

EXHIBIT 1030

URT EX1030
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
OPPOSITION TO PATENT OWNER'S MOTION TO AMEND**

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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
1035	Program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1039	Deposition of Vani Dantam

IV. LITHOREC IN VIEW OF PERRY

A. Wherein the Drying Uses a Drying Device Operated in Batch mode

7. Even though a vibratory fluidized bed dryer was mentioned for use with the pilot plant illustrated in Fig. G-1 of Lithorec, the teaching of Lithorec would also have led a person of ordinary skill at the time of the invention to dry comminuted battery material in batch mode.

8. When developing the pilot plant, the authors of LithoRec created the process chain for the pilot plant prior to selecting the equipment for the pilot plant. Accordingly, the process chain for the pilot plant was created without a particular type of dryer in mind. EX1016, 222-235.

9. 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. In addition, although the authors mentioned a particular type of dryer for the pilot plant (a vibrator fluidized bed dryer), the authors noted that the decision was based on incomplete data relating to the substances contained in the battery cells. Ex1016, 226-227.

10. In addition, the arrangement of equipment illustrated in G-1 is not solely and exclusively tailored to a vibrator fluidized bed dryer. EX1016, Fig. G-1.

According to EX2012, 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. However, Fig. G-1 of LithoRec does not show any “forced draft fan”. EX1016, Fig. G-1.

11. 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. 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.

12. A person of ordinary skill would have understood that this portion of LithoRec indicates that the pilot plant is not limited to the particular dryer that was selected (i.e., the pilot plant is not limited to vibratory fluidized bed dryers) and that the other types of dryers (particularly dryers that are compatible with vacuum drying) could and should be implemented in the pilot plant, as per LithoRec’s express favoring of drying under vacuum. EX1016, 226.

13. Furthermore, LithoRec does not provide any reason why the unselected options cannot be used to evaporate electrolytes from comminuted battery material. EX1016, 226-227.

14. With respect to drying in batch mode, LithoRec discloses “There is also the question of whether drying should also take place in a batch or continuously...It is assumed that the necessary process steps (inerting, filling, drying, emptying) of a discontinuously operating dryer require a longer work cycle in total than the pre-shredder. For this reason, batch drying is not used.” EX1016, 226. Thus, the only reason LithoRec chooses continuous drying over batch drying is merely because the work cycle of a continuous dryer is assumed to be faster (at least in this instance). As noted above, the decision was based on incomplete data relating to the substances contained in the battery cells. EX1016, 226-227.

Moreover, LithoRec teaches how the work cycle of a batch dryer can be accommodated. In particular, 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.

15. As agreed by PO’s expert, Mr. Vani Dantam during his deposition, a person of ordinary skill in the art would also be familiar with the benefits and

tradeoffs of batch and continuous drying. For example, a person of ordinary skill would understand that batch drying offers better control of drying, while continuous drying is used when drying consistency is not necessary. EX1039, 21:14-23. 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 control of drying. Accordingly, a person of ordinary skill would have implemented the well-known and understood alternative of batch drying.

16. Perry provides further motivation for implementing batch drying in view of LithoRec's disclosure of vacuum drying. LithoRec discloses "As some of the liquids to be vaporized are highly flammable solvents, the drying temperature should probably be severely restricted." EX1016, 226. Vacuum drying is often performed in batch mode. For example, Perry teaches that batch vacuum rotary dryers are typically employed when low temperatures must be maintained if excess heat will cause oxidation or an explosive condition and/or when materials must be dried to extremely low moisture levels. EX1006, 12-65:12-66. Perry also discloses that vacuum-shelf dryers "are particularly useful for handling small batches of materials wet with toxic or valuable solvents. Recovery of the solvent is easily

accomplished without danger of passing through an explosive range.” EX1006, 12-44.

17. In view of LithoRec’s disclosure that drying under vacuum is desired and that batch drying is an option, and given that Perry discloses multiple examples of batch dryers that employ vacuum drying to dry combustible and toxic solvents, a person of ordinary skill in the art would have been motivated to employ batch drying to evaporate the “highly flammable” solvent of LithoRec. EX1016, 227.

B. Wherein the Drying Occurs at a Maximum Pressure of 300 hPa

18. As discussed above, LithoRec is not limited to the vibratory fluidized bed dryer. In addition, 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.

19. 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.

20. Although LithoRec does not specify any particular pressure range under which drying is performed, a person of ordinary skill would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13.

21. Furthermore, Perry discloses various pressure ranges at which batch dryers operate. In particular, Perry discloses that, on a commercial scale, vacuum dryers (which includes batch vacuum rotary dryers, among others) typically operate at levels above 5 mmHg (6.7 hPa). EX1006, 12-66. Perry also discloses that vacuum-shelf (batch) dryers operate in the range of 1 to 25 mmHg (1.3 to 33.3 hPa). EX1006, 12-45. Such pressure ranges are within the claimed pressure range (0 to 300 hPa). Therefore, combining Perry and LithoRec would have resulted in a drying pressure range within the claimed pressure range.

22. At the very least, in my view, it would have been obvious to arrive at the claimed pressure range through routine optimization, because pressure and

temperature were recognized as being outcome-effective variables. EX1039, 15:15-16:13. In my experience, a process engineer would perform this kind of routine optimization at the time of the invention as a standard part of plant setup—just as Mr. Dantam also explained. EX1039, 15:15-16:13.

C. Producing, During the Drying, a Gaseous Electrolyte Component Recoverable by Condensation

23. LithoRec discloses “The dryer gases are circulated in a closed circuit and cleaned using a filter and condenser...The nitrogen to be circulated is freed from the solids through a jet filter and then passed through a condenser in which the solvents contained are separated.” EX1016, 227. In other words, during the drying operation, the flammable solvents (electrolytes such as dimethyl carbonate, ethyl methyl carbonate, diethyl carbonate) are evaporated into the nitrogen gas and then recovered by being condensed out of the nitrogen gas. EX1016, 100, 227; EX1034, 9.

24. Thus, a person of ordinary skill would have understood that in the process discussed above produces a gaseous electrolyte component by way of drying and recovers the gaseous electrolyte component by condensation.

V. LITHOREC IN VIEW OF UCHIDA

A. Wherein the Drying Uses a Drying Device Operated in Batch mode

25. As discussed above, a person of ordinary skill would have understood that the disclosure of LithoRec is not limited to vibratory fluidized bed dryers and

that batch drying would have been among the types of dryers within the teaching of LithoRec. *See supra* ¶¶7-15.

26. Uchida provides a further teaching that would have led a person of ordinary skill to implement batch drying in the battery processing system of LithoRec. In particular, Uchida discloses a system that utilizes batch drying under vacuum to recover valuable materials from lithium batteries (although not explicitly disclosed, a person of ordinary skill would have recognized that the reduced pressure heating furnace 60 operates in batch mode since the material to be dried remains stationary in the chamber 64 during the drying process). EX1026 [Abstract], ¶72, Fig. 5. In one embodiment, a spent lithium battery undergoes a vacuum heating process to remove electrolytes (including dimethyl carbonate (DMC) and ethyl methyl carbonate (EMC)) from the battery. EX1026, ¶¶0071, 0075.

27. During operation, the battery of Uchida is opened to expose the substances contained within and is then positioned within a treatment chamber (batch drying mode). A vacuum pump is then actuated to reduce the pressure in the treatment chamber to a range of 1 to 500 hPa, and the electrolytes are heated to a temperature near their boiling point.

28. LithoRec discloses batch drying as a viable option for evaporating electrolytes from battery material and provides guidance regarding how to employ

batch drying. EX1016, 226. Uchida discloses a system that employs batch drying to evaporate electrolytes from battery material. Accordingly, based on the guidance provided by LithoRec and Uchida, a person of ordinary skill would have been motivated to utilize batch drying as a method to evaporate electrolytes from comminuted battery material since both references teach batch drying as a viable option for evaporating electrolytes from battery material. EX1016, 98, 226; EX1026, ¶¶0071, 0075.

B. Wherein the Drying Occurs at a Maximum Pressure of 300 hPa

29. As discussed above, LithoRec is not limited to the vibratory fluidized bed dryer and discloses drying under vacuum. *See supra* ¶¶9-15. However, LithoRec does not specify any particular vacuum pressure range under which the vacuum drying is performed. Regardless, a person of ordinary skill would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13.

30. Furthermore, Uchida discloses a pressure range at which electrolytes (including dimethyl carbonate (DMC) and ethyl methyl carbonate (EMC)) are evaporated from battery material . EX1026, ¶¶0071, 0075. I note that DMC and EMC are electrolytes of interest in the '097 patent. EX1016, 100; EX1027, 9.

31. During Uchida's operation, the battery is opened to expose the substances contained within and is then positioned within a treatment chamber. A

vacuum pump is then actuated to reduce the pressure in the treatment chamber to a range of 1 to 500 hPa, and the electrolytes are heated to a temperature near their boiling point. Uchida also notes that the vapor pressure of DMC at 24 °C is 24 hPa and that the vapor pressure of EMC at 25 °C is 33 hPa. EX1026, ¶¶0074-75, 0078.

32. Accordingly, in my view, one of ordinary skill would have been motivated to apply the pressure range taught by Uchida to the drying process taught by LithoRec in order to keep the drying temperature low and avoid a hazardous chemical reaction during the drying process, as taught by LithoRec. EX1016, 226.

33. In addition, since LithoRec identifies one of the electrolytes as being DMC, one of ordinary skill would have been motivated to evaporate the DMC electrolyte at the conditions disclosed in Uchida (i.e., 24 hPa), which is within the claimed pressure range.

C. Producing, During the Drying, a Gaseous Electrolyte Component Recoverable by Condensation

34. As discussed above, a person of ordinary skill would have understood that the process discussed above produces a gaseous electrolyte component by way of drying and recovers the gaseous electrolyte component by condensation. *See supra* ¶¶23-24.

D. Wherein the Drying Occurs at a Temperature of 80 °C or Less

35. LithoRec teaches “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. However, LithoRec does not specify any particular temperature range under which drying is performed. Nonetheless, a person of ordinary skill would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13.

36. Furthermore, Uchida discloses various temperature ranges at which electrolytes are evaporated from battery material. In particular, Uchida discloses a method of recovering valuable materials from lithium batteries. EX1026 [Abstract]. In one embodiment, a spent lithium battery undergoes a vacuum heating process to remove electrolytes (including dimethyl carbonate (DMC) and ethyl methyl carbonate (EMC)) from the battery at a reduced temperature. EX1026, ¶¶0071, 0075.

37. During operation, the battery is opened to expose the substances contained within and is then positioned within a treatment chamber. A vacuum pump is then actuated to reduce the pressure in the treatment chamber to a range of 1 to 500 hPa, and the electrolytes are heated to a temperature near their boiling

point. Uchida notes that the vapor pressure of DMC at 24 °C is 24 hPa and that the vapor pressure of EMC at 25 °C is 33 hPa. EX1026, ¶¶0074-75, 0078.

38. A person of ordinary skill would have known that a vapor pressure of an element is the pressure at which the element boils at a particular temperature. Thus, based on the teaching of Uchida, a person of ordinary skill would have known that DMC and EMC can be evaporated at 24 °C and 25 °C, respectively at the corresponding pressure. The 24 and 33 hPa pressure values are within the 1 to 500 hPa pressure range identified by Uchida. Accordingly, in my view, selecting 24 °C and 25 °C as the temperature at which to dry DMC and EMC (which is within the claimed temperature range of 0-80 °C) would have simply been a matter of optimizing a result effective variable (i.e., temperature). As discussed above, it was standard practice for a person of ordinary skill to optimize pressure, temperature, and duration when designing a dryer for battery processing. EX1039, 15:15-16:13; EX1026, ¶78.

VI. LITHOREC IN VIEW OF MITSUBISHI AND PERRY

A. Wherein the Drying Uses a Drying Device Operated in Batch mode

39. As discussed above, a person of ordinary skill would have understood that the disclosure of LithoRec is not limited to vibratory fluidized bed dryers and that batch drying would have been among the types of dryers within the teaching of LithoRec. *See supra* ¶¶7-15.

40. In addition, as agreed by Mr. Dantam during his deposition, a person of ordinary skill in the art would also be familiar with the benefits and tradeoffs of batch and continuous drying. For example, a person of ordinary skill would understand that batch drying offers better control of drying, while continuous drying is used when drying consistency is not necessary. EX1039, 21:14-23. 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 control of drying. Accordingly, a person of ordinary skill would have implemented the well-known and understood alternative of batch drying.

41. In addition, Perry provides further motivation for implementing batch drying in view of LithoRec's disclosure of vacuum drying. EX1006, 12-44. *See supra* ¶¶16-17. In view of LithoRec's disclosure that drying under vacuum is desired and that batch drying is an option, and given that Perry discloses multiple examples of batch dryers that employ vacuum drying to dry combustible and toxic solvents, a person of ordinary skill in the art would have been motivated to employ batch drying to evaporate the "highly flammable" solvent of LithoRec. EX1016, 227.

B. Wherein the Drying Occurs at a Maximum Pressure of 300 hPa

42. As discussed above, LithoRec is not limited to the vibratory fluidized bed dryer and discloses drying under vacuum. *See supra* ¶¶9-15. However, LithoRec does not specify any particular vacuum pressure range under which vacuum drying is performed. Regardless, a person of ordinary skill would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13.

43. In addition, as discussed above, Perry discloses various pressure ranges at which batch dryers operate, including 1.3 to 33.3 hPa. *See supra* ¶¶21-22.

44. Mitsubishi also discloses a system and process for recycling lithium ion batteries (including batteries used in automobiles). EX1031, ¶18. Mitsubishi recognizes the need to remove, stabilize, and detoxify the electrolytic solution and fluorine found inside lithium ion batteries by way of drying under vacuum. EX1031, ¶16. Mitsubishi further discloses that the vacuum pressure should be 100 hPa or less. EX1031, ¶25.

45. Given that Mitsubishi discloses pressure ranges for drying electrolytes under vacuum in a lithium ion battery recycling system, in my view, a person of ordinary skill would have applied the teaching of Mitsubishi to the system of LithoRec, which also teaches drying electrolyte solutions under vacuum in a lithium ion battery recycling system.

C. Producing, During the Drying, a Gaseous Electrolyte Component Recoverable by Condensation

46. As discussed above, a person of ordinary skill would have understood that in the process discussed above produces a gaseous electrolyte component by way of drying and recovers the gaseous electrolyte component by condensation.

See supra ¶¶23-24.

D. Wherein the Drying Occurs at a Temperature of 80 °C or Less

47. LithoRec teaches “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. However, LithoRec does not specify any particular temperature range under which drying is performed. Nonetheless, a person of ordinary skill would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13.

48. In addition, as discussed above, Mitsubishi discloses a system and process for recycling lithium ion batteries (including batteries used in automobiles). EX1031, ¶18. Mitsubishi also recognizes the need to remove, stabilize, and detoxify the electrolytic solution and fluorine found inside lithium ion batteries by way of drying under vacuum. EX1031, ¶16. In addition, Mitsubishi

discloses a temperature range (80 °C to 120 °C) associated with the disclosed vacuum pressure range (100 hPa or less). EX1031, ¶25.

49. Given the overlapping teachings of LithoRec and Mitsubishi, one of ordinary skill would have been motivated to limit the vacuum drying to the range disclosed in Mitsubishi in order to dry the electrolytes at temperatures that avoid ignition. Therefore, a POSITA would have dried the electrolytes in batch mode as taught by LithoRec and Perry because the hazardous characteristics of the electrolytes call for drying under lowered temperatures to avoid ignition.

VII. EX1027 AND EX1035

50. I found Exhibits 1027 and 1035 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 of these documents 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.

VIII. CONCLUSION

51. 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.

52. 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