

**Ascend Elements, Inc., Petitioner
v.
Duesenfeld GmbH, Patent Owner**

**U.S. Patent No. 11,050,097
IPR2024-00948
Oral Argument August 22, 2025**

Duesenfeld Hearing Demonstratives

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

Advantages of the invention:

- Inactivation without addition of materials
 - “A further advantage is that no additional material has to be added to inactivate the comminuted material.”
- Suppresses the formation of hazardous materials
 - “Fluorophosphates are often strong neurotoxins, the formation of which must be reliably prevented.”
 - “The organic carbonate content is preferably so small that the formation of a significant amount of fluorophosphates can be ruled out.”
- Material is safe for transport
 - “The comminuted material is therefore largely inert and can be transported safely, especially if it is packed under vacuum.”
 - “In addition, it is advantageous that a comminuted material is obtained that can be transported safely.”

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

Independent Claim 1:

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**.

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

Independent Claim 12:

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 transport container with the inactivated comminuted material; and
- (d) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device.

Instituted Grounds

Trials@uspto.gov
571-272-7822

Paper 10
Entered: November 22, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND ELEMENTS, INC.,
Petitioner,

v.

- **As to claims 1-3, 7-10, 12, 13, and 19:**
 - **Ground 1:** Hanisch (Ex. 1004) in view of Dunagan (Ex. 1018)
 - **Ground 2:** Hanisch in view of Dunagan and Hayashi (Ex. 1006), Meador (Ex. 1011), or Shin (Ex. 1010)

35 U.S.C. § 314, 37 C.F.R. § 42.4

Claim Construction

- Board issued preliminary understanding of “inactivating”:

Thus, on the present record, we take inactivating to require the removal of sufficient amounts of dimethyl carbonate and/or ethyl methyl carbonate from the comminuted material to make an electrochemical reaction either no longer possible or only possible to a negligibly small extent. We encourage the parties to further develop the record on this question at trial.

Claim Construction: Agreed D. Ct. Constructions

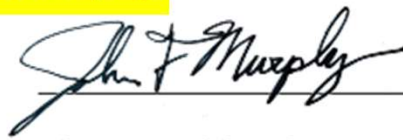
- “Inactivating” → “result of drying”

ORDER

Having considered the parties' Joint Notice of Agreement on Outstanding Claim Construction Disputes, the Court hereby enters the following **agreed constructions** for U.S. Patent No. 11,050,097:

- "drying the comminuted material" (claims 1, 2, 7, 13) shall have its plain and ordinary meaning, which is removing at least one solvent from the comminuted material.
- "drying device configured to inactivate the comminuted material" (claim 12) shall have its plain and ordinary meaning, which is a device configured to produce **inactivated comminuted material as a result of drying.**

DATE: October 30, 2024


The Honorable John F. Murphy

- Inactivating ≠ drying

Claim Construction: Metrics For Result of Drying

Ex. 1001	Specification Text
3:49-4:4	...after the completion of the drying process, no flammable or explosive gas mixture can form...
4:5-18	The comminuted material is preferably dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible....
4:19-27	The comminuted material is preferably dried for so long that a 50 kg amount of comminuted material... does not experience a build-up of heat, or the build-up of heat is so low that a thermal runaway...is ruled out for at least two months.
4:28-32	...dried until the electrolyte content of organic components that are volatile at 80° C. has a maximum value of 3% by weight....
4:33-36	The drying is preferably conducted for so long that the accumulated content of organic carbonates from the electrolyte that are volatile at 80° C. falls short of 3% by volume in the atmosphere above the comminuted material.
4:37-40	...the drying is conducted until the dimethyl carbonate content is lower than 4% by volume, especially 3% by volume, and/or the cyclohexylbenzene content is lower than 1 % by volume, in particular 0.5% by volume.

Claim Construction: Metrics For Result of Drying

Ex. 1001 Specification Text

3:49-4:4 ...after the completion of the drying process, no flammable or explosive gas mixture can form...

4:5-18 The comminuted material is preferably dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible....

4:19-27 The comminuted material is preferably dried for so long that a 50 kg amount of comminuted material... does not experience a build-up of heat, or the build-up of heat is so low that a thermal runaway...is ruled out for at least two months.

4:28-32 ...dried until the electrolyte content of organic components that are volatile at 80° C. has a maximum value of 3% by weight....

4:33-36 The drying is preferably conducted for so long that the accumulated content of organic carbonates from the electrolyte that are volatile at 80° C. falls short of 3% by volume in the atmosphere above the comminuted material.

4:37-40 ...the drying is conducted until the dimethyl carbonate content is lower than 4% by volume, especially 3% by volume, and/or the cyclohexylbenzene content is lower than 1 % by volume, in particular 0.5% by volume.

Board's preliminary understanding

Ex. 1001; Paper 20 (POR) at 9

DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

Claim Construction

- Claims not limited to single embodiment:
 - “[W]hen the specification describes the invention in broad terms, accompanied by specific examples or embodiments, the claims are generally not restricted to the specific examples or the preferred embodiments unless that scope was limited during prosecution.”
 - *Kinik Co. v. Int'l Trade Comm'n.*, 362 F.3d 1359, 1364 (Fed. Cir. 2004);
 - “Even when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using ‘words or expressions of manifest exclusion or restriction.’”
 - *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004)

Paper 20 (POR) at 10

Claim Construction

- Presumption that limitation in dependent claim is not present in independent claim:
 - Differences among claims can also be a useful guide in understanding the meaning of particular claim terms. For example, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.”
 - *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314–15 (Fed. Cir. 2005) (internal citations omitted).

Claim Construction: Dependent Claims

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.

2. The method according to claim 1, wherein the comminuted material is **dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.**

7. The method according to claim 1, wherein the drying of the comminuted material is only completed if one or more of the following conditions is met:
no flammable or explosive gas mixture is formable above the comminuted material in the transport container, and
the comminuted material is so dry that no flammable or explosive gas mixture is able to emerge in the transport container.

Claim Construction: Dependent Claims

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.

2. The method according to claim 1, wherein the comminuted material is **dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.**

7. The method according to claim 1, wherein the drying of the comminuted material is only completed if one or more of the following conditions is met:
no flammable or explosive gas mixture is formable above the comminuted material in the transport container, and
the comminuted material is so dry that no flammable or explosive gas mixture is able to emerge in the transport container.

Board's preliminary understanding

DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

Ex. 1001; Paper 20 (POR) at 10

Claim Construction: Adopt D. Ct. Construction

- Patent Owner's Proposal: plain and ordinary meaning; inactivation is the end point of drying

The Board should adopt the District Court's construction and recognize that Inactivation is the endpoint result of drying, but not specify the particular metric of drying that must be reached.

ORDER

Having considered the parties' Joint Notice of Agreement on Outstanding Claim Construction Disputes, the Court hereby enters the following agreed constructions for U.S. Patent No. 11,050,097:

- "drying the comminuted material" (claims 1, 2, 7, 13) shall have its plain and ordinary meaning, which is removing at least one solvent from the comminuted material.
- "drying device configured to inactivate the comminuted material" (claim 12) shall have its plain and ordinary meaning, which is a device configured to produce inactivated comminuted material as a result of drying.

DATE: October 30, 2024


The Honorable John F. Murphy

Ex. 2023 (*Duesenfeld GmbH v. Ascend Elements, Inc.*, Case No. 1:23-cv-01194-JFM (D. Del.) at Dkt. 62); Paper 20 (POR) at 9-10;

Hanisch (Ex. 1004)



US009780419B2

(12) **United States Patent**

(10) **Patent No.:** **US 9,780,419 B2**

(12) **United States Patent**
Hanisch et al.

(10) **Patent No.:** **US 9,780,419 B2**
(45) **Date of Patent:** **Oct. 3, 2017**

(54) **METHOD FOR RECLAIMING ACTIVE MATERIAL FROM A GALVANIC CELL, AND AN ACTIVE MATERIAL SEPARATION INSTALLATION, PARTICULARLY AN ACTIVE METAL SEPARATION INSTALLATION**

(52) **U.S. Cl.**
CPC *H01M 10/54* (2013.01); *B02C 23/06* (2013.01); *B02C 23/08* (2013.01); *B07B 4/08* (2013.01);

(Continued)

(58) **Field of Classification Search**
CPC *B02C 23/08*; *B02C 23/00*; *B02C 19/06*–*19/068*; *H01M 10/54*; *B07B 4/08*; *Y02W 30/84*; *C22B 26/12*

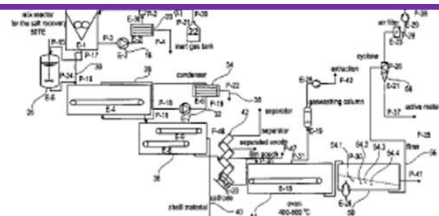
(Continued)

(75) **Inventors:** **Christian Hanisch**, Braunschweig (DE); **Wolfgang Haselrieder**, Braunschweig (DE); **Arno Kwade**, Wendeburg (DE)

(56) **References Cited**

(73) **Assignee:** **Lion Engineering GmbH**, Braunschweig (DE)

U.S. PATENT DOCUMENTS

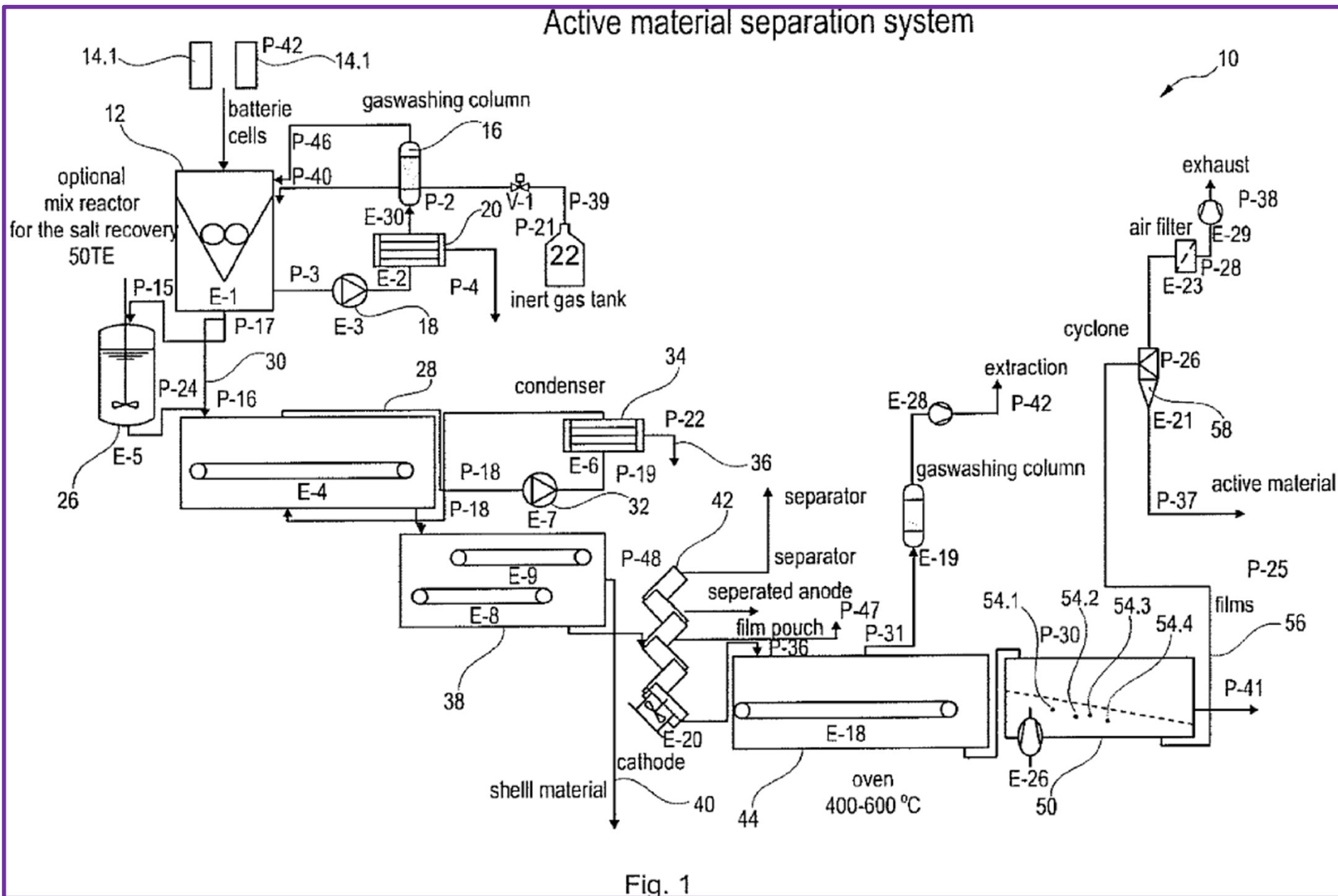


Ascend Elements EX1004 Page 1

Ex. 1004 (Hanisch)

DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

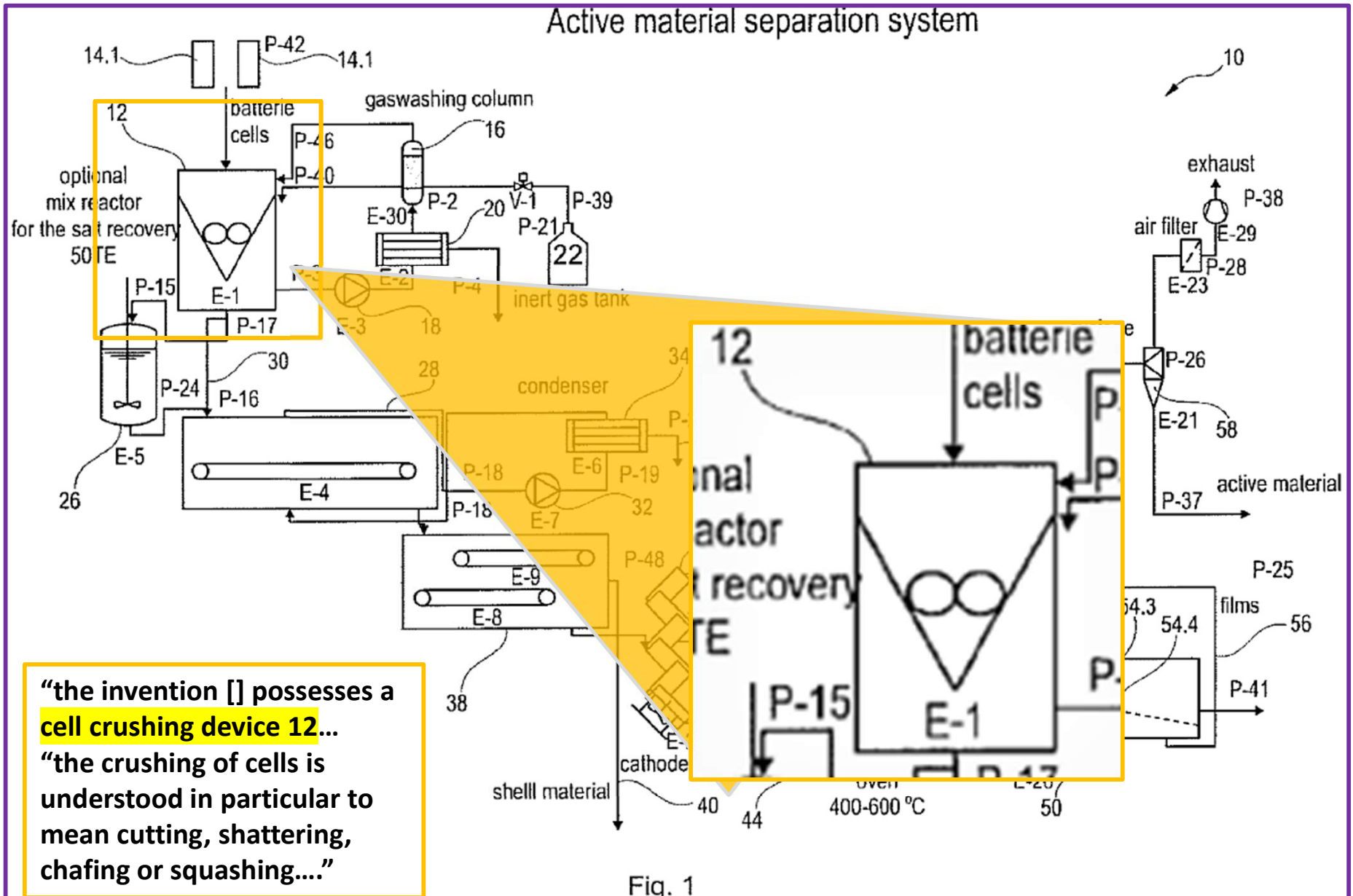
Hanisch – Figure 1



DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

Ex. 1004 (Hanisch) at Fig. 1

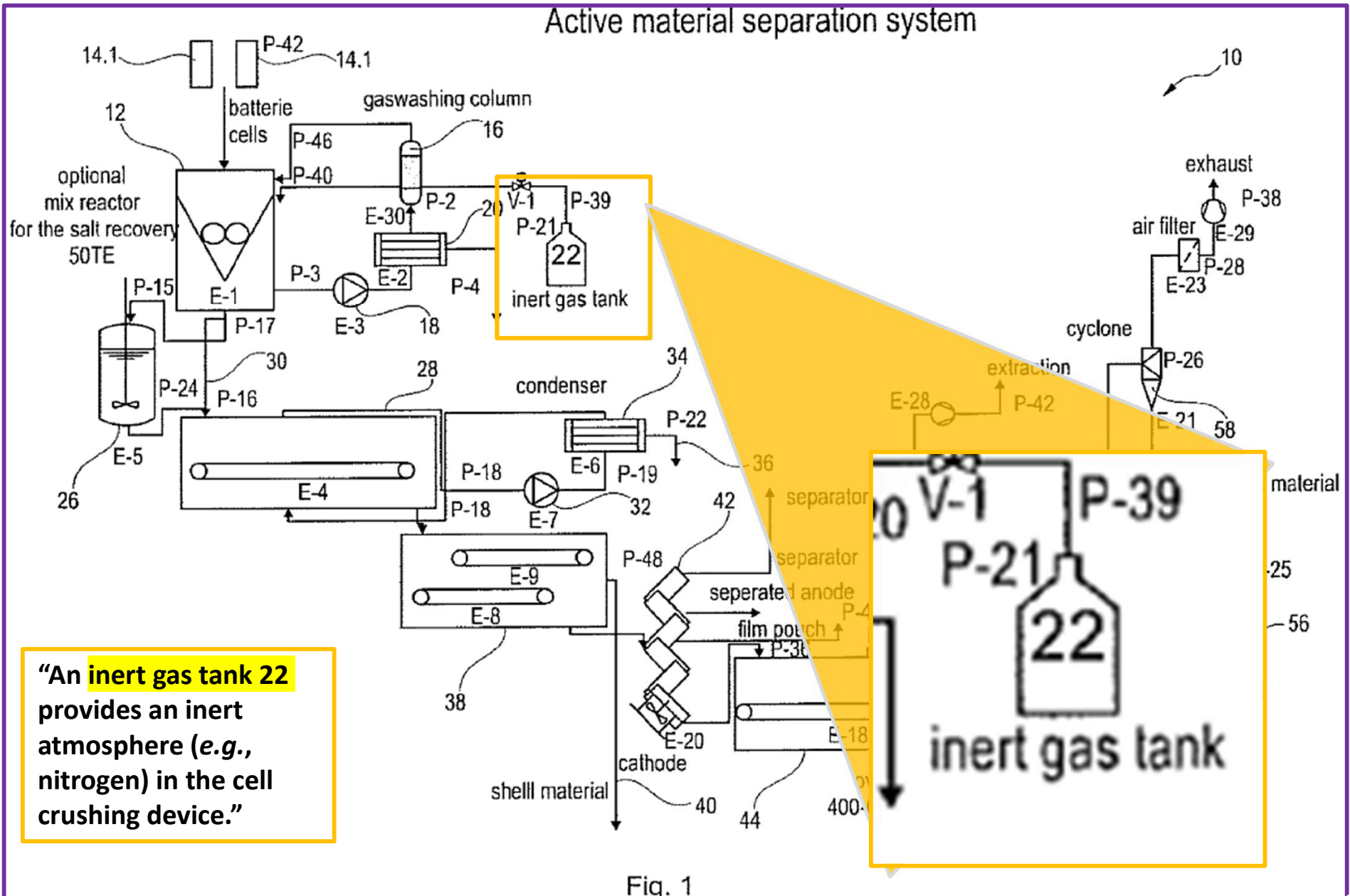
Hanisch – Cell Crushing Device/Comminution



Ex. 1004 (Hanisch) at Fig. 1; see also *id.* at 3:65-67, 5:38-39;

Paper 20 (POR) 12-14

Hanisch – Inert Gas Tank



Hanisch – Decomposition Oven

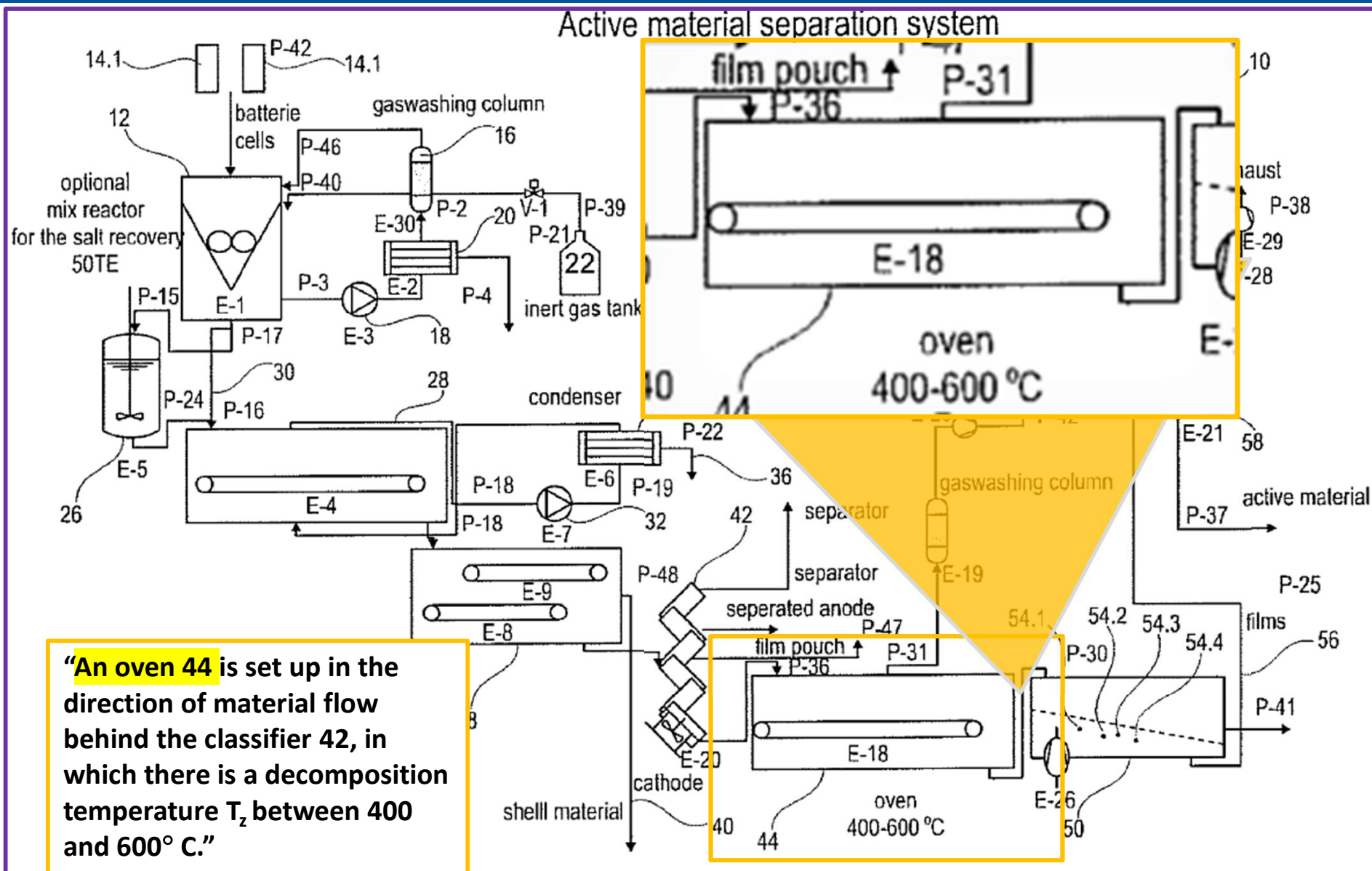
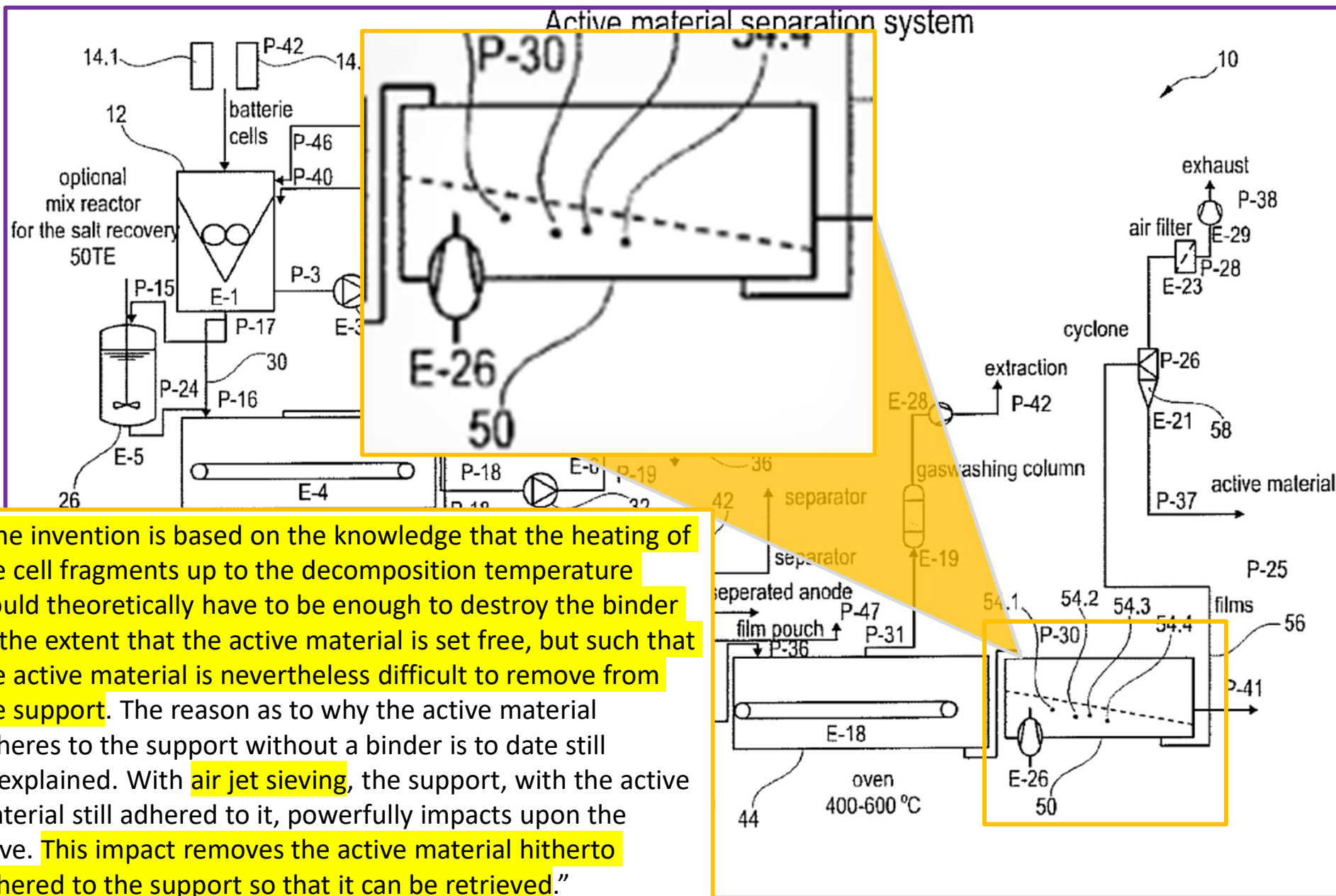


Fig. 1

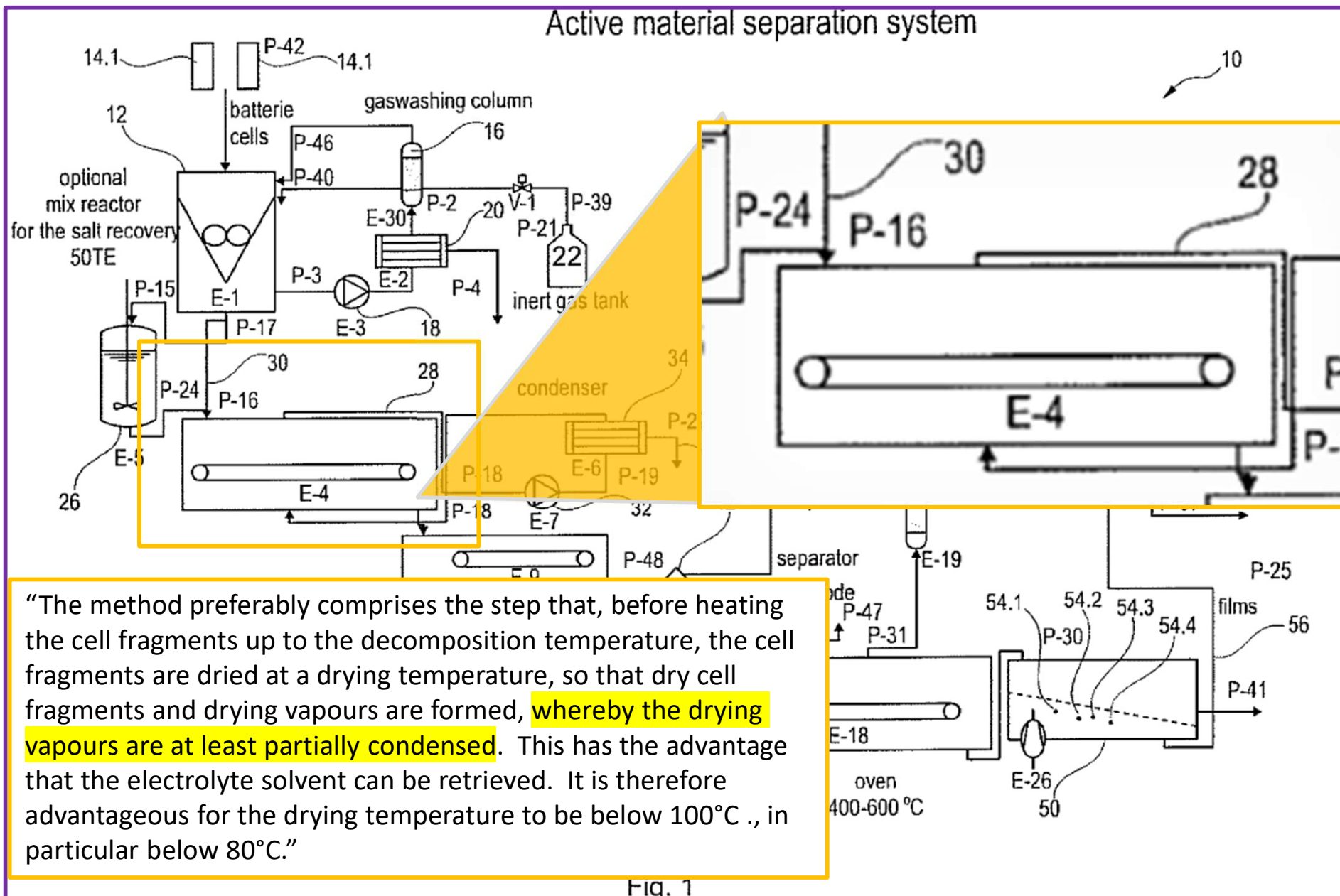
Ex. 1004(Hanisch) at Fig. 1; see also *id.* at 6:7-9; Paper 20 (POR) 12-14

Hanisch – Air Jet Sieve



DEMONSTRATIVE EXHIBIT—NOT EVIDENCE Ex. 1004 at Fig. 1; see also *id.* at 2:31-42; Paper 20 (POR) 12-14

Hanisch – Pre-dryer



Hanisch – Continuous Process

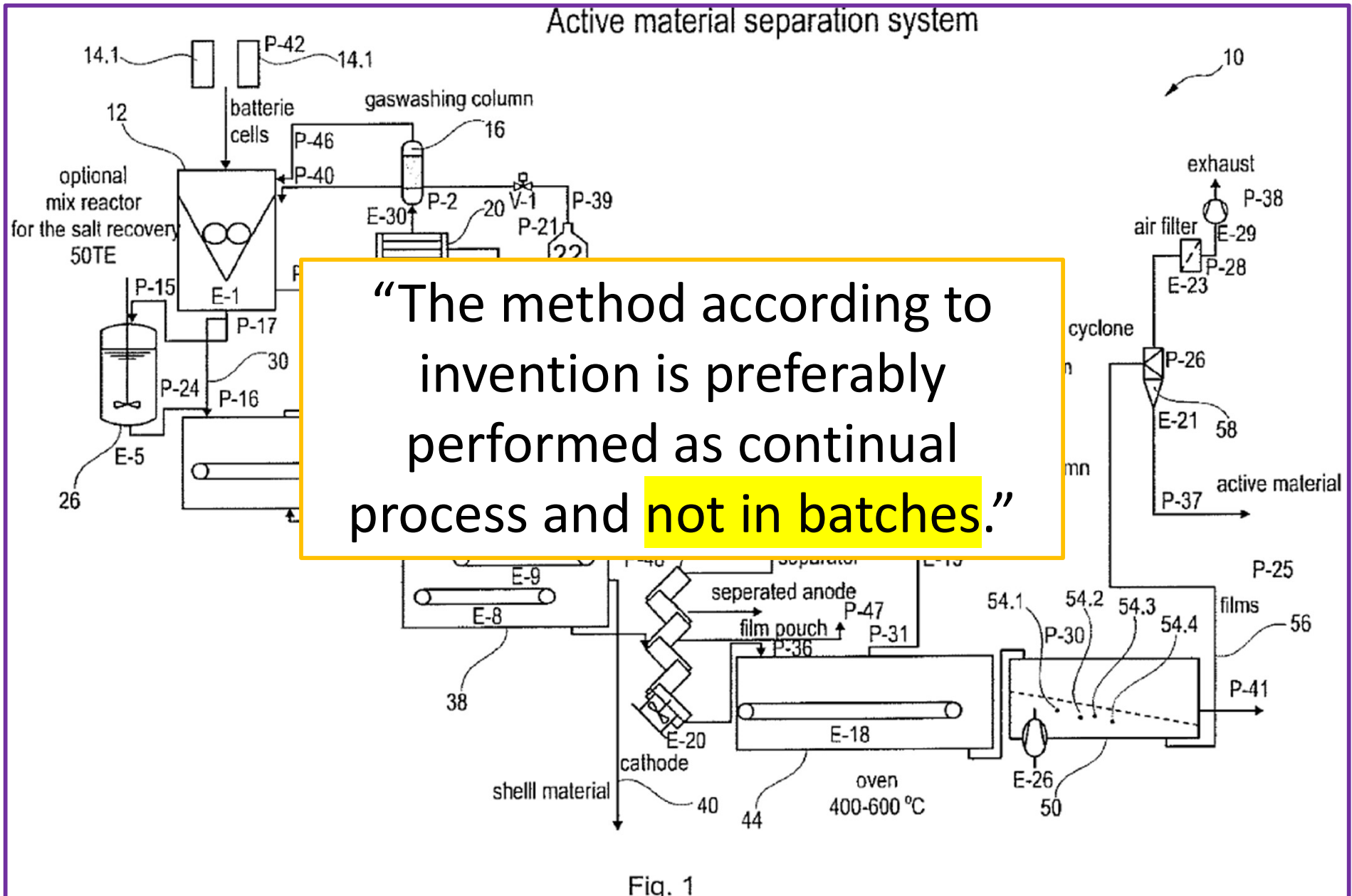


Fig. 1

Ex. 1004 (Hanisch) at Fig. 1; *see also id.* at 3:27-28; Paper 20 (POR) at 13.

Meador (Ex. 1011)



US005632863A

United States Patent [19]
Meador

[11] Patent Number: 5,632,863
[45] Date of Patent: May 27, 1997

[54] BATTERY PYROLYSIS PROCESS

[57] ABSTRACT

[76] Inventor: W. R. Meador, P.O. Box 571, Pecos,
Tex. 79772

Used batteries and other material for reclamation and recovery or environmentally safe disposal are transferred from a

US005632863A

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Meador

[11] Patent Number: 5,632,863
[45] Date of Patent: May 27, 1997

[54] BATTERY PYROLYSIS PROCESS

[57] ABSTRACT

[76] Inventor: W. R. Meador, P.O. Box 571, Pecos,
Tex. 79772

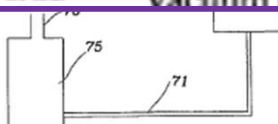
Used batteries and other material for reclamation and recovery or environmentally safe disposal are transferred from a feed bin by an auger into a crusher and then into a pyrolysis chamber. The feed system excludes air or oxygen from passing through the auger and crusher into the pyrolysis chamber. The material from the crusher is transferred by an auger through the pyrolysis chamber which is heated to a decomposition temperature between 350° and 650° F. and is decomposed. The pyrolysis chamber includes a vapor recovery system for removing the vapors and maintaining a vacuum in the pyrolysis chamber. The vapors are withdrawn

[21] Appl. No.: 344,092

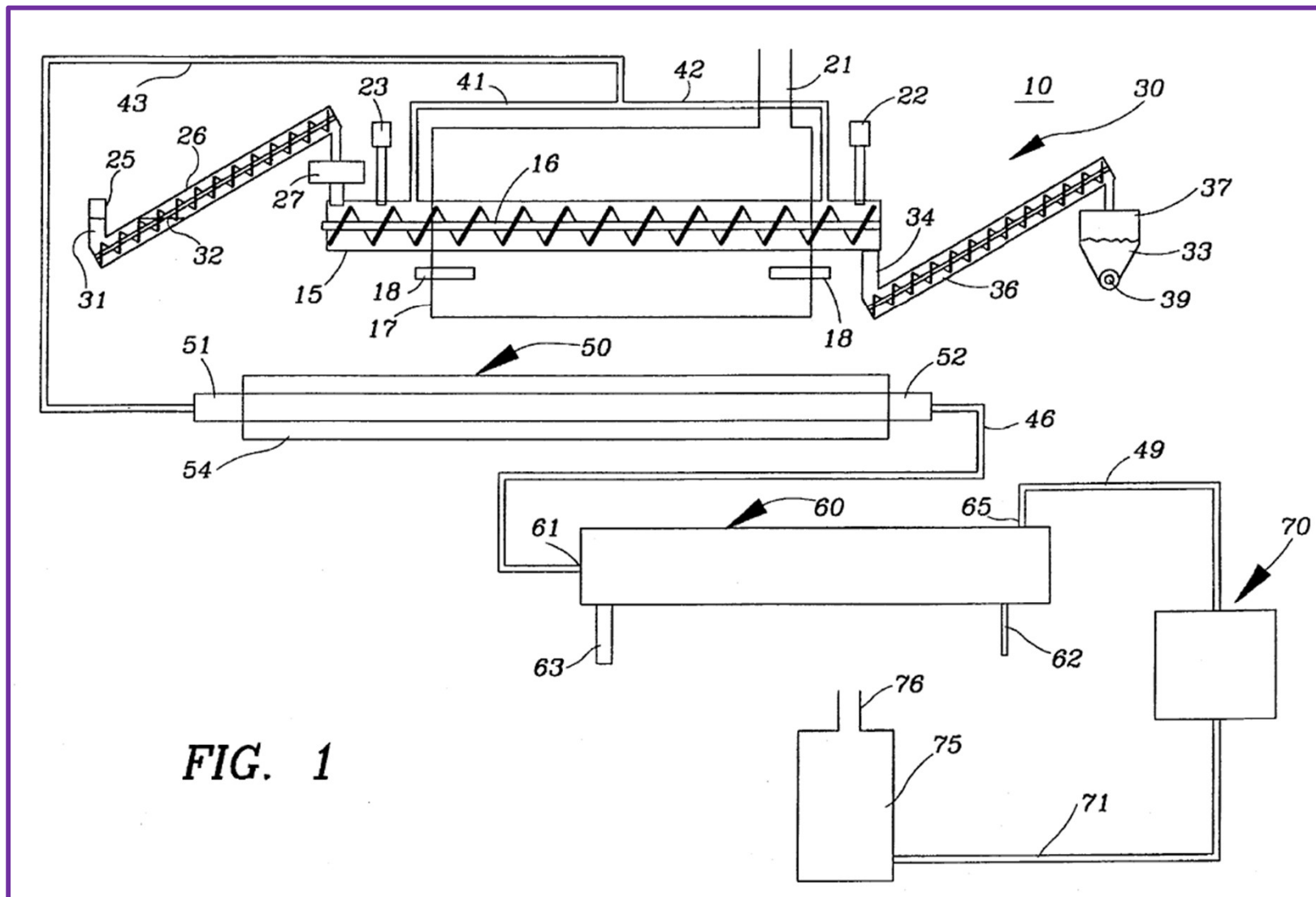
[22] Filed: Nov. 22, 1994

[51] Int. Cl.⁶ C10B 51/00

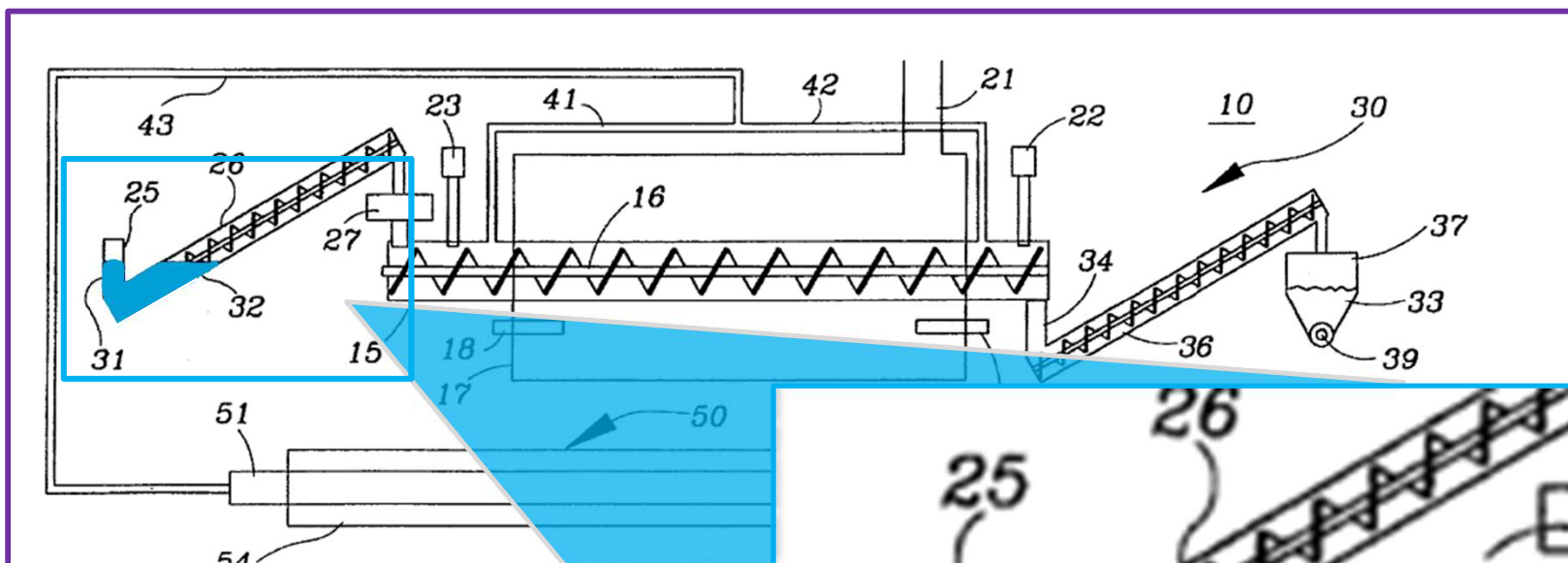
[52] U.S. CL. 201/25; 201/3; 201/4;
201/7; 201/27; 201/28; 201/29; 241/14;
241/23



Meador – Figure 1

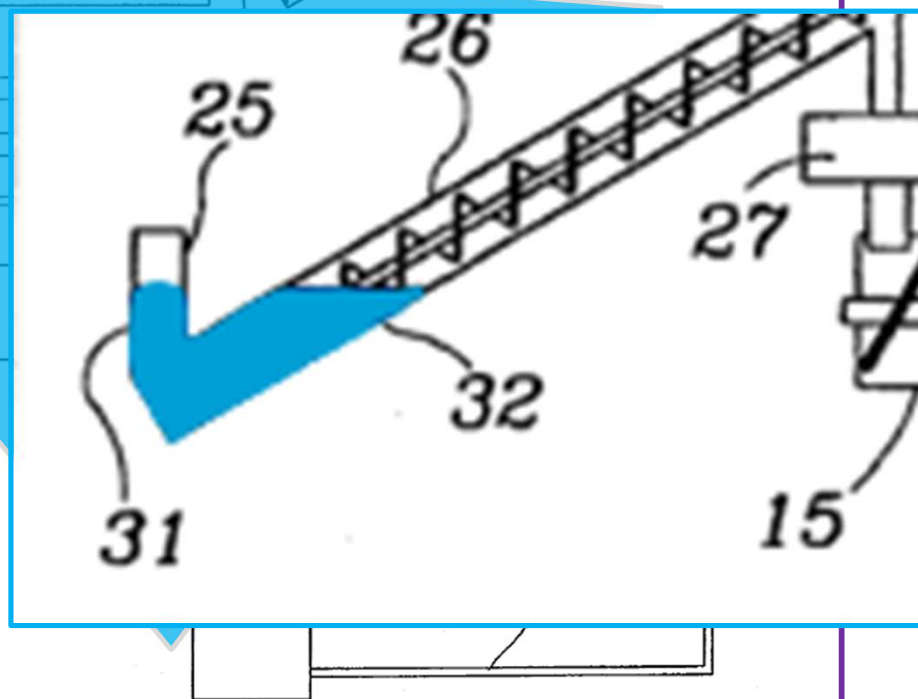


Meador – Water Seals



"A liquid 31, such as, water is maintained at level 32 in the hopper 25 and screw conveyor 26 to exclude oxygen or air entering into the crusher 27 and then, into the pyrolysis chamber 15." Ex. 1011 at 4:50-53

"The recovery auger may be water sealed or by using a closed hopper with a pressure switch, the dry, solid materials will serve as a discharge valve thus, maintaining a vacuum on the system." Ex. 1011 at 3:37-40.



Ex. 1011 (Meador) at Fig. 1; see also *id* at 3:37-40; 4:50-53; Paper 20 (POR) at 25-27

DEMONSTRATIVE EXHIBIT–NOT EVIDENCE

Meador – Pressure Levels

United States Patent [19]
Meador



US005632863A

[11] Patent Number: 5,632,863
[45] Date of Patent: May 27, 1997

[54] BATTERY PYROLYSIS PROCESS

[76] Inventor: W. R. Meador, P.O. Box 571, Pecos, Tex. 79772

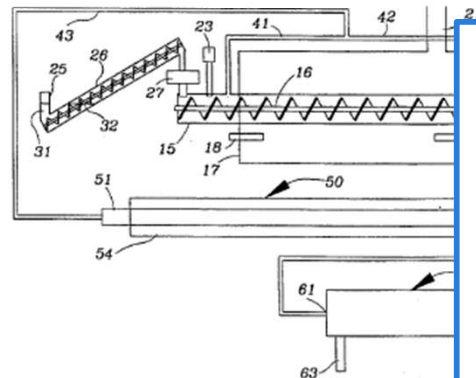
[57] ABSTRACT

Used batteries and other material for reclamation and recovery or environmentally safe disposal are transferred from a to a crusher and then into a pyrolysis system. The system excludes air or oxygen from the crusher and crusher into the pyrolysis from the crusher is transferred by an pyrolysis chamber which is heated to a ture between 350° and 650° F. and is ysis chamber includes a vapor recovering the vapors and maintaining a s chamber. The vapors are withdrawn ger and into the liquid/gas separator liquids are removed and the gas is residue from the pyrolysis chamber is ue recovery system which includes a erring the residue from the pyrolysis A pressure sensitive switch which level of solid material in the bin which ent air or oxygen from entering the residue is transferred to a screening per and a lower screen. The screens er sized metals are collected from the g collector, the heavier metals off the aper and plastic off the upper screen.

ss, 2 Drawing Sheets

“The vacuum pump 70 maintains a vacuum on pyrolysis chamber 15 of approximately one-half inch of mercury (five inches of water).”

Ex. 1011 at 5:61-63



“Meador states to maintain a vacuum of ‘about one half to one inch of mercury,’ and also refers to ‘five inches of water.’

Converted to hPa, these ranges equate to about 12 hPa to 34 hPa.”

Ex. 2022, ¶ 118 (quoting Ex. 1011 at 5:60-62 & 6:58-59).

Ex. 1011 (Meador) at 5:61-63; Ex. 2022, ¶118; Paper 20 (POR) at 27-28

Meador – Pressure Levels Relative to Ambient

	
US005632863A	
United States Patent [19]	[11] Patent Number: 5,632,863
Meador	[45] Date of Patent: May 27, 1997
[54] BATTERY PYROLYSIS PROCESS	[57] ABSTRACT
[76] Inventor: W. R. Meador, P.O. Box 571, Pecos, Tex. 79772	Used batteries and other material for reclamation and recovery or environmentally safe disposal are transferred from a

Ascend's excerpt, Dr. van Schalkwijk: And that's why it made sense to me to interpret this as a slight vacuum, just coming down from 30 to 29.5 inches.

Mr. LaRoque: Okay. And so when you say that's why it made sense to you to interpret this as a slight vacuum just coming down from 30 to 29.5 inches, you mean it makes sense to you to interpret this as a relative pressure, not an absolute pressure?

Dr. van Schalkwijk: A relative pressure, because that makes sense because of the water.

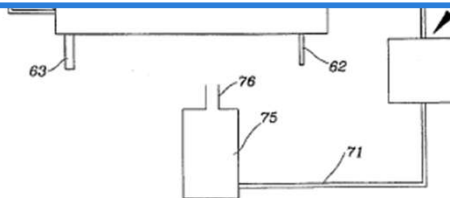
Ascend Elements EX1011 Page 1

Ex. 2024 (van Schalkwijk Dep.) at 72:17-4;
see also id. at 68:18-73:4 & 112:25-114:13;
Paper 20 (POR) at 27-28

Meador – Pressure Levels Relative to Ambient

	
US005632863A	
United States Patent [19]	[11] Patent Number: 5,632,863
Meador	[45] Date of Patent: May 27, 1997
[54] BATTERY PYROLYSIS PROCESS	[57] ABSTRACT
[76] Inventor: W. R. Meador, P.O. Box 571, Pecos, Tex. 79772	Used batteries and other material for reclamation and recovery or environmentally safe disposal are transferred from a feed bin by an auger into a crusher and then into a pyrolysis chamber. The feed system excludes air or oxygen from passing through the auger and crusher into the pyrolysis chamber. The material from the crusher is transferred by an auger through the pyrolysis chamber which is heated to a decomposition temperature between 350° and 650° F. and is decomposed. The pyrolysis chamber includes a vapor recovery system for removing the vapors and maintaining a
[21] Appl. No.: 344,092	
[22] Filed: Nov. 22, 1994	
[51] Int. Cl. ⁶ C10B 51/00	
[52] U.S. Cl. 201/25; 201/3; 201/4; 201/7; 201/27; 201/28; 201/29; 241/14; 241/23	

“120. I note that Dr. van Schalkwijk revised his opinions in his deposition, and agreed that it was **appropriate to interpret the vacuum levels stated in Meador to be pressure relative to ambient, and not an absolute pressure.** Ex. 2024 at 68:18-73:4 & 112:25-114:13. He confirmed his opinion that the pressure in Meador’s system would be a slight underpressure of about a half-inch of mercury (or an absolute pressure of 29.5 inches of mercury). See Ex. 2024 at 71:1-73:4. **This equates to an absolute pressure of about 999 hPa.** It appears then, that Dr. van Schalkwijk and I are now in **agreement on the pressure level taught by Meador.**”



Ex. 2022 (Dantam) at ¶¶120 & 139;
Paper 20 (POR) at 27-28

Ground 1

Trials@uspto.gov
571-272-7822

Paper 10
Entered: November 22, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND ELEMENTS, INC.,
Petitioner,

Ground 1:

Hanisch (Ex. 1004) in view of Dunagan (Ex. 1018)

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

Paper 10 (Institution Dec.)

Petitioner's Ground 1 Arguments: Claim 1

Independent Claim 1:

1. A method for the treatment of used batteries, comprising the steps:	Hanisch
(a) comminuting the batteries such that comminuted material is obtained;	Hanisch
(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	Hanisch
(c) filling a transport container with the inactivated comminuted material;	Hanisch in view of skill in the art and/or Dunagan
wherein the inactivating step is performed by drying the comminuted material , and	Hanisch
wherein the drying occurs at a maximum pressure of 300 hPa .	Hanisch

Petitioner's Ground 1 Arguments: Claim 1

	Pre-Dryer	Decomposition Oven
Inactivation		Not contested
300 hPa		

Pre-dryer and Inactivation



US009780419B2

(12) **United States Patent**
Hanisch et al.

(10) **Patent No.:** **US 9,780,419 B2**

(45) **Date of Patent:** **Oct. 3, 2017**

(54) **METHOD FOR RECLAIMING ACTIVE MATERIAL FROM A GALVANIC CELL, AND AN ACTIVE MATERIAL SEPARATION INSTALLATION, PARTICULARLY AN ACTIVE METAL SEPARATION INSTALLATION**

(52) **U.S. CL.**
CPC **H01M 10/54** (2013.01); **B02C 23/06** (2013.01); **B02C 23/08** (2013.01); **B07B 4/08** (2013.01);

(Continued)

(58) **Field of Classification Search**

“The method preferably comprises the step that, before heating the cell fragments up to the decomposition temperature, the cell fragments are dried at a drying temperature, so that dry cell fragments and drying vapours are formed, whereby the drying vapours are at least partly condensed. This has the advantage that the electrolyte solvent can be retrieved. It is therefore advantageous for the drying temperature to be below 100° C., in particular below 80° C.”

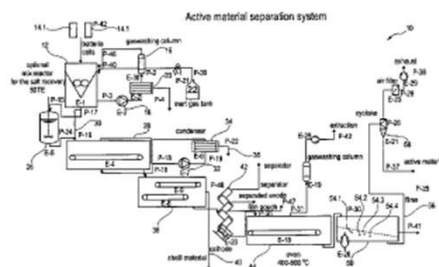
(65) **Prior Publication Data**
US 2014/0290438 A1 Oct. 2, 2014

(30) **Foreign Application Priority Data**
Aug. 12, 2011 (DE) 10 2011 110 083

(51) **Int. CL.**
B02C 23/00 (2006.01)
H01M 10/54 (2006.01)
(Continued)

Cook, P.C.

(57) **ABSTRACT**
A method for retrieving active material from a galvanic cell is provided. 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 method includes the following steps: (a) crushing the cells, in particular under inert gas or in a vacuum, so that solid cell fragments are also formed, (b) heating the solid cell fragments up to the decomposition temperature (T_d), which is high enough to
(Continued)



Ascend Elements EX1004 Page 1

Ex. 1004 (Hanisch) at 3:65-4:5;
Paper 1 at 26

Pre-dryer: Institution Ruling

“On the present record, we do not find this argument persuasive. Although Hanisch teaches the removal of some volatile electrolyte through heating and condensing the resulting vapor in its low-temperature drying process, Petitioner does not direct us to evidence that tends to show that Hanisch’s low-temperature drying removes sufficient vapor to make electrochemical reactions impossible or only possible to a negligibly small extent.”

Paper 10 (Institution Dec.) at 13

Pre-dryer: Prior to Decomposition

“Further, Hanisch '419 teaches that the battery material goes from the pre-dryer to the decomposition oven, where it will be subjected to temperatures of at least 350°C. A POSITA would have understood that whatever solvent remains in the comminuted battery material through the pre-dryer will be destroyed in this furnace. See Paper 10, at 13. Thus, a POSITA would understand that there is no need to take the caution and incur the cost to dry the material to the endpoint result of inactivation.”

“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. See Paper 10, at 13. Rather, a POSITA would have understood the pre-dryer to perform a short treatment step prior to decomposition.”

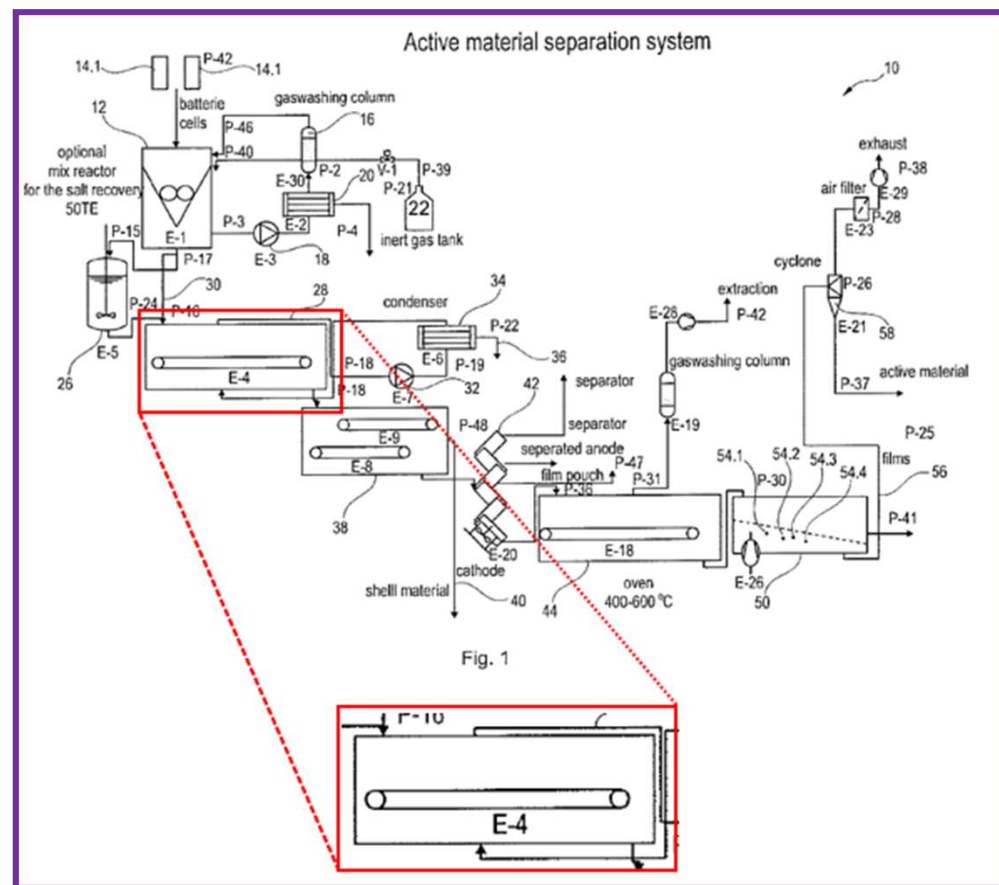
Ex. 2022 (Dantam) at ¶¶80-81;
Paper 20 (POR) at 14-17

Pre-dryer: Difficulty of Extraction

“Further, a POSITA would have understood that the rate of electrolyte extraction is inversely proportional to the volume of electrolyte extracted. In other words, as more electrolyte is extracted in the pre-drying process, it takes longer and longer to extract additional electrolyte. Given these indications that Hanisch '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.”

Pre-dryer: Concerned with Speed

“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.”



Ex. 2022 (Dantam) at ¶178

(reproducing and annotating Ex. 1004 (Hanisch) at Fig. 1);

Paper 20 (POR) at 13-17

Pre-dryer: Lack of Technical Guidance

“Hanisch '419 does not include the necessary technical detail to instruct how to achieve inactivation of battery material using the pre-dryer. Specifically, the patent lacks any disclosure regarding the duration of time the material must spend in the pre-dryer or the pressure conditions required to achieve inactivation. Additionally, Hanisch '419 does not provide any guidance on how to assess whether the material has reached a sufficiently dry state. Furthermore, it fails to address the variability in electrolyte solvents that would be encountered depending on the types of batteries being processed, nor does it include any discussion of the specific drying conditions needed to ensure the complete evaporation of these solvents A POSITA would have understood that this lack of detail renders the pre-dryer unsuitable for achieving inactivation, as it fails to address the fundamental parameters and conditions necessary to ensure the material is adequately processed to become inactivated.”

Hanisch: No Vacuum Control Mechanisms

“Hanisch ’419 is silent as to the devices that could be used to allow this continuous flow of materials into and out of the vacuum system. Nor does Hanisch ’419 say what vacuum levels could be sustained in this system.”

Ex. 2022 (Dantam) at ¶149; Paper 20 (POR) at 38

“To allow battery material to enter and exit this oven continuously, it would be difficult to maintain a strong vacuum (rather than a slight underpressure), especially at high temperatures. There are limited options of mechanisms that would allow this functionality.”

Ex. 2022 (Dantam) at ¶150; Paper 20 (POR) at 38

Hanisch: Knowledge of a POSITA

“But, you know, you didn't want the vacuum to be intense, because it was -- one, it takes a lot of energy to maintain an intense vacuum, a lot of carrier gas; and it takes, also -- you know, you might -- when you're getting down -- especially on the higher temperature portion of the battery recycling, when you're up doing decomposition, you're getting down to particulates. And if you have a vacuum that is really intense, it's sucking air and moving air, and you can get some of the particulate matter from the deactivated anode and cathode coming out. It's -- it's abrasion that will damage your equipment. So you want to have a vacuum that moves air but not particles.”

Ex. 2024 (van Schalkwijk Depo.) at 107:5-19;
Paper 20 (POR) at 19-20;
Paper 38 (PO Sur-reply) at 10

Hanisch: Knowledge of a POSITA

Q So -- Okay. So that statement indicates that, between those two interpretations that you just mentioned, the slight vacuum interpretation is -- is the one -- is the correct one?

A In my reading of this, yes. Half-inch of mercury is sucking, but it's not -- you know, it's sucking intensely down to a really big vacuum. If you sucked all the way to a really big vacuum, that's pretty energy intensive. A half-inch of mercury difference in pressure, that small, slight vacuum, as I termed it, is still enough to move a lot of air, push it out of the system, without intense use of the vacuum pump. It would be just really having to lower the pressure a little bit, and then keep airflow all the way through the system so that everything that's generated is moved on out of the -- out of the chamber after the pyrolysis has occurred.

Q That can happen at that slight vacuum, which is .5 inches of mercury less than atmospheric pressure?

A Yes. That -- that is still enough to make a considerable breeze.

Ex. 2024 (van Schalkwijk Depo.) at 69:20-70:19; Paper 20 (POR) at 19-20

0.5 inches mercury is approximately 16.9 hPa (relative to atmospheric pressure), *i.e.*, about 999 hPa (absolute pressure)

Ex. 1003 (van Schalkwijk Decl.) at ¶77 (p. 27); Ex. 2022 (Dantam Decl.) at ¶120;

Paper 20 (POR) at 19, 28 & 35

Hanisch: Knowledge of a POSITA

“68. It has long been understood in the art that battery recycling processes, including those for lithium-ion batteries, should avoid conditions that could lead to explosion, fire, and/or release of toxic compounds.”

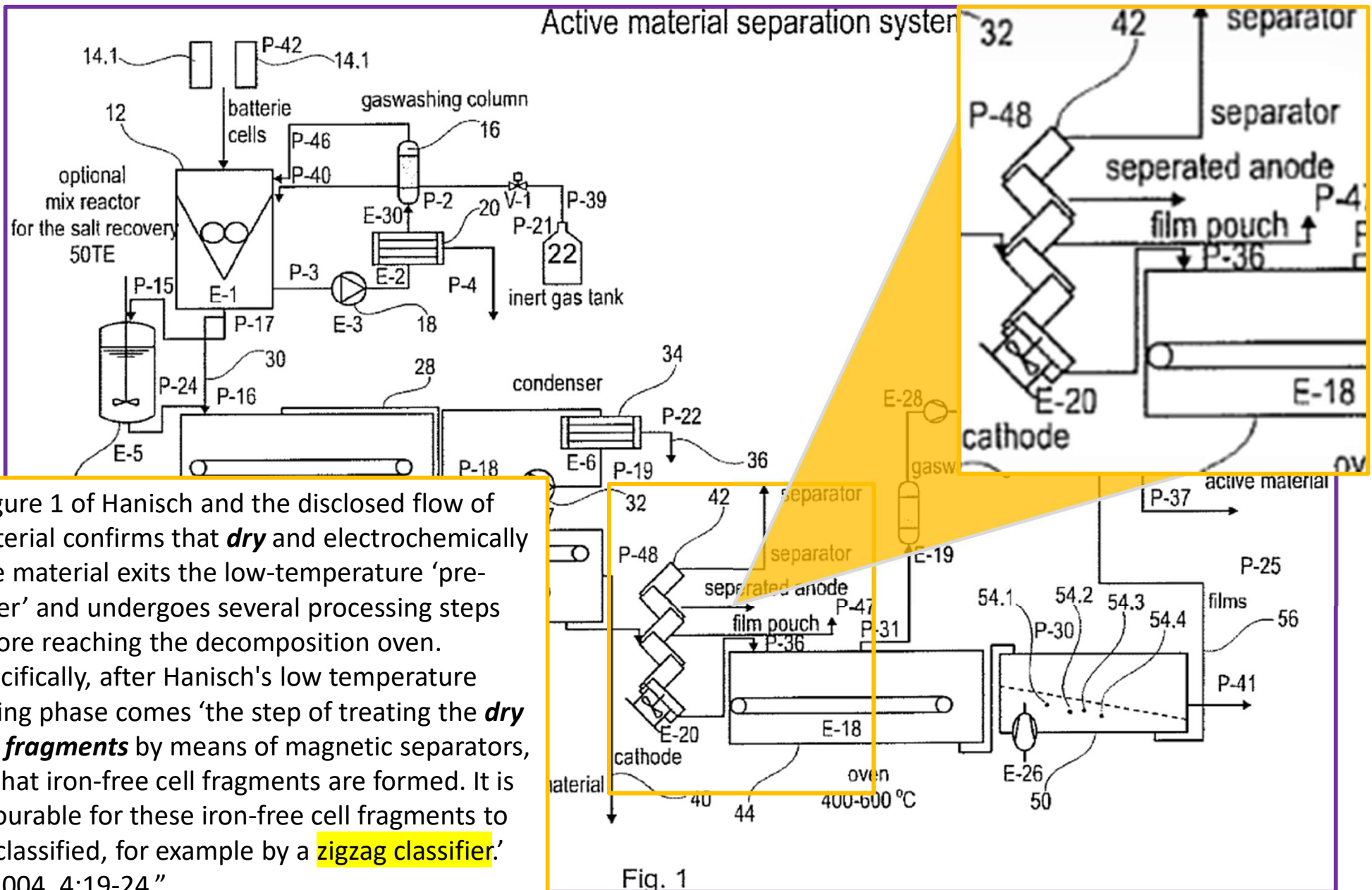
**Ex. 1003 (van Schalkwijk Decl.) at ¶168;
Paper 20 (POR) at 1, 19, 46 & 53**

Hanisch: Knowledge of a POSITA

“71. In addition, it has been well-known in the art that **comminuted material that results from shredding** and drying stages of lithium-ion battery recycling contains a mix of materials including lithium, manganese, cobalt, and nickel, among other compounds, many of which can exist in **toxic or hazardous** forms when present in this material. **Because such material can often exist in a fine particulate that can enter air circulation if sufficiently disturbed, it has also been well-known in the art that care must be taken to prevent dust and fine particulate from entering air circulation, given the potential for health risks from inhalation or soft tissue exposure.**”

Ex. 1003 (van Schalkwijk Decl.) at ¶71;
Paper 1 (Petition) at 7;
Paper 20 (POR) at 19-20;
Paper 38 (PO Sur-reply) at 10

Petitioner's Reply Argument: Zig-Zag Classifier



"Figure 1 of Hanisch and the disclosed flow of material confirms that **dry** and electrochemically safe material exits the low-temperature 'pre-dryer' and undergoes several processing steps before reaching the decomposition oven. Specifically, after Hanisch's low temperature drying phase comes 'the step of treating the **dry cell fragments** by means of magnetic separators, so that iron-free cell fragments are formed. It is favourable for these iron-free cell fragments to be classified, for example by a **zigzag classifier**.' EX1004, 4:19-24."

Petitioner's Reply Argument: Zig-Zag Classifier

- Argument presented for the first time on reply:
 - “Petitioner may not submit new evidence or argument in reply that it could have presented earlier” *Consolidated Trial Practice Guide* at 73.
 - “It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’ 35 U.S.C. § 312(a)(3). ‘All arguments for the relief requested in a motion must be made in the motion. A reply may only respond to arguments raised in the corresponding opposition or patent owner response.’ 37 C.F.R. § 42.23(b). *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-1370 (Fed. Cir. 2016) (holding argument “raised by the first time in [Petitioner’s] reply brief and expert declaration” was “improper” because it “relied on an entirely new rationale”).

Petitioner's Reply Argument: Zig-Zag Classifier

Extent of Disclosure In Original Declaration:

- “Hanisch provides an example of an apparatus that can be used to carry out this high-temperature heating in the description accompanying Fig. 1: "An oven 44 is set up in the direction of material flow behind the classifier 42, in which there is a decomposition temperature T_z between 400 and 600°C. The binder, for example, polyvinylidene flouride [sic] (PVDF), thus decomposes." (EX1004, 6:8-11.)”

Ex. 1003 (van Schalkwijk decl.), ¶75

- “Hanisch provides additional disclosures of this process in the description accompanying Fig. 1.: "An oven 44 is set up in the direction of material flow behind the classifier 42, in which there is a decomposition temperature T_z between 400 and 600°C. The binder, for example polyvinylidene fluoride (PVDF), thus decomposes." (EX1004, 6:8-11.)”

Ex. 1003 (van Schalkwijk decl.), ¶101

Prejudice to Patent Owner: Expert Deprived of Response

Petitioner's Reply Argument: Zig-Zag Classifier

- No evidence presented material in zig-zag classifier is more than partially dry or meets Board's construction of "inactivated."
- Dr. van Schalkwijk's testimony on low danger of wet material:
 - Q "Taking the zig-zag classifier, it's your opinion that passing wet and active battery fragments through this de-classifier would be dangerous; right?"
A "I didn't say they would be dangerous." (Ex. 2061 at 20:8-17);
 - "They're not likely to generate enough heat to cause this kind of reaction to take place because since they are wet particles, they're not going to create the static electricity that you would need to generate the heat, the heat." (*Id.* at 25:13-19);
 - "Generally, even if the material is active because there's some wet material, there's not enough to support an electrochemical reaction that would go beyond a few seconds." (*Id.* at 33:14-18.)

Ex. 2061 (van Schalkwijk Depo.) at 20:8-17; 25:13-19; 33:14-18; Paper 38 (PO Sur-reply) at 3-5

Petitioner's Ground 1 Arguments: Pressure

Independent Claim 1:

1. A method for the treatment of used batteries, comprising the steps:

Hanisch

(a) comminuting the batteries such that comminuted material is obtained;

Hanisch

(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

Hanisch

(c) filling a transport container with the inactivated comminuted material;

Hanisch in view of skill in the art and/or Dunagan

wherein **the inactivating step is performed by drying the comminuted material**, and

Hanisch

wherein the drying occurs at **a maximum pressure of 300 hPa**.

Hanisch

Hanisch and Pressure: No Explicit Disclosure

- Petitioner's evidence from Hanisch regarding pressure:

"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. The active material is understood in particular to mean a" Ex. 1004 at 3:4-9 (Pet. at 30).

"The heating of cell fragments up to the decomposition temperature is preferably carried out under inert gas or in a vacuum." Ex. 1004 at 4:6-8 (Pet. at 30).

"The active material separation system preferably possesses a pre-dryer which is set up in the material flow, behind the cell crushing device and before the oven. The pre-dryer is configured to heat the cell fragments up to the drying temperature." Ex. 1004 at 4:55-59. (Pet. at 30).

"The pre-dryer 28 is designed to be gas-proof and is flushed with inert gas by the circulation pump 32." Ex. 1004 at 5:62-63 (Pet. at 30).

"The method according to claim 1, wherein the heating of the solid cell fragments up to the decomposition temperature takes place under inert gas or in a vacuum." Ex. 1004 at claim 6 (Pet. at 31).

Hanisch and Pressure: Knowledge of a POSITA

- Instead, Petitioner relies on “knowledge of a POSITA”:

“To the extent that Hanisch does not explicitly disclose this claim limitation, it would have been obvious in view of the common knowledge of a POSITA before the effective filing date of the '097 Patent that using pressures at or below 300 hPA when drying the comminuted material would be desirable, and that doing so would have likely been successful. (EX1003, ¶¶113-16.) For example, it has been well-known for decades, if not longer, that the evaporation of gases, including volatile compounds and gases formed during drying, can be facilitated at lower temperatures when ambient pressure is reduced from normal pressure, because of the reduction in boiling point that occurs. (EX1003, ¶¶ 68-70, 114.) In addition, the boiling point of organic carbonate solvents such as dimethyl carbonate or ethyl methyl carbonate over ranges of ambient pressures and temperatures was well-known in the art for many years before the effective filing date of the '097 Patent. (EX1003, ¶114.) A POSITA would also have understood that the formation of toxic hydrogen fluoride during hydrolysis of LiPF_6 is reduced at lower temperatures, because the reaction is endothermic, such that the use of reduced pressure to allow for lower temperatures when drying comminuted material would be desirable. (EX1003, ¶114.) The potential for reduction in energy utilization in a recycling system stemming from reduced temperatures for drying (facilitated by using reduced pressure) would also have been attractive. (EX1003, ¶115.) A POSITA also would have had a reasonable expectation of success in applying pressures at or below 300hPA during either the electrolyte evaporation approach or the decomposition heating approach, where Hanisch teaches that the devices used when drying comminuted material to evaporate electrolyte is gas-proof, and thus capable of maintaining reduced ambient pressures, such as those below 300hPA. (EX1003 ¶116.)”

Knowledge of a POSITA and Pressure: Meador

United States Patent [19]
Meador

US005632863A
[11] Patent Number: 5,632,863
[45] Date of Patent: May 27, 1997

[54] BATTERY PYROLYSIS PROCESS

[57]

ABSTRACT

[76] In

[21] Ap

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[51] Int

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Ascend's excerpt, Dr. van Schalkwijk: And that's why it made sense to me to interpret this as a slight vacuum, just coming down from 30 to 29.5 inches.

Mr. LaRoque: Okay. And so when you say that's why it made sense to you to interpret this as a slight vacuum just coming down from 30 to 29.5 inches, you mean it makes sense to you to interpret this as a relative pressure, not an absolute pressure?

Dr. van Schalkwijk: A relative pressure, because that makes sense because of the water.



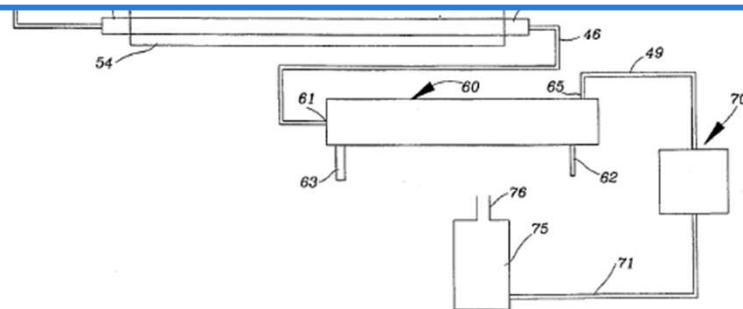
Ascend Elements EX1011 Page 1

Ex. 2024 (van Schalkwijk Depo.) at 72:17-4;
see also *id.* at 68:18-73:4 & 112:25-114:13;
Paper 20 (POR) at 33-34

Knowledge of a POSITA and Pressure: Meador

 US005632863A	
United States Patent [19]	[11] Patent Number: 5,632,863
Meador	[45] Date of Patent: May 27, 1997
[54] BATTERY PYROLYSIS PROCESS	[57] ABSTRACT
[76] Inventor: W. R. Meador, P.O. Box 571, Pecos, Tex. 79772	Used batteries and other material for reclamation and recovery or environmentally safe disposal are transferred from a feed bin by an auger into a crusher and then into a pyrolysis chamber. The feed system excludes air or oxygen from
[21] Appl. No.: 344,092	

“120. I note that Dr. van Schalkwijk revised his opinions in his deposition, and agreed that it was **appropriate to interpret the vacuum levels stated in Meador to be pressure relative to ambient, and not an absolute pressure.** Ex. 2024 at 68:18-73:4 & 112:25-114:13. He confirmed his opinion that the pressure in Meador’s system would be a slight underpressure of about a half-inch of mercury (or an absolute pressure of 29.5 inches of mercury). See Ex. 2024 at 71:1-73:4. **This equates to an absolute pressure of about 999 hPa.** It appears then, that Dr. van Schalkwijk and I are now in **agreement on the pressure level taught by Meador.**”



Ex. 2022 (Dantam Dec.) at ¶¶120, 139;
Paper 20 (POR) at 32-35

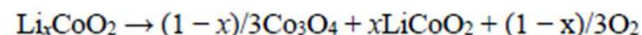
Hanisch and Pressure: Petitioner's Reply Argument

- New argument RE: pressure in decomposition oven

“A POSITA would have understood from these disclosures that it was desirable to use pressures lower than 300 hPa in the decomposition oven because minimizing the atmospheric oxygen in the chamber would promote the best chances of avoiding this oxidization, and a pressure of 300 hPa would have on the order of 3-4 fold less oxygen than 1 atmosphere, whereas a stronger vacuum pressure of 0.0000133 hPa would be predicted to have up to nearly eight orders of magnitude less free oxygen than 1 atmosphere, and thus the vacuum of less than 300 hPa would be much preferred. EX1023, ¶¶19-27.”
Paper No. 30 at 15.

22. LiCoO_2 , like many such lithium metal oxides, is normally thermally stable at the range of temperatures disclosed in Hanisch for the decomposition heating of 350-800°C, but during regular cycling and use of the battery, Li ions can be lost to the anode (EX1003, ¶¶62-63) and this delithiated LiCoO_2 can be thermally labile at temperatures ranging from 200-350°C. EX1030, 1. That reaction proceeds as follows, and leads to the production of, among other things, free molecules of oxygen that can react with copper:

delithiated Li_xCoO_2 ($x = 0.49-0.9$)



EX1030, 1. Although the fraction of this thermally labile LiCoO_2 is typically reduced by discharging of cathode materials prior to recycling, it remains possible that a small portion of that species will remain in the comminuted material being processed by the high temperature decomposition oven, and when decomposed, that material will undergo the reaction above, contributing to the release of reactive species of oxygen that can contribute to oxidization of copper. This can be a non-

**Ex. 1023 (van Schalkwijk Decl.) at ¶22;
Paper 31 (Petitioner's Reply to the POR) at 15**

Petitioner's Reply Argument: Pressure

- Argument presented for the first time on reply:
 - “Petitioner may not submit new evidence or argument in reply that it could have presented earlier” *Consolidated Trial Practice Guide* at 73.
 - “It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’ 35 U.S.C. § 312(a)(3). ‘All arguments for the relief requested in a motion must be made in the motion. A reply may only respond to arguments raised in the corresponding opposition or patent owner response.’ 37 C.F.R. § 42.23(b).” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-1370 (Fed. Cir. 2016) (holding argument “raised by the first time in [Petitioner’s] reply brief and expert declaration” was “improper” because it “relied on an entirely new rationale”).

Petitioner's Reply Argument: Pressure

- Argument supported only by expert testimony:
 - “[E]xpert testimony regarding [a particular] limitation cannot take the place of disclosure from patents or printed publications.” *Unified Pats. Inc. v. Velos Media, LLC*, No. IPR2019-00883, 2019 WL 6999079, at *5 (P.T.A.B. Nov. 15, 2019).
 - Where an issue is “more than a peripheral issue,” any determination on a limitation “requires a core factual finding” “point[ing] to some concrete evidence in the record in support of these findings.” *K/S Himpp v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365 (Fed. Cir. 2014).
 - “Similarly, in an obviousness analysis, conclusory assertions from a third party about general knowledge in the art cannot, without supporting evidence of record, supply a limitation that is not evidently and indisputably within the common knowledge of those skilled in the art.” Consolidated Trial Practice Guide at 36.

Petitioner's Reply Argument: Pressure

- Petitioner ignores that there should be no LiCoO_2 in decomposition oven after batteries are discharged.

22. LiCoO_2 , like many such lithium metal oxides, is normally thermally stable at the range of temperatures disclosed in Hanisch for the decomposition heating of 350-800°C, but during regular cycling and use of the battery, Li ions can be lost to the anode (EX1003, ¶¶62-63) and this delithiated LiCoO_2 can be thermally labile at temperatures ranging from 200-350°C. EX1030, 1. That reaction proceeds as follows, and leads to the production of, among other things, free molecules of oxygen that can react with copper:

delithiated Li_xCoO_2 ($x = 0.49-0.9$)



Although the fraction of this thermally labile LiCoO_2 is typically reduced by discharging of cathode materials prior to recycling, it remains possible that a small portion of that species will remain in the comminuted material being processed by the high temperature decomposition oven, and when decomposed, that material will undergo the reaction above, contributing to the release of reactive species of oxygen that can contribute to oxidization of copper.

Ex. 1023 (van Schalkwijk Decl), ¶22; Paper 38 (PO Sur-reply) at 9

Q Would a POSITA have known to discharge the batteries before putting them in this cell-crushing device?

A Yes.

Ex. 2061 (van Schalkwijk Depo.) at 15:3-8; Paper 38 (PO Sur-reply) at 9

Petitioner's Reply Argument: Pressure

- Petitioner ignores that a much weaker vacuum would be sufficient for decomposition oven.

“But, you know, you didn't want the vacuum to be intense, because it was -- one, it takes a lot of energy to maintain an intense vacuum, a lot of carrier gas; and it takes, also -- you know, you might -- when you're getting down -- especially on the higher temperature portion of the battery recycling, when you're up doing decomposition, you're getting down to particulates. And if you have a vacuum that is really intense, it's sucking air and moving air, and you can get some of the particulate matter from the deactivated anode and cathode coming out. It's -- it's abrasion that will damage your equipment. So you want to have a vacuum that moves air but not particles.”

Ex. 2024 (van Schalkwijk Depo.) at 107:5-19;
Paper 38 (PO Sur-reply) at 10

Petitioner's Reply Argument: Pressure

- Petitioner ignores that a much weaker vacuum would be sufficient for decomposition oven.

Q So -- Okay. So that statement indicates that, between those two interpretations that you just mentioned, the slight vacuum interpretation is -- is the one -- is the correct one?

A In my reading of this, yes. Half-inch of mercury is sucking, but it's not -- you know, it's sucking intensely down to a really big vacuum. If you sucked all the way to a really big vacuum, that's pretty energy intensive. A half-inch of mercury difference in pressure, that small, slight vacuum, as I termed it, is still enough to move a lot of air, push it out of the system, without intense use of the vacuum pump. It would be just really having to lower the pressure a little bit, and then keep airflow all the way through the system so that everything that's generated is moved on out of the -- out of the chamber after the pyrolysis has occurred.

Q That can happen at that slight vacuum, which is .5 inches of mercury less than atmospheric pressure?

A Yes. That -- that is still enough to make a considerable breeze.

0.5 inches mercury is approximately 16.9 hPa (less than atmospheric pressure), which is about 999 hPa (absolute pressure)

Ex. 2024 (van Schalkwijk Depo.) at 69:20-70:19; Ex. 1003 (van Schalkwijk Decl.) at ¶77 (p. 27);

Ex. 2022 (Dantam Decl.) at ¶120;

Paper 38 (PO Sur-reply) at 10

Petitioner's Ground 1 Arguments: Claim 12

Independent Claim 12:

12. A battery processing installation for treatment of used batteries, comprising:	Same as 1[pre]
(a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;	Same as 1[a]
(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; wherein the inactivating step is performed by drying the comminuted material, and	Same as 1[b] and [d]
(c) a filling device configured to fill a transport container with the inactivated comminuted material; and	Same as 1[c]
(d) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device.	Same as 1[e] and additional reasons based on Hanisch

Petitioner's Ground 1 Arguments: Inactivation

Independent Claim 12:

12. A battery processing installation for treatment of used batteries, comprising:

Same as 1[pre]

(a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;

Same as 1[a]

(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; wherein the inactivating step is performed by drying the comminuted material, and

Same as 1[b] and [d]

(c) a filling device configured to fill a transport container with the inactivated comminuted material; and

Same as 1[c]

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

Same as 1[e] and additional reasons based on Hanisch

Pet.'s Ground 1 Arguments: Vacuum Installation

Independent Claim 12:

12. A battery processing installation for treatment of used batteries, comprising:	Same as 1[pre]
(a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;	Same as 1[a]
(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; wherein the inactivating step is performed by drying the comminuted material, and	Same as 1[b] and [d]
(c) a filling device configured to fill a transport container with the inactivated comminuted material; and	Same as 1[c]
(d) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device.	Same as 1[e] and additional reasons based on Hanisch

Petitioner's Ground 1 Arguments: Claim 12

	Pre-Dryer	Decomposition Oven
Inactivation		Not contested
Vacuum Installation		

Vacuum Installation: Institution Decision

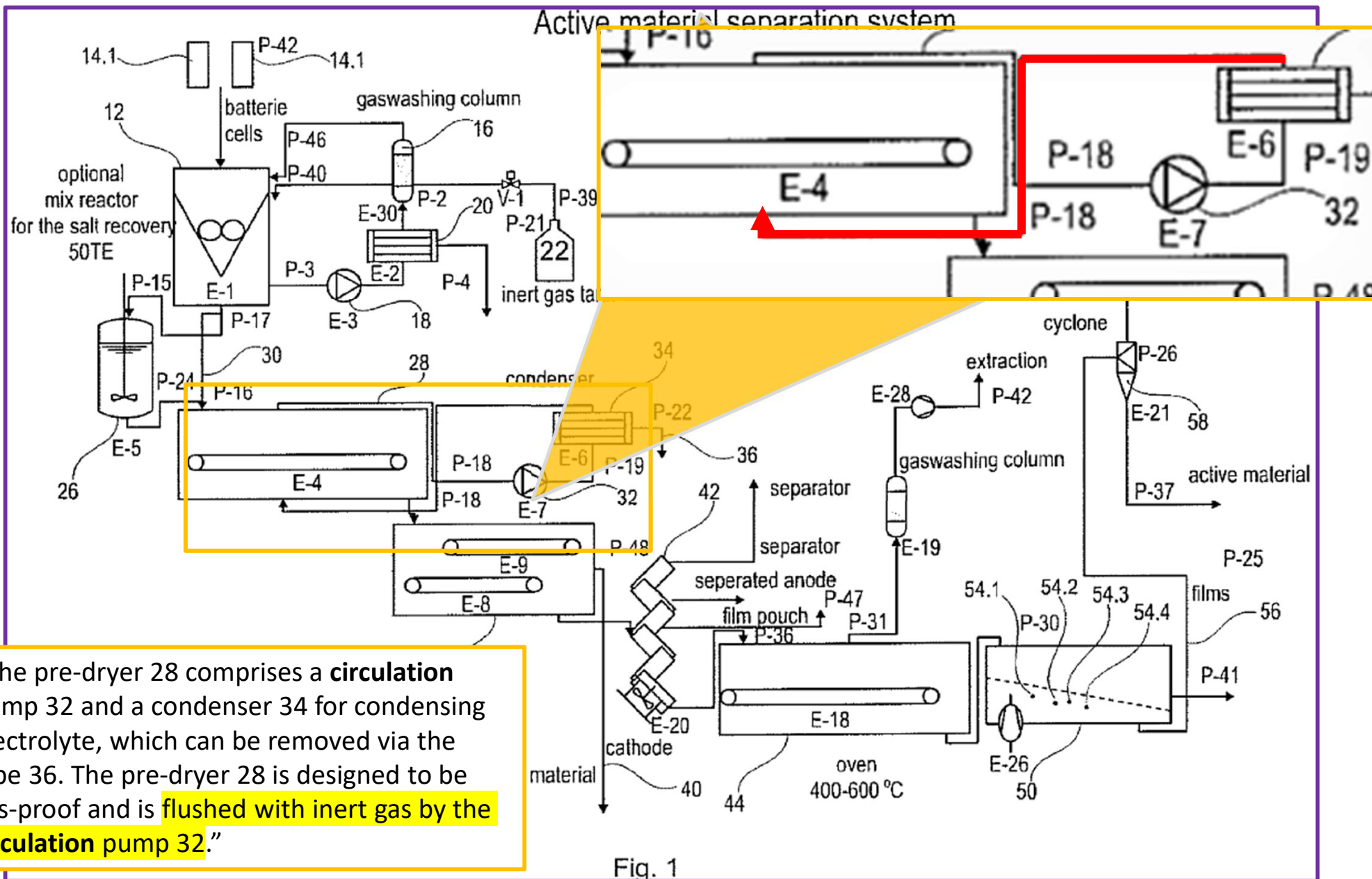
We begin by noting that the vacuum installation of this limitation must be “connected to the drying device,” which is the device “configured to inactivate the comminuted material.” Ex. 1001, 11:48–61. As discussed above, Petitioner shows sufficiently on the present record that Hanisch’s decomposition oven is such a drying device, but Petitioner does not show sufficiently that Hanisch’s pre-dryer is. Thus, to show a reasonable likelihood of prevailing as to this limitation, Petitioner must show that Hanisch teaches or suggests a vacuum installation connected to the decomposition oven.

generate the vacuum. Ex. 1003 ¶ 135. Petitioner also cites the testimony of Dr. van Schalkwijk that a person of ordinary skill in the art “would have understood the circulation pump and condenser of Hanisch to be a ‘vacuum installation.’” Pet. 39–40 (citing Ex. 1003 ¶¶ 136–137). But the circulation pump and condenser that Petitioner and Dr. van Schalkwijk refer to are attached to Hanisch’s pre-dryer, not to Hanisch’s decomposition oven. Pet. 39–40; Ex. 1004, 5:59–61, Fig. 1; Ex. 1003 ¶¶ 136–137. Thus, Petitioner shows sufficiently that Hanisch teaches or suggests a vacuum installation attached to Hanisch’s pre-dryer, but not, as Petitioner must show, that Hanisch teaches or suggests a vacuum installation attached to Hanisch’s decomposition oven.

Pet.'s Ground 1 Arguments: Vacuum Installation

"136. Further, Hanisch discloses a drying device that is connected to a vacuum installation: "pre-dryer 28 comprises a circulation pump 32 and a condenser 34 for condensing electrolyte, which can be removed via the pipe 36." (EX1004, 5:59-61.) In my opinion, a POSITA would understand the circulation pump and condenser of Hanisch 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 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.) ..."

Hanisch – Circulation Pump/Pre-Dryer



“The pre-dryer 28 comprises a **circulation** pump 32 and a condenser 34 for condensing electrolyte, which can be removed via the pipe 36. The pre-dryer 28 is designed to be gas-proof and is flushed with inert gas by the **circulation pump 32.**”

Ex. 1004 (Hanisch) at Fig. 1; see also *id.* at 5:59-63; Paper 1 at 39-40

Pet.'s Ground 1 Arguments: Vacuum Installation

“As there is no suggestion in Hanisch '419 of a vacuum installation connected either to the pre-dryer or to the decomposition oven, Hanisch '419 does not teach this claim element.”

Ex. 2022 (Dantam) at ¶105; *see also* ¶¶103-04;
Paper 20 (POR) at 23

Ground 1: Claims 2 & 7

Claims 2 & 7: particular metrics of drying

2. The method according to claim 1, wherein the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.

Ex. 1001 at Cl. 2; Paper 1 at 32-34; Paper 20 (POR) at 10 & 21

7. The method according to claim 1, wherein the drying of the comminuted material is only completed if one or more of the following conditions is met:

no flammable or explosive gas mixture is formable above the comminuted material in the transport container, and the comminuted material is so dry that no flammable or explosive gas mixture is able to emerge in the transport container.

Ex. 1001 at Cl. 7; Paper 1 at 35-36; Paper 20 (POR) at 10 & 21

Ground 1: Claims 2 & 7

Claims 2 & 7: prior art disclosure

“The method preferably comprises the step that, before heating the cell fragments up to the decomposition temperature, the **cell fragments are dried** at a drying temperature, so that **dry cell fragments** and drying vapours are formed, whereby the drying vapours are at least partly condensed. This has the advantage that the electrolyte solvent can be retrieved. It is therefore advantageous for the drying temperature to be below 100° C., in particular below 80° C.”

Ex. 1004 (Hanisch) at 3:65-4:5; Paper 1 at 26; Paper 6 (POPR) at 19;
Paper 20 (POR) at 16-17; Paper 38 (Sur-reply) at 2-3;
see also Ex. 1003 (van Schalkwijk Decl.) at ¶¶117-121 & ¶¶123-125

Ground 1 : Claim 13

13. The battery processing installation according to claim 12, wherein the drying device is configured to dry the comminuted material until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.

Same deficiency of proof

Ground 2

Trials@uspto.gov
571-272-7822

Paper 10
Entered: November 22, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND ELEMENTS, INC.,
Petitioner,

Ground 2:

Hanisch in view of Dunagan and Hayashi (Ex. 1006),
Meador (Ex. 1011), or Shin (Ex. 1010)

KAISER, *Administrative Patent Judge.*

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

Paper 10 (Institution Dec.)

Petitioner's Ground 2 Arguments: Pressure

Independent Claim 1:

1. A method for the treatment of used batteries, comprising the steps:

Hanisch (same as Ground 1)

(a) comminuting the batteries such that comminuted material is obtained;

Hanisch (same as Ground 1)

(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

Hanisch (same as Ground 1)

(c) filling a transport container with the inactivated comminuted material;

Hanisch in view of skill in the art and/or Dunagan (same as Ground 1)

wherein **the inactivating step is performed by drying the comminuted material**, and

Hanisch (same as Ground 1)

wherein the drying occurs at **a maximum pressure of 300 hPa.**

Hanisch **OR Meador OR Shin OR Hayashi**

Petitioner's Ground 2 Arguments: Meador

- Petitioner originally asserted Meador in its Petition (Paper No. 1 at 43-44).
- Petitioner dropped all arguments based on Meador in its reply:

⁶ To streamline the proceeding, Petitioner limits its argument in this Reply to PO's contentions regarding Hanisch alone, or in combination with Hayashi and Shin, and does not present arguments with respect to Meador.

Paper 30 (Petitioner's Reply to POR) at 16

Meador – Slight Relative Vacuum

United States Patent [19]
Meador



US005632863A

[11] Patent Number: 5,632,863
[45] Date of Patent: May 27, 1997

[54] BATTERY PYROLYSIS PROCESS

[76] Inventor: W. R. Meador, P.O. Box 571, Pecos, Tex. 79772

[21] Appl. No.: 344,092

[22] Filed: Nov. 22, 1994

[51] Int. Cl.⁶ C10B 51/00

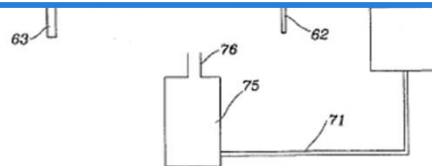
[52] U.S. Cl. 201/25; 201/3; 201/4;
201/7; 201/27; 201/28; 201/29; 241/14;
241/23

[58] Field of Search 201/3, 4, 7, 25,
201/27, 28, 29, 30, 241/14, 23, 24, 25

[57] ABSTRACT

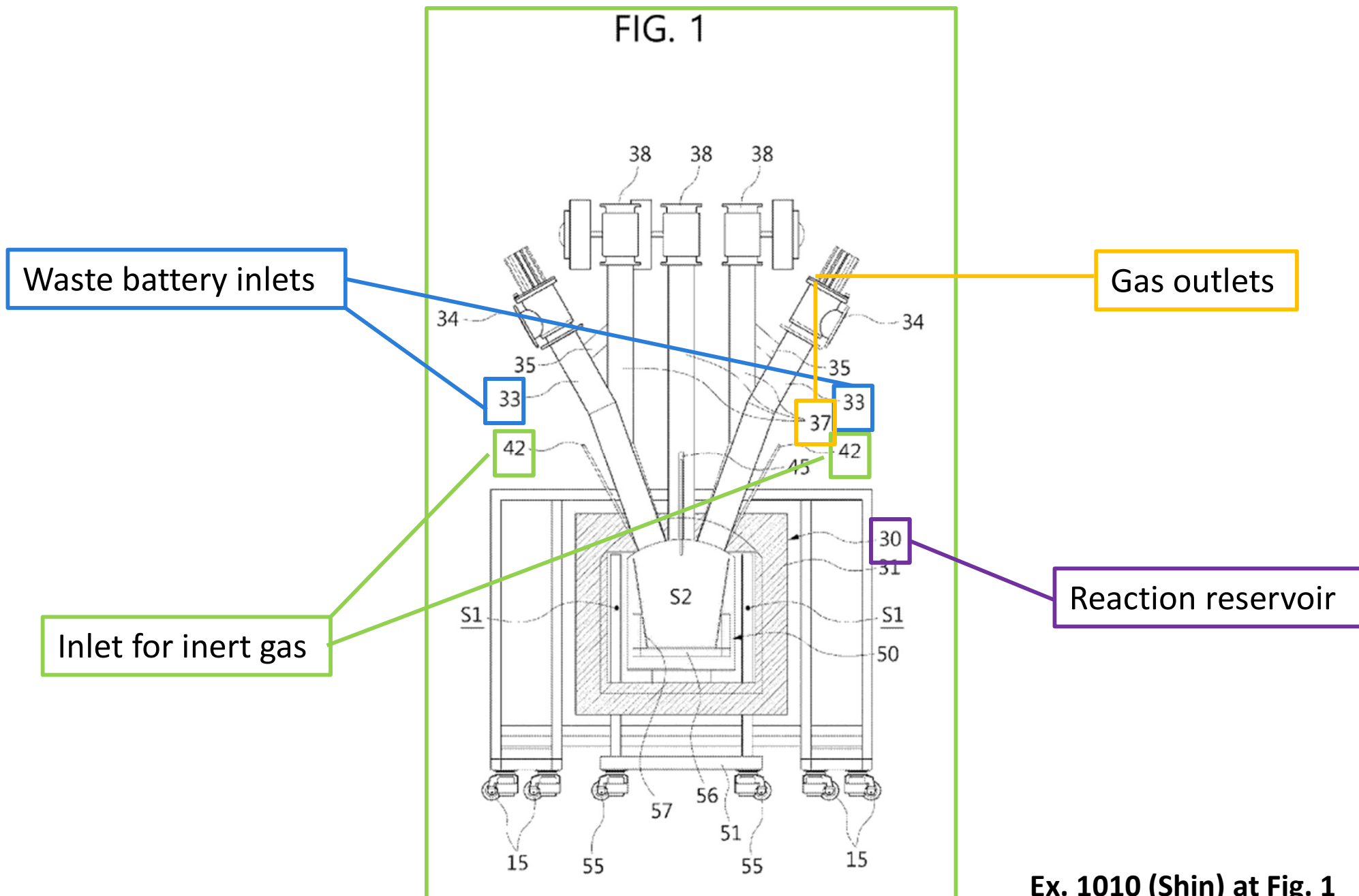
Used batteries and other material for reclamation and recovery or environmentally safe disposal are transferred from a feed bin by an auger into a crusher and then into a pyrolysis chamber. The feed system excludes air or oxygen from passing through the auger and crusher into the pyrolysis chamber. The material from the crusher is transferred by an auger through the pyrolysis chamber which is heated to a decomposition temperature between 350° and 650° F. and is decomposed. The pyrolysis chamber includes a vapor recovery system for removing the vapors and maintaining a vacuum in the pyrolysis chamber. The vapors are withdrawn through a heat exchanger and into the liquid/gas separator

“120. I note that Dr. van Schalkwijk revised his opinions in his deposition, and agreed that it was **appropriate to interpret the vacuum levels stated in Meador to be pressure relative to ambient, and not an absolute pressure.** Ex. 2024 at 68:18-73:4 & 112:25-114:13. He confirmed his opinion that the pressure in Meador’s system would be a slight underpressure of about a half-inch of mercury (or an absolute pressure of 29.5 inches of mercury). See Ex. 2024 at 71:1-73:4. **This equates to an absolute pressure of about 999 hPa.** It appears then, that Dr. van Schalkwijk and I are now in **agreement on the pressure level taught by Meador.**”



Ex. 2022 (Dantam) at ¶¶120 & 139;
Paper 20 (POR) at 32-35

Petitioner's Ground 2 Arguments: Shin



Ex. 1010 (Shin) at Fig. 1

Petitioner's Ground 2 Arguments: Shin

reservoir 30 is formed in the vacuum state (S30). That is, the inside of the treatment space S1 of the reaction reservoir 30 becomes the vacuum state by the vacuum forming means 40 and in the embodiment, the inside of the treatment space S1 of the reaction reservoir 30 is vacuum-controlled up to a maximum of 10^{-4} torr within 5 minutes by using the rotary pump provided in the vacuum forming means 40. As a result, the oxygen in the treatment space S1 may be removed and the explosion possibility may be maximally suppressed in a heat treatment step.

In this state, the inert gas is injected into the treatment space S1 of the reaction reservoir 30 through the gas inlet 42. In the embodiment, nitrogen (N2) is injected into the treatment space S1. Of course, the gas injection may be omitted

Ex. 1010 (Shin) at 8:6-19; Paper 20 (POR) at 50-52

Petitioner's Ground 2 Arguments: Shin

174. Shin teaches using a high vacuum of 10^{-4} torr (*i.e.*, about 0.00013 hPa), running a rotary pump for about 5 minutes. Ex. 1010 at 8:4-12. This high vacuum purges the system of oxygen. *Id.* at 8:12-15. (“As a result, the oxygen in the treatment space S1 may be removed and the explosion possibility may be maximally suppressed in a heat treatment step.”).

175. Shin does not maintain vacuum when batteries are processed. Rather, after purging the oxygen under vacuum, Shin then pumps nitrogen into the chamber. 8:16-17 (“In this [purged] state, the inert gas is injected into the treatment space S1 of the reaction reservoir 30 through the gas inlet 42.”). And more gas is contributed to the reservoir during the processing, because batteries rupture, emitting “poisonous gas” as they are heated to 470° to 550° Celsius very rapidly at the rate of 5 to 15 waste batteries per minute. *Id.* at 8:28-31 & 8:62-66.

Ex. 2022 (Dantam Dec.) at ¶¶174-175; Paper 20 (POR) at 50-52

Petitioner's Ground 2 Arguments: Shin

179. A POSITA would not have combined Shin with Hanisch. The approaches of these two references are fundamentally incompatible with each other. Whereas Shin ruptures whole batteries under high heat, Hanisch '419 comminutes the batteries first. While Shin initially uses a high vacuum to purge oxygen, it negates that vacuum by flooding the chamber with nitrogen gas; by contrast, Hanisch '419 states that the processing may be carried out under vacuum, which is not taught in Shin. There is no reason that a person of skill, when contemplating Hanisch '419, would turn to Shin for its teachings. And there is no teaching in Shin to dry comminuted batteries at a pressure of less than 300 hPa.

Ex. 2022 (Dantam) at ¶179; Paper 20 (POR) at 50-52

Petitioner's Ground 2 Arguments: Shin

Independent Claim 1:

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.

Pet.'s Ground 2 Arguments: Shin

Independent Claim 12:

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; wherein the inactivating step is performed by drying the comminuted material, and

(c) a filling device configured to fill a transport container with the inactivated comminuted material; and

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

Petitioner's Ground 2 Arguments: Hayashi



US009843077B2

(12) **United States Patent**
Hayashi et al.

(10) Patent No.: US 9,843,077 B2
(45) Date of Patent: Dec. 12, 2017

(54) METHOD FOR PROCESSING
FLUORINE-CONTAINING ELECTROLYTE
SOLUTION

(52) **U.S. Cl.**
CPC *H01M 10/54* (2013.01); *C01F 11/22*
(2013.01); *C10L 1/02* (2013.01); *C10L*
2290/06 (2013.01);

(71) Applicant: **MITSUBISHI MATERIAL CORPORATION**, Tokyo (JP)

(72) Inventors: **Hiroshi Hayashi**, Iwaki (JP); **Hirata**, Iwaki (JP); **Hidegoro Tsurumaki**, Iwaki (JP); **Hiroshi Hoshina**, Tokyo (JP)

(73) Assignee: **MITSUBISHI MATERIAL CORPORATION**, Tokyo (J)

(*) Notice: Subject to any disclaimer, the patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 14/778,701

(22) PCT Filed: Sep. 26, 2013

(86) PCT No.: PCT/JP2013/076083
§ 371 (c)(1),
(2) Date: Sep. 21, 2015

(87) PCT Pub. No.: **WO2014/155784**
PCT Pub. Date: **Oct. 2, 2014**

(65) **Prior Publication Data**
US 2016/0049699 A1 Feb. 18, 2016

(30) Foreign Application Priority 1
Mar. 29, 2013 (JP)

(51) **Int. Cl.**
H01M 10/54 (2006.01)
C01F 11/22 (2006.01)
C10L 1/02 (2006.01)

(12) **United States Patent**
Hayashi et al.

(10) **Patent No.:** US 9,843,077 B2
(45) **Date of Patent:** Dec. 12, 2017

(54) METHOD FOR PROCESSING FLUORINE-CONTAINING ELECTROLYTE SOLUTION

(52) **U.S. CL**
CPC *H01M 10/54* (2013.01); *C01F 11/22*
(2013.01); *C10L 1/02* (2013.01); *C10L*
2290/06 (2013.01);

(71) Applicant: **MITSUBISHI MATERIALS CORPORATION**, Tokyo (JP)

(Continued)

(72) Inventors: **Hiroshi Hayashi**, Iwaki (JP); **Koichiro Hirata**, Iwaki (JP); **Hidenori Tsurumaki**, Iwaki (JP); **Hisashi Hoshina**, Tokyo (JP)

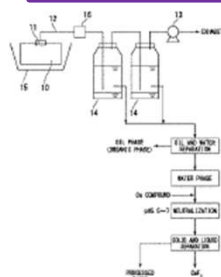
(58) **Field of Classification Search**
CPC C10L 1/02; C10L 2290/06; C10L 2290/54;
C10L 2290/541; C10F 11/22; Y02W
30/84; H01M 10/54; H01M 2300/0034
See application file for complete search history.

(73) Assignee: **MITSUBISHI MATERIALS CORPORATION**, Tokyo (JP)

(56) **References Cited**

U.S. PATENT DOCUMENTS

2008/0050295 A1 2/2008 Uchida et al.

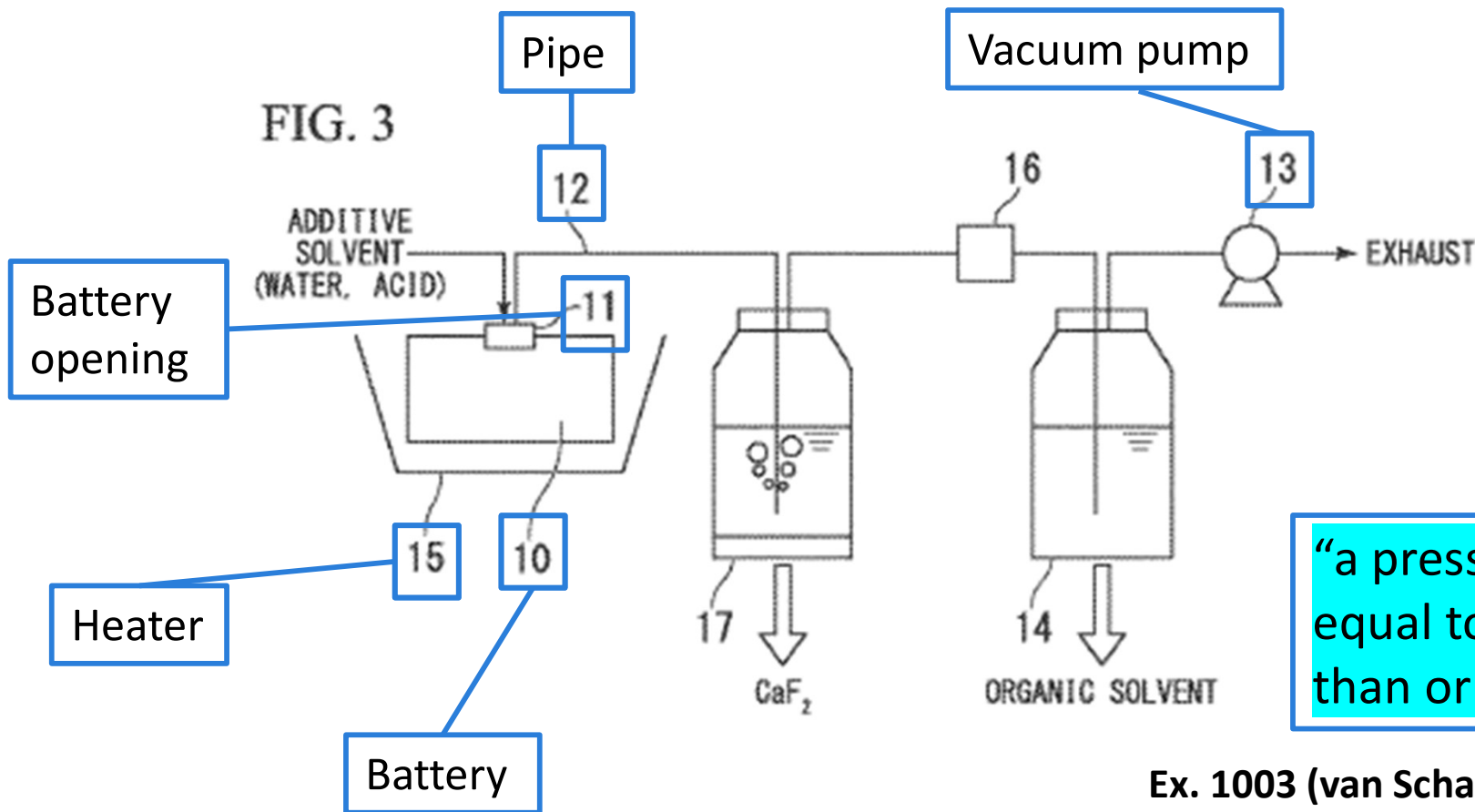


Ascend Elements EX1006 Page 1

Ex. 1006 (Hayashi)

EX: 1000
DEMONSTRATIVE EXHIBIT-NOT EVIDENCE

Petitioner's Ground 2 Arguments: Hayashi



“a pressure ‘less than or equal to 1 kPa’ (i.e., less than or equal to 10 hPa)”

Ex. 1003 (van Schalkwijk Decl.) at ¶149;
Paper 1 (Petition) at 45

[8] The method for processing a fluorine-containing electrolyte solution according to [1] described above, in which the electrolyte solution is heated at 80° C. to 150° C. under reduced pressure of less than or equal to 1 kPa, the volatile component is gasified, and the gasified gas is introduced to a dry processing step.

Ex. 1006 (Hayashi) at 3:20-25

DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

Hanisch – Figure 1

Active material separation system

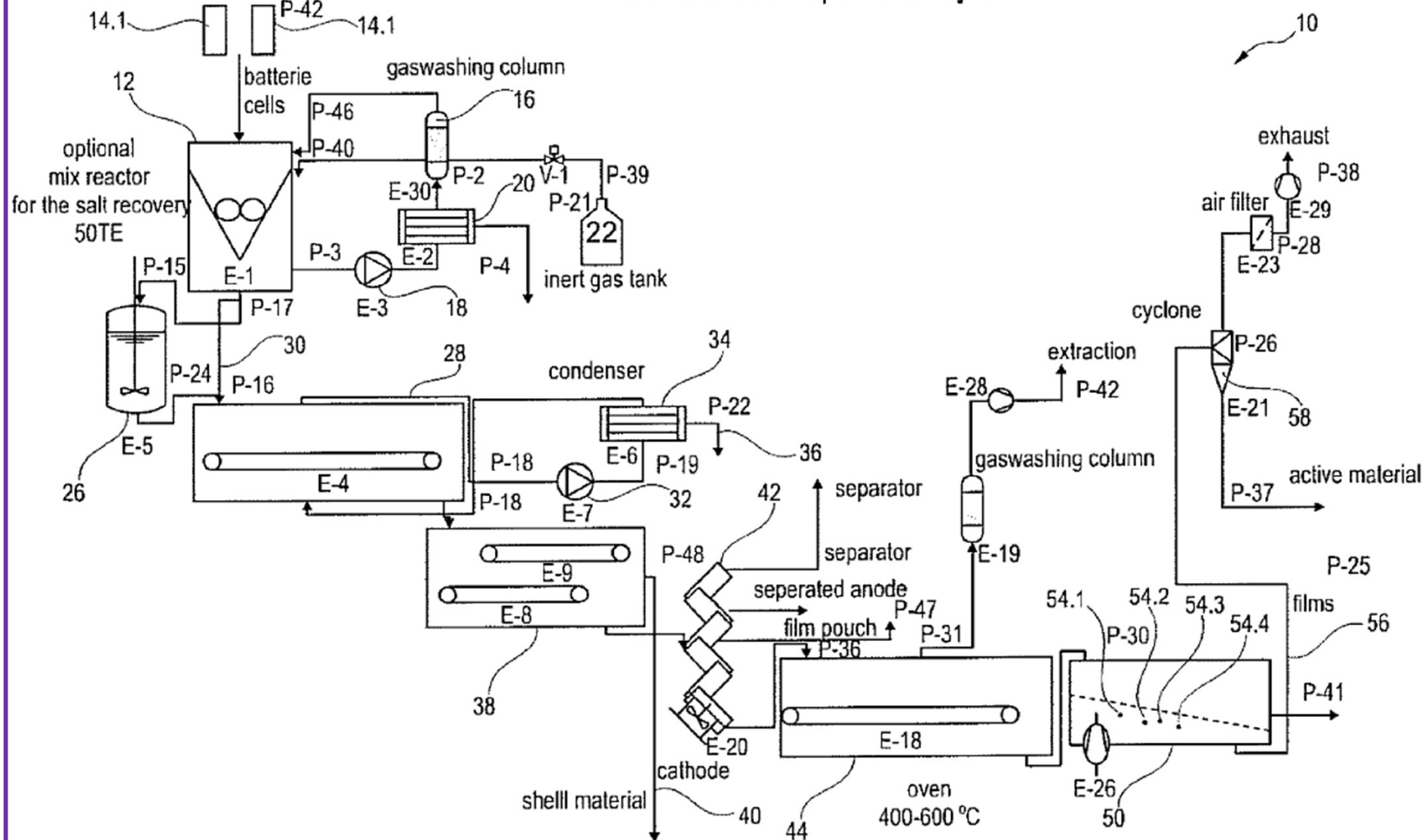


Fig. 1

Hanisch: Knowledge of a POSITA

68. It has long been understood in the art that battery recycling processes, including those for lithium-ion batteries, should avoid conditions that could lead to explosion, fire, and/or release of toxic compounds.

**Ex. 1003 (van Schalkwijk Decl.) at ¶168;
Paper 20 (POR) at 1, 19, 46 & 53**

No Motivation to Combine: Explosion Hazard

“Applying a vacuum in the pre-dryer, which is coupled to the shredder, would cause oxygen from the environment to seep into the shredder, where it could cause an explosion. Thus, rather than controlling flammable compounds, applying Hayashi to the pre-dryer of Hanisch '419 could instead cause an explosion hazard. And the strong vacuum levels of Hayashi (preferably 1 hPa to 50 hPa) would be incompatible with the continuous system of the pre-dryer (which lacks any air flow blocking mechanisms).”

No Motivation to Combine: Particulates

“But, you know, you didn't want the vacuum to be intense, because it was -- one, it takes a lot of energy to maintain an intense vacuum, a lot of carrier gas; and it takes, also -- you know, you might -- when you're getting down -- especially on the higher temperature portion of the battery recycling, when you're up doing decomposition, you're getting down to particulates. And if you have a vacuum that is really intense, it's sucking air and moving air, and you can get some of the particulate matter from the deactivated anode and cathode coming out. It's -- it's abrasion that will damage your equipment. So you want to have a vacuum that moves air but not particles.”

Ex. 2024 (van Schalkwijk Depo.) at 107:5-19;
Paper 20 (POR) at 19-20;
Paper 38 (PO Sur-reply) at 10

No Motivation to Combine: Particulates

“71. In addition, it has been well-known in the art that **comminuted material that results from shredding** and drying stages of lithium-ion battery recycling contains a mix of materials including lithium, manganese, cobalt, and nickel, among other compounds, many of which can exist in **toxic or hazardous** forms when present in this material. **Because such material can often exist in a fine particulate that can enter air circulation if sufficiently disturbed, it has also been well-known in the art that care must be taken to prevent dust and fine particulate from entering air circulation, given the potential for health risks from inhalation or soft tissue exposure.**”

Ex. 1003 (van Schalkwijk Decl.) at ¶71;
Paper 1 (Petition) at 7;
Paper 20 (POR) at 19-20;
Paper 38 (PO Sur-reply) at 10

No Motivation to Combine Hayashi and Hanisch

ranging from 80°C to 150°C.” *Id.* (citing Ex. 1006, 3:20–25). Petitioner argues that a person of ordinary skill in the art would have been motivated to combine this teaching with the teachings of Hanisch “because of the advantages of improved electrolyte evaporation at a given temperature when lower ambient pressures are used . . . , the attenuation of toxic hydrogen fluoride production during the heating process . . . , and the control over potentially flammable compounds and gasses generated during such heating.” *Id.* at 46 (citing Ex. 1003 ¶¶ 67–71, 150–152; Ex. 1006, 4:12–36, 4:43–67, Table 1). On the present record, Patent Owner does not dispute these arguments. Prelim. Resp. 35–39.

No Motivation to Combine: Pressure Levels

argues that a person of ordinary skill in the art would have been motivated to combine this teaching with the teachings of Hanisch “because of the advantages of improved electrolyte evaporation at a given temperature when lower ambient pressures are used . . . , the attenuation of toxic hydrogen

Paper No. 10 (Institution Dec.) at 23.

- Avoid hazards posed by strong vacuum levels of Hayashi

Ex. 1003 (van Schalkwijk Decl.) at ¶¶68 & 71;

Ex. 2024 (van Schalkwijk Dep.) at 69:20-70:19 & 107:5-19;

Ex. 2022 (Dantam Decl.) at ¶170; Paper 20 (POR) 44-47

- Additionally, for decomposition oven:

With respect to the decomposition oven of Hanisch '419, that is a pyrolytic furnace operated at a temperature in excess of 350°C. Ex. 1004 at 4:25-28. At such high a temperature, there would be no need to seek guidance from Hayashi about to how to improve electrolyte evaporation. Rather, the electrolyte solvents would be destroyed in the furnace, with no need to facilitate their evaporation.

Ex. 2022 (Dantam Decl.) at ¶164; *see also id.* at ¶144;

Paper 20 (POR) at 45

No Motivation to Combine: Pressure Levels

combine this teaching with the teachings of Hanisch “because of the advantages of improved electrolyte evaporation at a given temperature when lower ambient pressures are used . . . , the attenuation of toxic hydrogen fluoride production during the heating process . . . , and the control over

Paper 10 (Institution Dec.) at 23.

167. Hayashi opens the safety seal on a battery cell and adds water to deliberately provoke the hydrolysis of LiPF_6 , to form hydrogen fluoride. Ex. 1006 at 4:38-5:21. This is the opposite of the supposed goal to attenuate the production of hydrogen fluoride. Thus, Hayashi teaches away from this goal.

Ex. 2022 (Dantam Decl.) at ¶167; Paper 20 (POR) at 46

No Motivation to Combine: Pressure Levels

lower ambient pressures are used . . . , the attenuation of toxic hydrogen fluoride production during the heating process . . . , and the control over potentially flammable compounds and gasses generated during such heating.” *Id.* at 46 (citing Ex. 1003 ¶¶ 67–71, 150–152; Ex. 1006, 4:12–36,

Paper 10 (Institution Dec.) at 23.

- Avoid hazards posed by strong vacuum levels of Hayashi

Ex. 1003 (van Schalkwijk Decl.) at ¶¶ 68 & 71;

Ex. 2024 (van Schalkwijk Dep.) at 69:20-70:19 & 107:5-19;

Ex. 2022 (Dantam Decl.) at ¶ 170; Paper 20 (POR) at 47

- Additionally, for decomposition oven:

“Hayashi does not provide any teachings about how gasses would be controlled in the context of the system of Hanisch ’419. In the decomposition oven of Hanisch ’419, flammable compounds are managed by pyrolyzing them.”

Ex. 2022 (Dantam) at ¶ 169; Paper 20 (POR) at 47

No Motivation to Combine: Batch/Continuous

Hanisch '419: **"The method according to invention is preferably performed as continual process and not in batches."**

Ex. 1004 (Hanisch) at 3:27-28;
Paper 20 (POR) at 42-44

162. Hayashi is a batch process. Hayashi treats a single cell at a time, in a labor-intensive process involving pulling the safety seal off a battery cell, adding precisely specified amounts (+/- 0.1 ml) of water to liberate HF gas, and affixing a pipe to withdraw the HF vapors (this is extremely difficult in a commercial production setting when we have to process each cell or battery individually). Hayashi says nothing about how to permit a continuous flow of solid materials into a chamber while maintaining a vacuum. A POSITA would not look to vacuum levels from a batch process to inform how to determine the pressure levels to maintain in a continuous process. Furthermore, the vacuum levels taught in Hayashi are quite strong (*i.e.*, as low as 50 hPa). These vacuum levels are stronger than the levels that would be compatible with the requirement in Hanisch '419 to allow battery materials to continually enter and exit the pyrolytic oven while maintaining some level of vacuum. These vacuum levels are stronger than rotary

Ex. 2022 (Dantam Dec.) at ¶162;
Paper 20 (POR) at 42-44

No Motivation to Combine: Batch/Continuous

Teaching away

“A reference teaches away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.”

Pozen Inc. v. Par Pharm., Inc., 696 F.3d 1151, 1164–65 (Fed. Cir. 2012)

“A reference ‘teaches away’ when it ‘suggests that the line of development flowing from the reference’s disclosure is unlikely to be productive of the result sought by the applicant.’”

Santarus, Inc. v. Par Pharmaceutical, 694 F.3d 1344, 1354-55 (Fed. Cir. 2012)

No Motivation to Combine: Batch/Continuous

Avoid hazards from batch processing

“79. A POSITA would have understood the advantages of using a continuous process, rather than a batch process, in Hanisch '419. Shredded battery material is toxic, and Hanisch '419 clearly wanted to avoid accumulation of this toxic material, which could undergo various undesired reactions, and could potentially catch fire, or explode, or release toxic hydrogen fluoride gas. By using a continuous process, Hanisch '419 minimized the hazard, by promptly removing electrolyte and sending the material to the pyrolytic furnace as fast as possible. A continuously operating dryer reduces the risk of explosions because it ensures that only small quantities of undried, comminuted batteries are present in the pre-dryer at any given time.”

No Motivation to Combine

“The obviousness inquiry does not merely ask whether a skilled artisan could combine the references, but instead asks whether ‘they would have been motivated to do so.’ Fundamental differences between the references are central to this motivation to combine inquiry.”

Adidas AG v. Nike, Inc., 963 F.3d 1355, 1359 (Fed. Cir. 2020), cert. denied, 141 S. Ct. 1376 (2021) (internal citation omitted)

“If references taken in combination would produce a ‘seemingly inoperative device,’ we have held that such references teach away from the combination and thus cannot serve as predicates for a prima facie case of obviousness.”

McGinley v. Franklin Sports, Inc.,
262 F.3d 1339, 1354 (Fed. Cir. 2001)
Paper 20 (POR) at 44

Ground 2 (Claim 12): Vacuum Installation

Independent Claim 12:

12. A battery processing installation for treatment of used batteries, comprising:

Same as 1[pre]

(a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;

Same as 1[a] (Hanisch)

(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; wherein the inactivating step is performed by drying the comminuted material, and

Same as 1[b]

(c) a filling device configured to fill a transport container with the inactivated comminuted material; and

Same as 1[c] (Hanisch in view of skill in the art and/or Dunagan)

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

Hanisch in view of Meador OR Hayashi OR Shin

Ground 2 (Claim 12): Hanisch + Meador

- Petitioner dropped further reliance on Meador

Paper 31 (Petitioner's Reply to POR) at 16 n.6

- Combination of Hanisch and Meador would be hazardous
 - Water seal in Meador compatible with the batteries containing aqueous electrolyte solutions as disclosed in Meador
 - Water seal in Meador incompatible with lithium batteries processed in Hanisch
 - Combination would be explosive and corrosive

Paper 20 (POR) at 53; Ex. 2022 (Dantam) at ¶181

Ground 2 (Claim 12): Hanisch + Shin

- Shin does not teach processing battery material under vacuum
- Vacuum is only to purge oxygen, after which nitrogen floods the system

Paper 20 (POR) at 54-55; Ex. 2022 (Dantam) at ¶183

Ground 2 (Claim 12): Hanisch + Hayashi

- Hayashi is a batch system with no mechanism to allow for continuous flow of battery material
- The intense vacuum levels in Hayashi would be hazardous
 - Risk of explosion if nitrogen tank overwhelmed
 - Risk of airborne particulates
- No motivation to combine vacuum levels in Hayashi with the decomposition furnace in Hanisch because solvents destroyed at high heat

Paper 20 (POR) at 54; Ex. 2022 (Dantam) at ¶182

SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

**Due to protective order considerations,
the parties will rest on their briefing**

Motion to Amend - Motivation

Petitioner argues:

Claims 22 and 26 add to independent claims 1 and 12 the requirements of "wherein the drying uses a drying device operated in batch mode" and "a drying device operated in batch mode," respectively. As explained in Petitioner's concurrently filed Reply, Hanisch in fact discloses a drying device operated in batch mode. *See, e.g.*, Reply, Section III.A.2, IV.A.2. Specifically, Hanisch discloses that its "method according to invention is *preferably* performed as continual process and not in batches," EX1004, 3:27-28 (emphasis added), *i.e.*, Hanisch discloses a drying process in batch mode as a non-preferred embodiment. *See In re Mouttet*, 686 F.3d

Pet. Opp. Motion to Amend, p. 3

Motivation

Claims 22 and 26 add to independent claims 1 and 12 the requirements of "wherein the drying uses a drying device operated in batch mode" and "a drying device operated in batch mode," respectively. As explained in Petitioner's concurrently filed Reply, Hanisch in fact discloses a drying device operated in batch mode. See, e.g., Reply, Section III.A.2, IV.A.2. Specifically, Hanisch discloses that its "method according to invention is *preferably* performed as continual process and not in batches," EX1004, 3:27-28 (emphasis added), i.e., Hanisch discloses a drying process in batch mode as a non-preferred embodiment. See *In re Mouttet*, 686 F.3d

Further, PO fails to acknowledge that the continuous process embodiment is merely a *preferred* embodiment, but not the sole disclosed embodiment. EX1004, 3:27-28. Hanisch thus implicitly acknowledges that its system could be run as a batch process.

Pet. Reply, Section III.A.2 (p. 10)

Motivation

Hanisch '419:

The method according to invention is preferably performed as continual process and not in batches.

The throughput preferably amounts to more than 100 tons per year. Air jet sieving has to date been used at laboratory level, where it is used for the processing of samples in batches. Furthermore, these samples are very small. The use of the air jet sieving on a mass scale is currently unknown.

Ex. 1004, Hanisch '419, 3:27-33.

Motivation

“In *In re Gurley*, 27 F.3d 551, 553 (Fed.Cir.1994), we emphasized that ‘[a] reference may be said to teach away when ‘a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or **would be led in a direction divergent from the path that was taken by the applicant.**’”

In re Mouttet, 686 F.3d 1322, 1333–34 (Fed. Cir. 2012)(Emphasis added)

Motivation

Petitioner argues:

9:37-40. Accordingly, Hayashi discloses a batch process, and for the reasons explained in the Petition and the Reply, the batch process of Hayashi would have been combined with the disclosures of Hanisch. *See* Pet., Section VIII, A.6.; EX1003, ¶¶145-52; EX1023, ¶¶50-51; *See, e.g.*, Reply, Section IV.A.

on a batch basis, not a continuous process." POR, 51-52. For the reasons explained in the Petition and the Reply, the batch process of Shin would have been combined with the disclosures of Hanisch. *See* Pet., Section VIII, A.6.; EX1003, ¶¶145-52; EX1023, ¶52; Reply, Section IV.A.

Pet. Opp. Motion to Amend, p. 11

Motivation

Petitioner argues:

9:37-40. Accordingly, Hayashi discloses a batch process, and for the reasons explained in the Petition and the Reply, the batch process of Hayashi would have been combined with the disclosures of Hanisch. *See* Pet., Section VIII, A.6. EX1003, ¶¶145-52; EX1023, ¶¶50-51; *See, e.g.*, Reply, Section IV.A.

A POSITA would have been motivated to implement Hanisch using the teachings of either Meador, Shin, or Hayashi that comminuted material or electrolyte could be inactivated under a vacuum. (EX1003, ¶¶150-52.) A POSITA would have

Petition, p. 43 (section VIII.A.6)

Motivation

Petitioner argues:

9:37-40. Accordingly, Hayashi discloses a batch process, and for the reasons explained in the Petition and the Reply, the batch process of Hayashi would have been combined with the disclosures of Hanisch. *See* Pet., Section VIII, A.6.; EX1003, ¶¶145-52; EX1023, ¶¶50-51; *See, e.g.* Reply, Section IV.A.

Contrary to PO's repeated suggestion (e.g., POR 38-44), Hanisch's disclosure is *not* limited to a continuous process; rather, the "continual process" is only a *preferred* embodiment, thus implicitly acknowledging that its process *could* be performed in batches, similar to Hayashi and Shin. EX1004, 3:27-28. Hanisch's

Petitioner Reply, p. 17 (section IV.A)

Combination

“The Board explained ‘[t]he extensive need to modify Kontos’ device in a way not suggested in the Petition supports [Teleflex's] argument that the proposed modifications are based on a hindsight desire to recreate the claimed invention, as opposed to a known need in the art for such a device.’ *Id.* The Board did not err in discounting modifications not presented in Medtronic’s petition as indicative of hindsight.”

Medtronic, Inc. v. Teleflex Innovations S.A.R.L.,
70 F.4th 1331, 1347 (Fed. Cir. 2023).

Overlapping ranges

[A] presumption of obviousness may be invoked ‘when the only difference from the prior art is a difference in the range or value of a particular variable.’ *In re Kumar*, 418 F.3d 1361, 1366 (Fed. Cir. 2005). In this case, however, there are additional differences between the prior art and claim 2 of the ’090 patent. For example, the district court found that the prior art did not disclose that ibrutinib was effective at treating R/R MCL in particular. *Pharmacyclics*, 556 F. Supp. 3d at 403 & n.8. That finding was not clearly erroneous.

Pharmacyclics LLC v. Alvogen, Inc.,
No. 2021-2270, 2022 WL 16943006, at *9 (Fed. Cir.
Nov. 15, 2022)(unpublished).