on my training, knowledge, and experience. Furthermore, I have specifically considered the following documents that were submitted after my second Declaration, in addition to any other documents cited in this Declaration.

Exhibit No.	Document
1024	US 685,287
1025	US 5,575,083
1026	US 2008/0050295
1027	LithoRec Presentation 2013
1028	American Heritage Dictionary Second College Edition
1029	Continuous Dryer
1031	JP 2013-4299 ("Mitsubishi")
1032	English translation of JP 2013-4299
1034	English translation of LithoRec 2013 Presentation
1035	Program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference

Exhibit No.	Document
1037	English translation of program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1039	Deposition of Vani Dantam
2025	Declaration of Vani Dantam
2030	Somsuk et al.
2032	Boiling point of DMC
2033	Boiling point of EMC

IV. RESPONSE TO CERTAIN ARGUMENTS RAISED BY VANI DANTAM

A. LithoRec

7. PO asserts that LithoRec only discloses a conceptualized system for battery shredding and packaging that does not incorporate vacuum drying. POR, 1

8. However, LithoRec discloses that during their investigation into the treatment and recovery of electrolytes, vacuum drying was employed to evaporate electrolyte solvents under vacuum (“The electrolyte contained in the separator/electrode composite is removed at an elevated temperature in a vacuum.”). EX1016, 98. LithoRec also discloses “As some of the liquids to be vaporized are highly flammable solvents, the drying temperature should probably be severely restricted. This in turn speaks in favor of drying under vacuum, as the drying temperature can be kept low.” EX1016, 226.

9. A person of ordinary skill would understand that together, these two portions of LithoRec describe applying well-established vacuum drying technology to battery processing, particularly to evaporating electrolyte solvents from battery material (comminuted or otherwise). A person of ordinary skill would also understand that the drying of the battery material under vacuum would inactivate (as defined in the '097 patent) the battery material because LithoRec describes using vacuum drying technology to remove at least one electrolyte from the battery material. EX1016, 98, 226.

B. Claim Construction

10. Petitioner's expert, Mr. Vani Dantam, asserts that a person of ordinary skill would not have considered "inactivation" to be "the removal of at least one solvent, such as dimethyl carbonate or ethyl carbonate, from the conducting salt" because "inactivation" is an end goal of drying. However, Mr. Dantam contradicts himself by defining "inactivated" as "rendered safe for transport"—which is just a different (alleged) end goal. EX2025 ¶163.2.

11. PO's and Mr. Dantam's proposed construction of "inactivated" (rendered safe for transport) is merely one presumed characteristic among many characteristics common to the several embodiments disclosed in the '097 patent. EX1001, 2:1-14; 4:5-7, 19-40.

12. In my opinion, a person of ordinary skill would not have ignored the ‘097 patent’s explicit definition of “inactivated” to define “inactivated” based on some presumed characteristic common to the embodiments disclosed in the ‘097 patent.

13. In my opinion, the ‘097 patent provides an explicit definition for “inactivated” when the ‘097 patent states “The drying of the comminuted material results in inactivated comminuted material.” EX1001, 8:54-55. Thus, in my opinion, a person of ordinary skill would understand that, according to the explicit definition provided by the ‘097 patent, comminuted material that has been dried is “inactivated.”

14. In my opinion, the ‘097 patent also provides an explicit definition of “drying” when the ‘097 patent states “Within the scope of the present description, the term drying should be understood particularly to mean the removal of at least one solvent in the conducting salt. In particular, the drying is executed such that dimethyl carbonate and/or ethyl methyl carbonate is removed.” EX1001, 2:23-27.

15. The use of the term “drying” in the explicit definition of “inactivated” is not accompanied by any further description of “drying” or any qualification or exclusion that would distinguish the “drying” as used in the definition of “inactivated” from the explicit definition of “drying” provided by the ‘097 patent. Thus, in my opinion, a person of ordinary skill would understand that, according to

the '097 patent, comminuted material is "inactivated" when at least one solvent in the conducting salt (particularly dimethyl carbonate and/or ethyl methyl carbonate) has been removed.

16. In addition, my view is that one of ordinary skill would not have considered "rendered safe for transport" to be the plain and ordinary meaning of "inactivate." For example, the American Heritage Dictionary Second College Edition defines "inactivate" as "to render inactive." The American Heritage Dictionary Second College Edition further defines "inactive" as "not readily participating in a chemical reaction". EX1028. In my view, PO's definition is unhelpful to understanding the technology and claims, at least because it does not even explain what "safe for transport" means, and because PO's definition is at odds with this general definition.

C. Vacuum Installation

17. PO asserts that LithoRec is insufficient to show that a vacuum installation existed in the prior art. POR 16. PO points to the lack of an explicit disclosure of a vacuum pump in the pilot plant diagram of LithoRec as evidence that LithoRec fails to show that a vacuum installation existed in the prior art. POR 23.

18. However, as PO argued during prosecution, the '097 does not limit the structure of the vacuum installation to a vacuum pump. A vacuum installation

in my opinion therefore should be understood to be anything that is capable of producing a vacuum in a dryer. EX 1002, 157.

19. Furthermore, a dryer cannot operate under vacuum without a vacuum installation that generates the vacuum in the dryer. Given that drying under vacuum is an old and well-known technology (as exemplified by the existence of at least US 685,287 (EX1024); US 5,575,083 (EX1025); US 2008/0050295 (EX1026)), a person of ordinary skill would have understood that vacuum installations for dryers exist in the prior art.

20. Moreover, LithoRec explicitly discloses that during their investigation into the treatment and recovery of electrolytes, vacuum drying was employed to evaporate electrolyte solvents under vacuum. EX1016, 98. LithoRec does not expressly disclose how the vacuum condition in the dryer was created. But a person of ordinary skill would have understood that the vacuum condition was created by a vacuum installation because, by definition, a vacuum installation creates a vacuum.

21. As noted above, the authors of LithoRec discussed applying vacuum drying technology (which was used during their investigation into the treatment and recovery of electrolytes) to the evaporation of electrolytes from comminuted battery material. *See supra* ¶8. Given that a vacuum installation necessarily existed during the investigation, a person of ordinary skill would have understood that a

vacuum installation also existed for the “drying under vacuum” disclosed by LithoRec for the vacuum drying of the comminuted battery material.

D. The Dryer of LithoRec Is Not Limited to Vibratory Fluidized Bed Dryers or Continuous Convection Dryers

22. PO’s and Mr. Dantam’s arguments assume that the dryers disclosed in LithoRec are limited to continuous convection dryers and, more particularly, vibratory fluidized bed dryers, because those are the specific types of dryers mentioned for use with the pilot plant. POR, §§VI-VIII; EX2025, §§VII-X. However, a person of ordinary skill would not have considered the teaching of LithoRec to be limited to vibratory fluidized bed dryers or continuous convection dryers.

23. In the development of the pilot plant, the authors of LithoRec created a process chain for the pilot plant and then explored the different types of equipment that could be installed in the general layout. EX1016, 222-235. The process chain included: (1) a discharging system, (2) a pre-shredding system, (3) a drying system, (4) a sorting system, (5) a further processing and transportation system, and (6) an extraction and dedusting system. EX1016, 222-235.

24. The authors of LithoRec then explored different types of equipment to be implemented in the process chain. For the pre-shredding system, the authors noted that various types of shredding machines have become established in the field of shredding metallic secondary raw materials and that any of those types of

shredding machines could be used as the pre-shredding system for the pilot plant. For planning purposes, the authors concluded that any type of shredding machine capable of shredding metallic secondary raw materials could be used. EX1016, 226. Thus, a person of ordinary skill would have understood that the type of comminuting device taught by LithoRec is not limited to the cross-flow hogger selected for the pilot plant.

25. For the drying system, the authors identified different viable drying characteristics for evaporating electrolytes from the comminuted material (i.e., convection drying, vacuum drying, batch mode, continuous mode, etc.). Ex1016, 226. The authors identified various requirements for the dryer and factors for selecting the type of dryer and eventually selected a vibratory fluidized bed dryer for the configuration illustrated in Fig. G-1.

26. The arrangement of equipment is illustrated in Fig. G-1. In addition, although the authors ultimately chose a particular type of dryer for the configuration illustrated in Fig. G-1 is not tailored or otherwise limited to a vibratory fluidized bed dryer. Ex1016, 226-227, Fig. G-1.

27. The document provided by PO “Transferring Heat with a Vibratory Fluidized Bed” includes a diagram of a “vibrating fluidized bed” dryer. EX2012, 3. In the diagram, a first fan (forced draft fan) is located underneath the material flow bed, which is needed to generate a positive pressure and aerate the material bed.

Without this flow of air, the vibratory fluidized bed dryer cannot dry the battery material. In addition, a second fan is located on the outlet side of the dryer and is necessary to overcome the pressure drop of the system above the fluid bed.

EX2012, 3.

28. Fig. G-1 of LithoRec does not show any “forced draft fan.” The only “fan” shown in Fig. G-1 is identified as “ventilator 3.08,” which is drawn as a dedusting fan. Furthermore, the ventilator 3.08 supplies gas to various pieces of equipment such as, for example, the pre-shredder, rotary valve, etc., rather than just the dryer as shown in EX2012. EX1016, Fig. G-1.

29. In my view, a person of ordinary skill therefore would have understood that if the pilot plant was intended to be used only with a vibratory fluidized bed dryer, Fig. G-1 would have at least included the two fans described above. Moreover, the dryer shown in G-1 is labelled generically as “dryer”.

EX1016, Fig. G-1.

30. In view of the diagram in EX2012 and the lack of vibratory fluidized bed dryer specific accessories illustrated in Fig. G-1 of LithoRec, one of ordinary skill would have understood that the process chain for the pilot plant is generic with respect to the type of dryer used to evaporate the electrolytes and is designed to be used with more than one type of dryer system. EX1016, 222-235. Therefore, Fig. G-1 should not be interpreted as being limited to a specific kind of dryer,

much less a vibratory fluidized bed dryer—let alone a vibratory fluidized bed dryer that is incapable of operating under vacuum, as PO argues.

31. Although LithoRec discloses that “batch drying is not used” in one example, a person of ordinary skill would have understood that the disclosure of LithoRec still includes “batch drying.” The authors of LithoRec qualify their decision to select continuous drying over batch drying and then specifically teach how to accommodate the alleged deficiency of batch drying. EX1016, 226. In particular, LithoRec discloses that the only reason for choosing continuous drying over batch drying (i.e., an assumed longer work cycle associated with batch drying) is based on incomplete data. EX1016, 226.

32. In addition, LithoRec teaches that the longer work cycle can be accommodated when LithoRec discloses “Whereas conventional rotor shredders only work continuously in a throughput, the cross-flow shredders are operated in sets. This batch operation allows the duration and intensity of the load (rotor speed) to be optimally adapted to the desired degree of digestion.” EX1016, 226.

33. As Mr. Dantam agreed during his deposition, a person of ordinary skill would also be familiar with the benefits and tradeoffs of batch and continuous drying. EX1039, 21:14-23, 27:1-8. For example, a person of ordinary skill would have understood that batch drying offers better control of drying, while continuous drying is used when drying consistency is not necessary. EX1039, 21:14-23. I

agree that there are known tradeoffs. I further note that batch drying does quite often provide for better control of vacuum and temperature conditions during drying, and that continuous drying quite often provides a simplified process flow and better throughput. These tradeoffs have been known by those skilled in the art for decades.

34. Since LithoRec discloses the need to eliminate the potential hazard of flammable solvents and the need to convert the active mass to dry powder, a person of ordinary skill would have recognized the need to better control of drying and would have known that batch drying is the better option for better control of drying. EX1016, 226. Thus, in my view, it would have been obvious for one skilled in the art to have implemented batch drying in LithoRec.

35. Thus, one of ordinary skill would have considered the scope of LithoRec to include dryers that operate in batch mode and dryers that operate under vacuum.

36. Also, vacuum drying is not exclusive to batch drying. Continuous dryers have also been implemented for vacuum drying. One example is provided in EX1029, 1-2. This is a brochure from a company called Draiswerke GmbH in Germany. The pictures are from the late 1990s. I worked at this company for a time and left in 1998. The type K-TR is the machine in question, i.e., it is a continuous vacuum dryer. “K” stands for continuous, and “TR” stands for

“Trockner” (or dryer in English). Moreover, we would implement a pressure gate to help overcome potential pressure mismatches, e.g., between the vacuum operating pressure and the atmospheric pressure around the machine. There is no reason why the K-TR industrial dryers could not be used in this kind of application, even when vacuum was desired, as it was standard for us to use pressure gates. The K-TR dryer was commercially available long before 2015.

37. Further, I understand that PO called into question an earlier observation about whether continuous vacuum dryers exist. But as is easily confirmable via a simple Google search, continuous vacuum dryers have been commercially available from Gebrüder Lödige GmbH, AVA GmbH & Co. KG (nowadays BHS-Sonthofen GmbH, which is my current employer), Bachiller, Barcelona, B&P Littleford, and 3V Tech for years, and they have been used in a broad array of industrial applications. By contrast, I note that Mr. Dantam conceded he did not specifically search for the existence of continuous vacuum dryers. EX1039, 42:23-45:22.

38. In addition, since LithoRec identifies the battery material and the chemicals that are to be evaporated, a person of ordinary skill would have only required minimal guidance to implement the claimed shredder and vacuum dryer system. EX1016, 100, 222-235.

39. In particular, as Mr. Dantam agreed during his deposition, the most important dryer variables to optimize for drying particular materials are pressure, time, and temperature. EX1039, 16:22 through 17:10. In addition, optimizing such variables is standard practice for designing drying systems. EX1039, 15:15 through 20:2. I agree that vacuum dryers have been simple to implement in a wide variety of applications, and indeed have been implemented by process engineers for over 40 years. I also agree that they generally tend to follow Boyle's law. That means that it is routine to optimize pressure and temperature to achieve expected results, including lowering pressure to reduce temperature. In the context of comminuting of rechargeable batteries, for example, one skilled in the art at the time of the invention would have had no trouble making these optimizations and indeed would have done so to avoid the very well known issues of combustibility and flammability as discussed, for example, in LithoRec, and as noted in salient international standards. In my view, one skilled in the art would have undertaken these standard tasks and optimized time, temperature, and pressure, knowing that lower pressures lead to lower temperatures which would have been advantageous in this specific application where there are combustion/flammability concerns.

E. LithoRec Teaches Completely Drying the Comminuted Material

40. Mr. Dantam and PO assert that because the dryer selected for the pilot plant is continuous and because the comminuted material contains multiple types

of solvents with different boiling points, the material exiting the dryer will not be fully dried. EX2025, ¶¶119-120, 145.1-145.2, 160-161; POR, 24-25. However, PO and Mr. Dantam fail to provide any evidence supporting their assertion. Their entire argument is speculative at best. By the time of the invention, the types of batteries and electrolytes of concern were well known—as was the target material size. LithoRec was making public presentations about this prior to the filing of the application leading to the ‘097 patent. EX1027; EX1035.

41. Mr. Dantam and PO assert that LithoRec lacks a disclosure of a control system that would ensure proper drying. At the outset, although a control system may be evidence that the materials are sufficiently dried, the opposite is not necessarily true. A person of ordinary skill would have understood that drying systems are capable of sufficiently drying materials regardless of whether there is a control system that ensures the proper drying of solvents. In my opinion, one skilled in the art at the time of the invention certainly would have controlled the system to ensure proper drying. As Mr. Dantam pointed out, there is an obligation to build to specifications, and drying logically would be part of the specifications. EX1039, 21:5-12. There was nothing new or unknown about the batteries or electrolytes, as evidenced by other public LithoRec activities prior to the invention.

42. In addition, there are many examples of continuous dryers that are capable of fully drying non-homogeneous materials as well as continuous dryers

that operate under vacuum (e.g., K-TR 630 and K-TR 1200). *See supra* ¶36.

EX1029, 1-2. Moreover, LithoRec explicitly discloses that the flammable solvents are completely evaporated. In particular, LithoRec discloses that “The electrolytes need to be evaporated for the subsequent dry treatment processes, which are primarily aimed at extracting the active mass. On the one hand, this step eliminates the potential hazard of flammable solvents and, on the other hand, converts the active mass into the dry powder form required for dry processing.” EX1016, 226. A person of ordinary skill would have understood that the complete evaporation of the flammable solvents (electrolytes) would result in the elimination of the potential hazard.

43. Mr. Dantam asserts that there is no discussion in LithoRec that the electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible. EX2025 ¶145.1. However, since the flammable solvents (electrolytes) being evaporated are the elements needed for electrochemical reactions, a person of ordinary skill would have understood that the complete evaporation of electrolytes would make electrochemical reactions impossible. Thus, LithoRec’s explicit disclosure contradicts Mr. Dantam’s statement. EX1016, 226.

44. Mr. Dantam also asserts that there is no discussion in LithoRec that the electrolyte content in the comminuted material is so low that no flammable or

explosive gas mixture is formable above the comminuted material in the transport container. EX2025 ¶145.2. However, as discussed above, LithoRec explicitly discloses eliminating the potential hazard of flammable solvents. EX1016, 226.

45. In addition, a person of ordinary skill would have understood that the elimination of the potential hazard (i.e., the complete evaporation of flammable solvents) would have rendered the dried comminuted material safe for transport.

F. Enablement

46. Mr. Dantam and PO assert that LithoRec is not enabling with respect to claims 1 and 12. However, Mr. Dantam and PO focus solely on the alleged incompatibility between vacuum drying and vibratory fluidized bed dryers. POR 25-35; EX2025, ¶¶164-168. As previously stated, LithoRec is not limited to vibratory fluidized bed dryers. *See supra* ¶¶22-27. Moreover, in my view, the claims are not limited to a particular kind of dryer or comminuting under vacuum.

47. PO and Mr. Dantam assert that the technology described in the ‘097 patent “would not be predictable”. POR 37; EX2025, ¶167.3. Dantam alleges that (1) the characteristics of the batteries make it difficult to process, (2) transporting the batteries are dangerous, (3) it is difficult and costly to transport batteries, (4) there are regulatory hurdles, and (5) it would have been difficult and costly to obtain LithoRec’s recommended drying equipment. However, factors 1-5 would not have affected the predictability of implementing a dryer and comminuting

device to evaporate at least one solvent. In addition, the equipment discussed by LithoRec for the pilot plant is all preexisting and widely known and used technology. EX1016, 226-227. As discussed above, the LithoRec team had already identified electrolytes of interest, chemical reactions of concerns, target end-material sizes, etc., before the application leading to the '097 patent. In my view, this knowledge further supports a finding that it would have been straightforward to implement LithoRec alone and/or in the various combinations set forth in the Petition. EX1016, 100; EX1034.

48. Mr. Dantam also asserts that LithoRec is nonenabling because the teaching of LithoRec is internally contradictory due to vibratory fluidized bed dryers being incompatible with vacuum drying. However, as previously stated, LithoRec is not limited to vibratory fluidized bed dryers. *See supra* ¶¶22-27. Given that LithoRec teaches dryers that are compatible with vacuum drying and indicates that those dryers can be implemented in the pilot plant, the teaching of LithoRec is not internally contradictory. EX1016, 226-227. Thus, there are no internal contradictions or errors in LithoRec that would prevent a person of ordinary skill from achieving the invention of claims 1 and 12. Moreover, as noted, batch and continuous dryers were both very well known prior to the invention, and it would have been trivial for a POSITA to have implemented them, particularly when the

tradeoffs between them were known, they predictably follow Boyle's law, reactions of interest were identified, etc.

49. Furthermore, claims 1 and 12 merely require a comminution unit, an inactivation device that comprises a drying device, a filling device, and a vacuum installation connected to the drying device, which have all been widely known for decades prior. EX1024; EX1025. Thus, a person of ordinary skill would have been well-versed in how to make and operate the long-existing and well-known technology associated with vacuum drying and comminuting. Given the age of the technology and how well-known the technology was, a person of ordinary skill could have easily predicted the results of comminuting battery material and drying such comminuted material. EX1020. Even Mr. Dantam conceded that the "ways and means" of dryer operation were all known prior to the invention. EX1039, 34:3-37:19.

50. Given that comminuting devices and vacuum dryers were well known and given that claims 1 and 12 do not require any unique structure or function, a person of ordinary skill would require minimal guidance to achieve a system with the comminuting device and vacuum dryer of claims 1 and 12. Thus, no undue experimentation would be required for a person of ordinary skill to make the claimed invention based on the content of LithoRec. The only experimentation that might have been done would have been a routine part of a process engineer

implementing one of the well-known and commonly-used dryers to arrive at temperature and pressure settings, as was standard practice according to Mr. Dantam. These activities would not have constituted an undue amount of experimentation; to the contrary, they would be expected parts of routine activities and would yielded exactly what was claimed.

G. Vacuum Pressure Guidance From LithoRec and DIN24800

51. Mr. Dantam asserts that because LithoRec does not explicitly disclose a method for determining the level of vacuum that must be applied to vaporize the flammable solvents and because LithoRec does not provide the specific parameters needed to determine the level of vacuum, LithoRec does not provide any guidance that would instruct a person of ordinary skill as to which range of pressures, listed in DIN24800, to use for vacuum drying of shredded EV batteries. EX2025, ¶137-139. Mr. Dantam's assessment of LithoRec is incorrect, and Mr. Dantam seems to misunderstand the reason why I mentioned DIN24800.

52. As an initial matter, the claimed range (300 hPa or less) of the '097 patent is presented as a dryer setting for achieving a desired drying output (i.e., inactivation). Thus, determining the 300 hPa or less pressure range is merely a matter optimizing the result effective variables associated with the drying process. Optimizing result effective variables to achieve a desired drying output is standard practice in the industry, as Mr. Dantam admitted. EX1039, 16:2-20.

53. As noted by Mr. Dantam, the result effective variables that are associated with the drying process include temperature, pressure, and time. EX2025 ¶137. A person of ordinary skill would have known to look for such data in publicly available phase diagrams, ignition data, and decomposition data associated with the type of electrolytes being dried.

54. Looking to LithoRec, the authors of LithoRec provided a list of electrolytes and solvents that would need to be inactivated by way of the drying process (i.e., diethyl carbonate, dimethyl carbonate and ethylene carbonate, and lithium hexafluorophosphate). EX1016, 100. In addition, LithoRec discloses “The electrolytes need to be evaporated for the subsequent treatment processes, which are primarily aimed at extracting the active mass. On the one hand, this step eliminates the potential hazard of flammable solvents and, on the other hand, converts the active mass into the dry powder form required for dry processing....As some of the liquid to be vaporized are highly flammable solvents, the drying temperature should probably be severely restricted. This in turn speaks in favor of drying under vacuum, as the drying temperature can be kept low.” EX1016, 226.

55. DIN24800 provides further evidence that low vacuum ranges were well known and corresponded with those pressures recited in the ‘097 patent. Such low vacuum ranges overlap the claimed range of 0 to 300 hPa. EX1007.

H. Continuous vs. Batch Drying

56. Mr. Dantam argues that LithoRec rejects and expressly counsels against batch drying as a viable option for inactivating comminuted battery material because LithoRec chose continuous drying over batch drying for the pilot plant. EX2025¶115, 126. However, a person of ordinary skill in the art would have understood from the teaching of LithoRec that, even though LithoRec chose continuous drying for one example, the inactivation of the comminuted battery material could also be achieved by way of batch drying.

57. LithoRec provides only one reason for choosing continuous drying over batch drying, i.e., the assumed length of time required for the drying work cycle as compared to the work cycle of the comminuting device. Moreover, LithoRec does not state that the longer work cycle of batch drying precludes batch drying from being used. Instead, Lithorec explains that the “work cycle” factor is based on an assumption and not hard data. EX1016, 226.

58. LithoRec does not provide any reason as to why batch drying cannot be used to inactivate the comminuted battery material. On the contrary, LithoRec describes various considerations that are compatible with batch drying. For example, LithoRec suggests drying under vacuum to keep the drying temperature low. EX1016, 226. Batch dryers are capable of drying under vacuum. EX1006, 12-65:12-66. LithoRec also discloses that it would be “advantageous if the drying

process is accompanied by mechanical stress on the dried material” because the active mass “adheres more strongly to the arrester foils.” EX1016, 227. Batch dryers often include agitator blades that stir solids to be treated. EX1006, 12-65. And as Mr. Dantam admitted, the tradeoffs between batch and continuous dryers were known to those skilled in the art prior to the invention. See also discussion above. In my view, it would have been obvious to implement batch dryers as a recognized appropriate option given these known tradeoffs and the explicit teachings in LithoRec itself.

59. Thus, in my opinion, one of ordinary skill would have understood that although the authors of LithoRec chose continuous drying for one example, they still would have considered batch drying as a viable option for inactivating comminuted battery material.

60. And in my opinion, one of ordinary skill would have understood that although the authors of LithoRec chose continuous drying for one example, they still considered batch drying as a viable option for inactivating comminuted battery material.

I. Perry

61. Mr. Dantam states that Perry does not discuss evaporating the kind of solvents addressed in LithoRec. EX2025 ¶82. It seems to me at the outset that Mr. Dantam has misunderstood what Perry is, and why it is being cited. Perry is

basically an encyclopedia of different dryer types, and it is in my experience an essential guide and standard reference for German chemical and mechanical engineers, and others implementing industrial dryer systems. It provides evidence that many, many industrial dryers were known, and that many operated under pressures consistent with those mentioned in the '097 patent. But beyond that, and perhaps more substantively, I note that in the same section of Perry cited in the Petition (the Solids-Drying Equipment section), Perry states "Vacuum is used in conjunction with drying or other chemical operations when low solids temperatures must be maintained because heat will cause damage to the product or change its nature, when air combines with the product as it is heated, causing oxidation or an explosive condition, when solvent recovery is required, and when materials must be dried to extremely low moisture levels." EX1006, 12-65:12-66. It was known to those ordinary skill in the art that EV battery recovery involves the recovery of volatile chemicals and the recovery of solvents (electrolytes). EX 2001; EX2002. Accordingly, a person of ordinary skill in the art would understand that the "explosive condition," "solvent recovery," and "dried to extremely low moisture levels" Perry associates with vacuum drying are all conditions related to EV battery recovery and would have looked to the teaching of Perry for guidance regarding the drying of the electrolytes or solvents performed during EV battery recovery.

J. Hanisch

62. Mr. Dantam asserts that a person of ordinary skill would not have combined LithoRec with Hanisch. EX2025 ¶146.1. However, Hanisch teaches that electrolytes in lithium ion batteries can be evaporated from battery cell fragments and then reclaimed. Hanisch further discloses that the evaporation can be achieved at temperatures below 100 °C and particularly below 80 °C. Given that LithoRec teaches evaporating electrolytes at temperatures below their ignition temperature and then recovering the electrolytes (EX1016, 226-227), in my view a person of ordinary skill would have considered the teaching of Hanisch as guidance for the temperature range of the dryer of LithoRec.

V. EX1027 AND EX1035

63. I found these documents via Google search. They are from a presentation at the 2013 Annual Processing and Recycling Conference held in the Alte Mensa Conference Center located at Petersstrasse 5, 09599 Freiberg, Germany. These documents include an abstract (EX1035) and the presentation “slide deck” material (EX1027). Notably, the information is from the LithoRec team years prior to the application leading to the ‘097 patent. This information matches my recollection of what was being discussed at that time. The format is consistent with standard conference presentation protocol, and I confirmed with the

Wayback machine that these documents were in fact publicly available prior to the time of the invention.

VI. CONCLUSION

64. In signing this declaration, I recognize that this declaration will be filed as evidence in an *inter partes* review before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required, I will appear for cross-examination within the United States during the time allotted.

65. I hereby declare that all statements made herein are made of my own knowledge and are true and that all statements made on information and belief are believed to be true; and further 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.

Executed on this 07 day of May, 2025.



VOLKER SPIES