

EXHIBIT 1002



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE	REQUEST ID
15/569,484	10/26/2017	Christian HANISCH	03101160US	145074

Acknowledgement of Change to Small Entity Status

The entity status change request below filed through Private PAIR on 08/06/2021 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

☒ Applicant asserting small entity status. See 37 CFR 1.27.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/Michael E. Whitham/
Name:	Michael E. Whitham
Registration Number:	32635

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re

U.S. Patent 11,050,097 issued June 29, 2021

from

In re patent application of

HANISCH et al.

Confirmation No. 9373

Application No. 15/569,484

Group Art Unit 3725

Filed October 26, 2017

Examiner Swiatocha

For METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR
RECHARGABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION

Commissioner for Patents

PO Box 1450

Alexandria, Virginia 22313-1450

SMALL ENTITY STATUS

Sir:

The patentee, Duesenfeld GmbH, of U.S. Patent 11,050,097 is entitled to small entity status.

Please change the status of the patentee in the USPTO so that the patentee may pay small entity fees for the maintenance fees going forward.

Respectfully submitted,

/Michael E. Whitham/

Michael E. Whitham

Reg. No. 32,635

W&C IP

11491 Sunset Hills Road, Suite 340

Reston, VA 20190

Tel. (703) 787-9400

Fax. (703) 787-7557

Customer No.: 30743

Electronic Acknowledgement Receipt

EFS ID:	43447909
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Michael E. Whitham
Filer Authorized By:	
Attorney Docket Number:	03101160US
Receipt Date:	06-AUG-2021
Filing Date:	26-OCT-2017
Time Stamp:	14:40:06
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	03101160US_8_6_21.pdf	15337	no	1
			c9b5d34f6f175989c9a4f5d0efe7124b59c64b9f		

Warnings:

Information:	
Total Files Size (in bytes):	15337
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>	



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/569,484	06/29/2021	11050097	03101160US	9373

30743 7590 06/09/2021
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 344 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Christian HANISCH, Braunschweig, GERMANY;
DUESENFELD GMBH, Braunschweig, GERMANY;
Bastian WESTPHAL, Braunschweig, GERMANY;
Wolfgang HASELRIEDER, Braunschweig, GERMANY;
Martin SCHOENITZ, Braunschweig, GERMANY;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15569484
	Filing Date	2017-10-26
	First Named Inventor	Christian HANISCH
	Art Unit	
	Examiner Name	
	Attorney Docket Number	03101160US

U.S.PATENTS							Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	
	1						

If you wish to add additional U.S. Patent citation information please click the Add button.

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U.S.PATENT APPLICATION PUBLICATIONS							Remove
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	
	1	20160049699	A1	2016-02-18	MITSUBISHI MATERIALS CORPORATION Hayashi et al.		

If you wish to add additional U.S. Published Application citation information please click the Add button.

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FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	106259062	CN	B	2015-09-09	UNIV TSINGHUA GRADUATE SCHOOL		×
	2	4424825	DE	A1	1996-01-18	GABLER ING KONTOR LUEBECK		☒
	3	10-0665626	KR	B1	2007-01-09	REMETECH CO., LTD.		☒

Doc code: IDS

PTO/SB/08a (03-15)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2016. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number

Filing Date

First Named Inventor

Art Unit

Examiner Name

Attorney Docket Number

U.S.PATENTS

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9780419	B2	2017-10-03	<div> <div> Hanisch, et al. LION ENGINEERING OMBH </div> </div>	

Change(s) applied
to document,
/M.L.G./

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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20050241943	A1	2005-11-03	<div> <div> Kakuta et al. KAWASAKI JUKOGYO KABUSHIKI KAISHA </div> </div>	

If you wish to add additional U.S. Published Application citation information please click the Add button.

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	2010/102377	WO	A1	2010-09-16	STEVENS, WAYNE, C.		
	2	10 2011 110 083	DE	A1	2013-02-14	TECH UNI BRAUNSCHWEIG CAROLO WILHELMINA		
	3	10 2012 024 876	DE	A1	2014-06-26	ELECTROCYCLING GMBH; VOLKSWAGEN AKTIENGESELLSCHAFT		

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

30743 7590 03/01/2021
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/569,484	10/26/2017	Christian HANISCH	03101160US	9373

TITLE OF INVENTION: METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	06/01/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
SWIATOCHA, GREGORY D.	3799	241-024130

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 W&C IP
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

DUESENFELD GMBH

BRAUNSCHWEIG, DE

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Michael E. Whitham/

Date 2021-05-26

Typed or printed name Michael E. Whitham

Registration No. 32635

Electronic Patent Application Fee Transmittal				
Application Number:		15569484		
Filing Date:		26-Oct-2017		
Title of Invention:		METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		
First Named Inventor/Applicant Name:		Christian HANISCH		
Filer:		Michael E. Whitham/Kyle Comiskey		
Attorney Docket Number:		03101160US		
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1200

Electronic Acknowledgement Receipt

EFS ID:	42827374
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Michael E. Whitham/Kyle Comiskey
Filer Authorized By:	Michael E. Whitham
Attorney Docket Number:	03101160US
Receipt Date:	26-MAY-2021
Filing Date:	26-OCT-2017
Time Stamp:	15:17:04
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1200
RAM confirmation Number	E20215PF17161644
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	03101160US_IFP.pdf	91873	no	1
			8825bda3f6747d5bef671e12f8d884fc4a8166d1		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30761	no	2
			d5e857e5c188dec0eb26302b70405a4c8c4ea2ce		
Warnings:					
Information:					
Total Files Size (in bytes):			122634		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/569,484	10/26/2017	Christian HANISCH	03101160US	9373
30743	7590	04/23/2021		
W&C IP			EXAMINER	
11491 SUNSET HILLS ROAD			SWIATOCHA, GREGORY D.	
SUITE 340				
RESTON, VA 20190				
			ART UNIT	PAPER NUMBER
			3799	
			MAIL DATE	DELIVERY MODE
			04/23/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Corrected Notice of Allowability	Application No. 15/569,484	Applicant(s) HANISCH et al.	
	Examiner GREGORY D SWIATOCHA	Art Unit 3799	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to communications filed 19 April 2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-9 and 11-22. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☒ All b) ☐ Some *c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____ 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____ 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____	5. ☐ Examiner's Amendment/Comment 6. ☐ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____
--	--

/GREGORY D SWIATOCHA/ Primary Examiner, Art Unit 3799	
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Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15569484
	Filing Date	2017-10-26
	First Named Inventor	Christian HANISCH
	Art Unit	
	Examiner Name	
	Attorney Docket Number	03101160US

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20160049699	A1	2016-02-18	MITSUBISHI MATERIALS CORPORATION	

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	106259062	CN	B	2015-09-09	UNIV TSINGHUA GRADUATE SCHOOL		×
	2	4424825	DE	A1	1996-01-18	GABLER ING KONTOR LUEBECK		☒
	3	10-0665626	KR	B1	2007-01-09	REMETECH CO., LTD.		☒

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15569484
	Filing Date		2017-10-26
	First Named Inventor	Christian HANISCH	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	03101160US	

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	DEHNERT ET AL: "Vacuum Distillation", ALLGEMEINE CHEMIE, 14.3, page 14, 1979	×
	2	WOLF ET AL: Allgemeine und Physikalische Chemie, CHEMIE, 1985	☒

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/GREGORY D SWIATOCHA/	Date Considered	04/22/2021
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
Examiner Name	
Attorney Docket Number	03101160US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2021-04-16
Name/Print	Michael E. Whitham	Registration Number	32635

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15569484
	Filing Date		2017-10-26
	First Named Inventor	Christian HANISCH	
	Art Unit		
	Examiner Name		
	Attorney Docket Number		03101160US

U.S.PATENTS							Remove
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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	
	1	20160049699	A1	2016-02-18	MITSUBISHI MATERIALS CORPORATION		

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	106259062	CN	B	2015-09-09	UNIV TSINGHUA GRADUATE SCHOOL		×
	2	4424825	DE	A1	1996-01-18	GABLER ING KONTOR LUEBECK		☒
	3	10-0665626	KR	B1	2007-01-09	REMETECH CO., LTD.		☒

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	Filing Date		2017-10-26
	First Named Inventor	Christian HANISCH	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	03101160US	

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	DEHNERT ET AL: "Vacuum Distillation", ALLGEMEINE CHEMIE, 14.3, page 14, 1979	×
	2	WOLF ET AL: Allgemeine und Physikalische Chemie, CHEMIE, 1985	☒

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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	First Named Inventor	Christian HANISCH	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	03101160US	

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Name/Print	Michael E. Whitham	Registration Number	32635

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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15569484			
Filing Date:	26-Oct-2017			
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION			
First Named Inventor/Applicant Name:	Christian HANISCH			
Filer:	Michael E. Whitham/Kyle Comiskey			
Attorney Docket Number:	03101160US			
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
Total in USD (\$)				260

Electronic Acknowledgement Receipt

EFS ID:	42484161
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Michael E. Whitham/Kyle Comiskey
Filer Authorized By:	Michael E. Whitham
Attorney Docket Number:	03101160US
Receipt Date:	19-APR-2021
Filing Date:	26-OCT-2017
Time Stamp:	11:08:13
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$260
RAM confirmation Number	E20214IB08270739
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	03101160US_IDS5.pdf	1034669	no	4
			b56f1acc3d1c87db64926a9fc525086d476e53d4		
Warnings:					
Information:					
2	Foreign Reference	CN103259062B.PDF	519377	no	7
			e9829085fd5da9e7af7d8aceefce2133a5289882		
Warnings:					
Information:					
3	Foreign Reference	CN103259062B-eng.PDF	1027317	no	7
			324930fea37fef0007ba779871252c10f7b9f9e2		
Warnings:					
Information:					
4	Foreign Reference	DE4424825A1.PDF	408033	no	6
			18a01c755f98154d9fba84293398fc2589e807d9		
Warnings:					
Information:					
5	Foreign Reference	DE4424825-eng.pdf	68964	no	1
			671504037edb49e192c97626c8b635d3ac212b88		
Warnings:					
Information:					
6	Foreign Reference	KR100665626B1.PDF	211841	no	5
			ded2859e58ddb4b29343ff61912a709efb9f067		
Warnings:					
Information:					

7	Foreign Reference	KR100665626B1-eng.PDF	1406243	no	6
			9f22ebdea9459e24d5b93ad4c775dc9612b fafa1		

Warnings:

Information:

8	Non Patent Literature	Dehnert-1979.PDF	4580710	no	4
			5791ca7d64d58cf6a4198ae2698f600cfe4ef 664		

Warnings:

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9	Non Patent Literature	Wolf-1985.PDF	5432024	no	4
			f7a65d17d904c4ec97bcbf92d46a2372cb212 f9ae		

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Information:

10	Fee Worksheet (SB06)	fee-info.pdf	30882	no	2
			2c7e18c93b259a32df66351fa2639839191a 8f4c		

Warnings:

Information:

Total Files Size (in bytes):			14720060
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

30743 7590 03/01/2021
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

EXAMINER	
SWIATOCHA, GREGORY D.	
ART UNIT	PAPER NUMBER
3799	

DATE MAILED: 03/01/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/569,484	10/26/2017	Christian HANISCH	03101160US	9373

TITLE OF INVENTION: METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	06/01/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

30743 7590 03/01/2021
W&C IP
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SUITE 340
RESTON, VA 20190

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/569,484	10/26/2017	Christian HANISCH	03101160US	9373

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nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	06/01/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
SWIATOCHA, GREGORY D.	3799	241-024130

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/569,484	10/26/2017	Christian HANISCH	03101160US	9373
30743	7590	03/01/2021	EXAMINER	
W&C IP 11491 SUNSET HILLS ROAD SUITE 340 RESTON, VA 20190			SWIATOCHA, GREGORY D.	
			ART UNIT	PAPER NUMBER
			3799	

DATE MAILED: 03/01/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/569,484	Applicant(s) HANISCH et al.	
	Examiner GREGORY D SWIATOCHA	Art Unit 3799	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to communications filed 26 June 2020.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-9 and 11-22. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☒ All b) ☐ Some *c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
---	--

/GREGORY D SWIATOCHA/
Primary Examiner, Art Unit 3799

DETAILED ACTION

Notice of Pre-AIA or AIA Status

- 1) The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.
- 2) The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Continued Examination Under 37 CFR 1.114

- 3) A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4 June 2020 has been entered.

Information Disclosure Statement

- 4) The information disclosure statement (IDS) submitted is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Response to Arguments

- 5) Applicant's arguments, filed 4 June 2020, with respect to Claims 1 and 7 have been fully considered and are persuasive. The rejection of Claims 1 and 7 has been withdrawn.

Allowable Subject Matter

- 6) Claims 1-9 and 11-22 are allowed.
- 7) The following is an examiner's statement of reasons for allowance:
- 8) Applicant's arguments, filed 4 June 2020, with respect to Claims 1 and 7 have been fully considered and are persuasive. The rejection of Claims 1 and 7 has been withdrawn and the claims are allowed.

9) Regarding Claims 4, 11, and 20, it is the opinion of the Examiner that the art of record neither anticipates nor renders obvious wherein "a pump liquid of the jet pump has at least one of a pH value of at least 8, and contains a substance that precipitates fluoride" or "wherein the pump liquid is conducted within a circuit and the pump liquid contains a substance that reacts with hydrogen fluoride" in combination with the rest of the claimed limitations set forth in the dependent claim. Searching by the Examiner yielded prior art as cited below:

10) Stevens discloses the removal of an electrolyte including lithium from the recycled battery using a vacuum system, scrubber, and an atomizer using a 50% concentration of sodium hydroxide in water, and this discloses a liquid with a pH of at least 9. Sodium hydroxide is also known to react with hydrogen fluoride to precipitate fluoride. However, the electrolyte disclosed by Stevens is lithium perchlorate in propylene carbonate and dimethoxyethane. While, Tanii et al. (U.S. 6,524,737) discloses the recycling of lithium batteries containing lithium phosphohexafluoride as the electrolyte, and thus the electrolyte of Stevens could be replaced with lithium phosphohexafluoride, the fluoride compounds are treated in a wastewater tank instead of with a jet pump. Further, while the use of jet pumps containing alkaline liquids such as sodium hydroxide is known from Eckardt et al. (U.S. 2014/0003568) such a use is not disclosed for the recycling of a lithium electrolyte battery.

11) Therefore, Stevens, Tanii, and Eckardt alone, or in combination with any other prior art, do not anticipate or render obvious the claimed invention.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

12) Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY D. SWIATOKA whose telephone number is (571)272-7022. The examiner can normally be reached on Monday-Friday (9-5).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Tom Sweet** can be reached at **571-272-4761**. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <https://ppair-my.uspto.gov/pair/PrivatePair>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GREGORY D SWIATOKA/
Primary Examiner, Art Unit 3799

<i>Search Notes</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCHA	Art Unit 3799

CPC - Searched*		
Symbol	Date	Examiner
Y02W30/84	09/04/2019	G.S.
Y02P10/212	09/04/2019	G.S.
B02C23/08, 10	09/04/2019	G.S.
B09B3/008, 0058	09/04/2019	G.S.
B01D53/05, 002; 11/00; 2253/102	09/04/2019	G.S.
H01M10/54	02/25/2021	G.S.
H01M6/52	02/25/2021	G.S.

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/GREGORY D SWIATOCHA/ Primary Examiner, Art Unit 3725	
--	--

<i>Search Notes</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCCHA	Art Unit 3799

Search Notes		
Search Notes	Date	Examiner
EAST Inventor search, Assignee search, CPC search, Text search, Combination class../text search	09/04/2019	G.S.
Espacenet search	09/04/2019	G.S.
IP.com search	09/04/2019	G.S.
NPL Search	09/04/2019	G.S.
Y02W30/84 (See search history printout)	09/04/2019	G.S.
Y02P10/212 (See search history printout)	09/04/2019	G.S.
B02C23/08, 10 (See search history printout)	09/04/2019	G.S.
B09B3/008, 0058 (See search history printout)	09/04/2019	G.S.
B01D53/05, 002; 11/00; 2253/102 (See search history printout)	09/04/2019	G.S.
Updated Search	03/04/2020	G.S.
Updated Search	02/25/2021	G.S.
Interference Search	02/25/2021	G.S.

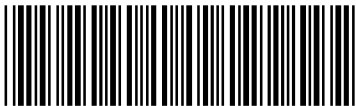
Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Text search	02/25/2021	G.S.
Y02W	30/84	02/25/2021	G.S.
Y02P	10/212	02/25/2021	G.S.
B02C	23/08, 10	02/25/2021	G.S.
B09B	3/008, 0058	02/25/2021	G.S.
B01D	53/05, 002; 11/00; 2250/102	02/25/2021	G.S.
H01M	10/54; 6/52	02/25/2021	G.S.

/GREGORY D SWIATOCCHA/ Primary Examiner, Art Unit 3725	
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<i>Index of Claims</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCHA	Art Unit 3799

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	09/05/2019	03/04/2020	02/25/2021						
1	1	✓	✓	=						
2	2	✓	✓	=						
3	3	✓	✓	=						
11	4	O	=	=						
4	5	✓	✓	=						
7	6	✓	✓	=						
12	7	✓	✓	=						
13	8	✓	✓	=						
14	9	✓	✓	=						
	10	-	-							
20	11	O	=	=						
15	12	✓	✓	=						
16	13	✓	✓	=						
17	14	✓	✓	=						
18	15	✓	✓	=						
19	16	✓	✓	=						
8	17	✓	✓	=						
5	18	✓	✓	=						
6	19	✓	✓	=						
21	20	O	=	=						
9	21		✓	=						
10	22			=						

Issue Classification 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCHA	Art Unit 3799

CPC						
Symbol					Type	Version
H01M	/	10	/	54	F	2013-01-01
C22B	/	1	/	005	I	2013-01-01
H01M	/	6	/	52	I	2013-01-01
B02C	/	21	/	00	I	2013-01-01
B02C	/	23	/	10	I	2013-01-01
B02C	/	23	/	20	I	2013-01-01
B09B	/	3	/	0058	I	2013-01-01
Y02W	/	30	/	84	A	2015-05-01
Y02P	/	10	/	20	A	2015-11-01
B01D	/	53	/	002	A	2013-01-01
B01D	/	53	/	04	A	2013-01-01
B01D	/	2253	/	102	A	2013-01-01

CPC Combination Sets							
Symbol				Type	Set	Ranking	Version
	/		/				

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 21	
/GREGORY D SWIATOCHA/ Primary Examiner, Art Unit 3799 (Primary Examiner) _____ (Date) _____		25 February 2021 O.G. Print Claim(s) 1	O.G. Print Figure 1

<i>Issue Classification</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCHA	Art Unit 3799

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H01M10/54	/	10	/ 54
B09B3/00	/	3	/ 00
B01D53/00	/	53	/ 00
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/GREGORY D SWIATOCHA/ Primary Examiner, Art Unit 3799	25 February 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

<i>Issue Classification</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCHA	Art Unit 3799

☐ Claims renumbered in the same order as presented by applicant
 ☐ CPA
 ☐ T.D.
 ☐ R.1.47

CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1		10	6	19										
2	2	20	11	21	20										
3	3	15	12	9	21										
11	4	16	13	10	22										
4	5	17	14												
7	6	18	15												
12	7	19	16												
13	8	8	17												
14	9	5	18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 21	
/GREGORY D SWIATOCHA/ Primary Examiner, Art Unit 3799 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 1	O.G. Print Figure 1

Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
Examiner Name	
Attorney Docket Number	03101160US

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1					

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	2005197149	JP	A	2005-07-21	TOYOTA MOTOR CORP		×

If you wish to add additional Foreign Patent Document citation information please click the Add button

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NON-PATENT LITERATURE DOCUMENTS				Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		15569484
Filing Date		2017-10-26
First Named Inventor	Christian HANISCH	
Art Unit		
Examiner Name		
Attorney Docket Number	03101160US	

1	
---	--

If you wish to add additional non-patent literature document citation information please click the Add button

Add

EXAMINER SIGNATURE

Examiner Signature	/GREGORY D SWIATOCHA/	Date Considered	02/24/2021
--------------------	-----------------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15569484		
Filing Date	2017-10-26		
First Named Inventor	Christian HANISCH		
Art Unit			
Examiner Name			
Attorney Docket Number	03101160US		

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2020-06-26
Name/Print	Michael E. Whitham	Registration Number	32635

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	5,543	(H01M10/54 or H01M6/52).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/25 22:40
S1	9	((("HANISCH") near3 ("Christian")) OR (("WESTPHAL") near3 ("Bastian")) OR (("HASELRIEDER") near3 ("Wolfgang")) OR (("SCHOENITZ") near3 ("Martin"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/09/04 10:38
S3	3	duesenfeld.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 10:43
S4	3	wo-2010102377-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 10:59
S5	3	de-102011110083-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 10:59
S6	2	de-102012024876-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 10:59
S7	2	wo-2010149611-\$.did.	US-PGPUB; USPAT; USOCR;	OR	ON	2019/09/04 11:00

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S8	1	kr-20060101683-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:00
S10	2	wo-2016174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:04
S11	2	wo-2016164752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:04
S12	2	cn-101394015-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:04
S13	3	de-102015207843-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:05
S14	3	de-602005001937-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:05
S15	3	cn-102496752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2019/09/04 12:57

			JPO; DERWENT; IBM_TDB			
S16	3	cn-103959553-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 12:57
S17	160	CA-2983768-\$.did. US-20190260101-\$.did. AU-2017347388-\$.did. WO-2016174156-\$.did. EP-3289627-\$.did. CA-3040793-\$.did. DE-102015207843-\$.did. DE-102015207843-\$.did. EP-3312922-\$.did. EP-3312922-\$.did. DE-102016120046-\$.did. WO-2018073101-\$.did. EP-3529841-\$.did. CN-109845008-\$.did. KR-20190084985-\$.did. CN-107636875-\$.did. WO-2019149698-\$.did. DE-102013011470-\$.did. DE-102018102026-\$.did. EP-2446497-\$.did. EP-3517641-\$.did. WO-2010149611-\$.did. EP-2446497-\$.did. DE-102012024876-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102013011470-\$.did. EP-2742559-\$.did. DE-102009027179-\$.did. DE-102011110083-\$.did. WO-2008074352-\$.did. DE-4424825-\$.did. DE-102011110083-\$.did. DE-102015206153-\$.did. WO-2019015892-\$.did. TW-201728531-\$.did. JP-H06338353-\$.did. US-5612150-\$.did. EP-673075-\$.did. US-5679477-\$.did. JP-2013229326-\$.did. JP-3240814-\$.did. DE-202013010308-\$.did. CN-106684487-\$.did. JP-3495707-\$.did. DE-102011082187-\$.did. EP-673075-\$.did. CN-105144464-\$.did. JP-3935594-\$.did. US-3748186-\$.did. US-8067107-\$.did. US-20050244704-\$.did. CN-106684487-\$.did. WO-2018218358-\$.did. EP-2741357-\$.did. CN-105021024-\$.did. CA-3043947-\$.did. JP-6124001-\$.did. JP-H11167936-\$.did. DE-19924707-\$.did. WO-2002023651-\$.did. CA-2391865-\$.did. EP-1269554-\$.did. KR-20190078653-\$.did. CN-108306050-\$.did. DE-102017212266-\$.did. WO-2005015668-\$.did. EP-1652253-\$.did. CA-2730336-\$.did. JP-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 13:05

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S18	156	<p>US-20170170529-\$.did. KR-100300829-\$.did. JP-2016207464-\$.did. US-9620828-\$.did. WO-2003061056-\$.did. US-6511639-\$.did. DE-19532626-\$.did. EP-1472756-\$.did. DE-102013111853-\$.did. US-20070292746-\$.did. JP-2017084707-\$.did. KR-19980064595-\$.did. CN-1442928-\$.did. EP-1333523-\$.did. DE-102013105676-\$.did. AU-2003205087-\$.did. US-7858216-\$.did. US-20180198115-\$.did. EP-1472756-\$.did. CA-2309773-\$.did. EP-1333522-\$.did. US-9843077-\$.did. US-20170207504-\$.did. WO-2017000157-\$.did. KR-20070090851-\$.did. US-20160049699-\$.did. US-20030186110-\$.did. EP-3063811-\$.did. DE-10049097-\$.did. DE-102012109032-\$.did. JP-2001332237-\$.did. EP-1333523-\$.did. US-9912022-\$.did. WO-2017073686-\$.did. KR-20030039376-\$.did. JP-6245412-\$.did. DE-19547151-\$.did. JP-4187804-\$.did. JP-2017084706-\$.did. US-20030180604-\$.did. DE-10049097-\$.did. WO-2019150403-\$.did. JP-5050845-\$.did. JP-2000223123-\$.did. JP-H0785889-\$.did. CN-104412426-\$.did. US-20130122398-\$.did. WO-2015046211-\$.did. KR-100997349-\$.did. US-7833646-\$.did. CN-</p>	<p>US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB</p>	OR	ON	2019/09/04 13:06

		109478473-\$.did. US-20040096746-\$.did. US-20180198179-\$.did. DE-102007012693-\$.did. JP-2014222582-\$.did. US-9728807-\$.did. US-20150188137-\$.did. EP-854530-\$.did. CN-107910610-\$.did. DE-102014226241-\$.did. JP-2019008980-\$.did. CN-1442928-\$.did. JP-2012204131-\$.did. US-6789757-\$.did. US-20030038197-\$.did. JP-2016152226-\$.did. JP-5894688-\$.did. WO-1998044580-\$.did. EP-1330299-\$.did. CN-107403930-\$.did. US-5972531-\$.did. EP-854530-\$.did. DE-102013012250-\$.did. US-8999009-\$.did. DE-102010020738-\$.did. KR-20160064104-\$.did. US-6986967-\$.did. WO-2002028500-\$.did. US-6461766-\$.did. JP-2014160575-\$.did. JP-2015179666-\$.did. EP-2894702-\$.did. US-20130232772-\$.did. JP-2013146680-\$.did. EP-972313-\$.did. US-7910242-\$.did. CA-2285275-\$.did. CA-2418527-\$.did. CN-109193064-\$.did. KR-20040071776-\$.did. CA-2409218-\$.did. EP-1408575-\$.did. CN-103959553-\$.did. TW-201418387-\$.did.				
S19	172	JP-2016207465-\$.did. TW-201318972-\$.did. JP-5708121-\$.did. US-6335122-\$.did. WO-2000051806-\$.did. JP-3540085-\$.did. JP-2018022670-\$.did. JP-2016511916-\$.did. DE-19842658-\$.did. US-20080199768-\$.did. CN-105144464-\$.did. WO-2017073687-\$.did. CN-104412425-\$.did. KR-100838943-\$.did. WO-2019060996-\$.did. US-20180309126-\$.did. US-20140290438-\$.did. JP-4753220-\$.did. CA-2225699-\$.did. CN-103959553-\$.did. JP-2016170878-\$.did. CN-107591583-\$.did. JP-5966457-\$.did. US-20150180020-\$.did. WO-2014120718-\$.did. TW-201545976-\$.did. EP-3370286-\$.did. US-20060138056-\$.did. DE-102015223136-\$.did. KR-20150110797-\$.did. WO-1998035396-\$.did. WO-2001091210-\$.did. EP-958626-\$.did. CN-104412425-\$.did. KR-20160143829-\$.did. EP-1293003-\$.did. EP-2951872-\$.did. KR-20090020888-\$.did. US-6444356-\$.did. TW-I644859-\$.did. CN-108281729-\$.did. EP-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 13:06

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	<p>DE-102013011470-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102012024876-\$.did. DE-4118001-\$.did. EP-2742559-\$.did. DE-102011110083-\$.did. DE-4424825-\$.did. DE-102011110083-\$.did. DE-102015206153-\$.did. AT-407753-\$.did. IN-285315-\$.did. US-20100162619-\$.did. CA-2710719-\$.did. AU-2007340905-\$.did. US-9512376-\$.did. DE-19547151-\$.did. US-6789757-\$.did. US-20030038197-\$.did. CA-2391865-\$.did. AU-2007340905-\$.did. WO-2002023651-\$.did. US-20170283725-\$.did. EP-1269554-\$.did. CA-2409218-\$.did. WO-2019015892-\$.did. EP-1269554-\$.did. CA-2730336-\$.did. US-20040028585-\$.did. EP-2741357-\$.did. CA-2710719-\$.did. CA-3031475-\$.did. TW-201728531-\$.did. CH-678131-\$.did. AU-2013201163-\$.did. US-6461766-\$.did. US-7192564-\$.did. DE-102008058444-\$.did. JP-H06338353-\$.did. DE-19518643-\$.did. JP-3240814-\$.did. WO-2001091210-\$.did. EP-1293003-\$.did. EP-1215023-\$.did. EP-1652253-\$.did. WO-2005015668-\$.did. WO-2008074352-\$.did. EP-2376597-\$.did. JP-3495707-\$.did. WO-2008081408-\$.did. EP-673075-\$.did. WO-2018218358-\$.did. CN-106684487-\$.did. DE-102011082187-\$.did. DE-202013010308-\$.did. WO-2008081407-\$.did. EP-2106435-\$.did. CA-3043947-\$.did. JP-H06338352-\$.did. CN-106684487-\$.did. WO-1994007277-\$.did. WO-2008081409-\$.did. WO-2008081410-\$.did. US-5352270-\$.did. EP-673075-\$.did. EP-1333523-\$.did. JP-3935594-\$.did. WO-2008119525-\$.did. US-5679477-\$.did. US-5612150-\$.did. JP-H11167936-\$.did. US-20150080630-\$.did. DE-10062947-\$.did. DE-10045241-\$.did. EP-3063811-\$.did. US-9450277-\$.did. JP-3079849-\$.did. JP-2013229326-\$.did. EP-1333522-\$.did. US-20170012328-\$.did. RO-106045-\$.did. DE-10021383-\$.did. EP-1333523-\$.did. WO-2015063007-\$.did. US-9620828-\$.did. US-8067107-\$.did. CN-105144464-\$.did. US-6223449-\$.did. US-20030180604-\$.did. DE-102008055508-\$.did. JP-6124001-\$.did.</p>				
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S21	5,959	y02W30/84.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:19
S22	1,437	(y02p10/212.cpc. b02c21/\$.cpc. (b02c23/08,10).cpc. b09b3/008.cpc. (b01d53/02,002).cpc. b01d11/00.cpc. b09b3/0058.cpc. b01d2253/102.cpc.) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:31
S23	3	wo-2010102377-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S24	3	de-102011110083-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S25	2	de-102012024876-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S26	2	wo-2010149611-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S27	1	kr-20060101683-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2019/09/04 14:37

			JPO; DERWENT; IBM_TDB			
S28	0	wo-2106174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S29	2	wo-2016174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S30	2	wo-2016164752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S31	2	cn-101394015-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S32	3	de-102015207843-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S33	3	de-602005001937-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S34	3	cn-102496752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/09/04 14:37

			DERWENT; IBM_TDB			
S35	3	cn-103959553-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S38	352	S22 and lithium	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 16:40
S39	2,006	S21 and lithium	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 16:40
S40	3	de-19954998-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 19:41
S41	2	de-29803442-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 19:41
S42	1	(S38 S39) AND (liquid WITH gas WITH jet WITH (ejector pump))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:19
S44	484	(liquid WITH gas WITH jet WITH (ejector pump)) WITH vacuum	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/09/04 20:21

			DERWENT; IBM_TDB			
S45	8	(liquid WITH gas WITH jet WITH (ejector pump) WITH vacuum) SAME pH	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:21
S46	21	(jet ADJ (ejector pump)) WITH ((sodium calcium) ADJ carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:26
S47	169	(S38 S39) AND ((sodium calcium) ADJ carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:27
S48	3	WO-2013140039-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:31
S49	3	(S38 S39) AND (jet ADJ (ejector pump))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:39
S50	8	(jet ADJ (ejector pump)) WITH fluoride	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:41
S51	1	(jet ADJ (ejector pump)) WITH (fluoride fluorine) WITH (carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/09/04 20:42

			DERWENT; IBM_TDB			
S53	174	(S38 S39) AND (electrolyte WITH (remov\$4 weight))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 21:02
S54	28	(S38 S39) AND (electrolyte WITH (remov\$4 vaporiz\$3) WITH (dri\$2 dry\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 21:06
S55	5,959	y02W30/84.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 07:34
S56	658	S55 and lithium and (dry\$3 dri\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 07:34
S61	11	(venturi adj pump) SAME (fluorine fluoride carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 10:54
S62	12	"9780419" "20050241943" "7713396"	US-PGPUB; USPAT; USOCR	OR	ON	2019/09/05 11:07
S63	3	wo-2010102377-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S64	3	de-102011110083-\$.did.	US-PGPUB; USPAT;	OR	ON	2019/09/05 11:07

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S65	2	de-102012024876-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S66	2	wo-2010149611-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S67	1	kr-20060101683-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S68	0	wo-2106174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S69	2	wo-2016174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S70	2	wo-2016164752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S71	2	cn-101394015-\$.did.	US-PGPUB; USPAT; USOCR;	OR	ON	2019/09/05 11:07

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S72	3	de-102015207843-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S73	3	de-602005001937-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S74	3	cn-102496752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S75	3	cn-103959553-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S76	27	S63 S64 S65 S66 S67 S68 S69 S70 S71 S72 S73 S74 S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S77	160	CA-2983768-\$.did. US-20190260101- \$.did. AU-2017347388-\$.did. WO- 2016174156-\$.did. EP-3289627-\$.did. CA-3040793-\$.did. DE-102015207843- \$.did. DE-102015207843-\$.did. EP- 3312922-\$.did. EP-3312922-\$.did. DE- 102016120046-\$.did. WO-2018073101- \$.did. EP-3529841-\$.did. CN- 109845008-\$.did. KR-20190084985- \$.did. CN-107636875-\$.did. WO- 2019149698-\$.did. DE-102013011470-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08

\$.did. DE-102018102026-\$.did. EP-2446497-\$.did. EP-3517641-\$.did. WO-2010149611-\$.did. EP-2446497-\$.did. DE-102012024876-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102013011470-\$.did. EP-2742559-\$.did. DE-102009027179-\$.did. DE-102011110083-\$.did. WO-2008074352-\$.did. DE-4424825-\$.did. DE-102011110083-\$.did. DE-102015206153-\$.did. WO-2019015892-\$.did. TW-201728531-\$.did. JP-H06338353-\$.did. US-5612150-\$.did. EP-673075-\$.did. US-5679477-\$.did. JP-2013229326-\$.did. JP-3240814-\$.did. DE-202013010308-\$.did. CN-106684487-\$.did. JP-3495707-\$.did. DE-102011082187-\$.did. EP-673075-\$.did. CN-105144464-\$.did. JP-3935594-\$.did. US-3748186-\$.did. US-8067107-\$.did. US-20050244704-\$.did. CN-106684487-\$.did. WO-2018218358-\$.did. EP-2741357-\$.did. CN-105021024-\$.did. CA-3043947-\$.did. JP-6124001-\$.did. JP-H11167936-\$.did. DE-19924707-\$.did. WO-2002023651-\$.did. CA-2391865-\$.did. EP-1269554-\$.did. KR-20190078653-\$.did. CN-108306050-\$.did. DE-102017212266-\$.did. WO-2005015668-\$.did. EP-1652253-\$.did. CA-2730336-\$.did. JP-H06338352-\$.did. EP-1056146-\$.did. US-20040028585-\$.did. EP-1269554-\$.did. CN-105594056-\$.did. US-6524737-\$.did. KR-20150135304-\$.did. US-7192564-\$.did. DE-102015010955-\$.did. CN-105594056-\$.did. WO-2014155784-\$.did. DE-102018100158-\$.did. US-9937481-\$.did. US-7198865-\$.did. EP-1041659-\$.did. CN-109777957-\$.did. CN-107910610-\$.did. EP-3063811-\$.did. WO-1994007277-\$.did. JP-3079849-\$.did. TW-I543431-\$.did. US-20150080630-\$.did. CA-2311792-\$.did. CN-109449525-\$.did. DE-19518643-\$.did. US-5352270-\$.did. TW-201724628-\$.did. DE-4118001-\$.did. DE-202014007301-\$.did. DE-202013006631-\$.did. US-9450277-\$.did. DE-202013006632-\$.did. WO-2015063007-\$.did. US-20170012328-\$.did. AT-407753-\$.did. JP-2016207463-\$.did. RU-2201018-\$.did.

S78	156	US-20170170529-\$.did. KR-100300829-\$.did. JP-2016207464-\$.did. US-9620828-\$.did. WO-2003061056-\$.did. US-6511639-\$.did. DE-19532626-\$.did. EP-1472756-\$.did. DE-102013111853-\$.did. US-20070292746-\$.did. JP-2017084707-\$.did. KR-19980064595-\$.did. CN-1442928-\$.did. EP-1333523-\$.did. DE-102013105676-\$.did. AU-2003205087-\$.did. US-7858216-\$.did. US-20180198115-\$.did. EP-1472756-\$.did. CA-2309773-\$.did. EP-1333522-\$.did. US-9843077-\$.did. US-20170207504-\$.did. WO-2017000157-\$.did. KR-20070090851-\$.did. US-20160049699-\$.did. US-20030186110-\$.did. EP-3063811-\$.did. DE-10049097-\$.did. DE-102012109032-\$.did. JP-2001332237-\$.did. EP-1333523-\$.did. US-9912022-\$.did. WO-2017073686-\$.did. KR-20030039376-\$.did. JP-6245412-\$.did. DE-19547151-\$.did. JP-4187804-\$.did. JP-2017084706-\$.did. US-20030180604-\$.did. DE-10049097-\$.did. WO-2019150403-\$.did. JP-5050845-\$.did. JP-2000223123-\$.did. JP-H0785889-\$.did. CN-104412426-\$.did. US-20130122398-\$.did. WO-2015046211-\$.did. KR-100997349-\$.did. US-7833646-\$.did. CN-109478473-\$.did. US-20040096746-\$.did. US-20180198179-\$.did. DE-102007012693-\$.did. JP-2014222582-\$.did. US-9728807-\$.did. US-20150188137-\$.did. EP-854530-\$.did. CN-107910610-\$.did. DE-102014226241-\$.did. JP-2019008980-\$.did. CN-1442928-\$.did. JP-2012204131-\$.did. US-6789757-\$.did. US-20030038197-\$.did. JP-2016152226-\$.did. JP-5894688-\$.did. WO-1998044580-\$.did. EP-1330299-\$.did. CN-107403930-\$.did. US-5972531-\$.did. EP-854530-\$.did. DE-102013012250-\$.did. US-8999009-\$.did. DE-102010020738-\$.did. KR-20160064104-\$.did. US-6986967-\$.did. WO-2002028500-\$.did. US-6461766-\$.did. JP-2014160575-\$.did. JP-2015179666-\$.did. EP-2894702-\$.did. US-20130232772-\$.did. JP-2013146680-\$.did. EP-972313-\$.did. US-7910242-\$.did. CA-2285275-\$.did. CA-2418527-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08
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		\$.did. CN-109193064-\$.did. KR-20040071776-\$.did. CA-2409218-\$.did. EP-1408575-\$.did. CN-103959553-\$.did. TW-201418387-\$.did.				
S79	172	JP-2016207465-\$.did. TW-201318972-\$.did. JP-5708121-\$.did. US-6335122-\$.did. WO-2000051806-\$.did. JP-3540085-\$.did. JP-2018022670-\$.did. JP-2016511916-\$.did. DE-19842658-\$.did. US-20080199768-\$.did. CN-105144464-\$.did. WO-2017073687-\$.did. CN-104412425-\$.did. KR-100838943-\$.did. WO-2019060996-\$.did. US-20180309126-\$.did. US-20140290438-\$.did. JP-4753220-\$.did. CA-2225699-\$.did. CN-103959553-\$.did. JP-2016170878-\$.did. CN-107591583-\$.did. JP-5966457-\$.did. US-20150180020-\$.did. WO-2014120718-\$.did. TW-201545976-\$.did. EP-3370286-\$.did. US-20060138056-\$.did. DE-102015223136-\$.did. KR-20150110797-\$.did. WO-1998035396-\$.did. WO-2001091210-\$.did. EP-958626-\$.did. CN-104412425-\$.did. KR-20160143829-\$.did. EP-1293003-\$.did. EP-2951872-\$.did. KR-20090020888-\$.did. US-6444356-\$.did. TW-I644859-\$.did. CN-108281729-\$.did. EP-3132485-\$.did. DE-102016208407-\$.did. WO-2018034155-\$.did. CN-108808156-\$.did. US-6503432-\$.did. KR-101025415-\$.did. EP-3191195-\$.did. WO-2016038207-\$.did. AU-2003205087-\$.did. US-20170047586-\$.did. EP-794587-\$.did. CA-2280622-\$.did. CA-2471015-\$.did. WO-2015158557-\$.did. JP-2016152225-\$.did. US-9780419-\$.did. EP-1408575-\$.did. IN-201917003070-\$.did. EP-622862-\$.did. WO-2017057146-\$.did. JP-5691636-\$.did. KR-20070090850-\$.did. WO-2014034859-\$.did. EP-794587-\$.did. EP-84381-\$.did. JP-2016152224-\$.did. DE-102013219604-\$.did. CA-2199096-\$.did. IN-198823-\$.did. US-20010008723-\$.did. JP-2012190768-\$.did. JP-2004355977-\$.did. JP-6315198-\$.did. AU-701597-\$.did. WO-2015129200-\$.did. KR-20000019850-\$.did. RO-106045-\$.did. US-20030054245-\$.did. JP-3371713-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08

		\$.did. JP-6345116-\$.did. JP-2015092465-\$.did. US-20160268597-\$.did. US-7666310-\$.did. WO-2019158177-\$.did. WO-2014034857-\$.did. JP-2010086885-\$.did. DE-102012000914-\$.did. US-20050247914-\$.did. JP-6079651-\$.did. JP-H08279358-\$.did. KR-20020025480-\$.did. US-6329096-\$.did. JP-5647377-\$.did. US-20180323433-\$.did. CN-101944585-\$.did. WO-2015136722-\$.did. JP-6311877-\$.did. US-20020039686-\$.did. WO-2006088021-\$.did. EP-1168479-\$.did. KR-100880525-\$.did.				
S80	198	AU-2017347388-\$.did. CA-3040793-\$.did. US-20180301769-\$.did. EP-3312922-\$.did. CA-2983768-\$.did. EP-3312922-\$.did. DE-102016120046-\$.did. WO-2018073101-\$.did. EP-3529841-\$.did. WO-2016174156-\$.did. EP-3289627-\$.did. DE-102015207843-\$.did. DE-102015207843-\$.did. CN-109845008-\$.did. KR-20190084985-\$.did. CN-107636875-\$.did. WO-2019149698-\$.did. EP-2446497-\$.did. WO-2010149611-\$.did. EP-2446497-\$.did. DE-102013011470-\$.did. DE-102018102026-\$.did. DE-102009027179-\$.did. EP-3517641-\$.did. DE-102013011470-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102012024876-\$.did. DE-4118001-\$.did. EP-2742559-\$.did. DE-102011110083-\$.did. DE-4424825-\$.did. DE-102011110083-\$.did. DE-102015206153-\$.did. AT-407753-\$.did. IN-285315-\$.did. US-20100162619-\$.did. CA-2710719-\$.did. AU-2007340905-\$.did. US-9512376-\$.did. DE-19547151-\$.did. US-6789757-\$.did. US-20030038197-\$.did. CA-2391865-\$.did. AU-2007340905-\$.did. WO-2002023651-\$.did. US-20170283725-\$.did. EP-1269554-\$.did. CA-2409218-\$.did. WO-2019015892-\$.did. EP-1269554-\$.did. CA-2730336-\$.did. US-20040028585-\$.did. EP-2741357-\$.did. CA-2710719-\$.did. CA-3031475-\$.did. TW-201728531-\$.did. CH-678131-\$.did. AU-2013201163-\$.did. US-6461766-\$.did. US-7192564-\$.did. DE-102008058444-\$.did. JP-H06338353-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08

		\$.did. DE-19518643-\$.did. JP-3240814-\$.did. WO-2001091210-\$.did. EP-1293003-\$.did. EP-1215023-\$.did. EP-1652253-\$.did. WO-2005015668-\$.did. WO-2008074352-\$.did. EP-2376597-\$.did. JP-3495707-\$.did. WO-2008081408-\$.did. EP-673075-\$.did. WO-2018218358-\$.did. CN-106684487-\$.did. DE-102011082187-\$.did. DE-202013010308-\$.did. WO-2008081407-\$.did. EP-2106435-\$.did. CA-3043947-\$.did. JP-H06338352-\$.did. CN-106684487-\$.did. WO-1994007277-\$.did. WO-2008081409-\$.did. WO-2008081410-\$.did. US-5352270-\$.did. EP-673075-\$.did. EP-1333523-\$.did. JP-3935594-\$.did. WO-2008119525-\$.did. US-5679477-\$.did. US-5612150-\$.did. JP-H11167936-\$.did. US-20150080630-\$.did. DE-10062947-\$.did. DE-10045241-\$.did. EP-3063811-\$.did. US-9450277-\$.did. JP-3079849-\$.did. JP-2013229326-\$.did. EP-1333522-\$.did. US-20170012328-\$.did. RO-106045-\$.did. DE-10021383-\$.did. EP-1333523-\$.did. WO-2015063007-\$.did. US-9620828-\$.did. US-8067107-\$.did. CN-105144464-\$.did. US-6223449-\$.did. US-20030180604-\$.did. DE-102008055508-\$.did. JP-6124001-\$.did. DE-19809400-\$.did. US-20050244704-\$.did. DE-10228471-\$.did. US-6524737-\$.did. DE-19547151-\$.did. US-7833646-\$.did. US-20170207504-\$.did.				
S81	500	S77 S78 S79 S80	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08
S82	204	(vacuum WITH scrub\$4) SAME (fluorine fluoride carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:14
S83	204	(vacuum WITH scrub\$4) SAME (fluorine fluoride carbonate)S82 and (battery batteries)	US-PGPUB; USPAT; USOCR;	OR	ON	2019/09/05 11:14

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S84	9	S82 and (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:15
S85	111	(vacuum WITH scrub\$4) SAME (fluorine fluoride)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:28
S86	4	(vacuum WITH scrub\$4) SAME ((fluorine fluoride) AND carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:28
S87	2	wo-2013023640-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 16:16
S88	106	((sodium adj hydroxide) NaOH) WITH ((jet adj pump) ejector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 13:48
S89	23	(US-20190260101-\$ or US-20180301769-\$ or US-20180205122-\$ or US-20030186110-\$ or US-20070134546-\$ or US-20160251740-\$ or US-20160043450-\$ or US-20140290438-\$ or US-20100230518-\$ or US-20040113588-\$ or US-20030180604-\$ or US-20140003568-\$).did. or (US-9780419-\$ or US-6524737-\$ or US-5632863-\$).did. or (DE-4424825-\$ or CA-2311792-\$).did.	US-PGPUB; USPAT; FPRS; DERWENT	OR	ON	2019/09/07 13:50

		or (WO-2010102377-\$ or DE-102011110083-\$ or WO-2013140039-\$ or CN-102496752-\$ or CN-101183740-\$ or EP-1333522-\$).did.				
S91	8	S89 and (fluor\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 13:50
S92	1	(carbonate WITH ((jet adj pump) ejector) SAME (fluorine fluoride)) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:24
S93	0	(base WITH ((jet adj pump) ejector) SAME (fluorine fluoride)) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:24
S94	0	((basic alka\$3) WITH ((jet adj pump) ejector) SAME (fluorine fluoride)) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:25
S95	18	((bas\$2 alka\$3) WITH ((jet adj pump) ejector) SAME (fluorine fluoride))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:25
S96	3	(carbonate WITH ((jet adj pump) ejector) SAME (fluorine fluoride))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:25
S97	2	"20070134546"	US-PGPUB; USPAT; USOCR	OR	ON	2019/09/08 12:20

S99	2	wo-2013023640-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/08 14:28
S100	1	"8210456".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/04 20:39
S101	214	"8210456" "1587623" "3393876" "3456886" "3493183" "3777994" "3892563" "4026477" "4384683" "4775107" "5377920" "5575907" "5632863" "5707015" "9780419" "20050241943"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/04 20:48
S102	2	"20140290438"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/04 20:49
S104	24	(US-20190260101-\$ or US- 20180301769-\$ or US-20180205122-\$ or US-20030186110-\$ or US- 20070134546-\$ or US-20160251740-\$ or US-20160043450-\$ or US- 20140290438-\$ or US-20100230518-\$ or US-20040113588-\$ or US- 20030180604-\$ or US-20140003568- \$).did. or (US-9780419-\$ or US- 6524737-\$ or US-5632863-\$ or US- 8210456-\$).did. or (DE-4424825-\$ or CA-2311792-\$).did. or (WO- 2010102377-\$ or DE-102011110083-\$ or WO-2013140039-\$ or CN- 102496752-\$ or CN-101183740-\$ or EP- 1333522-\$).did.	US-PGPUB; USPAT; FPRS; DERWENT	OR	ON	2020/03/04 20:53
S105	21	(S100 S101 S102 S104) AND (dry\$3 SAME (vacuum pressure))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/04 20:53
S106	957	(H01M10/54 or H01M6/52 or B02C21/00 or B02C23/10 or B02C23/20 or B09B3/0058 or C22B1/005 or Y02P10/20 or Y02W30/84 or B01D53/002 or B01D53/04 or B01D2253/102).cpc. AND ((shred\$4 crush\$4 comminut\$4 grind\$3) AND	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/24 21:46

		((dry\$3 dried inactivat\$3) SAME (vacuum Mpa hPa kPa)))				
S107	571	(H01M10/54 or H01M6/52 or B02C21/00 or B02C23/10 or B02C23/20 or B09B3/0058 or C22B1/005 or Y02P10/20 or Y02W30/84 or B01D53/002 or B01D53/04 or B01D2253/102).cpc. AND ((shred\$4 crush\$4 comminut\$4 grind\$3) AND ((dry\$3 dried inactivat\$3) WITH (vacuum Mpa hPa kPa)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/24 21:47
S108	210	(H01M10/54 or H01M6/52 or B02C21/00 or B02C23/10 or B02C23/20 or B09B3/0058 or C22B1/005 or Y02P10/20 or Y02W30/84 or B01D53/002 or B01D53/04 or B01D2253/102).cpc. AND ((shred\$4 crush\$4 comminut\$4 grind\$3) AND (batter\$3 electrode) AND ((dry\$3 dried inactivat\$3) WITH (vacuum Mpa hPa kPa)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/24 21:51
S109	44	(H01M10/54 or H01M6/52 or B02C21/00 or B02C23/10 or B02C23/20 or B09B3/0058 or C22B1/005 or Y02P10/20 or Y02W30/84 or B01D53/002 or B01D53/04 or B01D2253/102).cpc. AND ((shred\$4 crush\$4 comminut\$4 grind\$3) AND (batter\$3 electrode) AND ((dry\$3 dried inactivat\$3) WITH (vacuum pressure) WITH (Mpa hPa kPa)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/24 22:02
S112	294	(H01M10/54 or H01M6/52 or B02C21/00 or B02C23/10 or B02C23/20 or B09B3/0058 or C22B1/005 or Y02P10/20 or Y02W30/84 or B01D53/002 or B01D53/04 or B01D2253/102).cpc. AND ((shred\$4 crush\$4 comminut\$4 grind\$3) AND (batter\$3 electrode) AND ((dry\$3 dried inactivat\$3) WITH (vacuum pressure)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/25 11:33
S113	275	(H01M10/54 or H01M6/52 or B02C21/00 or B02C23/10 or B02C23/20 or B09B3/0058 or C22B1/005 or Y02P10/20 or Y02W30/84 or B01D53/002 or B01D53/04 or B01D2253/102).cpc. AND ((shred\$4 crush\$4 comminut\$4 grind\$3) AND (batter\$3 electrode) AND ((dry\$3 dried inactivat\$3) WITH (vacuum negative)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/25 11:33

S119	360	S112 S113	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/25 14:58
S121	360	S119 and ((shred\$4 crush\$4 comminut\$4 grind\$3) AND ((dry\$3 dried inactivat\$3) WITH (vacuum pressure negative)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/25 15:13

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	6	((shred\$4 crush\$4 comminut\$4 grind\$3) AND inactiv\$5 AND (dry\$3 drier\$2 oven) AND (pressure vacuum negative) and (battery batteries electrode)).clm.	US-PGPUB; USPAT	OR	ON	2021/02/25 22:12
L3	23	((shred\$4 crush\$4 comminut\$4 grind\$3) AND (dry\$3 drier\$2 oven) AND (pressure vacuum negative) and (battery batteries electrode)).clm. AND (H01M10/54 or H01M6/52 or B02C21/00 or B02C23/08,10 or B02C23/20 or B09B3/0058,008 or C22B1/005 or Y02P10/20 or Y02W30/84 or B01D53/002,05 b01d11/00 or B01D53/04 or B01D2253/102 Y02P10/212).cpc.	US-PGPUB; USPAT	OR	ON	2021/02/25 22:43

2/25/2021 10:48:06 PM

C:\Users\gswiatocha\Documents\EAST\Workspaces\15569484.wsp

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15569484
	Filing Date	2017-10-26
	First Named Inventor	Christian HANISCH
	Art Unit	
	Examiner Name	
	Attorney Docket Number	03101160US

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1	2005197149	JP	A	2005-07-21	TOYOTA MOTOR CORP		×

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NON-PATENT LITERATURE DOCUMENTS			Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15569484
	Filing Date		2017-10-26
	First Named Inventor	Christian HANISCH	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	03101160US	

1	
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EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
Examiner Name	
Attorney Docket Number	03101160US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2020-06-26
Name/Print	Michael E. Whitham	Registration Number	32635

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	39839679
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Michael E. Whitham/Kyle Comiskey
Filer Authorized By:	Michael E. Whitham
Attorney Docket Number:	03101160US
Receipt Date:	26-JUN-2020
Filing Date:	26-OCT-2017
Time Stamp:	13:58:54
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	03101160US_IDS4.pdf	1034297	no	4
			3436506200b780575aaef3ce7ffa796a60ce1cc9		

Warnings:

Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Foreign Reference	JP2005197149A.pdf	3401351	no	68
			f288b5316e263c3cde7bce11b176f62b38a3431b		
Warnings:					
Information:					
			Total Files Size (in bytes):	4435648	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

Electronic Patent Application Fee Transmittal				
Application Number:		15569484		
Filing Date:		26-Oct-2017		
Title of Invention:		METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		
First Named Inventor/Applicant Name:		Christian HANISCH		
Filer:		Timothy Bryce Miller		
Attorney Docket Number:		03101160US		
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1615	1	100	100
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				100

Electronic Acknowledgement Receipt

EFS ID:	39635674
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Timothy Bryce Miller
Filer Authorized By:	
Attorney Docket Number:	03101160US
Receipt Date:	05-JUN-2020
Filing Date:	26-OCT-2017
Time Stamp:	10:29:08
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 100
RAM confirmation Number	E202065A29276034
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Fee Worksheet (SB06)	fee-info.pdf	30474	no	2
			054b9db4bc0900fe0b1e327d0a1bc53672ef0718		
Warnings:					
Information:					
Total Files Size (in bytes):			30474		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)

Application Number	15569484	Filing Date	2017-10-26	Docket Number (if applicable)	03101160US	Art Unit	3725
First Named Inventor	HANISCH			Examiner Name	Swiatocha		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☒ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to
Deposit Account No 502041

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature
Applicant Signature

Signature of Registered U.S. Patent Practitioner			
Signature	T. Bryce Miller/	Date (YYYY-MM-DD)	2020-06-04
Name	T. Bryce Miller	Registration Number	72545

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

HANISCH et al.

Application No. 15/569,484

Filed October 26, 2017

Confirmation No. 9373

Group Art Unit 3725

Examiner Swiatocha

For METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR
RECHARGABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT UNDER 37 C.F.R. § 1.114

Sir:

This response is concurrently filed with an RCE.

In response to the Office Action mailed March 5, 2020, Applicant respectfully requests entry of the following Amendment and reconsideration.

Amendments to the Claims: begin on page 2.

Remarks: begin on page 7.

Listing of the Claims:

The following is a complete listing of all the claims in the application, with an indication of the status of each:

1. (currently amended) 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. (previously presented) 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.

3. (previously presented) The method according to claim 1, wherein the drying occurs under vacuum.

4. (previously presented) 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; and
- (c) filling a transport container with the inactivated comminuted material; wherein the inactivating step is performed by drying the comminuted material, wherein the drying occurs under vacuum, wherein the vacuum is created by means of a jet pump, and wherein a pump liquid of the jet pump has at least one of
 - a pH value of at least 8, and
 - a substance that precipitates fluoride.

5. (previously presented) The method according to claim 1, further comprising the steps of:

removing the comminuted material from the transport container; and

one or more of

detaching hard parts,

separating active material from a carrier, such that an active material fraction and a carrier fraction are obtained, and

separately packing the active material fraction and carrier fraction in respective further containers.

6. (previously presented) 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.

7. (currently amended) 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.

8. (previously presented) The battery processing installation according to claim 7, 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.

9. (previously presented) The battery processing installation according to claim 7, wherein the comminution unit and the drying device are arranged in a container.

10. (canceled)

11. (previously presented) 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 configured to inactivate the comminuted material, wherein the inactivation device comprises a drying device;

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

(d) a vacuum installation that is connected to the drying device and configured to generate a vacuum in the drying device;

wherein

the vacuum installation has a jet pump with a pump liquid,

the pump liquid is conducted within a circuit, and

the pump liquid contains a substance that reacts with hydrogen fluoride.

12. (previously presented) The battery processing installation according to claim 7 further comprising:

a hard metal detachment device and/or a light fraction detachment device;

a separation device configured to separate active material from a carrier such that an active material fraction and a carrier fraction occur; and

a second filling device configured to separately fill the active material fraction and the carrier fraction in respective containers.

13. (previously presented) The battery processing installation of claim 12 wherein the carrier fraction are aluminum and copper foils.

14. (previously presented) The battery processing installation of claim 12, wherein the separation device is an air jet sieving device.

15. (previously presented) The battery processing installation of claim 12 wherein the separation device is a second comminution device.

16. (previously presented) The battery processing installation of claim 7 wherein the batteries are lithium batteries.

17. (previously presented) The method according to claim 1 wherein the batteries are lithium batteries.

18. (previously presented) The method according to claim 5 wherein separation of the active material from the carrier is performed by air jet sieving.

19. (previously presented) The method according to claim 5 wherein separation of the active material from the carrier is performed using a second comminution stage.

20. (previously presented) 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, and
- (c) filling a transport container with the inactivated comminuted material, wherein the inactivating step is performed by drying the comminuted material, wherein the drying occurs under vacuum, wherein the vacuum is created by means of a jet pump, and wherein a pump liquid of the jet pump has a pH value of at least 9.

21. (previously presented) The method according to claim 1 wherein drying occurs at a temperature of less than 80°C.

22. (new) The method according to claim 1 further comprising a step of sealing the transport container so as to be dust-tight after the step of filling with the inactivated comminuted material.

REMARKS

Claims 1 and 7 are amended. New claim 22 is added. Applicant respectfully requests reconsideration of the claims above in view of the remarks presented below.

35 U.S.C. 103

Claims 1, 3, 5, 7, 12, 13, 16, and 17 are rejected under 35 U.S.C. 103 as being unpatentable over Stevens (US 8,210,456) in view of Kellermann (DE 4424825) and Zhang (CN 102496752). This rejection is respectfully traversed. While some of the following remarks may refer only to claim 1 for convenience of discussion, the remarks are equally made with respect to independent claim 7 based on similar claim recitations and to the dependent claims which inherit the same limitations.

Stevens describes a method of recycling sealed batteries involving heating as well as drawing air from a pre-shredder, shredder, oven conveyer, and a sieve using a vacuum source (see, e.g., column 2 lines 54-60).

Kellermann discloses inactivating batteries by deep freezing and then shredding them in a frozen state (cf. figure 1). Freezing requires a lot of energy. The shredded material undergoes a floating procedure (Flotation 19) that removes the organic compounds from the flotation liquid.

The examiner's rejection is premised on a supposed suitability of "replac[ing] the inactivation and drying process of Stevens with the process of Zhang" (Action, paragraph bridging pgs. 6-7). Respectfully, one of ordinary skill in the art would not attempt or be able to combine the processes of these references.

Zhang is narrowly tailored to "recycling the used lithium ion battery electrolyte" (see EPO translation posted to PAIR by the examiner, first sentence of the Description). More specifically, Zhang is all about recovering "lithium hexafluorophosphate". According to Zhang, "lithium ion battery electrolyte is mainly a solution formed by dissolving lithium hexafluorophosphate in various organic solvents" (see EPO translation, pg. 1 final paragraph). Zhang is relied upon specifically for rejecting claim 1's recitation of "inactivating the 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." The claim language expressly requires "**material**" which is "**comminuted**". The inactivation/drying is applied to

material, more specifically **“comminuted material.”** These words are consequential not least because they require **solid pieces of battery** to be involved in the claimed process. **Zhang does not apply heating inactivation to solid materials; Zhang’s inactivation/drying process is applied to a liquid solution, not solids.**

The translation of Zhang makes clear that both the heating and vacuum application cited by the examiner are employed specifically for **“distillation”** of electrolyte (see in particular the final paragraph of page 2 of the EPO translation). One of ordinary skill in the art would recognize that “distillation” is a process performed on liquid solutions, not on solid materials. In the context of Zhang’s disclosure, this distinction becomes even more apparent. It is clear Zhang is applying the heating and vacuum application only to the “electrolyte” already removed from the battery, not to any solid pieces of battery.

It would not be obvious to one of ordinary skill in the art to encounter a distillation process as in Zhang and assume the distillation’s heat and vacuum settings would be directly applicable to comminuted (pulverized) solid battery material. Such a dramatic shift in precisely what is being heated and to what a vacuum is being applied (a liquid solution versus pulverized solid pieces of battery) would not be obvious to try either.

Notwithstanding the previous distinctions, Zhang also leads one of ordinary skill in the art away from the *order* of steps recited in claim 1. Zhang discloses a step of “crushing,” but it is literally the very last step of Zhang’s procedure. In Zhang’s Figure 1 flowchart, “crushing” is block 11, following only by “finished product” 12. “Distillation” on the other hand, which involves the heating and vacuum application cited by the examiner, is performed much earlier in Zhang’s process, namely at block 3. This order of steps in Zhang, namely distilling with heat first and crushing afterwards, leads one of ordinary skill directly away from the order required by amended claim 1 herein. Claim 1 recites “inactivating the comminuted material...”. Logically, to inactivate comminuted material, you must comminute either before or during the inactivation, but in no event can you wait to comminute until after the inactivation. While the previously recited claim language already impliedly asserted this sequence, amended claim 1 further specifies that “the inactivating step is performed during or after the comminuting step” to emphasize it further.

Even without the feature in claim 1 described in the preceding paragraph, the three documents cited by the examiner to reject claims 1 and 7 have incompatible teachings:

Stevens, Zhang, and Kellerman are three different approaches that are incompatible with one another. Zhang teaches to be careful with the battery when removing the electrolyte (“open the battery and carefully remove the electrolyte”, see page 2 of the EPO translation; “carefully take out the electrolyte and put it into the tank” see page 4 of the EPO translation). This careful opening and removal is obviously an opposite strategy to that of Stevens and Kellerman, in which the batteries are shredded first.

Kellerman’s invention is to use low temperatures to inactivate the electrolyte and to shred the frozen battery (claim 1 of Kellerman). If the skilled person wanted to combine the teachings of Kellerman and Zhang, he/she would have to ignore this significant and central feature of Kellerman’s invention. However, ignoring specifically this feature of Kellerman is only justified by impermissible hindsight bias.

Stevens’ invention is to shred the batteries and to heat them afterwards so that the volatile component evaporate (col. 5, lines 9-15). Heating the shredded feedstock is an integral part of Stevens’ invention, as it is in all claims. To pursue the combination proposed in the Action, the skilled person would have to go against this feature of Stevens’ disclosure.

Zhang, as already discussed, is focused on removing liquid electrolyte from “opened” but uncrushed/unpulverized batteries and then performed a distillation procedure on the liquid solution. There is no clear way to integrate such a distillation procedure into either approach of Stevens and Kellerman.

In sum, the differences in approach to recycling batteries is simply too disparate and varied among the three references to suggest their combination to one of ordinary skill in the art. Even were a combination attempted, which features to keep and which to eliminate from each reference is not self-apparent. To do so and arrive at the claimed subject matter must require hindsight bias based on knowledge of the claimed invention herein, which is not permitted under 35 U.S.C. 103.

New claim 22 recites an additional step of “sealing the transport container so as to be dust-tight after the step of filling with the inactivated comminuted material” (see, e.g., page 12 of the specification). None of the cited art describes this feature. Zhang, Kellerman, and Stevens all describe open systems. However, it is one aspect of the claimed invention to inactivate the

shredded batteries and to transport them to a central recycling facility. This requires closed transport containers.

Claims 2, 6, and 8 are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Sloop (US 2003/0186110). This rejection is respectfully traversed.

Sloop uses yet another method to remove the electrolyte from batteries, i.e. using supercritical CO₂. Supercritical CO₂ requires a pressure of more than 73,75 bar (1060 psi). Thus Sloop's teaching contradicts claim 1's recitation of "inactivating the comminuted material...by drying...at a maximum pressure of 300 hPa". Sloop thus cannot cure the deficiencies of Stevens, Zhang, and Kellermann discussed above. As claims 2, 6, and 8 all depend from claim 1, they are new and nonobvious over any combination of the cited references for at least the same reasons as claim 1.

Claim 9 is rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann, Zhang, and Meador (US 5,632,863). This rejection is respectfully traversed.

Meador discloses a battery reclamation system and method which centers around pyrolysis, in particular decomposition temperatures between 350° and 650° F (see, e.g., Abstract). "Drying" and "drying device" as described in the disclosure at, e.g., page 4 of the specification, is distinguished from Meador's furnace 17. Accordingly, Meador fails to even have a "drying device" much less a "comminution unit and...drying device [that] are arranged in a container" as recited in claim 9.

Claims 14 and 18 have been rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann, Zhang, and Hanisch et al., herein "Hanisch," (WO 2013/023640), to which the examiner references using corresponding U.S. Patent No. 9,780,419. This rejection is respectfully traversed.

Like Meador, Hanisch involves heating to extremely high decomposition temperatures. In Hanisch's case, the desired temperatures are 350 to 800°C. A combination of Stevens, Kellermann, Zhang, and Hanisch fails to arrive at the subject matter of the claims as amended herein. Claims 14 and 18 are new and nonobvious for at least the same reasons discussed above in respect of the independent claims from which they depend.

Claims 15 and 19 have been rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann, Zhang, and Sloop (US 2016/0043450), herein “Sloop2”. This rejection is respectfully traversed. Sloop2 describes a method of battery recycling which does not include or suggest ““inactivating the comminuted material...by drying...at a maximum pressure of 300 hPa” as recited in claim 1 or “a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device” as recited in claim 7. Claims 15 and 19, which depend from these independent claims, are new and nonobvious on at least this basis.

Allowable Subject Matter

Applicant acknowledges with appreciation indication of claims 4, 11, and 20 as being allowed.

Conclusion

In view of the foregoing, it is respectfully requested that the application be reconsidered; that claims 1-3, 5-9, 12-19, and 21-22 be allowed in addition to claims 4, 11, and 20; and that the application be passed to issue.

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of the application. Applicant reserves the right to pursue at a later time any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution.

Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic, WebEx, or personal interview.

A provisional petition is hereby made for any extension of time necessary for the

Docket No.: 03101160US; App. No.: 15/569,484

continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,

/T. Bryce Miller/

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Electronic Patent Application Fee Transmittal

Application Number:	15569484			
Filing Date:	26-Oct-2017			
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION			
First Named Inventor/Applicant Name:	Christian HANISCH			
Filer:	Timothy Bryce Miller			
Attorney Docket Number:	03101160US			
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1300	1300
Total in USD (\$)				1300

Electronic Acknowledgement Receipt

EFS ID:	39631751
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Timothy Bryce Miller
Filer Authorized By:	
Attorney Docket Number:	03101160US
Receipt Date:	04-JUN-2020
Filing Date:	26-OCT-2017
Time Stamp:	17:53:48
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1300
RAM confirmation Number	E202064H55291437
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	2020-06-04_03101160US_RCE.pdf	1349895	no	3
			ee8d7ab29379e6ce5b76c80693a1d9ec0e2e4498		
Warnings:					
Information:					
2		2020-06-04_03101160US_res1114.pdf	60241	yes	12
			e3b4f54551ca8a08616477d739a2502f856647ca		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	6	
	Applicant Arguments/Remarks Made in an Amendment		7	12	
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30478	no	2
			8314a5e8359b7e97340b7ea1108144d313725b9f		
Warnings:					
Information:					
Total Files Size (in bytes):			1440614		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/569,484		Filing Date 10/26/2017		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED - PART I									
		(Column 1)	(Column 2)						
FOR		NUMBER FILED	NUMBER EXTRA		RATE (\$)		FEE (\$)		
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A		N/A				
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A	N/A		N/A				
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A		N/A				
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *		x \$80 =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *		x \$420 =					
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.					TOTAL				
APPLICATION AS AMENDED - PART II									
		(Column 1)		(Column 2)	(Column 3)				
AMENDMENT	06/04/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 21	Minus	** 20	= 1	x \$100 =		100	
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 5	= 0	x \$460 =		0	
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE		100	
		(Column 1)		(Column 2)	(Column 3)				
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =			
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/POLIN ANG/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/569,484	10/26/2017	Christian HANISCH	03101160US	9373
30743	7590	03/05/2020		
W&C IP 11491 SUNSET HILLS ROAD SUITE 340 RESTON, VA 20190			EXAMINER SWIATOCHA, GREGORY D.	
			ART UNIT	PAPER NUMBER
			3725	
			MAIL DATE	DELIVERY MODE
			03/05/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

15/569,484

Applicant(s)

HANISCH et al.

Examiner

GREGORY D SWIATOCHA

Art Unit

3725

AIA (FITF) Status

Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2020.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-9 and 11-21 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☒ Claim(s) 4, 11 and 20 is/are allowed.
- 7) ☒ Claim(s) 1-3, 5-9, 12-19 and 21 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 10 January 2020 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☒ All b) ☐ Some** c) ☐ None of the:
- 1) ☒ Certified copies of the priority documents have been received.
- 2) ☐ Certified copies of the priority documents have been received in Application No. ____.
- 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 4) ☐ Other: ____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

- 1) The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.
- 2) This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

Response to Arguments

- 3) Applicant's response filed 10 January 2020 has overcome the objections to the drawings, specification, and claims, and rejections under 35 U.S.C. 112. Accordingly, the objections to the drawings, specification, and claims, and rejections under 35 U.S.C. 112 have been withdrawn.
- 4) Applicant's Remarks filed 10 January 2020 regarding the interpretation of the terms, "an inactivation device," "a drying device," "a filling device," "a second filling device," and "separation device" have been considered and are persuasive.
- 5) Applicant's arguments with respect to claims 1 and 7 have been considered but are moot because the arguments do not apply to the current combination of references being used in the current rejection. Applicant's amendment necessitated the new grounds of rejection of this Office Action.

Information Disclosure Statement

- 6) The information disclosure statement (IDS) is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Interpretation

- 7) The following is a quotation of 35 U.S.C. 112(f):

(f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

- 8) The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

- (A) the claim limitation uses the term “means” or “step” or a term used as a substitute for “means” that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function;
- (B) the term “means” or “step” or the generic placeholder is modified by functional language, typically, but not always linked by the transition word “for” (e.g., “means for”) or another linking word or phrase, such as “configured to” or “so that”; and
- (C) the term “means” or “step” or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word “means” (or “step”) in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word “means” (or “step”) in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word “means” (or “step”) are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this application that do not use the word “means” (or “step”) are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

9) This application includes one or more claim limitations that do not use the word “means,” but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are: **“a hard metal detachment device and/or light fraction detachment device” (Claim 12, line 3).**

Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, it/they is/are being interpreted to cover the corresponding structure

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described in the specification as performing the claimed function, and equivalents thereof. **The**

following appears to be the corresponding structure as disclosed:

Hard metal detachment device - magnet or other separator

Light fraction detachment device - zigzag separator or air separator

10) If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

Claim Rejections - 35 USC § 103

11) The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

12) The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13) **Claims 1, 3, 5, 7, 12, 13, 16, and 17 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens (U.S. 8,210,456) in view of Kellermann (DE 4424825) and Zhang (CN 102496752).**

14) Regarding Claim 1, Stevens discloses a method for the treatment of used batteries, comprising the steps:

(a) comminuting the batteries such that comminuted material is obtained (Lithium batteries are shredded: Col 5, L16-17),

(b) inactivating the comminuted material such that an inactivated comminuted material is obtained (Oven conveyor Fig. 3, #20 & Dried material: Col 1, L37 & VOCs: Col 5, L15);

wherein the inactivating step is performed by drying the comminuted material (Dried material: Col 1, L37). Stevens is not explicit to filling a transport container with the inactivated comminuted material.

Kellermann teaches a method for the disposal of lithium batteries including filling a transport container with the inactivated comminuted material (The fractional fractions of the crushed batteries are collected in collection vessels: Page 2) in order to further process the batteries. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to collect the inactivated comminuted material of Stevens in a transport container, as taught by **Kellermann**, in order to further process the batteries. While Stevens discloses an inactivation step and drying step using an oven conveyor, Stevens does not disclose an inactivation and drying step wherein the drying occurs at a maximum pressure of 300 hPa.

However, **Zhang** teaches an alternative method of inactivating material in lithium ion batteries including a drying process, where the drying occurs at a maximum pressure of 300 hPa (Dry room & Vacuum degree 0 to 20 kPa: Page 2) in order to recycle the electrolyte, protect the electrolyte from hydrolysis reactions and oxidation reactions, and prevent decomposition side reactions of lithium hexafluorophosphate. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the inactivation and drying process of

Stevens with the process of Zhang, as doing so would protect the electrolyte from hydrolysis reactions and oxidation reactions and prevent the decomposition of the lithium hexafluorophosphate since Lithium hexafluorophosphate is a heat-sensitive material, which is easy to decompose at high temperatures, and it is very active and easily reacts with air and moisture (Zhang: Page 2).

15) Regarding Claim 3, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Zhang further teaches wherein the drying occurs under vacuum Vacuum: Page 2).

16) Regarding Claim 5, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Stevens further discloses one or more of detaching hard parts (magnetic component separated by the magnetic wheel: Col 5, L35), separating active material from a carrier, such that an active material fraction and a carrier fraction are obtained (The specific gravity separator separates out nonferrous fluff encapsulated with this magnetic component and also separates the steel, magnetic alloys, aluminum, and copper from each other: Col 5, L38-41). Kellermann further teaches removing the comminuted material from the transport container (The fractional fractions of the crushed batteries are collected in collection vessels and sent to a pool of a flotation station where a first separation treatment of fractions takes place: Page 2. Examiner notes that the comminuted material would be removed from the collection vessels in order to be put into the separation pool) and separately packing the active material fraction and carrier fraction in containers (Dried parts are fed in a container: Page 3 & The iron component are deposited: Page 3 & The non-ferrous components are deposited: Page 3).

17) Regarding Claim 7, Stevens discloses (a) a comminution unit configured to comminute the batteries such that comminuted material is obtained (Shredder: Fig. 3, #14);

(b) an inactivation device comprising a drying device configured to inactivate the comminuted material (Oven conveyor Fig. 3, #20 & Dried material: Col 1, L37 & VOCs: Col 5, L15). Stevens is not explicit to a filling device configured to fill a transport container with the inactivated comminuted material.

Kellermann teaches a device for the disposal of lithium batteries including a filling device configured to fill a transport container with the inactivated comminuted material (Collection vessels: Fig. 1, #18.

Examiner notes that the filling vessels are located along the process path or within the shredder device and therefor would include a filling device or frame where the collection vessels would be filled) in order to further process the batteries. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to collect the inactivated comminuted material of Stevens in a transport container with a filling device, as taught by Kellermann, in order to further process the batteries. While Stevens discloses an inactivation device and drying device using an oven conveyor, Stevens does not disclose a vacuum installation connected to the drying device configured to generate a vacuum in the drying device.

However, **Zhang** teaches an alternative method of inactivating material in lithium ion batteries including a drying device (Dry room: Page 2) and a vacuum installation connected to the drying device configured to generate a vacuum in the drying device (Dry room & Vacuum degree 0 to 20 kPa: Page 2) in order to recycle the electrolyte, protect the electrolyte from hydrolysis reactions and oxidation reactions, and prevent decomposition side reactions of lithium hexafluorophosphate. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the inactivation and drying process of Stevens with the process of Zhang, as doing so would protect the electrolyte from hydrolysis reactions and oxidation reactions and prevent the decomposition of the lithium hexafluorophosphate since Lithium hexafluorophosphate is a heat-sensitive material, which is easy to decompose at high temperatures, and it is very active and easily reacts with air and moisture (Zhang: Page 2).

18) Regarding Claim 12, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Stevens further discloses a hard metal detachment device (Magnetic wheel: Fig. 3, #52) and/or a light fraction detachment device, a separation device configured to separate active material from a carrier such that an active material fraction and a carrier fraction occur (Specific gravity separator: Fig. 3, #68). Kellermann further teaches a second filling device configured to separately fill the active material fraction and the carrier fraction in respective containers (Dried parts are fed in a container: Page 3 & The iron component are deposited: Page 3 & The non-ferrous components are deposited: Page 3. Examiner notes that depositing of the material would occur with a filling device.).

19) Regarding Claim 13, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Steven further discloses wherein the carrier fraction are aluminum and copper foils (Aluminum and copper: Col 5, L36-37).

20) Regarding Claim 16, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Stevens further discloses wherein the batteries are lithium batteries (Lithium battery: Col 5, L5).

21) Regarding Claim 17, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Stevens further discloses wherein the batteries are lithium batteries (Lithium battery: Col 5, L5).

22) Regarding Claim 21, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Zhang further teaches wherein drying occurs at a temperature of less than 80°C (20 and 120 degrees: Page 2. Examiner notes that the range of 20-120 degrees has substantial overlap with less than 80 degrees. Further, the range 20-120 degrees achieves the same function of less than 80°C. Examiner notes that Page 4 of Applicant's specification discloses that the advantage of low temperatures is that the formation of hydrogen fluoride is hindered. Page 2 of Zhnag

discloses that high vacuum and reduced pressure distillation process which takes place between 20 and 120 degrees prevent the decomposition side reactions of lithium hexafluorophosphate, which would break down into hydrogen fluoride).

23) **Claims 2, 6, and 8 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann, Zhang, and Sloop (U.S. 2003/0186110).**

24) Regarding Claim 2, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Stevens further discloses that VOCs are removed from the dried material (Col 5, L19), but is not explicit to wherein the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.

Sloop teaches the recycling of lithium batteries including wherein the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible (Dry, non-flammable, minimally reactive form: Par. 0042) as a known result of drying the batteries to remove the electrolyte. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention that the dried batteries of Stevens, or Stevens in view of Kellermann and Zhang, would be such that an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible, as taught by Sloop, as a known result of drying the batteries to remove the electrolyte.

25) Regarding Claim 6, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Stevens further discloses that VOCs are removed from the dried material (Col 5, L19), but is not explicit to 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 formed 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.

Sloop teaches the recycling of lithium batteries including 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 (Dry, non-flammable, minimally reactive form: Par. 0042. Examiner notes that if the dried material is non-flammable and minimally reactive, no flammable or explosive gas would emerge) as a known result of drying the batteries to remove the electrolyte. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention that the dried batteries of Stevens, or Stevens in view of Kellermann and Zhang, would be such that no flammable or explosive gas mixture can form above the comminuted material in the transport container and/or if the comminuted material is so dry that no flammable or explosive gas mixture can emerge in the transport container or during the subsequent processing, as taught by Sloop, as a known result of drying the batteries to remove the electrolyte.

26) Regarding Claim 8, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. Stevens further discloses that VOCs are removed from the dried material (Col 5, L19), but is not explicit to 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.

Sloop teaches the recycling of lithium batteries including 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 (After the electrolyte is removed . . . Dry, non-flammable, minimally reactive form: Par. 0042) as a known result of drying the batteries to remove the electrolyte. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention that the dried batteries of Stevens, or Stevens in view of Kellermann and Zhang,

would be such that an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible, as taught by Sloop, as a known result of drying the batteries to remove the electrolyte.

27) **Claim 9 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann, Zhang, and Meador (U.S. 5,632,863).**

28) Regarding Claim 9, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. The combination of Steven, Kellerman, and Zhang do not teach wherein the comminution device and the drying device are arranged in a container.

Meador teaches a battery recycling process wherein the comminution device (27) and the drying device (17) are arranged in a container (See frame of device & Col 4, L36-53) in order to prevent oxygen from entering the device which could cause an explosion hazard. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to arrange the comminution device and drying device of Stevens, or Stevens in view of Kellermann and Zhang, in a container, as taught by Meador, in order to prevent oxygen from entering the device (Meador: Col 4, L52).

29) **Claims 14 and 18 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann, Zhang, and Hanisch et al., hereinafter Hanisch, (WO 2013/023640). Note that citations for Hanisch are taken from corresponding U.S. Patent No. 9,780,419.**

30) Regarding Claim 14, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. The combination of Stevens, Kellerman, and Zhang, do not teach wherein the separation device is an air jet sieving device.

Hanisch teaches a separation device for an active material and a carrier wherein the separation device is an air jet sieving device (Air jet sieve: Fig. 1, #50) in order to separate materials with a high degree of purity. Therefore, it would have been obvious to one of ordinary skill in the art before the effective

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filing date of the claimed invention to replace the specific gravity separator of Stevens with the air jet sieve of Hanisch in order to separate materials with a high degree of purity (Hanisch: Col 2, L6).

31) Regarding Claim 18, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. The combination of Stevens, Kellerman, and Zhnag do not teach wherein separation of the active material from the carrier is performed by air jet sieving.

Hanisch teaches a separation device for an active material and a carrier wherein separation of the active material from the carrier is performed by air jet sieving (Air jet sieve: Fig. 1, #50) in order to separate materials with a high degree of purity. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the specific gravity separator of Stevens with the air jet sieve of Hanisch in order to separate materials with a high degree of purity (Hanisch: Col 2, L6).

32) **Claims 15 and 19 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann, Zhnag, and Sloop (U.S. 2016/0043450).**

33) Regarding Claim 15, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. The combination of Steven and Kellerman do not teach wherein the separation device is a second comminution device.

Sloop teaches a device for the recycling of lithium batteries including a comminuting stage (14), drying stage (20), and separating stage (22, 24) wherein the separation device is a second comminution device (Grinding step: Par. 0019) in order to improve yield in subsequent sieving. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the specific gravity separator of Stevens with the grinder of Sloop in order to improve yield in subsequent sieving (Sloop: Par. 0019).

34) Regarding Claim 19, the combination of Stevens, Kellermann, and Zhang teach all elements of the claimed invention as stated above. The combination of Stevens, Kellerman, and Zhang do not teach

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wherein separation of the active material from the carrier is performed using a second comminution stage.

Sloop teaches a device for the recycling of lithium batteries including a comminuting stage (14), drying stage (20), and separating stage (22, 24) wherein separation of the active material from the carrier (24) is performed using a second comminution stage (Grinding step: Par. 0019) in order to improve yield in subsequent sieving. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the specific gravity separator of Stevens with the grinder of Sloop in order to improve yield in subsequent sieving (Sloop: Par. 0019).

Allowable Subject Matter

35) Claims 4, 11, and 20 are allowed.

36) The following is a statement of reasons for the indication of allowable subject matter:

37) Regarding Claims 4, 11, and 20, it is the opinion of the Examiner that the art of record neither anticipates nor renders obvious wherein *“a pump liquid of the jet pump has at least one of a pH value of at least 8, and contains a substance that precipitates fluoride” or “wherein the pump liquid is conducted within a circuit and the pump liquid contains a substance that reacts with hydrogen fluoride”* in combination with the rest of the claimed limitations set forth in the dependent claim. Searching by the Examiner yielded prior art as cited below:

38) Stevens discloses the removal of an electrolyte including lithium from the recycled battery using a vacuum system, scrubber, and an atomizer using a 50% concentration of sodium hydroxide in water, and this discloses a liquid with a pH of at least 9. Sodium hydroxide is also known to react with hydrogen fluoride to precipitate fluoride. However, the electrolyte disclosed by Stevens is lithium perchlorate in propylene carbonate and dimethoxyethane. While, **Tanii et al. (U.S. 6,524,737)** discloses the recycling of lithium batteries containing lithium phosphohexafluoride as the electrolyte, and thus the electrolyte of Stevens could be replaced with lithium phosphohexafluoride, the fluoride compounds

are treated in a wastewater tank instead of with a jet pump. Further, while the use of jet pumps containing alkaline liquids such as sodium hydroxide is known from **Eckardt et al. (U.S. 2014/0003568)** such a use is not disclosed for the recycling of a lithium electrolyte battery.

39) Therefore, Stevens, Tanii, and Eckardt alone, or in combination with any other prior art, do not anticipate or render obvious the claimed invention.

Conclusion

40) Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

41) Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY D. SWIATOGA whose telephone number is (571)272-7022. The examiner can normally be reached on Monday-Friday (9-5).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shelley Self can be reached on (571) 272-4524. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GREGORY D SWIATOCHA/
Primary Examiner, Art Unit 3725

Notice of References Cited	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.	
	Examiner GREGORY D SWIATOCHA	Art Unit 3725	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A					
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Machine translation of CN102496752, 4 Pages. (Year: 2012)
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	09/05/2019	03/04/2020							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	O	=							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	-	-							
	11	O	=							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	O	=							
	21		✓							

<i>Search Notes</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
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CPC - Searched*		
Symbol	Date	Examiner
Y02W30/84	09/04/2019	G.S.
Y02P10/212	09/04/2019	G.S.
B02C23/08, 10	09/04/2019	G.S.
B09B3/008, 0058	09/04/2019	G.S.
B01D53/05, 002; 11/00; 2253/102	09/04/2019	G.S.

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/GREGORY D SWIATOCHA/ Primary Examiner, Art Unit 3725	
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<i>Search Notes</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
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Search Notes		
Search Notes	Date	Examiner
EAST Inventor search, Assignee search, CPC search, Text search, Combination class../text search	09/04/2019	G.S.
Espacenet search	09/04/2019	G.S.
IP.com search	09/04/2019	G.S.
NPL Search	09/04/2019	G.S.
Y02W30/84 (See search history printout)	09/04/2019	G.S.
Y02P10/212 (See search history printout)	09/04/2019	G.S.
B02C23/08, 10 (See search history printout)	09/04/2019	G.S.
B09B3/008, 0058 (See search history printout)	09/04/2019	G.S.
B01D53/05, 002; 11/00; 2253/102 (See search history printout)	09/04/2019	G.S.
Updated Search	03/04/2020	G.S.

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/GREGORY D SWIATOCCHA/ Primary Examiner, Art Unit 3725	
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Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
Examiner Name	
Attorney Docket Number	03101160US

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	1	20140290438	A1	2014-10-02	C. HANISCH; W. HASELRIEDER; A. KWADE	
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	1	2010/102337	WO	A1	2010-09-16	W. STEVENS		
	2	103959553	CN	A	2014-07-30	UNIV. BRAUNSCHWEIG TECH	Equivalent to WO2010/102337	
	3	102496752	CN	A	2012-06-13	CHINA NAT OFFSHORE OIL CORP ET AL.		×

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15569484	
Filing Date	2017-10-26	
First Named Inventor	Christian HANISCH	
Art Unit		
Examiner Name		
Attorney Docket Number	03101160US	

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1		

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EXAMINER SIGNATURE

Examiner Signature	/GREGORY D SWIATOCHA/	Date Considered	03/04/2020
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15569484		
Filing Date	2017-10-26		
First Named Inventor	Christian HANISCH		
Art Unit			
Examiner Name			
Attorney Docket Number	03101160US		

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2019-09-12
Name/Print	Michael E. Whitham	Registration Number	32635

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	1	"8210456".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/04 20:39
L4	214	"8210456" "1587623" "3393876" "3456886" "3493183" "3777994" "3892563" "4026477" "4384683" "4775107" "5377920" "5575907" "5632863" "5707015" "9780419" "20050241943"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/04 20:48
L5	2	"20140290438"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/04 20:49
L7	24	(US-20190260101-\$ or US-20180301769-\$ or US-20180205122-\$ or US-20030186110-\$ or US-20070134546-\$ or US- 20160251740-\$ or US-20160043450-\$ or US-20140290438-\$ or US-20100230518-\$ or US-20040113588-\$ or US-20030180604-\$ or US-20140003568-\$).did. or (US- 9780419-\$ or US-6524737-\$ or US- 5632863-\$ or US-8210456-\$).did. or (DE- 4424825-\$ or CA-2311792-\$).did. or (WO- 2010102377-\$ or DE-102011110083-\$ or WO-2013140039-\$ or CN-102496752-\$ or CN-101183740-\$ or EP-1333522-\$).did.	US-PGPUB; USPAT; FPRS; DERWENT	OR	ON	2020/03/04 20:53
L8	21	(I3 I4 I5 I7) AND (dry\$3 SAME (vacuum pressure))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/04 20:53
S1	9	((("HANISCH") near3 ("Christian")) OR ((("WESTPHAL") near3 ("Bastian")) OR ((("HASELRIEDER") near3 ("Wolfgang")) OR ((("SCHOENITZ") near3 ("Martin")))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/09/04 10:38
S3	3	duesenfeld.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 10:43
S4	3	wo-2010102377-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/09/04 10:59

			IBM_TDB			
S5	3	de-102011110083-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 10:59
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S7	2	wo-2010149611-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:00
S8	1	kr-20060101683-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 11:00
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S14	3	de-602005001937-\$.did.	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/09/04 11:05

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		WO-2000051806-\$.did. JP-3540085-\$.did. JP-2018022670-\$.did. JP-2016511916-\$.did. DE-19842658-\$.did. US-20080199768-\$.did. CN-105144464-\$.did. WO-2017073687-\$.did. CN-104412425-\$.did. KR-100838943-\$.did. WO-2019060996-\$.did. US-20180309126-\$.did. US-20140290438-\$.did. JP-4753220-\$.did. CA-2225699-\$.did. CN-103959553-\$.did. JP-2016170878-\$.did. CN-107591583-\$.did. JP-5966457-\$.did. US-20150180020-\$.did. WO-2014120718-\$.did. TW-201545976-\$.did. EP-3370286-\$.did. US-20060138056-\$.did. DE-102015223136-\$.did. KR-20150110797-\$.did. WO-1998035396-\$.did. WO-2001091210-\$.did. EP-958626-\$.did. CN-104412425-\$.did. KR-20160143829-\$.did. EP-1293003-\$.did. EP-2951872-\$.did. KR-20090020888-\$.did. US-6444356-\$.did. TW-I644859-\$.did. CN-108281729-\$.did. EP-3132485-\$.did. DE-102016208407-\$.did. WO-2018034155-\$.did. CN-108808156-\$.did. US-6503432-\$.did. KR-101025415-\$.did. EP-3191195-\$.did. WO-2016038207-\$.did. AU-2003205087-\$.did. US-20170047586-\$.did. EP-794587-\$.did. CA-2280622-\$.did. CA-2471015-\$.did. WO-2015158557-\$.did. JP-2016152225-\$.did. US-9780419-\$.did. EP-1408575-\$.did. IN-201917003070-\$.did. EP-622862-\$.did. WO-2017057146-\$.did. JP-5691636-\$.did. KR-20070090850-\$.did. WO-2014034859-\$.did. EP-794587-\$.did. EP-84381-\$.did. JP-2016152224-\$.did. DE-102013219604-\$.did. CA-2199096-\$.did. IN-198823-\$.did. US-20010008723-\$.did. JP-2012190768-\$.did. JP-2004355977-\$.did. JP-6315198-\$.did. AU-701597-\$.did. WO-2015129200-\$.did. KR-20000019850-\$.did. RO-106045-\$.did. US-20030054245-\$.did. JP-3371713-\$.did. JP-6345116-\$.did. JP-2015092465-\$.did. US-20160268597-\$.did. US-7666310-\$.did. WO-2019158177-\$.did. WO-2014034857-\$.did. JP-2010086885-\$.did. DE-102012000914-\$.did. US-20050247914-\$.did. JP-6079651-\$.did. JP-H08279358-\$.did. KR-20020025480-\$.did. US-6329096-\$.did. JP-5647377-\$.did. US-20180323433-\$.did. CN-101944585-\$.did. WO-2015136722-\$.did. JP-6311877-\$.did. US-20020039686-\$.did. WO-2006088021-\$.did. EP-1168479-\$.did. KR-100880525-\$.did.	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S20	198	AU-2017347388-\$.did. CA-3040793-\$.did. US-20180301769-\$.did. EP-3312922-\$.did. CA-2983768-\$.did. EP-3312922-\$.did. DE-102016120046-\$.did. WO-2018073101-\$.did. EP-3529841-\$.did. WO-2016174156-\$.did. EP-3289627-\$.did. DE-102015207843-\$.did. DE-102015207843-\$.did. CN-109845008-\$.did. KR-20190084985-\$.did. CN-107636875-\$.did. WO-2019149698-\$.did. EP-2446497-\$.did. WO-2010149611-\$.did. EP-2446497-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 13:26

		DE-102013011470-\$.did. DE-102018102026-\$.did. DE-102009027179-\$.did. EP-3517641-\$.did. DE-102013011470-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102012024876-\$.did. DE-4118001-\$.did. EP-2742559-\$.did. DE-102011110083-\$.did. DE-4424825-\$.did. DE-102011110083-\$.did. DE-102015206153-\$.did. AT-407753-\$.did. IN-285315-\$.did. US-20100162619-\$.did. CA-2710719-\$.did. AU-2007340905-\$.did. US-9512376-\$.did. DE-19547151-\$.did. US-6789757-\$.did. US-20030038197-\$.did. CA-2391865-\$.did. AU-2007340905-\$.did. WO-2002023651-\$.did. US-20170283725-\$.did. EP-1269554-\$.did. CA-2409218-\$.did. WO-2019015892-\$.did. EP-1269554-\$.did. CA-2730336-\$.did. US-20040028585-\$.did. EP-2741357-\$.did. CA-2710719-\$.did. CA-3031475-\$.did. TW-201728531-\$.did. CH-678131-\$.did. AU-2013201163-\$.did. US-6461766-\$.did. US-7192564-\$.did. DE-102008058444-\$.did. JP-H06338353-\$.did. DE-19518643-\$.did. JP-3240814-\$.did. WO-2001091210-\$.did. EP-1293003-\$.did. EP-1215023-\$.did. EP-1652253-\$.did. WO-2005015668-\$.did. WO-2008074352-\$.did. EP-2376597-\$.did. JP-3495707-\$.did. WO-2008081408-\$.did. EP-673075-\$.did. WO-2018218358-\$.did. CN-106684487-\$.did. DE-102011082187-\$.did. DE-202013010308-\$.did. WO-2008081407-\$.did. EP-2106435-\$.did. CA-3043947-\$.did. JP-H06338352-\$.did. CN-106684487-\$.did. WO-1994007277-\$.did. WO-2008081409-\$.did. WO-2008081410-\$.did. US-5352270-\$.did. EP-673075-\$.did. EP-1333523-\$.did. JP-3935594-\$.did. WO-2008119525-\$.did. US-5679477-\$.did. US-5612150-\$.did. JP-H11167936-\$.did. US-20150080630-\$.did. DE-10062947-\$.did. DE-10045241-\$.did. EP-3063811-\$.did. US-9450277-\$.did. JP-3079849-\$.did. JP-2013229326-\$.did. EP-1333522-\$.did. US-20170012328-\$.did. RO-106045-\$.did. DE-10021383-\$.did. EP-1333523-\$.did. WO-2015063007-\$.did. US-9620828-\$.did. US-8067107-\$.did. CN-105144464-\$.did. US-6223449-\$.did. US-20030180604-\$.did. DE-102008055508-\$.did. JP-6124001-\$.did. DE-19809400-\$.did. US-20050244704-\$.did. DE-10228471-\$.did. US-6524737-\$.did. DE-19547151-\$.did. US-7833646-\$.did. US-20170207504-\$.did.				
S21	5959	y02W30/84.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:19
S22	1437	(y02p10/212.cpc. b02c21/\$.cpc. (b02c23/08,10).cpc. b09b3/008.cpc. (b01d53/02,002).cpc. b01d11/00.cpc.	US-PGPUB; USPAT; USOCR;	OR	ON	2019/09/04 14:31

		b09b3/0058.cpc. b01d2253/102.cpc.) AND (battery batteries)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S23	3	wo-2010102377-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S24	3	de-102011110083-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S25	2	de-102012024876-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S26	2	wo-2010149611-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S27	1	kr-20060101683-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S28	0	wo-2106174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S29	2	wo-2016174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S30	2	wo-2016164752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S31	2	cn-101394015-\$.did.	US-PGPUB;	OR	ON	2019/09/04

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			14:37
S32	3	de-102015207843-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S33	3	de-602005001937-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S34	3	cn-102496752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S35	3	cn-103959553-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S38	352	S22 and lithium	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 16:40
S39	2006	S21 and lithium	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 16:40
S40	3	de-19954998-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 19:41
S41	2	de-29803442-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/09/04 19:41

			IBM_TDB			
S42	1	(S38 S39) AND (liquid WITH gas WITH jet WITH (ejector pump))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:19
S44	484	(liquid WITH gas WITH jet WITH (ejector pump)) WITH vacuum	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:21
S45	8	(liquid WITH gas WITH jet WITH (ejector pump) WITH vacuum) SAME pH	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:21
S46	21	(jet ADJ (ejector pump)) WITH ((sodium calcium) ADJ carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:26
S47	169	(S38 S39) AND ((sodium calcium) ADJ carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:27
S48	3	WO-2013140039-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:31
S49	3	(S38 S39) AND (jet ADJ (ejector pump))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:39
S50	8	(jet ADJ (ejector pump)) WITH fluoride	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:41
S51	1	(jet ADJ (ejector pump)) WITH (fluoride fluorine) WITH (carbonate)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/09/04 20:42

			EPO; JPO; DERWENT; IBM_TDB			
S53	174	(S38 S39) AND (electrolyte WITH (remov\$4 weight))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 21:02
S54	28	(S38 S39) AND (electrolyte WITH (remov\$4 vaporiz\$3) WITH (dri\$2 dry\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 21:06
S55	5959	y02W30/84.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 07:34
S56	658	S55 and lithium and (dry\$3 dri\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 07:34
S61	11	(venturi adj pump) SAME (fluorine fluoride carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 10:54
S62	12	"9780419" "20050241943" "7713396"	US-PGPUB; USPAT; USOCR	OR	ON	2019/09/05 11:07
S63	3	wo-2010102377-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S64	3	de-102011110083-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S65	2	de-102012024876-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/09/05 11:07

			IBM_TDB			
S66	2	wo-2010149611-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S67	1	kr-20060101683-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S68	0	wo-2106174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S69	2	wo-2016174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S70	2	wo-2016164752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S71	2	cn-101394015-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S72	3	de-102015207843-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S73	3	de-602005001937-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S74	3	cn-102496752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/09/05 11:07

			EPO; JPO; DERWENT; IBM_TDB			
S75	3	cn-103959553-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S76	27	S63 S64 S65 S66 S67 S68 S69 S70 S71 S72 S73 S74 S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:07
S77	160	CA-2983768-\$.did. US-20190260101-\$.did. AU-2017347388-\$.did. WO-2016174156- \$.did. EP-3289627-\$.did. CA-3040793- \$.did. DE-102015207843-\$.did. DE- 102015207843-\$.did. EP-3312922-\$.did. EP-3312922-\$.did. DE-102016120046- \$.did. WO-2018073101-\$.did. EP-3529841- \$.did. CN-109845008-\$.did. KR- 20190084985-\$.did. CN-107636875-\$.did. WO-2019149698-\$.did. DE-102013011470- \$.did. DE-102018102026-\$.did. EP- 2446497-\$.did. EP-3517641-\$.did. WO- 2010149611-\$.did. EP-2446497-\$.did. DE- 102012024876-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102013011470- \$.did. EP-2742559-\$.did. DE- 102009027179-\$.did. DE-102011110083- \$.did. WO-2008074352-\$.did. DE-4424825- \$.did. DE-102011110083-\$.did. DE- 102015206153-\$.did. WO-2019015892- \$.did. TW-201728531-\$.did. JP- H06338353-\$.did. US-5612150-\$.did. EP- 673075-\$.did. US-5679477-\$.did. JP- 2013229326-\$.did. JP-3240814-\$.did. DE- 202013010308-\$.did. CN-106684487-\$.did. JP-3495707-\$.did. DE-102011082187-\$.did. EP-673075-\$.did. CN-105144464-\$.did. JP- 3935594-\$.did. US-3748186-\$.did. US- 8067107-\$.did. US-20050244704-\$.did. CN- 106684487-\$.did. WO-2018218358-\$.did. EP-2741357-\$.did. CN-105021024-\$.did. CA-3043947-\$.did. JP-6124001-\$.did. JP- H11167936-\$.did. DE-19924707-\$.did. WO- 2002023651-\$.did. CA-2391865-\$.did. EP- 1269554-\$.did. KR-20190078653-\$.did. CN- 108306050-\$.did. DE-102017212266-\$.did. WO-2005015668-\$.did. EP-1652253-\$.did. CA-2730336-\$.did. JP-H06338352-\$.did. EP-1056146-\$.did. US-20040028585-\$.did. EP-1269554-\$.did. CN-105594056-\$.did. US-6524737-\$.did. KR-20150135304-\$.did. US-7192564-\$.did. DE-102015010955- \$.did. CN-105594056-\$.did. WO- 2014155784-\$.did. DE-102018100158- \$.did. US-9937481-\$.did. US-7198865- \$.did. EP-1041659-\$.did. CN-109777957-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08

		<p>\$\$.did. CN-107910610-\$.did. EP-3063811- \$.did. WO-1994007277-\$.did. JP-3079849- \$.did. TW-I543431-\$.did. US- 20150080630-\$.did. CA-2311792-\$.did. CN- 109449525-\$.did. DE-19518643-\$.did. US- 5352270-\$.did. TW-201724628-\$.did. DE- 4118001-\$.did. DE-202014007301-\$.did. DE-202013006631-\$.did. US-9450277- \$.did. DE-202013006632-\$.did. WO- 2015063007-\$.did. US-20170012328-\$.did. AT-407753-\$.did. JP-2016207463-\$.did. RU-2201018-\$.did.</p>				
S78	156	<p>US-20170170529-\$.did. KR-100300829- \$.did. JP-2016207464-\$.did. US-9620828- \$.did. WO-2003061056-\$.did. US-6511639- \$.did. DE-19532626-\$.did. EP-1472756- \$.did. DE-102013111853-\$.did. US- 20070292746-\$.did. JP-2017084707-\$.did. KR-19980064595-\$.did. CN-1442928-\$.did. EP-1333523-\$.did. DE-102013105676- \$.did. AU-2003205087-\$.did. US-7858216- \$.did. US-20180198115-\$.did. EP-1472756- \$.did. CA-2309773-\$.did. EP-1333522- \$.did. US-9843077-\$.did. US-20170207504- \$.did. WO-2017000157-\$.did. KR- 20070090851-\$.did. US-20160049699- \$.did. US-20030186110-\$.did. EP-3063811- \$.did. DE-10049097-\$.did. DE- 102012109032-\$.did. JP-2001332237-\$.did. EP-1333523-\$.did. US-9912022-\$.did. WO- 2017073686-\$.did. KR-20030039376-\$.did. JP-6245412-\$.did. DE-19547151-\$.did. JP- 4187804-\$.did. JP-2017084706-\$.did. US- 20030180604-\$.did. DE-10049097-\$.did. WO-2019150403-\$.did. JP-5050845-\$.did. JP-2000223123-\$.did. JP-H0785889-\$.did. CN-104412426-\$.did. US-20130122398- \$.did. WO-2015046211-\$.did. KR- 100997349-\$.did. US-7833646-\$.did. CN- 109478473-\$.did. US-20040096746-\$.did. US-20180198179-\$.did. DE-102007012693- \$.did. JP-2014222582-\$.did. US-9728807- \$.did. US-20150188137-\$.did. EP-854530- \$.did. CN-107910610-\$.did. DE- 102014226241-\$.did. JP-2019008980-\$.did. CN-1442928-\$.did. JP-2012204131-\$.did. US-6789757-\$.did. US-20030038197-\$.did. JP-2016152226-\$.did. JP-5894688-\$.did. WO-1998044580-\$.did. EP-1330299-\$.did. CN-107403930-\$.did. US-5972531-\$.did. EP-854530-\$.did. DE-102013012250-\$.did. US-8999009-\$.did. DE-102010020738- \$.did. KR-20160064104-\$.did. US-6986967- \$.did. WO-2002028500-\$.did. US-6461766- \$.did. JP-2014160575-\$.did. JP- 2015179666-\$.did. EP-2894702-\$.did. US- 20130232772-\$.did. JP-2013146680-\$.did. EP-972313-\$.did. US-7910242-\$.did. CA- 2285275-\$.did. CA-2418527-\$.did. CN- 109193064-\$.did. KR-20040071776-\$.did. CA-2409218-\$.did. EP-1408575-\$.did. CN- 103959553-\$.did. TW-201418387-\$.did.</p>	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08
S79	172	<p>JP-2016207465-\$.did. TW-201318972- \$.did. JP-5708121-\$.did. US-6335122-\$.did.</p>	US-PGPUB; USPAT;	OR	ON	2019/09/05 11:08

		WO-2000051806-\$.did. JP-3540085-\$.did. JP-2018022670-\$.did. JP-2016511916-\$.did. DE-19842658-\$.did. US-20080199768-\$.did. CN-105144464-\$.did. WO-2017073687-\$.did. CN-104412425-\$.did. KR-100838943-\$.did. WO-2019060996-\$.did. US-20180309126-\$.did. US-20140290438-\$.did. JP-4753220-\$.did. CA-2225699-\$.did. CN-103959553-\$.did. JP-2016170878-\$.did. CN-107591583-\$.did. JP-5966457-\$.did. US-20150180020-\$.did. WO-2014120718-\$.did. TW-201545976-\$.did. EP-3370286-\$.did. US-20060138056-\$.did. DE-102015223136-\$.did. KR-20150110797-\$.did. WO-1998035396-\$.did. WO-2001091210-\$.did. EP-958626-\$.did. CN-104412425-\$.did. KR-20160143829-\$.did. EP-1293003-\$.did. EP-2951872-\$.did. KR-20090020888-\$.did. US-6444356-\$.did. TW-I644859-\$.did. CN-108281729-\$.did. EP-3132485-\$.did. DE-102016208407-\$.did. WO-2018034155-\$.did. CN-108808156-\$.did. US-6503432-\$.did. KR-101025415-\$.did. EP-3191195-\$.did. WO-2016038207-\$.did. AU-2003205087-\$.did. US-20170047586-\$.did. EP-794587-\$.did. CA-2280622-\$.did. CA-2471015-\$.did. WO-2015158557-\$.did. JP-2016152225-\$.did. US-9780419-\$.did. EP-1408575-\$.did. IN-201917003070-\$.did. EP-622862-\$.did. WO-2017057146-\$.did. JP-5691636-\$.did. KR-20070090850-\$.did. WO-2014034859-\$.did. EP-794587-\$.did. EP-84381-\$.did. JP-2016152224-\$.did. DE-102013219604-\$.did. CA-2199096-\$.did. IN-198823-\$.did. US-20010008723-\$.did. JP-2012190768-\$.did. JP-2004355977-\$.did. JP-6315198-\$.did. AU-701597-\$.did. WO-2015129200-\$.did. KR-20000019850-\$.did. RO-106045-\$.did. US-20030054245-\$.did. JP-3371713-\$.did. JP-6345116-\$.did. JP-2015092465-\$.did. US-20160268597-\$.did. US-7666310-\$.did. WO-2019158177-\$.did. WO-2014034857-\$.did. JP-2010086885-\$.did. DE-102012000914-\$.did. US-20050247914-\$.did. JP-6079651-\$.did. JP-H08279358-\$.did. KR-20020025480-\$.did. US-6329096-\$.did. JP-5647377-\$.did. US-20180323433-\$.did. CN-101944585-\$.did. WO-2015136722-\$.did. JP-6311877-\$.did. US-20020039686-\$.did. WO-2006088021-\$.did. EP-1168479-\$.did. KR-100880525-\$.did.	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
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		DE-102013011470-\$.did. DE-102018102026-\$.did. DE-102009027179-\$.did. EP-3517641-\$.did. DE-102013011470-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102012024876-\$.did. DE-4118001-\$.did. EP-2742559-\$.did. DE-102011110083-\$.did. DE-4424825-\$.did. DE-102011110083-\$.did. DE-102015206153-\$.did. AT-407753-\$.did. IN-285315-\$.did. US-20100162619-\$.did. CA-2710719-\$.did. AU-2007340905-\$.did. US-9512376-\$.did. DE-19547151-\$.did. US-6789757-\$.did. US-20030038197-\$.did. CA-2391865-\$.did. AU-2007340905-\$.did. WO-2002023651-\$.did. US-20170283725-\$.did. EP-1269554-\$.did. CA-2409218-\$.did. WO-2019015892-\$.did. EP-1269554-\$.did. CA-2730336-\$.did. US-20040028585-\$.did. EP-2741357-\$.did. CA-2710719-\$.did. CA-3031475-\$.did. TW-201728531-\$.did. CH-678131-\$.did. AU-2013201163-\$.did. US-6461766-\$.did. US-7192564-\$.did. DE-102008058444-\$.did. JP-H06338353-\$.did. DE-19518643-\$.did. JP-3240814-\$.did. WO-2001091210-\$.did. EP-1293003-\$.did. EP-1215023-\$.did. EP-1652253-\$.did. WO-2005015668-\$.did. WO-2008074352-\$.did. EP-2376597-\$.did. JP-3495707-\$.did. WO-2008081408-\$.did. EP-673075-\$.did. WO-2018218358-\$.did. CN-106684487-\$.did. DE-102011082187-\$.did. DE-202013010308-\$.did. WO-2008081407-\$.did. EP-2106435-\$.did. CA-3043947-\$.did. JP-H06338352-\$.did. CN-106684487-\$.did. WO-1994007277-\$.did. WO-2008081409-\$.did. WO-2008081410-\$.did. US-5352270-\$.did. EP-673075-\$.did. EP-1333523-\$.did. JP-3935594-\$.did. WO-2008119525-\$.did. US-5679477-\$.did. US-5612150-\$.did. JP-H11167936-\$.did. US-20150080630-\$.did. DE-10062947-\$.did. DE-10045241-\$.did. EP-3063811-\$.did. US-9450277-\$.did. JP-3079849-\$.did. JP-2013229326-\$.did. EP-1333522-\$.did. US-20170012328-\$.did. RO-106045-\$.did. DE-10021383-\$.did. EP-1333523-\$.did. WO-2015063007-\$.did. US-9620828-\$.did. US-8067107-\$.did. CN-105144464-\$.did. US-6223449-\$.did. US-20030180604-\$.did. DE-102008055508-\$.did. JP-6124001-\$.did. DE-19809400-\$.did. US-20050244704-\$.did. DE-10228471-\$.did. US-6524737-\$.did. DE-19547151-\$.did. US-7833646-\$.did. US-20170207504-\$.did.				
S81	500	S77 S78 S79 S80	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:08
S82	204	(vacuum WITH scrub\$4) SAME (fluorine fluoride carbonate)	US-PGPUB; USPAT; USOCR;	OR	ON	2019/09/05 11:14

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S83	204	(vacuum WITH scrub\$4) SAME (fluorine fluoride carbonate)S82 and (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:14
S84	9	S82 and (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:15
S85	111	(vacuum WITH scrub\$4) SAME (fluorine fluoride)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:28
S86	4	(vacuum WITH scrub\$4) SAME ((fluorine fluoride) AND carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 11:28
S87	2	wo-2013023640-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 16:16
S88	106	((sodium adj hydroxide) NaOH) WITH ((jet adj pump) ejector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 13:48
S89	23	(US-20190260101-\$ or US-20180301769-\$ or US-20180205122-\$ or US-20030186110-\$ or US-20070134546-\$ or US-20160251740-\$ or US-20160043450-\$ or US-20140290438-\$ or US-20100230518-\$ or US-20040113588-\$ or US-20030180604-\$ or US-20140003568-\$.did. or (US-9780419-\$ or US-6524737-\$ or US-5632863-\$.did. or (DE-4424825-\$ or CA-2311792-\$.did. or (WO-2010102377-\$ or DE-102011110083-\$ or WO-2013140039-\$ or CN-102496752-\$ or CN-101183740-\$ or EP-1333522-\$.did.	US-PGPUB; USPAT; FPRS; DERWENT	OR	ON	2019/09/07 13:50
S91	8	S89 and (fluor\$3)	US-PGPUB; USPAT;	OR	ON	2019/09/07 13:50

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S92	1	(carbonate WITH ((jet adj pump) ejector) SAME (fluorine fluoride)) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:24
S93	0	(base WITH ((jet adj pump) ejector) SAME (fluorine fluoride)) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:24
S94	0	((basic alka1in\$3) WITH ((jet adj pump) ejector) SAME (fluorine fluoride)) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:25
S95	18	((bas\$2 alka1in\$3) WITH ((jet adj pump) ejector) SAME (fluorine fluoride))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:25
S96	3	(carbonate WITH ((jet adj pump) ejector) SAME (fluorine fluoride))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/07 20:25
S97	2	"20070134546"	US-PGPUB; USPAT; USOCR	OR	ON	2019/09/08 12:20
S99	2	wo-2013023640-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/08 14:28

3/4/2020 9:54:26 PM
C:\Users\gswiatocha\Documents\EAST\Workspaces\15569484.wsp

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/569,484		Filing Date 10/26/2017		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED - PART I									
		(Column 1)	(Column 2)						
FOR		NUMBER FILED	NUMBER EXTRA		RATE (\$)		FEE (\$)		
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A		N/A				
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A	N/A		N/A				
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A		N/A				
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *		x \$80 =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *		x \$420 =					
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.					TOTAL				
APPLICATION AS AMENDED - PART II									
		(Column 1)		(Column 2)	(Column 3)				
AMENDMENT	01/10/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 21	Minus	** 20	= 1	x \$ 100 =		100	
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 3	= 2	x \$ 460 =		920	
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE		1020	
		(Column 1)		(Column 2)	(Column 3)				
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$ 0 =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$ 0 =			
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/ANGELONA D JONES/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

HANISCH et al.

Application No. 15/569,484

Filed October 26, 2017

Confirmation No. 9373

Group Art Unit 3725

Examiner Swiatocha

For METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR
RECHARGABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

**PETITION FOR EXTENSION OF TIME AND
AMENDMENT UNDER 37 C.F.R. § 1.111**

Sir:

Applicant hereby petitions for a one month extension of time. Commissioner is hereby authorized to charge Deposit Account No. 50-2041 for any deficiency in the petition fee required to gain entry and consideration of this amendment.

In response to the Office Action mailed September 10, 2019, Applicant respectfully requests entry of the following Amendment and reconsideration.

Amendments to the Specification: begin on page 2.

Amendments to the Abstract: begin on page 4.

Amendments to the Drawings: Replacement sheets for Figures 1-3 are attached hereto.

Amendments to the Claims: begin on page 5.

Remarks: begin on page 10.

Electronic Patent Application Fee Transmittal

Application Number:	15569484			
Filing Date:	26-Oct-2017			
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION			
First Named Inventor/Applicant Name:	Christian HANISCH			
Filer:	Timothy Bryce Miller			
Attorney Docket Number:	03101160US			
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1615	1	100	100
INDEPENDENT CLAIMS IN EXCESS OF 3	1614	2	460	920
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 1 month with \$0 paid	1251	1	200	200
Miscellaneous:				
Total in USD (\$)				1220

Electronic Acknowledgement Receipt

EFS ID:	38261423
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Timothy Bryce Miller
Filer Authorized By:	
Attorney Docket Number:	03101160US
Receipt Date:	10-JAN-2020
Filing Date:	26-OCT-2017
Time Stamp:	12:23:55
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1220
RAM confirmation Number	E202010C24193352
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2019-01-10_03101160US_res111.pdf	168313	yes	20
			de6fdc00a7931f651b89560c3b2518cf78e87ec87		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Drawings-only black and white line drawings		18	20	
	Applicant Arguments/Remarks Made in an Amendment		10	17	
	Claims		5	9	
	Abstract		4	4	
	Specification		2	3	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	34031	no	2
			d3365caa75150cd2f3a021caba758b3b5bcd03d6		
Warnings:					
Information:					
Total Files Size (in bytes):			202344		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

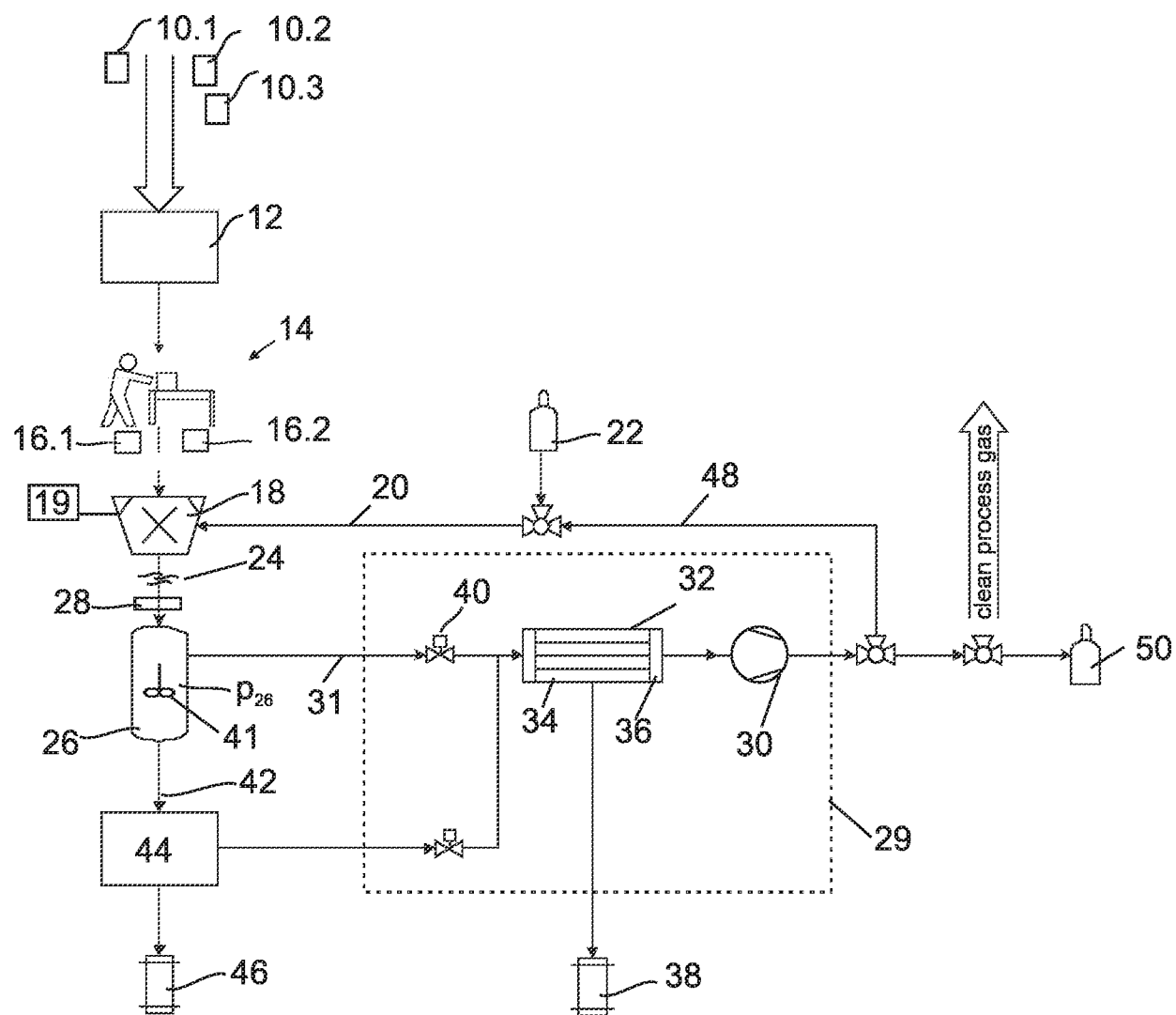
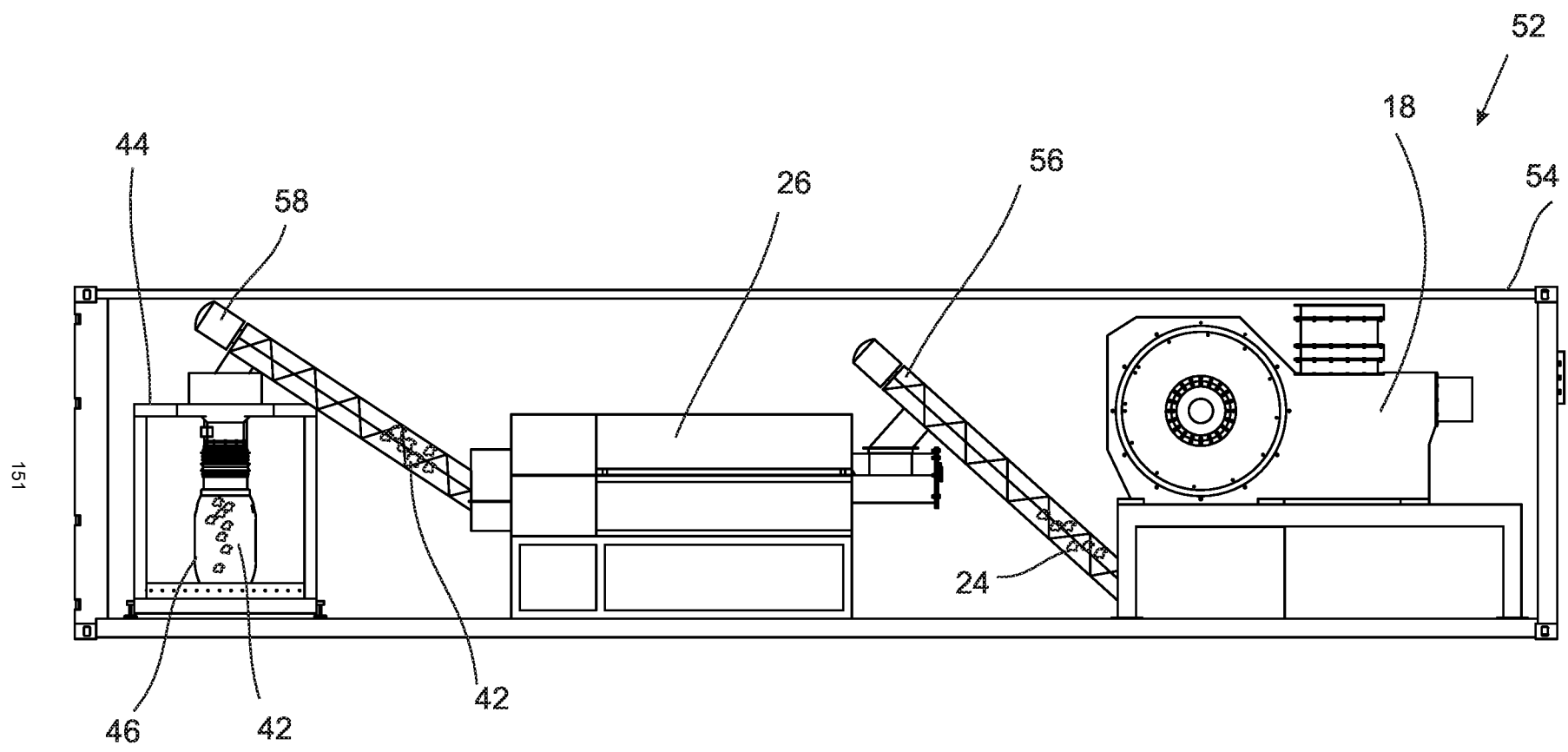


Fig. 1



REPLACEMENT SHEET

Fig. 2

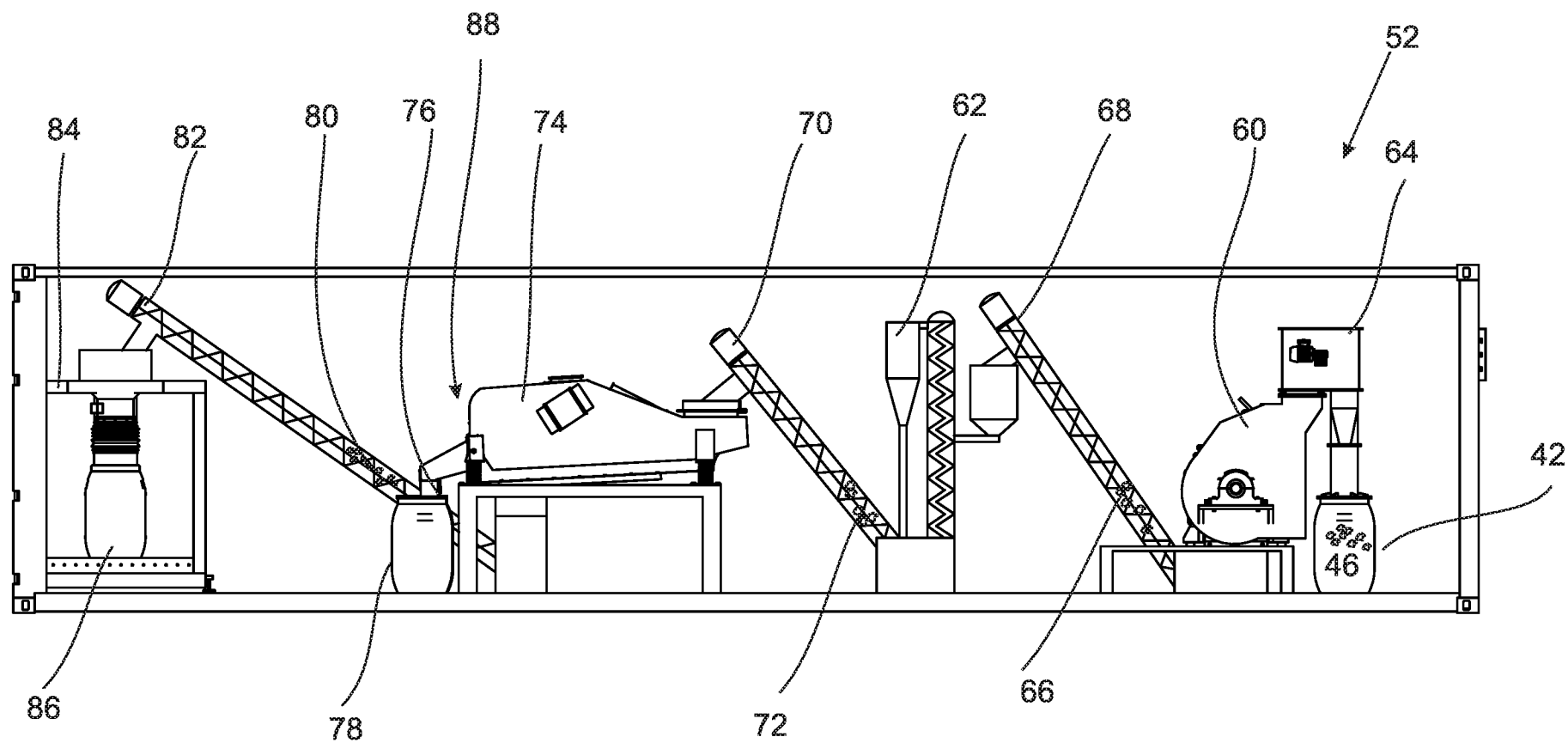


Fig. 3

REMARKS

Claims 1, 4, 5, 6, 7, 11, 12, 13, 15, and 20 are amended. Claim 21 is newly added (see, e.g., page 4 of the specification). Applicant respectfully requests reconsideration of the claims above in view of the remarks presented below.

Specification and Drawings

The drawings were objected to. Replacement sheets for Figures 1-3 are attached hereto. No new matter is introduced.

The abstract was objected to for containing language such as “invention”. The abstract is amended herein to comply with formalities.

The disclosure was objected to for its use of reference character “26” with two different nouns. The paragraph on page 13 lines 15-19 of the specification is amended herein to correct the typographical error.

Claim Objections

Claims 1, 5, 7, and 15 were objected to for various informalities. The examiner’s suggested changes on page 4 of the action have been adopted in the claim set above, obviating these objections.

The examiner also indicated a lack of clarity in grammatical structures in claims 1, 5, 6, and 11. These claims are amended herein to improve clarity.

35 U.S.C. 112(f)

Several claim terms which employ the noun “device” have been interpreted under 35 U.S.C. 112(f). Applicant respectfully traverses.

As the examiner indicates in the Action, “a claim limitation that **does not use the term “means” or “step”** will trigger the rebuttable **presumption** that 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. **112, sixth paragraph does not apply**” (see supporting case law cited in MPEP 2181, emphasis added). Thus, because the instant claims do not use “means plus function” formulations, presumptively 35 U.S.C. 112 should not apply. In addition, “The standard is whether the words of the claim are understood by persons of ordinary skill in the art to have a

sufficiently definite meaning as the name for structure." *Williamson*, 792 F.3d at 1349, 115 USPQ2d at 1111; see also *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583, 39 USPQ2d 1783, 1786 (Fed. Cir. 1996). Respectfully, applicant submits that the terms interpreted under 35 U.S.C. 112(f) by the examiner have sufficiently defined meaning to persons of ordinary skill in the art to be the names of structures.

What's more, the three-prong test for 112(f) (which the examiner cites on page 5 of the Action) *disfavors* interpretation of the claims under 112(f). Each of the three prongs (A), (B), and (C) must be satisfied before applying 112(f) to a claim term. Respectfully, prong (C) highlights that a supposedly generic placeholder “**modified by sufficient structure, material, or acts for performing the claimed function**” should NOT be interpreted under 112(f). In other words, sufficient specificity of what a “device” is configured or otherwise required to do places such “device” outside of 112(f) interpretation.

“an inactivation device” – Assuming even for the sake of argument that “inactivation device” ought to be interpreted under 112(f), the claims do in fact recite more structure for this device, namely a “drying device.”

“a drying device” – This term supplies sufficient structure and should not be interpreted under 112(f). “Dryer” and “drying device” are substantively identical terms, and “dryer” is widely used as the name of a non-generic structure and not merely a functional placeholder. Moreover, the application clearly supplies more than just “vacuum circulation system” as exemplary drying devices / dryers. Page 4 of the specification, for instance, gives ample description, including “vacuum drying, contact drying, convection drying and/or infra-red drying”. All of these terms imply adequate structure according to their plain meanings as understood to persons of ordinary skill in the art and bolster the presumption in favor of NOT applying 112(f). Even if 112(f) is nevertheless applied, “drying device” is not so limited as to encompass only “vacuum circulation system” and its equivalents, since the applicant's specification gives many further instances of drying device techniques besides “vacuum circulation”.

“a filling device” and “second filling device” – Here prong (C) of the 112(f) test supports the conclusion that a 112(f) interpretation should not be applied. Claim 7 does not merely recite “a filling device” but rather modifies “filling device” with the requirements that it be physically capable of *filling a transport container* and be able to handle *inactivated*

comminuted battery materials. These limitations supply the requisite “acts for performing the claimed function” under prong (C) of the 112(f) test to make 112(f) interpretation inapplicable.

“separation device” – The examiner has interpreted this to be an air jet sieving device or comminuting device. As clear from page 16 first paragraph of the specification, separation may be achieved by any sieve, not strictly air jet sieves. Moreover, claim 12 (where “separation device” appears) goes on to specifically modify the term “separation device” by requiring it be “configured to separately fill the active material fraction and the carrier fraction in respective containers.” Under prong (C) of the 112(f) test, these limitations supply the requisite modifying “acts for performing the claimed function” to render 112(f) inapplicable.

35 U.S.C. 112(b)

Claim 6 is rejected under 35 U.S.C. 112(b) for indefiniteness over “the drying” and “the drying process”. The redundancy has been eliminated by this amendment, obviating this rejection. Issue was also raised with respect to the phrase “the subsequent processing” in claim 6. This phrase has been removed.

35 U.S.C. 112(a)

Claim 13 is rejected under 35 U.S.C. 112(a) as failing the written description requirement. Claim 13 is amended for clarity, and applicant submits that amended claim 13 should obviate the rejection.

35 U.S.C. 103

Claims 1, 3, 5, 7, 12, 13, 16, and 17 are rejected under 35 U.S.C. 103 as being unpatentable over Stevens (US 8,210,456) in view of Kellermann (DE 4424825). This rejection is respectfully traversed.

Stevens describes a method of recycling sealed batteries involving heating as well as drawing air from a pre-shredder, shredder, oven conveyer, and a sieve using a vacuum source (see, e.g., column 2 lines 54-60).

Kellermann discloses inactivating batteries by deep freezing and then shredding them in a frozen state (cf. figure 1). Freezing requires a lot of energy. The shredded material undergoes a floating procedure (Flotation 19) that removes the organic compounds from the flotation liquid.

As the examiner acknowledges on page 10 of the action, Stevens fails to disclose “filling a transport container with the inactivated comminuted material” as recited in claim 1. Stevens also fails to disclose “inactivating the comminuted material...by drying...at a maximum pressure of 300 hPa” as recited in claim 1 as amended.

Stevens describes a rotary kiln in which the comminuted material is heated. Gases from the kiln are removed by suction. However, nothing in Stevens discloses anything close to or suggestive of drying at a maximum pressure of 300 hPa. The person skilled in the art learns from Stevens that lithium cells should be heated at an average temperature of approximately 148°C, with the resulting gases being sucked off. But, as the present inventors have found, this can lead to the formation of highly toxic organic fluorine compounds. Sucking off gases does not lead to a pressure below 300 hPa. As best understood from Stevens disclosure, Stevens’ air uptakes 13, 15, 21, and 51, described at column 2 lines 54-60, are not so different from range hoods, such as used for stove tops in many kitchens. They “draw air” as expressly stated at column 2 line 59, but drawing air does not itself result in a pressure drop from ambient anywhere near to the 300 hPa threshold now recited in claim 1. Moreover, since the oven of Stevens has no airlock, no vacuum can form in any case. Simply put, a pressure of 300 hPa cannot be achieved with suction devices disclosed or suggested by Stevens.

Kellermann does not cure Stevens’ deficiency in respect to the drying and pressure requirements of amended claim 1. As a general matter, Kellermann voices low concern for gases and vapors from the recycled batteries, indicating that very little harmful gases and vapors are generated as a result of a deep freeze approach. Some gases are moved from one location to another by pumps (8 and 16 for example) but in no instance does Kellerman disclose or suggest pumping gases from a container of such design as to actually create an appreciable pressure drop from ambient pressures. Moreover, Kellermann does not employ inactivation by drying, using instead inactivation by freezing, making Kellermann that much further unlike amended claim 1 which recites “inactivating the comminuted material...by drying...at a maximum pressure of 300 hPa”.

Further distinguishing Kellermann, claim 1 provides for safe and effective battery recycling and removing the electrolyte without the need for expensive liquid nitrogen. By contrast, in Kellermann, the electrolyte comes into contact with the floating liquid and is disposed of as exhaust gases in device 23.

In sum, Stevens does not describe the element that the drying takes place at a pressure of at most 300 hPa and that this is carried out in such a way that the comminuted material is filled into a transport container. These distinguishing features have the technical effect that the comminuted material can be safely inactivated and transported to a central processing unit and the electrolyte recycled. Kellermann teaches a different approach, i.e. inactivation by liquid nitrogen, that cannot be combined with Stevens. Kellermann, like Stevens, does not disclose a pressure of less than 300 hPa. A combination of Stevens and Kellermann would inherit their mutual deficiencies. Any of the references or any purported combination thereof would fail to arrive at a method for the treatment of used batteries as recited in claim 1, especially “inactivating the comminuted material...by drying...at a maximum pressure of 300 hPa” as recited in claim 1 as amended.

Independent claim 7 is also distinguished from Stevens, Kellermann, and their purported combination. Amended claim 7 positively recites a battery processing installation having “a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device.” As mentioned above, the apparatuses of Stevens and Kellermann are not designed to be capable of generating anything that might qualify as a “vacuum” according to the ordinary meaning of that word. A pump that draws air may cause displacement of air but does not alone produce anything that may be qualify as a “vacuum.” To use the same analogy as above, the references disclose apparatuses for drawing off air which may be compared to a stove range hood in most kitchens. It should be readily apparent to any range hood user that a “vacuum” is not generated nor generatable over the stove burners with such a configuration. Claim 7 is new and non-obvious over the references of record and their purported combination on at least this basis.

Claims 2, 6, and 8 are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Sloop (US 2003/0186110). This rejection is respectfully traversed.

Sloop uses yet another method to remove the electrolyte from batteries, i.e. using supercritical CO₂. Supercritical CO₂ requires a pressure of more than 73,75 bar (1060 psi). Thus Sloop’s teaching contradicts claim 1’s recitation of “inactivating the comminuted material...by drying...at a maximum pressure of 300 hPa”. Sloop thus cannot cure the deficiencies of Stevens

and Kellermann discussed above. As claims 2, 6, and 8 all depend from claim 1, they are new and nonobvious over any combination of the cited references for at least the same reasons as claim 1.

Claim 9 is rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Meador (US 5,632,863). This rejection is respectfully traversed.

Meador discloses a battery reclamation system and method which centers around pyrolysis, in particular decomposition temperatures between 350° and 650° F (see, e.g., Abstract). “Drying” and “drying device” as described in the disclosure at, e.g., page 4 of the specification, is distinguished from Meador’s furnace 17. Accordingly, Meador fails to even have a “drying device” much less a “comminution unit and...drying device [that] are arranged in a container” as recited in claim 9.

Claims 14 and 18 have been rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Hanisch et al., herein “Hanisch,” (WO 2013/023640), to which the examiner references using corresponding U.S. Patent No. 9,780,419. This rejection is respectfully traversed.

Like Meador, Hanisch involves heating to extremely high decomposition temperatures. In Hanisch’s case, the desired temperatures are 350 to 800°C. A combination of Stevens, Kellermann, and Hanisch fails to arrive at the subject matter of the claims as amended herein. Claims 14 and 18 are new and nonobvious for at least the same reasons discussed above in respect of the independent claims from which they depend.

Claims 15 and 19 have been rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Sloop (US 2016/0043450), herein “Sloop2”. This rejection is respectfully traversed. Sloop2 describes a method of battery recycling which does not include or suggest “inactivating the comminuted material...by drying...at a maximum pressure of 300 hPa” as recited in claim 1 or “a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device” as recited in claim 7. Claims 15 and 19, which depend from these independent claims, are new and nonobvious on at least this basis.

New claim 21 is added and recites “The method according to claim 1 wherein drying occurs at a temperature of less than 80°C.”

Stevens discloses in col. 5, lines 28-30 that the temperature should be below 454 ° F (234°C), but does not disclose that high temperatures can lead to the formation of highly toxic fluorine compounds and does not say that low temperatures could be beneficial. On the contrary, the person skilled in the art knows that high temperatures accelerate drying. The person skilled in the art will therefore choose a temperature which is as high as possible but below 234 ° C. In col. 4, lines 10-12 300° F (148° C) are referred to as "low temperature" and in col. 5, line 44 Stevens teaches that a "mid temperature" should be used for lithium batteries, i.e. a temperature higher than 148° C. Accordingly, Stevens does not disclose (and in fact teaches away from) claim 21 herein.

Kellermann uses ultra-low temperatures in order to inactivate the batteries, but does not dry them, cf. 5th para. “because the residual energy capacity of the batteries by their freezing before crushing is not or substantially no longer a chemical and physical reaction in air capable under normal pressure and temperature conditions when the protective metal casing of the batteries has been opened or removed”. Thus, Kellerman disclose an altogether different approach from what is claimed herein. Kellermann (inactivation by freezing and electrolyte removal by flotation) is incompatible with Stevens (inactivation by heating). The references, alone or in combination, would not lead one of ordinary skill in the art to claim 1 or claim 21.

Allowable Subject Matter

Applicant acknowledges with appreciation indication of claims 4, 11, and 20 as being drawn to allowable subject matter. Each of these claims has been rewritten in independent form by this amendment, placing them in condition for allowance.

Conclusion

In view of the foregoing, it is respectfully requested that the application be reconsidered, that claims 1-9 and 11-21 be allowed, and that the application be passed to issue.

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather,

any alterations or characterizations are being made to facilitate expeditious prosecution of the application. Applicant reserves the right to pursue at a later time any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution.

Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic, WebEx, or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,

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Listing of the Claims:

The following is a complete listing of all the claims in the application, with an indication of the status of each:

1. (currently amended) 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; 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. (previously presented) 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.

3. (previously presented) The method according to claim 1, wherein the drying occurs under vacuum.

4. (currently amended) ~~The~~ A method for the treatment of used batteries, comprising the steps: according to claim 3,

- (a) comminuting the batteries such that comminuted material is obtained;
- (b) inactivating the comminuted material such that an inactivated comminuted material is obtained; and
- (c) filling a transport container with the inactivated comminuted material;
wherein the inactivating step is performed by drying the comminuted material,
wherein the drying occurs under vacuum,
wherein the vacuum is created by means of a jet pump, and
wherein a pump liquid of the jet pump has at least one of
a pH value of at least 8, and
~~contains~~ a substance that precipitates fluoride.

5. (currently amended) The method according to claim 1, further comprising the steps of:

~~removing removal of the comminuted material from the transport container; and,~~

one or more of

~~detaching detachment of hard parts, and~~

~~separating separation of active material from a carrier, such that an active material fraction and a carrier fraction-(80) are obtained, and~~

~~separately separate packing of the active material fraction and carrier fraction in respective further transport containers.~~

6. (currently amended) 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;

~~after the completion of the drying process, no flammable or explosive gas mixture is formable can form above the comminuted material in the transport container, and and/or if~~

~~the comminuted material is so dry that no flammable or explosive gas mixture is able to emerge can emerge in the transport container or during the subsequent processing.~~

7. (currently amended) A battery processing installation for treatment of used batteries, comprising:

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

(b) an inactivation device comprising a drying device configured to inactivate for inactivating the comminuted material; ~~and~~

(c) a filling device ~~for filling~~ 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.

wherein

~~the inactivation device comprises a drying device, and~~

~~the battery processing installation has a vacuum installation that is connected to the drying device for generating a vacuum in the drying device.~~

8. (previously presented) The battery processing installation according to claim 7, 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.

9. (previously presented) The battery processing installation according to claim 7, wherein the comminution unit and the drying device are arranged in a container.

10. (canceled)

11. (currently amended) ~~The A~~ battery processing installation for treatment of used batteries, comprising: according to claim 7, wherein

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

(b) an inactivation device configured to inactivate the comminuted material, wherein the inactivation device comprises a drying device;

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

(d) a vacuum installation that is connected to the drying device and configured to generate a vacuum in the drying device;

wherein

[[-]] the vacuum installation has a jet pump with a pump liquid, ~~and wherein~~

[[-]] the pump liquid is conducted within a circuit, and

[[-]] the pump liquid contains a substance that reacts with hydrogen fluoride.

12. (currently amended) The battery processing installation according to claim 7 further comprising:

[[-]] a hard metal detachment device and/or a light fraction detachment device;

[[-]] a separation device configured to separate ~~for separating~~ active material from a carrier such that an active material fraction and a carrier fraction occur; and

[[-]] a second filling device configured to separately fill ~~for separate filling of~~ the active material fraction and the carrier fraction in respective containers.

13. (currently amended) The battery processing installation of claim 12 wherein ~~the active material fraction and the carrier fraction are respectively~~ aluminum and copper foils.

14. (previously presented) The battery processing installation of claim 12, wherein the separation device is an air jet sieving device.

15. (currently amended) The battery processing installation of claim 12 wherein the separation device is a second comminution device, ~~stage~~.

16. (previously presented) The battery processing installation of claim 7 wherein the batteries are lithium batteries.

17. (previously presented) The method according to claim 1 wherein the batteries are lithium batteries.

18. (previously presented) The method according to claim 5 wherein separation of the active material from the carrier is performed by air jet sieving.

19. (previously presented) The method according to claim 5 wherein separation of the active material from the carrier is performed using a second comminution stage.

20. (currently amended) ~~The method according to claim 4~~ 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, and
- (c) filling a transport container with the inactivated comminuted material,
wherein the inactivating step is performed by drying the comminuted material,
wherein the drying occurs under vacuum,
wherein the vacuum is created by means of a jet pump, and

wherein a pump liquid of the jet pump has a ~~the~~ pH value ~~is~~ of at least 9.

21. (new) The method according to claim 1 wherein drying occurs at a temperature of less than 80°C.

Amendments to the Abstract:

Please amend the abstract as follows:

~~The invention relates to a~~ A method is described for the treatment of used batteries ~~(10)~~, in particular lithium batteries, containing the steps: comminuting the batteries ~~(10)~~ such that comminuted material ~~(24)~~ is obtained, inactivating the comminuted material ~~(24)~~ such that inactivated comminuted material ~~(42)~~ is obtained, and filling a transport container ~~(46)~~ with the inactivated comminuted material ~~(42)~~. ~~It is provided according to the invention that the~~ The inactivation is performed by drying the comminuted material ~~(24)~~ and the comminuted material ~~(24)~~ is dried until an electrolyte content is so low that an electrochemical reaction is not possible.

Amendments to the Specification:

Please amend the specification as follows:

Insert the following header at page 1 line 3:

FIELD OF THE INVENTION

Insert the following header at page 1 line 17:

BACKGROUND

Amend the paragraph at page 1 lines 24-31 as follows:

DE 10 2012 024 876 A1 describes a system for transferring transport-critical electrolyte cells, in which they are initially comminuted under inert gas and then dusted with a deactivation powder so as to prevent the electrochemically active material from spontaneously combusting. The disadvantage of this is that the resulting material still poses a comparatively high hazard potential and that the dusting ~~power~~powder itself poses a risk of explosion and that the formation of a flammable and explosive atmosphere in the transport container cannot be ruled out.

Insert the following header at page 2 line 6:

SUMMARY

Insert the following header at page 12 line 17:

BRIEF DESCRIPTION OF THE DRAWINGS

Insert the following header at page 12 line 28:

DETAILED DESCRIPTION

Amend the paragraph on page 13 lines 9-13 as follows:

The comminution unit 18 comminutes the batteries 10 under shielding gas 20, which is extracted, for example, from a shielding gas cylinder 22. Alternatively or additionally, liquid nitrogen from a liquid nitrogen source 19 may be ~~may be~~ injected. The shielding gas may refer, for example, to nitrogen, a noble gas, carbon dioxide, nitrous oxide or another gas which is preferably not toxic.

Amend the paragraph on page 13 lines 15-19 as follows:

Comminuted material 24 is produced during the comminuting; the material is fed into an inactivation device in the form of a drying device 26. An airlock 28 is arranged between the comminution unit 18 and the drying device 26, the airlock being so gas-tight that the drying ~~pressure~~ device 26 is - to a good approximation - separated from the comminution unit 18 so as to be gas-tight.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15569484
	Filing Date		2017-10-26
	First Named Inventor	Christian HANISCH	
	Art Unit		
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	3	102496752	CN	A	2012-06-13	CHINA NAT OFFSHORE OIL CORP ET AL.		×

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STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
Examiner Name	
Attorney Docket Number	03101160US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2019-09-12
Name/Print	Michael E. Whitham	Registration Number	32635

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	37175718
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	03101160US_IDS3.pdf	1034146	no	4
			9e07e44637be547110edbaa1e1df9db1586e9e51		

Warnings:

173

Information:					
2	Foreign Reference	WO2010102377.pdf	793526	no	21
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3	Foreign Reference	CN103959553A.pdf	1132533	no	11
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4	Foreign Reference	CN102496752A.pdf	317330	no	6
			7b08b96d10c8c57a97828fa1e09dfbf9a641693		
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Information:					
5	Foreign Reference	CN102496752A-eng.pdf	68208	no	1
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Continuation of Attachment(s) 4) Other: DE 4424825 and Machine Translation; WO 2013/023640 and Machine Translation

DETAILED ACTION

Notice of Pre-AIA or AIA Status

- 1) The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.
- 2) In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.
- 3) This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

Priority

- 4) Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d).
- 5) Receipt is acknowledged of certified copies of papers required by 37 CFR 1.55.

Information Disclosure Statement

- 6) The information disclosure statements (IDS) are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Drawings

- 7) The drawings are objected to because of the following formalities:
 - The text and lines of the drawings is unclear

8) Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

9) Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words in length. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc. In addition, the form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided.

10) The abstract of the disclosure is objected to because of the following informalities:

- The abstract uses phrases which can be implied - "The invention relates to" (line 1)

- 11) Correction is required. See MPEP § 608.01(b).
- 12) The disclosure is objected to because of the following informalities:
- Reference character “26” has been used to designate both a “drying device” (Page 13, line 16) and a “pressure device” (Page 13, line 18).

Appropriate correction is required.

Claim Objections

- 13) Claims 1, 5, 7, and 15 are objected to because of the following informalities:

Claim 1 -

- “material.” (line 9). Examiner suggests, “material;”

Claim 5 -

- “in transport containers” (line 13). Examiner suggests, “in respective further containers”

Claim 7 -

- “with inactivated comminuted material” (line 9). Examiner suggests, “with the inactivated comminuted material”

Claim 15 -

- “a second comminution stage” (line 2). Examiner suggests, “a second comminution device”

Examiner notes that claims have not been submitted in a clear format. Therefore, there grammatical structures such as periods and commas are unclear as found in at least Claims 1, 5, 6, and 11.

Appropriate correction is required.

Claim Interpretation

- 14) The following is a quotation of 35 U.S.C. 112(f):

(f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts

in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

15) The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

- (A) the claim limitation uses the term “means” or “step” or a term used as a substitute for “means” that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function;
- (B) the term “means” or “step” or the generic placeholder is modified by functional language, typically, but not always linked by the transition word “for” (e.g., “means for”) or another linking word or phrase, such as “configured to” or “so that”; and
- (C) the term “means” or “step” or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word “means” (or “step”) in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C.

112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word “means” (or “step”) in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word “means” (or “step”) are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this application that do not use the word “means” (or “step”) are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

16) This application includes one or more claim limitations that do not use the word “means,” but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are: **“an inactivation device” (Claim 7, line 6); “a filling device” (Claim 7, line 8); “a drying device” (Claim 7, line 11); “a hard metal detachment device and/or light fraction detachment device” (Claim 12, line 3); “a separation device” (Claim 12, line 5); and “a second filling device” (Claim 12, line 10).**

Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, it/they is/are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof. **The following appears to be the corresponding structure as disclosed:**

Inactivation device - vacuum circulation system

Filling device - a platform or frame (Fig. 2)

Drying device - vacuum circulation system

Hard metal detachment device - magnet or other separator

Light fraction detachment device - zigzag separator or air separator

Separation device - air jet sieving device or comminuting device

Second filling device - a platform or frame (Fig. 2)

If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

Claim Rejections - 35 USC § 112

- 17) The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

- 18) Claim 6 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

19) Regarding Claim 6, the recitation of “the drying” (line 3) and “the drying process” (line 4) renders the claim indefinite. Claim 6 appears to be claiming that drying is completed after drying is completed. Therefore the phrase, “after the completion of the drying process” appears redundant.

20) Claim 6 recites the limitation “the subsequent processing” in line 8 of the claim. There is insufficient antecedent basis for this limitation in the claim. It is unclear what subsequent processing is being recited.

Claim Rejections - 35 USC § 112

21) The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

(a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

22) Claim 13 is rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention. **Regarding Claim 13, the Specification does not disclose that the active material fraction and the carrier fraction are aluminum and copper foils, respectively. Rather, Page 16 of the Specification discloses “a heavy material fraction with carrier foils (aluminum and copper).” Further Page 9 of the Specification discloses that, “The active material should be understood to mean the material that reacts electrochemically during operation of the batteries. The**

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carrier for the active material should be understood particularly to mean a carrier foil to which the active material is applied in the form of particles. For example, the carrier foil refers to a foil made of aluminium or an aluminium alloy.”

Claim Rejections - 35 USC § 103

23) The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

24) The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

25) **Claims 1, 3, 5, 7, 12, 13, 16, and 17 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens (U.S. 8,210,456) in view of Kellermann (DE 4424825).**

26) Regarding Claim 1, Stevens discloses a method for the treatment of used batteries, comprising the steps:

(a) comminuting the batteries such that comminuted material is obtained (Lithium batteries are shredded: Col 5, L16-17),

(b) inactivating the comminuted material such that an inactivated comminuted material is obtained

(Oven conveyor Fig. 3, #20 & Dried material: Col 1, L37 & VOCs: Col 5, L15);

wherein the inactivating step is performed by drying the comminuted material (Dried material: Col 1, L37). Stevens is not explicit to filling a transport container with the inactivated comminuted material.

Kellermann teaches a method for the disposal of lithium batteries including filling a transport container with the inactivated comminuted material (The fractional fractions of the crushed batteries are collected in collection vessels: Page 2) in order to further process the batteries. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to collect the inactivated comminuted material of Stevens in a transport container, as taught by Kellermann, in order to further process the batteries.

27) Regarding Claim 3, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses wherein the drying occurs under vacuum (Air uptake: Fig. 4, #21 & Vacuum source: Fig. 4, #44).

28) Regarding Claim 5, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses one or more of detachment of hard parts (magnetic component separated by the magnetic wheel: Col 5, L35), and separation of active material from a carrier, such that an active material fraction and a carrier fraction are obtained (The specific gravity separator separates out nonferrous fluff encapsulated with this magnetic component and also separates the steel, magnetic alloys, aluminum, and copper from each other: Col 5, L38-41). Kellermann further teaches removal of the comminuted material from the transport container (The fractional fractions of the crushed batteries are collected in collection vessels and sent to a pool of a flotation station where a first separation treatment of fractions takes place: Page 2. Examiner notes that the comminuted material would be removed from the collection vessels in order to be put into the separation pool) and separate packing of the active material fraction and carrier fraction in transport

containers (Dried parts are fed in a container: Page 3 & The iron component are deposited: Page 3 & The non-ferrous components are deposited: Page 3).

29) Regarding Claim 7, Stevens discloses (a) a comminution unit for comminuting the batteries such that comminuted material is obtained (Shredder: Fig. 3, #14),

(b) an inactivation device for inactivating the comminuted material (Oven conveyor Fig. 3, #20 & Dried material: Col 1, L37 & VOCs: Col 5, L15) wherein

the inactivation device comprises a drying device (Oven conveyor Fig. 3, #20 & Dried material: Col 1, L37), and

the battery processing installation has a vacuum installation that is connected to the drying device for generating a vacuum in the drying device (Air uptake: Fig. 4, #21 & Vacuum source: Fig. 4, #44). Stevens is not explicit to a filling device for filling a transport container with inactivated comminuted material.

Kellermann teaches a device for the disposal of lithium batteries including a filling device for filling a transport container with inactivated comminuted material (Collection vessels: Fig. 1, #18. Examiner notes that the filling vessels are located along the process path or within the shredder device and therefor would include a filling device or frame where the collection vessels would be filled) in order to further process the batteries. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to collect the inactivated comminuted material of Stevens in a transport container with a filling device, as taught by Kellermann, in order to further process the batteries.

30) Regarding Claim 12, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses a hard metal detachment device (Magnetic wheel: Fig. 3, #52) and/or a light fraction detachment device, a separation device, for separating active material from a carrier such that an active material fraction and a carrier fraction occur (Specific gravity separator: Fig. 3, #68). Kellermann further teaches a second

filling device for separate filling of the active material fraction and the carrier fraction (Dried parts are fed in a container: Page 3 & The iron component are deposited: Page 3 & The non-ferrous components are deposited: Page 3. Examiner notes that depositing of the material would occur with a filling device.).

31) Regarding Claim 13, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Steven further discloses wherein the active material fraction and the carrier fraction are respectively aluminum and copper foils (Aluminum and copper: Col 5, L36-37).

32) Regarding Claim 16, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses wherein the batteries are lithium batteries (Lithium battery: Col 5, L5).

33) Regarding Claim 17, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses wherein the batteries are lithium batteries (Lithium battery: Col 5, L5).

34) **Claims 2, 6, and 8 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Sloop (U.S. 2003/0186110).**

35) Regarding Claim 2, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses that VOCs are removed from the dried material (Col 5, L19), but is not explicit to wherein the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.

Sloop teaches the recycling of lithium batteries including wherein the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible (Dry, non-flammable, minimally reactive form: Par. 0042) as a known result of drying the batteries to remove the electrolyte. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention that the dried batteries of Stevens would be such that an electrolyte content in the comminuted material is so low that an electrochemical

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reaction is impossible, as taught by Sloop, as a known result of drying the batteries to remove the electrolyte.

36) Regarding Claim 6, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses that VOCs are removed from the dried material (Col 5, L19), but is not explicit to wherein the drying of the comminuted material is only completed if, after the completion of the drying process, no flammable or explosive gas mixture can form above the comminuted material in the transport container and/or if the comminuted material is so dry that no flammable or explosive gas mixture can emerge in the transport container or during the subsequent processing.

Sloop teaches the recycling of lithium batteries including wherein the drying of the comminuted material is only completed if, after the completion of the drying process, no flammable or explosive gas mixture can form above the comminuted material in the transport container and/or if the comminuted material is so dry that no flammable or explosive gas mixture can emerge in the transport container or during the subsequent processing (Dry, non-flammable, minimally reactive form: Par. 0042. Examiner notes that if the dried material is non-flammable and minimally reactive, no flammable or explosive gas would emerge) as a known result of drying the batteries to remove the electrolyte. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention that the dried batteries of Stevens would be such that no flammable or explosive gas mixture can form above the comminuted material in the transport container and/or if the comminuted material is so dry that no flammable or explosive gas mixture can emerge in the transport container or during the subsequent processing, as taught by Sloop, as a known result of drying the batteries to remove the electrolyte.

37) Regarding Claim 8, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. Stevens further discloses that VOCs are removed from the dried

material (Col 5, L19), but is not explicit to 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.

Sloop teaches the recycling of lithium batteries including 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 (After the electrolyte is removed . . . Dry, non-flammable, minimally reactive form: Par. 0042) as a known result of drying the batteries to remove the electrolyte. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention that the dried batteries of Stevens would be such that an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible, as taught by Sloop, as a known result of drying the batteries to remove the electrolyte.

38) **Claim 9 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Meador (U.S. 5,632,863).**

39) Regarding Claim 9, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. The combination of Steven and Kellerman do not teach wherein the comminution device and the drying device are arranged in a container.

Meador teaches a battery recycling process wherein the comminution device (27) and the drying device (17) are arranged in a container (See frame of device & Col 4, L36-53) in order to prevent oxygen from entering the device which could cause an explosion hazard. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to arrange the comminution device and drying device of Stevens in a container, as taught by Meador, in order to prevent oxygen from entering the device (Meador: Col 4, L52).

40) **Claims 14 and 18 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Hanisch et al., hereinafter Hanisch, (WO 2013/023640). Note that citations for Hanisch are taken from corresponding U.S. Patent No. 9,780,419.**

41) Regarding Claim 14, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. The combination of Steven and Kellerman do not teach wherein the separation device is an air jet sieving device.

Hanisch teaches a separation device for an active material and a carrier wherein the separation device is an air jet sieving device (Air jet sieve: Fig. 1, #50) in order to separate materials with a high degree of purity. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the specific gravity separator of Stevens with the air jet sieve of Hanisch in order to separate materials with a high degree of purity (Hanisch: Col 2, L6).

42) Regarding Claim 18, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. The combination of Steven and Kellerman do not teach wherein separation of the active material from the carrier is performed by air jet sieving.

Hanisch teaches a separation device for an active material and a carrier wherein separation of the active material from the carrier is performed by air jet sieving (Air jet sieve: Fig. 1, #50) in order to separate materials with a high degree of purity. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the specific gravity separator of Stevens with the air jet sieve of Hanisch in order to separate materials with a high degree of purity (Hanisch: Col 2, L6).

43) **Claims 15 and 19 is/are rejected under 35 U.S.C. 103 as being unpatentable over Stevens in view of Kellermann and Sloop (U.S. 2016/0043450).**

44) Regarding Claim 15, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. The combination of Steven and Kellerman do not teach wherein the separation device is a second comminution stage.

Sloop teaches a device for the recycling of lithium batteries including a comminuting stage (14), drying stage (20), and separating stage (22, 24) wherein the separation device is a second comminution stage (Grinding step: Par. 0019) in order to improve yield in subsequent sieving. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the specific gravity separator of Stevens with the grinder of Sloop in order to improve yield in subsequent sieving (Sloop: Par. 0019).

45) Regarding Claim 19, the combination of Stevens and Kellermann teach all elements of the claimed invention as stated above. The combination of Steven and Kellerman do not teach wherein separation of the active material from the carrier is performed using a second comminution stage.

Sloop teaches a device for the recycling of lithium batteries including a comminuting stage (14), drying stage (20), and separating stage (22, 24) wherein separation of the active material from the carrier (24) is performed using a second comminution stage (Grinding step: Par. 0019) in order to improve yield in subsequent sieving. Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to replace the specific gravity separator of Stevens with the grinder of Sloop in order to improve yield in subsequent sieving (Sloop: Par. 0019).

Allowable Subject Matter

46) Claims 4, 11, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

47) The following is a statement of reasons for the indication of allowable subject matter:

48) Regarding Claims 4 and 11, it is the opinion of the Examiner that the art of record neither anticipates nor renders obvious wherein *“a pump liquid of the jet pump has at least one of a pH value of at least 8, and contains a substance that precipitates fluoride” or “wherein the pump liquid is conducted within a circuit and the pump liquid contains a substance that reacts with hydrogen fluoride”* in combination with the rest of the claimed limitations set forth in the dependent claim. Searching by the Examiner yielded prior art as cited below:

49) Stevens discloses the removal of an electrolyte including lithium from the recycled battery using a vacuum system, scrubber, and an atomizer using a 50% concentration of sodium hydroxide in water, and this discloses a liquid with a pH of at least 9. Sodium hydroxide is also known to react with hydrogen fluoride to precipitate fluoride. However, the electrolyte disclosed by Stevens is lithium perchlorate in propylene carbonate and dimethoxyethane. While, **Tanii et al. (U.S. 6,524,737)** discloses the recycling of lithium batteries containing lithium phosphohexafluoride as the electrolyte, and thus the electrolyte of Stevens could be replaced with lithium phosphohexafluoride, the fluoride compounds are treated in a wastewater tank instead of with a jet pump. Further, while the use of jet pumps containing alkaline liquids such as sodium hydroxide is known from **Eckardt et al. (U.S. 2014/0003568)** such a use is not disclosed for the recycling of a lithium electrolyte battery.

50) Therefore, Stevens, Tanii, and Eckardt alone, or in combination with any other prior art, do not anticipate or render obvious the claimed invention.

Conclusion

51) The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Hashimoto (U.S. 2007/0134546).

52) Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY D. SWIATOCHA whose telephone number is (571)272-7022. The examiner can normally be reached on Monday-Friday (9-5).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shelley Self can be reached on (571) 272-4524. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/GREGORY D SWIATOCHA/
Primary Examiner, Art Unit 3725

<i>Notice of References Cited</i>	Application/Control No. 15/569,484		Applicant(s)/Patent Under Reexamination HANISCH et al.	
	Examiner GREGORY D SWIATOCHA		Art Unit 3725	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-8210456-B2	07-2012	Stevens; Wayne C.	B03B9/061	241/19
*	B	US-9780419-B2	10-2017	Hanisch; Christian	H01M10/54	1/1
*	C	US-20030186110-A1	10-2003	Sloop, Steven E.	H01G9/038	429/49
*	D	US-20070134546-A1	06-2007	Hashimoto; Zenzo	C22B7/005	429/49
*	E	US-20160043450-A1	02-2016	Sloop; Steven E.	C01G53/50	252/182.1
*	F	US-5632863-A	05-1997	Meador; W. R.	C10B47/44	201/25
*	G	US-6524737-B1	02-2003	Tanii; Tadaaki	C22B7/005	429/49
*	H	US-20140003568-A1	01-2014	Eckardt; Bernd	B01D47/10	376/283
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	DE-4424825-A1	01-1996	DE	KELLERMANN THAMMO	B03B9/061
	O	WO-2013023640-A1	02-2013	WO	KWADE ARNO	H01M10/54
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Machine Translation of DE 4424825, Translated 9/5/2019, 3 Pages. (Year: 1996)
	V	Machine Translation of WO 2013/023640, Translated 9/5/2019, 5 Pages (Year: 2013)
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Search Notes</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCHA	Art Unit 3725

CPC - Searched*		
Symbol	Date	Examiner
Y02W30/84	09/04/2019	G.S.
Y02P10/212	09/04/2019	G.S.
B02C23/08, 10	09/04/2019	G.S.
B09B3/008, 0058	09/04/2019	G.S.
B01D53/05, 002; 11/00; 2253/102	09/04/2019	G.S.

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/GREGORY D SWIATOCHA/ Primary Examiner, Art Unit 3725	
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<i>Search Notes</i> 	Application/Control No. 15/569,484	Applicant(s)/Patent Under Reexamination HANISCH et al.
	Examiner GREGORY D SWIATOCCHA	Art Unit 3725

Search Notes		
Search Notes	Date	Examiner
EAST Inventor search, Assignee search, CPC search, Text search, Combination class../text search	09/04/2019	G.S.
Espacenet search	09/04/2019	G.S.
IP.com search	09/04/2019	G.S.
NPL Search	09/04/2019	G.S.
Y02W30/84 (See search history printout)	09/04/2019	G.S.
Y02P10/212 (See search history printout)	09/04/2019	G.S.
B02C23/08, 10 (See search history printout)	09/04/2019	G.S.
B09B3/008, 0058 (See search history printout)	09/04/2019	G.S.
B01D53/05, 002; 11/00; 2253/102 (See search history printout)	09/04/2019	G.S.

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

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Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
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	1	2010/149611	WO	A1	2010-12-29	SB LIMOTIVE COMPANY LTD.		×
	2	20060101683	KR		2005-03-21			☒
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Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
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Attorney Docket Number	03101160US

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	HOGELKE: "Infinite Power Solutions stellt papierdunnen Akku vor", "(Infinite Power Solution presents paper thin Battery)", 2012-06-06	×
	2	VDMA-Norm 24351 Trocknungstechnik (VDMA-German Engineering Federation, VDMA Standard 24351 - Drying Technology - Basic terms and definitions), 1999-01	□
	3	HERAUSGEBER: "Flork/Wolff-Kursthemien-Chemis- Allgemeine und Physikalische Chemie", "(Course Issues Chemisty- General and Physical Chemistry)", 1985	×

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EXAMINER SIGNATURE

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Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
Examiner Name	
Attorney Docket Number	03101160US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2019-04-18
Name/Print	Michael E. Whitham	Registration Number	32635

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⑫ **Offenlegungsschrift**
⑩ **DE 44 24 825 A 1**

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B 09 B 5/00
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⑦① Anmelder:
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⑦② Erfinder:
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⑤④ Verfahren zum Entsorgen von entladenen und geladenen elektrischen Feststoff-Batterien

⑤⑦ Das Verfahren zum Entsorgen von entladenen und geladenen elektrischen Feststoff-Batterien, insbesondere von Lithium enthaltenden Batterien, umfaßt ein Zerkleinern der Batterien durch beispielsweise eine Shreddereinrichtung. Um das Shreddern gefahrlos durchführen zu können, werden die Batterien vor dem Zerkleinern auf eine solche tiefe Temperatur abgekühlt, daß eine chemische Reaktion der vom Metallgehäuse wenigstens teilweise befreiten Inhaltsstoffe bei normalen Temperatur- und Druckbedingungen und Sauerstoffeinwirkung im wesentlichen nicht mehr stattfindet. Danach kann dann eine Trennbehandlung der entstandenen Fraktionsanteile der Batterien mit herkömmlicher Technik erfolgen.

DE 44 24 825 A 1

Die Erfindung betrifft ein Verfahren zum Entsorgen von entladenen und geladenen elektrischen Feststoff-Batterien gemäß dem Oberbegriff des Patentanspruchs 1.

Das Problem bei der Entsorgung von Feststoff-Batterien, insbesondere von Lithium enthaltenden Batterien, auch wenn sie entladen bzw. verbraucht sind, besteht darin, daß die Bestandteile der Batterien beim Zerkleinerungsvorgang, zum Beispiel durch Shreddern, bei Normalbedingungen in Luft noch chemisch und physikalisch heftig miteinander reagieren und dabei Knall- und Verbrennungsgeräusche verursachen, weshalb die Zerkleinerungsanlage mit umfangreichen Schutzmaßnahmen versehen sein muß, was mit einem erheblichen Material- und Kostenaufwand verbunden ist. Desweiteren werden dabei auch schädliche Gase, Dämpfe und feste Stoffe freigesetzt, die Mensch und Umwelt belasten und ebenfalls mit erheblichem Material- und Kostenaufwand einzukapseln und zu entsorgen sind.

Die Aufgabe der Erfindung besteht darin, ein verbessertes Verfahren der eingangs angeführten Art vorzuschlagen, das ein gefahrloses Öffnen bzw. Zerkleinern von gasdicht gekapselten Feststoff-Batterien, insbesondere von Lithium enthaltenden Batterien, ermöglicht und eine einfache Weiterverarbeitung der zerkleinerten Batterien gestattet.

Die Lösung dieser Aufgabe geht von dem einleitend angeführten Verfahren aus und ist durch die Merkmale des Patentanspruchs 1 gekennzeichnet.

Durch die erfindungsgemäße Lösung ist ein gefahrloses Öffnen und Zerkleinern von zu entsorgenden Feststoff-Batterien, insbesondere von Lithium enthaltenden Batterien, ermöglicht, denn das Restenergievermögen der Batterien ist durch deren Tiefkühlung vor dem Zerkleinern nicht oder im wesentlichen nicht mehr zu einer chemischen und physikalischen Reaktion in Luft unter normalen Druck- und Temperaturbedingungen fähig, wenn das schützende Metallgehäuse der Batterien geöffnet bzw. entfernt worden ist. Die Batterien können also ohne Gefahr in Luft bei Normalbedingungen mechanisch zerkleinert werden, zum Beispiel durch Shreddern, wobei keinerlei Knall- und Verbrennungsgeräusche unter Rauch- und/oder Flammenentwicklung mehr entstehen. Weiterhin entstehen während der Tiefkühlbehandlung nur geringfügig schädliche Gase und Dämpfe. Die sich an die vollständige Zerkleinerung der Batterien anschließende Trennbehandlung aller entstandenen Fraktionsanteile sorgt dafür, daß sich die langsam wieder auf etwa Raumtemperatur erwärmten, nun losen Batteriebestandteile ebenfalls nicht mehr oder nur noch in einem unbedeutenden Umfang unkontrolliert chemisch reagieren können. Die Trennbehandlung kann mit herkömmlichen Verfahren und Vorrichtungen durchgeführt werden, derart, daß wenigstens einige der Bestandteile der zerstörten Batterien als Recycle-Rohstoff einer Wiederverwendung zugeführt werden können und nur noch wenige, nach Möglichkeit keine Reststoffe auf eine Deponie gegeben werden müssen.

Eine bevorzugte Tiefkühltemperatur beträgt wenigstens etwa -190° Celcius und als Tiefkühlmittel wird vorzugsweise flüssiger Stickstoff oder auch Argon verwendet.

Falls bei einigen zu entsorgenden Batterien nach dem Tiefkühlen beim Shreddern noch eine geringe chemische Reaktion zu befürchten ist, kann aus dem beim

Tiefkühlen verwendeten Tiefkühlmittel ein gasförmiger Anteil abgezweigt und für eine chemisch inerte Atmosphäre beim Zerkleinern der tiefgekühlten Batterien verwendet werden. Hierdurch erfolgt das Shreddern in einer möglichen chemischen Reaktion unterbindenden Atmosphäre.

Die Trennbehandlung der Fraktionsanteile der zerstörten Batterien wird vorzugsweise durch einen Flotationsvorgang eingeleitet, wobei das Flotationsgemisch einer Leichtfraktionsbehandlung und einer Schwerfraktionsbehandlung unterworfen wird, um eine Grobtrennung vorzunehmen.

Die Erfindung ist nachstehend anhand des anliegenden Ablaufdiagramms beispielsweise näher erläutert. In Fig. 1 ist ein erster Teil des Ablaufdiagramms gezeigt, während in Fig. 2 der zweite Teil des Ablaufdiagramms gezeigt ist.

Das vorgeschlagene Verfahren eignet sich zur Entsorgung von Feststoff-Batterien 1 und 2, die zum Beispiel in Zylinderform und Quaderform im Handel erhältlich sind, und zwar insbesondere für solche Batterien, die Lithium enthalten. Lithiumbatterien wiederum enthalten je nach Zellentyp außer Lithium noch Mangan-dioxid, Schwefeldioxid, Thionylchlorid und Acetonitril als elektrolytische Reaktoren. Derartige Batterien enthalten, auch wenn sie entladen oder fast entladen sind, noch eine relativ hohe Energiedichte, so daß eine chemische und physikalische Reaktion der genannten Substanzen stattfindet, wenn das schützende Metallgehäuse der Batterien bei Normalbedingungen in Luft geöffnet wird.

Gemäß dem vorgeschlagenen Verfahren nach den Fig. 1 und 2 werden die zu entsorgenden Batterien in einer Packstation 3 zu einer vorbestimmten Menge zusammengesetzt, welche dann in wenigstens einen Schleppkasten 4 eines Vorkühlraumes 5 gegeben wird. Die in die Schlepp- oder Transportkästen 4 eingefüllten Batterien durchlaufen dann mit Hilfe eines Transportsystems eine Vorkühlstrecke 6, innerhalb der sie von Raumtemperatur auf eine Temperatur von etwa -30° bis -50° Celsius abgekühlt werden. Die Durchlaufdauer durch die Vorkühlstrecke 6 wird von der Temperatur und der Art des zugeführten Kühlgases und der Batteriemasse bestimmt und kann beispielsweise 15–30 Minuten betragen.

Der Vorkühlraum 5 wird mit einem Vorkühlgas beschickt, welches beispielsweise eine Temperatur von -80° bis -190° Celsius aufweisen kann. Vorzugsweise wird das Kühlgas aus einem Hauptkühlraum 7 abgezweigt, in welchem die vorgekühlten Batterien mittels der Kästen 4 eingeführt werden. Das Vorkühlgas wird mittels einer Pumpe 8 aus dem Hauptkühlraum 7 abgesaugt und über eine Leitung 9 in den Vorkühlraum 5 eingeleitet.

Die vorgekühlten Batterien in den Kästen 4 durchlaufen dann mittels eines Transportsystems für eine vorbestimmte Zeit den Hauptkühlraum und werden darin auf eine solche tiefe Temperatur abgekühlt, daß eine chemische und physikalische Reaktion der später vom Metallgehäuse wenigstens teilweise befreiten Batterie-Inhaltstoffe bei normalen Temperatur- und Druckbedingungen und Sauerstoffeinwirkung im wesentlichen nicht mehr stattfindet. Eine solche Tiefkühltemperatur beträgt wenigstens etwa -80° Celsius, vorzugsweise etwa -190° Celsius.

Ein geeignetes Kühlmittel ist flüssiger Stickstoff (LIN), mit dem die vorgekühlten Batterien in Kontakt gebracht werden. Eine solche Kontaktdauer kann bei-

spielsweise 15 bis 30 Minuten oder mehr betragen, was davon abhängig ist, in welcher Form die vorgekühlten Batterien mit dem flüssigen Stickstoff in Kontakt kommen. Hierfür kann beispielsweise ein Eintauchvorgang in Frage kommen, so daß die Batterien in den flüssigen Stickstoff eingetaucht werden. Es kann aber auch eine Besprühung oder Begießen der vorgekühlten Batterien mit flüssigem Stickstoff in Frage kommen. Auch eine Mischung aller oder zweier Kontaktarten ist möglich. Der flüssige Stickstoff weist eine Temperatur von wenigstens -196° Celsius auf und wird mittels einer Pumpe 10 aus einem Vorratsbehälter 11 über eine Leitung 12 in den Hauptkühlraum 7 eingeleitet.

Während des Tiefkühlvorganges der Batterien in dem Hauptkühlraum 7 entsteht in diesem Raum aus dem flüssigen Stickstoff ein gasförmiger Anteil, der für verschiedene Weiterbehandlungsvorgänge der Batterien bzw. Batterieteile verwendet wird. Wie bereits angedeutet, wird ein gewisser Anteil für die Vorkühlung der Batterien in dem Vorkühlraum 5 verwendet.

Das nicht mehr benötigte Vorkühlgas in dem Vorkühlraum 5 wird aus diesem, gegebenenfalls zusammen mit Abluft, abgesaugt und für die Wiederverwendung im Hauptkühlraum 7 vorbereitet. Hierzu ist eine Rückgewinnungseinrichtung 13 vorgesehen, aus welcher der wieder flüssige Stickstoff über eine Leitung 14 dem Vorratsbehälter 11 zugeführt wird. Gegebenenfalls vorhandene Abluft wird aus der Einrichtung 13 ins Freie abgeleitet.

Die auf die vorbestimmte Tiefkühltemperatur abgekühlten Batterien werden dann in eine Zerkleinerungsvorrichtung 15 gegeben, wo sie zerkleinert werden. Diese Vorrichtung 15 kann beispielsweise aus einer mehrstufigen Shreddervorrichtung bestehen. Es können aber auch Sägeeinrichtungen oder andere Einrichtungen alternativ oder zusätzlich eingesetzt werden, um die tiefkalten Batterien zu ausreichend kleinstückigen Fraktionsanteilen zu zerstören. In der Vorrichtung 15 herrscht vorzugsweise ein Druck von 1 bar (10^5 Pa) und eine Temperatur von maximal etwa 20° Celsius. Im übrigen kann der Innenraum der Zerkleinerungsvorrichtung 15 mit Luft gefüllt sein.

Wenn es aus bestimmten Sicherheitsgründen erforderlich ist, anstelle von Luft in der Vorrichtung 15 ein inertes Gas zu verwenden, so kann dazu ebenfalls gasförmiger Stickstoff aus dem Hauptkühlraum 7 abgezweigt werden, der mittels einer Pumpe 16 über eine Leitung 17 in die Vorrichtung 15 eingeleitet wird.

Die Fraktionsanteile der zerkleinerten Batterien werden in Auffangbehältern 18 gesammelt und einem Becken einer Flotationsstation 19 zugeführt, wo eine erste Trennungsbehandlung der Fraktionsanteile stattfindet. Zur Durchführung des Flotationsvorganges befindet sich in dem Becken der Flotationsstation 19 neben einem aufbereiteten Wasser auch ein alkalisches Lösungsmittel, zum Beispiel Natronlauge, welche zusammen mit dem Wasser eine Suspension ergibt. Weiterhin wird neben Luft auch ein inertes Gas eingeleitet, welches wiederum gasförmiger Stickstoff sein kann und vorzugsweise aus dem Hauptkühlraum 7 über eine Leitung 20 und eine Pumpe 21 entnommen wird. Dieses Gas kann ebenfalls eine tiefe Temperatur aufweisen, beispielsweise -180° Celsius.

Durch die Flotation erfolgt eine Grobtrennung der Fraktionsanteile voneinander, und zwar eine Trennung der schwereren Fraktionsanteile, wie zum Beispiel Eisenmetalle, Nichteisenmetalle, Glas- und Keramikanteile, von den leichteren Fraktionsanteilen, die insbesonde-

re aus Kunststoff bestehen. Die für die Flotation insgesamt in die Station 19 eingeleiteten Gase, die während der Flotation ihre Aufgabe erfüllt haben, und die während der Flotation freigewordenen Gase, insbesondere organische Gase, werden über eine Leitung 22 abgeführt und einer Einrichtung 23 zum Unschädlichmachen dieser Abgase zugeführt. Dieser Einrichtung 23 können auch die nicht mehr benötigten Gase aus der Shreddervorrichtung 15 zugeführt werden, wie es mit der Leitung 24 angegeben ist.

Nachdem sich die schwereren von den leichten Fraktionsanteilen der zerstörten Batterien in der Flotationsstation abgesondert haben, ist es ohne weiteres möglich, die so grob getrennten Fraktionsanteile aus der Flotationsstation 19 zu entnehmen und weiteren Trennungsbehandlungen zu unterwerfen. Die verbrauchte Lösungssuspension wird ebenfalls aus der Station 19 abgeführt und einer Behandlung zum Unschädlichmachen und Wiederaufbereiten unterworfen, die jedoch nicht Gegenstand dieser Erfindung ist.

Die aus der Flotationsstation 19 entnommenen Leichtfraktionsanteile werden zunächst einer Trocknereinrichtung 25 zugeführt, wonach die getrockneten Anteile in einem Behälter 26 einer Sichteinrichtung 27 zugeführt werden, wo nochmals, falls erforderlich, eine Trennung der Kunststoffteile vorgenommen wird. Die so gewonnenen Kunststoffteile können als Recyclerohstoff in der chemischen Industrie wiederverwertet werden.

Auch die Schwerfraktionsanteile aus der Flotationsstation 19 werden zunächst einer Trocknereinrichtung 29 zugeführt, um sie dann besser weiterbehandeln zu können. Nach dem Trocknen können die Schwerfraktionsanteile zur weiteren und feineren Zerkleinerung einer weiteren Shreddereinrichtung 30 zugeführt werden. Von dort gelangen sie dann in eine erste Abscheideeinrichtung 31, wo mittels bekannter Technik die Eisenanteile abgeschieden werden. In einer dann folgenden zweiten Abscheideeinrichtung 32 werden die Nichteisenanteile, insbesondere Kupfer, abgeschieden. Die Eisenanteile und die Nichteisenanteile können dann als Recyclematerial als wiederverwertbare Rohstoffe zur Verfügung stehen und mittels der Verhüttungstechnik verarbeitet werden. Die nun noch verbleibenden Restanteile, wie insbesondere Glas, können deponiert oder beispielsweise in der Glasindustrie oder im Straßenbau wiederverwendet werden. Erforderlichenfalls können durch entsprechende Trenneinrichtungen auch die Restanteile nochmals getrennt werden, um zum Beispiel die Keramikanteile abzuscheiden und einer Wiederverwertung zuzuführen.

Bevorzugt wird als Tiefkühlmittel im Hauptkühlraum 7 flüssiger Stickstoff verwendet. Davon abgezwigter Stickstoff in Gasform wird bevorzugt zur Vorkühlung im Vorkühlraum 5 und für die anderen, vorstehend verwendeten Zwecke eingesetzt. Stattdessen kann jedoch auch ein anderes Gas verwendet werden, zum Beispiel Argon. Obwohl das vorstehende Verfahren hauptsächlich für Lithium enthaltende Feststoff-Batterien vorgesehen ist, können auch andere Feststoff-Batterien, beispielsweise Nickel-Hydrid-Batterien, wie vorstehend beschrieben, entsorgt werden.

Patentansprüche

1. Verfahren zum Entsorgen von entladenen und geladenen elektrische Feststoff-Batterien, insbesondere von Lithium enthaltenden Batterien, die

aus einem Metallgehäuse und darin enthaltenen festen Inhaltsstoffen bestehen, gemäß dem die zu entsorgenden Batterien mechanisch zerkleinert werden, **dadurch gekennzeichnet**, daß die Batterien vor dem Zerkleinern auf eine solche tiefe Temperatur abgekühlt werden, daß eine chemische und physikalische Reaktion der vom Metallgehäuse wenigstens teilweise befreiten Inhaltsstoffe bei normalen Temperatur- und Druckbedingungen und Sauerstoffeinwirkung im wesentlichen nicht mehr stattfindet und daß das nach dem Zerkleinern erhaltene Gemisch der Fraktionsanteile der zerstörten Batterien zur Gewinnung von wiederverwendbarem Ausgangsmaterial einer Trennbehandlung unterworfen wird.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das Tiefkühlen der Batterien durch in berührungbringen derselben mit einem chemisch inerten Tiefkühlmittel erfolgt, dessen Temperatur wenigstens etwa -196° Celsius beträgt.

3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß als Tiefkühlmittel flüssiger Stickstoff verwendet wird.

4. Verfahren nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß aus dem beim Tiefkühlen verwendeten Tiefkühlmittel ein gasförmiger Anteil abgezweigt und zum Durchführen einer Vorkühlung der Batterien verwendet wird.

5. Verfahren nach Anspruch 1, 2, 3 oder 4, dadurch gekennzeichnet, daß das Zerkleinern der tiefgekühlten Batterien in einer chemisch inerten Atmosphäre durchgeführt wird.

6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß aus dem beim Tiefkühlen verwendeten Tiefkühlmittel ein gasförmiger Anteil abgezweigt und für eine chemisch inerte Atmosphäre beim Zerkleinern der tiefgekühlten Batterien verwendet wird.

7. Verfahren nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das Gemisch der Fraktionsanteile der zerstörten Batterien einem Flotationsvorgang unterworfen wird, um eine Grobtrennung des Flotationsgemisches in Form eines Leichtfraktionsvorganges und eines Schwerfraktionsvorganges durchzuführen.

8. Verfahren nach Anspruch 7, dadurch gekennzeichnet, daß der Flotationsvorgang wenigstens im wesentlichen in einer chemisch inerten Atmosphäre durchgeführt wird.

9. Verfahren nach Anspruch 7 oder 8, dadurch gekennzeichnet, daß sich an den Leichtfraktions- und den Schwerfraktionsvorgang jeweils weitere Trennvorgänge zur Gewinnung einzelner Materialsarten aus den Fraktionsanteilen der zerstörten Batterien anschließen und daß wenigstens einige der gewonnenen Materialsarten der Wiederverwendung zugeführt werden.

Hierzu 2 Seite(n) Zeichnungen

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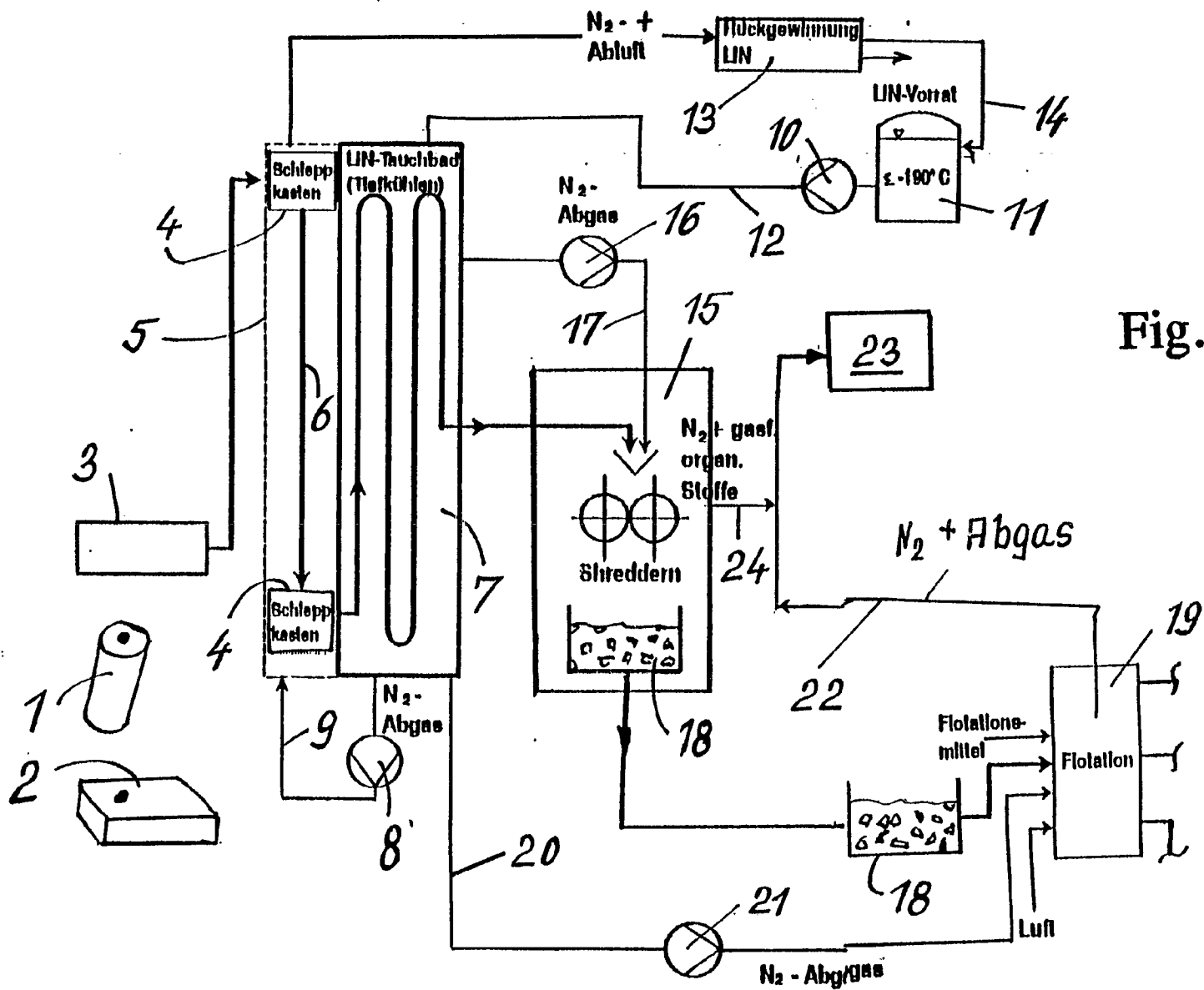
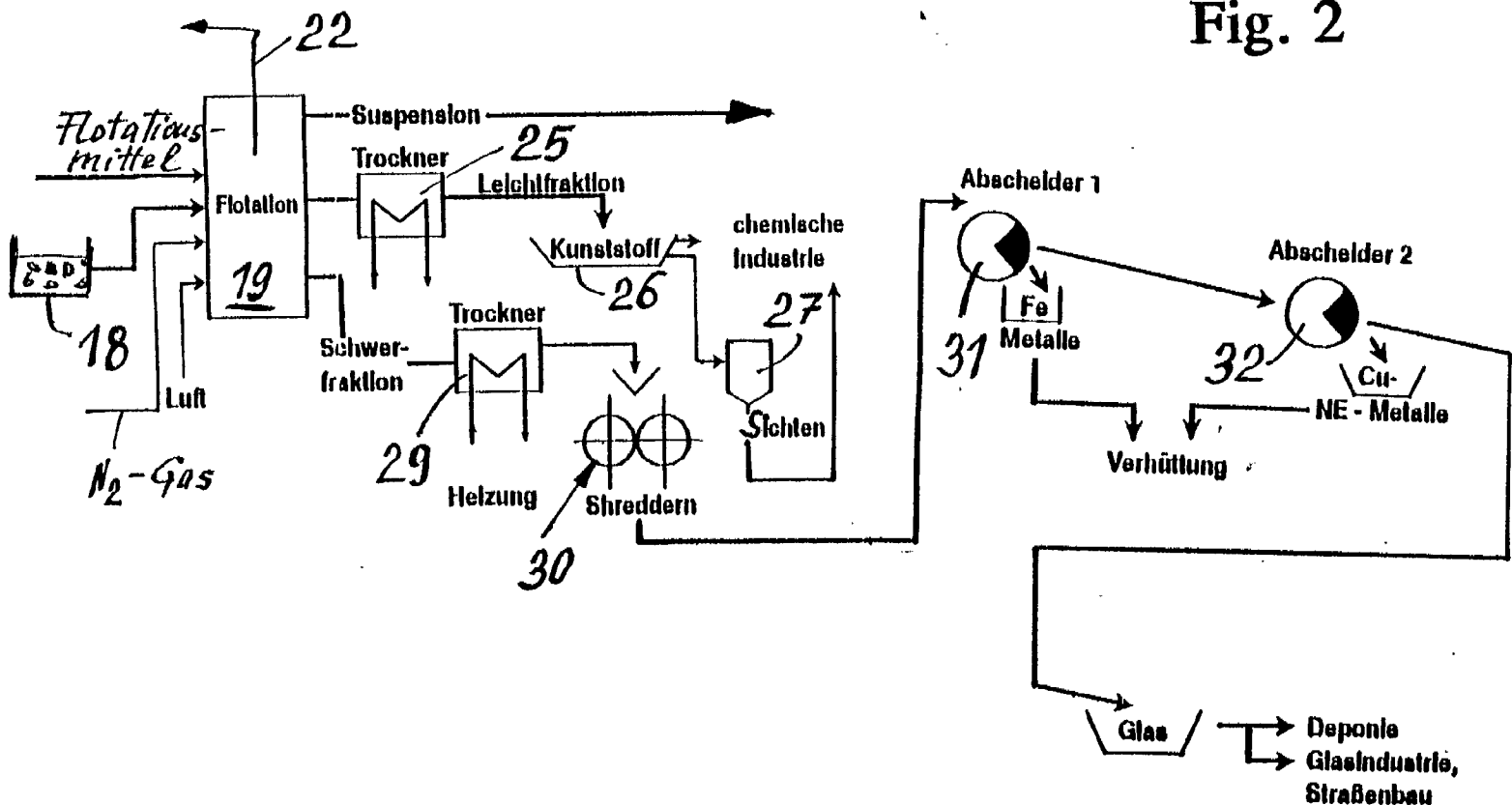


Fig. 1

Fig. 2



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CPCI	B03B9/061 20130101
CPCI	B09B3/00 20130101
CPCI	C22B1/005 20130101
CPCI	C22B7/005 20130101
CPCI	H01M10/54 20130101
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IPCP	B03B9/06 20060101
IPCS	H01M10/54 20060101
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B09B3/00 20060101

ABSTRACT :

Process for the disposal of spent, or partly spent, dry, metal-cased, batteries, especially those containing lithium, involves cooling the batteries before disintegration to such a low temperature that the partially freed components cannot react chemically or physically under normal conditions of temperature, pressure and the presence of oxygen. Further provision is made for the separation and recovery of materials which can be recycled. Batteries are cooled by direct contact with, pref., liquid nitrogen at -196 deg C. The gasified nitrogen is used in a pre-cooling chamber and also to provide an inert atmosphere in the disintegration section, including the materials separation chambers. A coarse separation is carried out in a flotation process followed by a further separation of individual materials, some of which will be used for recycling.

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/GREGORY D
SWIATOCHA/

Examiner's Signature

Initials

Title:

METHOD FOR THE TREATMENT OF USED BATTERIES, IN
PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY
PROCESSING INSTALLATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
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CONTINUING DATA

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
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S20	198	AU-2017347388-\$.did. CA-3040793-\$.did. US-20180301769-\$.did. EP-3312922-\$.did. CA-2983768-\$.did. EP-3312922-\$.did. DE-102016120046-\$.did. WO-2018073101-\$.did. EP-3529841-\$.did. WO-2016174156-\$.did. EP-3289627-\$.did. DE-102015207843-\$.did. DE-102015207843-\$.did. CN-109845008-\$.did. KR-20190084985-\$.did. CN-107636875-\$.did. WO-2019149698-\$.did. EP-2446497-\$.did. WO-2010149611-\$.did. EP-2446497-\$.did. DE-102013011470-\$.did. DE-102018102026-\$.did. DE-102009027179-\$.did. EP-3517641-\$.did. DE-102013011470-\$.did. EP-2742559-\$.did. WO-2013023640-\$.did. DE-102012024876-\$.did. DE-4118001-\$.did. EP-2742559-\$.did. DE-102011110083-\$.did. DE-4424825-\$.did. DE-102011110083-\$.did. DE-102015206153-\$.did. AT-407753-\$.did. IN-285315-\$.did. US-20100162619-\$.did. CA-2710719-\$.did. AU-2007340905-\$.did. US-9512376-\$.did. DE-19547151-\$.did. US-6789757-\$.did. US-20030038197-\$.did. CA-2391865-\$.did. AU-2007340905-\$.did. WO-2002023651-\$.did. US-20170283725-\$.did. EP-1269554-\$.did. CA-2409218-\$.did. WO-2019015892-\$.did. EP-1269554-\$.did. CA-2730336-\$.did. US-20040028585-\$.did. EP-2741357-\$.did. CA-2710719-\$.did. CA-3031475-\$.did. TW-201728531-\$.did. CH-678131-\$.did. AU-2013201163-\$.did. US-6461766-\$.did. US-7192564-\$.did. DE-102008058444-\$.did. JP-H06338353-\$.did. DE-19518643-\$.did. JP-3240814-\$.did. WO-2001091210-\$.did. EP-1293003-\$.did. EP-1215023-\$.did. EP-1652253-\$.did. WO-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 13:26

		2005015668-\$.did. WO-2008074352-\$.did. EP-2376597-\$.did. JP-3495707-\$.did. WO-2008081408-\$.did. EP-673075-\$.did. WO-2018218358-\$.did. CN-106684487-\$.did. DE-102011082187-\$.did. DE-202013010308-\$.did. WO-2008081407-\$.did. EP-2106435-\$.did. CA-3043947-\$.did. JP-H06338352-\$.did. CN-106684487-\$.did. WO-1994007277-\$.did. WO-2008081409-\$.did. WO-2008081410-\$.did. US-5352270-\$.did. EP-673075-\$.did. EP-1333523-\$.did. JP-3935594-\$.did. WO-2008119525-\$.did. US-5679477-\$.did. US-5612150-\$.did. JP-H11167936-\$.did. US-20150080630-\$.did. DE-10062947-\$.did. DE-10045241-\$.did. EP-3063811-\$.did. US-9450277-\$.did. JP-3079849-\$.did. JP-2013229326-\$.did. EP-1333522-\$.did. US-20170012328-\$.did. RO-106045-\$.did. DE-10021383-\$.did. EP-1333523-\$.did. WO-2015063007-\$.did. US-9620828-\$.did. US-8067107-\$.did. CN-105144464-\$.did. US-6223449-\$.did. US-20030180604-\$.did. DE-102008055508-\$.did. JP-6124001-\$.did. DE-19809400-\$.did. US-20050244704-\$.did. DE-10228471-\$.did. US-6524737-\$.did. DE-19547151-\$.did. US-7833646-\$.did. US-20170207504-\$.did.				
S21	5959	y02W30/84.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:19
S22	1437	(y02p10/212.cpc. b02c21/\$.cpc. (b02c23/08,10).cpc. b09b3/008.cpc. (b01d53/02,002).cpc. b01d11/00.cpc. b09b3/0058.cpc. b01d2253/102.cpc.) AND (battery batteries)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:31
S23	3	wo-2010102377-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S24	3	de-102011110083-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S25	2	de-102012024876-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/09/04 14:37

			IBM_TDB			
S26	2	wo-2010149611-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S27	1	kr-20060101683-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S28	0	wo-2106174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S29	2	wo-2016174156-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S30	2	wo-2016164752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S31	2	cn-101394015-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S32	3	de-102015207843-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S33	3	de-602005001937-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S34	3	cn-102496752-\$.did.	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/09/04 14:37

			EPO; JPO; DERWENT; IBM_TDB			
S35	3	cn-103959553-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S36	27	S23 S24 S25 S26 S27 S28 S29 S30 S31 S32 S33 S34 S35	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 14:37
S37	12	"9780419" "20050241943" "7713396"	US-PGPUB; USPAT; USOCR	OR	ON	2019/09/04 14:37
S38	352	S22 and lithium	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 16:40
S39	2006	S21 and lithium	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 16:40
S40	3	de-19954998-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 19:41
S41	2	de-29803442-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 19:41
S42	1	(S38 S39) AND (liquid WITH gas WITH jet WITH (ejector pump))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:19
S44	484	(liquid WITH gas WITH jet WITH (ejector pump)) WITH vacuum	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/09/04 20:21

			IBM_TDB			
S45	8	(liquid WITH gas WITH jet WITH (ejector pump) WITH vacuum) SAME pH	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:21
S46	21	(jet ADJ (ejector pump)) WITH ((sodium calcium) ADJ carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:26
S47	169	(S38 S39) AND ((sodium calcium) ADJ carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:27
S48	3	WO-2013140039-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:31
S49	3	(S38 S39) AND (jet ADJ (ejector pump))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:39
S50	8	(jet ADJ (ejector pump)) WITH fluoride	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:41
S51	1	(jet ADJ (ejector pump)) WITH (fluoride fluorine) WITH (carbonate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 20:42
S53	174	(S38 S39) AND (electrolyte WITH (remov\$4 weight))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/04 21:02
S54	28	(S38 S39) AND (electrolyte WITH (remov\$4 vaporiz\$3) WITH (dri\$2 dry\$3))	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/09/04 21:06

			EPO; JPO; DERWENT; IBM_TDB			
S55	5959	y02W30/84.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 07:34
S56	658	S55 and lithium and (dry\$3 dri\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/05 07:34

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Doc code: IDS

PTO/SB/08a (03-15)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2016. OMB 0651-0031

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First Named Inventor

Art Unit

Examiner Name

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	1	2010/102377	WO	A1	2010-09-16	STEVENS, WAYNE, C.		
	2	10 2011 110 083	DE	A1	2013-02-14	TECH UNI BRAUNSCHWEIG CAROLO WILHELMINA		
	3	10 2012 024 876	DE	A1	2014-06-26	ELECTROCYCLING GMBH; VOLKSWAGEN AKTIENGESELLSCHAFT		

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.D.S./

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Examiner Signature	/GREGORY D SWIATOCHA/	Date Considered	09/04/2019
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Filing Date

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Attorney Docket Number

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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2017-10-25
Name/Print	Michael E. Whitham	Registration Number	32635

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	Filing Date		2017-10-26
	First Named Inventor	Christian HANISCH	
	Art Unit		
	Examiner Name		
	Attorney Docket Number		03101160US

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	1	2010/149611	WO	A1	2010-12-29	SB LIMOTIVE COMPANY LTD.		×
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15569484
	Filing Date		2017-10-26
	First Named Inventor	Christian HANISCH	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	03101160US	

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	1	HIGGELKE: "Infinite Power Solutions stellt papierdunnen Akku vor", "(Infinite Power Solution presents paper-thin Battery)", 2012-06-06	✗
	2	VDMA-Norm 24351 Trocknungstechnik (VDMA=German Engineering Federation; VDMA Standard 24351 - Drying Technology - Basic terms and definitions), 1999-01	☐
	3	HERAUSGEBER: "Florke/Wolff Kursthemen Chemis - Allgemeine und Physikalische Chemie", "(Course Issues Chemistry- General and Physical Chemistry)", 1985	☒

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15569484
Filing Date	2017-10-26
First Named Inventor	Christian HANISCH
Art Unit	
Examiner Name	
Attorney Docket Number	03101160US

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Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2019-04-18
Name/Print	Michael E. Whitham	Registration Number	32635

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DESCRIPTION KR20060101683

(Dry-method of separating Co from battery scrap)

The present invention relates to a method of cobalt dry separation of waste batteries. Lithium-ion batteries (including primary and secondary batteries) are widely used as power sources for small electric and electronic equipment due to their high energy density and light weight and light weight characteristics. A spent lithium ion battery has been obtained by a specific method in terms of environmental pollution and resource recycling. Generally, techniques for obtaining cobalt or cobalt oxide from a spent lithium ion battery are disclosed in Korean Patent Registration No. 10-0448273 (2004.09.01), Korean Patent Registration No. 10-040742 (October 27, 2003) and Korean Patent Publication No. 2003-0011737 (2003.02.11) and the like, and a technique for obtaining a lithium-cobalt oxide is disclosed in Korean Patent Publication No. 2003-0093583 (2003.12.11). These techniques are capable of obtaining high purity cobalt (or cobalt oxide) and lithium-cobalt oxide by the wet process, but since the process of obtaining is very complicated and requires precise control, it is not possible to process large amounts of waste lithium. Of course, there is a problem that strong acid or strong alkali is used, which can cause secondary pollution. An object of the present invention, which is created to solve the above-mentioned problems, is to provide a dry battery capable of obtaining cobalt or cobalt oxide from a spent lithium ion battery by a dry method without secondary contamination which may be caused in the step of obtaining cobalt or cobalt oxide. And a cobalt dry separation method using the same. The object of the present invention is achieved by a method of manufacturing a lithium ion secondary battery comprising the steps of: (a) disrupting at least one spent lithium ion battery; (b) drying the crushed material to remove the electrolyte; (c) finely pulverizing the crushed material from which the electrolyte is removed, and separating the cobalt compound from the finely pulverized material using a particle size difference; and (d) reducing the cobalt compound to obtain pure cobalt. Preferably, the step (a) of the present invention is such that the waste lithium ion battery has an area of 100 to 1,600 mm².

Preferably, in the step (b) of the present invention, the pulverized product is dried by hot air at 300 to 550 ° C to completely remove the electrolyte. Preferably, the step (c) of the present invention comprises finely pulverizing the crushed material using a vibrating mill or a ball mill, wherein the cobalt compound is pulverized to a powder having a particle size of 50 to 100 mesh. A step (c) of dispersing the cobalt compound powder by supplying air at a high pressure to the fine pulverized product; and (2) a step (c) of dispersing the powder of the cobalt compound by passing through a filter for removing impurities to remove impurities. (C) -3 step of obtaining a compound powder. Preferably, the step (c) of the present invention is a step (c) of finely pulverizing the crushed material using a vibrating mill or a ball mill, wherein the cobalt compound is pulverized to a powder having a particle size of 50 to 100 meshes. And (c) 5-5 steps of providing the fine pulverized product on the upper side of the screen device in which the pulverization is performed, thereby to obtain a cobalt compound powder by free fall.

Hereinafter, the construction of the present invention will be described in detail. Step (a) - At least one waste lithium ion battery crushed waste lithium ion battery is crushed to have an area of 100 to 1,600 mm² by using a crusher. This method is obtained by mixing a case part made of iron and a content part in a crushed product. Another method is to separate the contents of the case of the waste lithium ion battery from the contents of the case to separate the contents from the case by cutting the center portion or both ends of the waste lithium ion battery and then crushing the contents using a crusher. (B) Step - Drying the lump to remove the electrolyte The lump is dried at a temperature of 300 to 550 [deg.] C The electrolyte is completely removed by hot air drying. When the drying process is performed at a temperature of only 300 ° C, the drying time is prolonged and the drying performance is not good. When drying is performed at a temperature higher than 550 ° C, the paste and organic matter There is a problem that pollutants are generated. The drying time is determined by the amount of the crushed material. (C) Step - Crushing of the crushed material and separation of the cobalt compound The crushed material is dried and pulverized by means of a vibrating mill or a ball mill. Here, it is very important to pulverize the cobalt compound to a powder having a particle size of 50 mesh to 100 mesh. The cobalt compound is present as a powder having a particle size of 50 to 100 meshes at the time of fine grinding, and the aluminum as the positive electrode component and the copper as the negative electrode component are each present as a thin plate. Nickel and iron are present at a ratio of 5 to 15 times It has grain size. The powder (powder) is sprayed only with the above-described cobalt compound powder by the supplied high-pressure air. The aluminum and the

copper thin plate except for the cobalt compound powder are pressed on the surface of the mill, and nickel And iron components remain in the wheat.

Here, the supplied high-pressure air has a pressure and an air amount corresponding thereto such that only the cobalt compound powder is scattered (air classification method). The scattered cobalt compound powder is collected after being flowed through a closed path such as a duct or the like. Here, since impurities (particularly aluminum or copper foil) may be mixed in the scattered cobalt compound powder, it is preferable to obtain the pure cobalt compound powder by removing the above-mentioned impurities via the filter for removing impurities in the pre-collecting step . The method of obtaining a simple cobalt compound powder in addition to the air classification method described above is to supply finely pulverized powder to an upper part of a swinging screen device provided with a mesh, it is preferable that the particle size is large. (D) Step - Reduction of Cobalt Compound Powder to Obtain Pure Cobalt Powder [0051] The cobalt compound powder obtained in the step (c) described above is obtained by reducing the powder of cobalt compound to the lower portion of the screen device. Since a small amount of carbon powder may be contained in the compound powder, pure cobalt powder can be obtained by removing carbon and then reducing it by heating at a high temperature of 300 ° C or higher. While the present invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, it is obvious that it belongs to the technical idea of.

The present invention having the above-mentioned constitution has an effect of obtaining a large amount of pure cobalt at a high price from a spent lithium ion battery. In addition, the present invention having such a configuration is characterized in that the process is not dangerous because strong acid or strong alkali is not used in the recycling process of the waste lithium ion battery, and secondary pollution due to the work process is prevented.

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CLAIMS KR20060101683

1.

(a) breaking at least one spent lithium ion battery; (b) drying the crushed material to remove the electrolyte; (c) finely pulverizing the crushed material from which the electrolyte is removed, and separating the cobalt compound from the finely pulverized material using a particle size difference; (d) reducing the cobalt compound to obtain pure cobalt.

2.

The method of claim 1, wherein the step (a) is performed such that the waste lithium ion battery has an area of 100 to 1,600 mm².

3.

The method of claim 1, wherein the step (b) comprises completely removing the electrolyte by hot-air drying the crushed product at 300 to 550 ° C.

4.

The method according to claim 1, wherein step (c) comprises: (c) pulverizing the pulverized product using a vibrating mill or a ball mill so that the cobalt compound is a powder having a particle size of 50 to 100 mesh; (C) a step (c) of dispersing the cobalt compound powder by supplying air at a high pressure to the fine pulverized product, and (2) a step of passing the pure cobalt compound powder through the impurity removing filter by passing the scattered cobalt compound powder through a filter for removing impurities (C) - 3 steps of capturing and collecting the cobalt dry separation of waste batteries.

5.

The method according to claim 1, wherein the step (c) comprises: (c) pulverizing the crushed material using a vibrating mill or a ball mill so that the cobalt compound is a powder having a particle size of 50 to 100 mesh; And (c) 5-5 steps of providing the fine pulverized product on the upper part of the screen device to be shaken to obtain a cobalt compound powder by free fall. [5] The cobalt dry separation method of claim 5,

(19)대한민국특허청(KR)

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심사결과 : 있음

(54) 폐건전지의 코발트 건식 분리방법

요약

본 발명은 폐건전지의 코발트 건식 분리 방법에 관한 것으로, (a) 적어도 하나 이상의 폐리튬 이온 전지를 파쇄하는 단계와; (b) 상기 파쇄물을 건조하여 전해질을 제거하는 단계와; (c) 상기 전해질이 제거된 파쇄물을 미세 분쇄하고, 상기 미세 분쇄물로부터 코발트 화합물을 침도착을 이용하여 분리하는 단계와; (d) 상기 코발트 화합물을 환원시켜 순수한 코발트를 수득하는 단계를 포함하여 구성됨으로써, 폐리튬 이온 전지로부터 고가(高價)의 순수한 코발트를 다량 수득할 수 있음은 물론, 폐리튬 이온 전지의 재활용 과정에서 강산 또는 강알칼리를 사용하지 않기 때문에 작업 과정이 위험하지 않으며 이로 인한 2차 오염을 원천 방지할 수 있는 효과가 있다.

색인이

폐건전지, 건전지 재생, 코발트, 건식 분리

명세서

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 폐건전지의 코발트 건식 분리 방법에 관한 것이다.

리튬 이온 전지(1차 및 2차 전지 포함)는 고 에너지 밀도 및 경박 경량의 특성으로 인하여 소형 전기, 전자장비의 전원 등으로 폭넓게 활용되고 있다. 사용이 완료된 폐리튬 이온 전지는 환경 오염 및 자원 재활용의 측면에서 특정 방법에 의해 유가 물질이 수득되고 있다.

통상적으로, 페리튬 이온 전지로부터 코발트 또는 코발트 산화물을 수득하는 기술은 대한민국 특허등록번호 10-0448273 (2004.09.01), 대한민국 특허등록번호 10-040742(2003.10.27) 및 대한민국 특허공개번호 특2003-0011737 (2003.02.11) 등에 다양하게 개시되어 있으며, 리튬-코발트 산화물을 수득하는 기술은 대한민국 특허공개번호 특2003-0093583호(2003.12.11)에 개시되어 있다.

이러한 기술들은 습식 방법에 의해 고순도의 코발트(또는 코발트 산화물) 및 리튬-코발트 산화물을 수득할 수 있으나, 수득 공정이 매우 복잡하고 정밀 제어가 요구되기 때문에 다량의 페리튬 이온 전지를 처리할 수 없음을 물론, 강산 또는 강알칼리가 사용됨으로써 2차 오염을 유발할 수 있는 문제점이 있다.

발명이 이루고자 하는 기술적 과제

상기와 같은 문제점을 해소하기 위하여 창출된 본 발명의 목적은, 코발트 또는 코발트 산화물 수득 공정시 야기될 수 있는 2차 오염없이 페리튬 이온 전지로부터 코발트 또는 코발트 산화물을 건식 방법으로 수득할 수 있는 폐전지의 코발트 건식 분리 방법을 제공함에 있다.

이러한 본 발명의 목적은, (a) 적어도 하나 이상의 페리튬 이온 전지를 파쇄하는 단계와; (b) 상기 파쇄물을 건조하여 전해질을 제거하는 단계와; (c) 상기 전해질이 제거된 파쇄물을 미세 분쇄하고, 상기 미세 분쇄물로부터 코발트 화합물을 입도차를 이용하여 분리하는 단계와; (d) 상기 코발트 화합물을 환원시켜 순수한 코발트를 수득하는 단계를 포함하여 폐전지의 코발트 건식 분리 방법에 의해 달성될 수 있다.

바람직하게는, 본 발명의 상기 (a) 단계는 상기 페리튬 이온 전지가 100 내지 1,600mm²의 면적을 갖도록 파쇄된다.

바람직하게는, 본 발명의 상기 (b) 단계는 상기 파쇄물을 300 내지 550℃로 열풍 건조하여 전해질을 완전 제거된다.

바람직하게는, 본 발명의 상기 (c) 단계는 상기 파쇄물을 진동 밀 또는 불 밀을 이용하여 미세 분쇄하되, 코발트 화합물이 50 내지 100 메시(mesh)의 입도를 갖는 분말이 되도록 분쇄하는 (c) - 1 단계와, 상기 미세 분쇄물에 고압의 공기를 공급하여 코발트 화합물 분말을 비산시키는 (c) - 2 단계와, 상기 비산된 코발트 화합물 분말을 불순물 제거용 필터를 통과시켜 불순물을 제거하여 순수한 코발트 화합물 분말을 포집 수득하는 (c) - 3 단계를 포함한다.

바람직하게는, 본 발명의 상기 (c) 단계는 상기 파쇄물을 진동 밀 또는 불 밀을 이용하여 미세 분쇄하되, 코발트 화합물이 50 내지 100 메시의 입도를 갖는 분말이 되도록 분쇄하는 (c) - 4 단계와, 상기 미세 분쇄물을 요동되는 스크린 장치 상부에 제공하여 자유 낙하에 의해 코발트 화합물 분말을 선별 수득하는 (c) - 5 단계를 포함한다.

발명의 구성 및 작용

이하, 본 발명의 구성을 상세히 설명하면 다음과 같다.

(a) 단계 - 적어도 하나 이상의 페리튬 이온 전지 파쇄

페리튬 이온 전지는 파쇄기를 이용하여 100 내지 1,600mm²의 면적이 되도록 파쇄되는 것이 바람직하다. 이러한 방법은 철 재질인 케이스 부분과 내용물 부분이 파쇄물에 혼합된 상태로 수득된다.

다른 방법으로는 페리튬 이온 전지의 철 재질인 케이스와 케이스에 내장된 내용물을 분리시키는 것으로 페리튬 이온 전지의 중심 부분이나 양단부를 절단하여 케이스로부터 내용물을 분리한 다음, 내용물을 파쇄기를 이용하여 파쇄하는 것이다.

이러한 방법은 내용물만을 파쇄하기 때문에 전술된 방법(케이스가 포함되는 경우) 보다는 보다 적은 면적을 갖도록 파쇄하는 것이 바람직하다.

(b) 단계 - 파쇄물을 건조하여 전해질을 제거

파쇄물은 300 내지 550℃로 열풍 건조하여 전해질을 완전 제거한다.

여기서, 건조 과정이 300℃ 이만의 온도에서 건조가 수행되는 경우에는 작업 건조 시간이 길어져서 작업성이 양호치 못하고, 550℃ 초과의 온도에서 건조가 수행되는 경우에는 파쇄물 중의 페이스트 및 유기물 등이 착화되어 오염 물질이 발생되는 문제점이 있다.

그리고, 건조 시간은 파쇄물의 양에 의해 결정된다.

(c) 단계 - 파쇄물 미세 분쇄 및 코발트 화합물 분리

건조가 완료된 파쇄물은 진동 밀 또는 볼 밀 등에 의해 미세 분쇄된다. 여기서, 코발트 화합물이 50 내지 100 메시의 입도를 갖는 분말이 되도록 분쇄하는 것이 매우 중요하다.

미세 분쇄시 코발트 화합물은 50 내지 100 메시의 입도를 갖는 분말로 존재하고, 양극 성분인 알루미늄과 음극 성분인 구리는 각기 박판으로 존재하게 되며, 니켈 및 철은 코발트 화합물 분말에 비하여 5 내지 15배의 입도를 갖게 된다.

그리고, 분쇄물(분말)은 공급되는 고압의 공기에 의해 전송된 코발트 화합물 분말만이 비산되고, 코발트 화합물 분말을 제외한 알루미늄 및 구리 박판은 밀 표면에 압착되어 있으며 코발트 화합물 분말보다 상대적으로 중량인 니켈과 철 성분은 밀에 잔류된다. 여기서, 공급되는 고압의 공기는 코발트 화합물 분말 만이 비산(공기 분급 방법)되도록 이에 상응하는 압력과 공기량을 갖는다.

비산된 코발트 화합물 분말은 덕트 등과 같은 폐쇄 경로를 통해 유도된 후 포집된다. 여기서, 비산된 코발트 화합물 분말 중에 불순물(특히, 알루미늄 또는 구리 박판)이 혼입될 수 있기 때문에 포집 전 단계에서 불순물 제거용 필터를 경유시켜 전송된 불순물을 제거한 후 순수한 코발트 화합물 분말을 수득하는 것이 바람직하다.

또한, 전송된 공기 분급 방법 이외에 간단한 코발트 화합물 분말을 수득하는 방법은 망체(網體)가 구비된 요동되는 스크린 장치의 상부에 미세 분쇄된 분말을 공급하는 것으로, 망체의 메시는 코발트 화합물 분말보다는 적어도 입도가 큰 것이 바람직하다. 따라서, 코발트 화합물 분말만이 스크린 장치의 하부로 자유 낙하되기 때문에 순수한 코발트 화합물을 수득할 수 있다.

(d) 단계 - 코발트 화합물 분말을 환원시켜 순수한 코발트 분말 수득

전송된 (c) 단계에서 수득된 코발트 화합물 분말 속에는 미량의 탄소 분말이 함유될 수 있기 때문에 우선적으로, 300℃ 이상의 고열로 가열함으로써 탄소를 제거한 후 환원처리하면 순수한 코발트 분말을 수득할 수 있다.

이상에서 설명된 본 발명은 전술된 실시예에 한정되어 설명되었지만, 이에 한정되지 않고 본 발명이 속하는 분야의 통상적인 기술분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있는 정도의 변형은 본 발명의 기술적 사상에 속하는 것임은 자명하다.

발명의 효과

이상의 구성을 갖는 본 발명은 폐리튬 이온 전지로부터 고가(高價)의 순수한 코발트를 다량 수득할 수 있는 효과가 있다. 또한, 이러한 구성을 갖는 본 발명은 폐리튬 이온 전지의 재활용 과정에서 강산 또는 강알칼리를 사용하지 않기 때문에 작업 과정이 위험하지 않으며 이로 인한 2차 오염을 원천 방지할 수 있는 특징이 있다.

(57) 청구의 범위

청구항 1.

(a) 적어도 하나 이상의 폐리튬 이온 전지를 파쇄하는 단계와;

(b) 상기 파쇄물을 건조하여 전해질을 제거하는 단계와;

(c) 상기 전해질이 제거된 파쇄물을 미세 분쇄하고, 상기 미세 분쇄물로부터 코발트 화합물을 입도차를 이용하여 분리하는 단계와;

(d) 상기 코발트 화합물을 환원시켜 순수한 코발트를 수득하는 단계를 포함하여 폐건전지의 코발트 건식 분리 방법.

청구항 2.

제 1 항에 있어서,

상기 (a) 단계는,

상기 폐리튬 이온 전지가 100 내지 1,600mm²의 면적을 갖도록 파쇄되는 것을 특징으로 하는 폐건전지의 코발트 건식 분리 방법.

청구항 3.

제 1 항에 있어서,

상기 (b) 단계는,

상기 파쇄물을 300 내지 550℃로 열풍 건조하여 전해질을 완전 제거하는 것을 특징으로 하는 폐건전지의 코발트 건식 분리 방법.

청구항 4.

제 1 항에 있어서,

상기 (c) 단계는,

상기 파쇄물을 진동 밀 또는 볼 밀을 이용하여 미세 분쇄하되, 코발트 화합물이 50 내지 100 메시의 입도를 갖는 분말이 되도록 분쇄하는 (c) - 1 단계와,

상기 미세 분쇄물에 고압의 공기를 공급하여 코발트 화합물 분말을 비산시키는 (c) - 2 단계와,

상기 비산된 코발트 화합물 분말을 불순물 제거용 필터를 통과시켜 불순물을 제거하여 순수한 코발트 화합물 분말을 포집 수득하는 (c) - 3 단계를 포함하는 것을 특징으로 하는 폐건전지의 코발트 건식 분리 방법.

청구항 5.

제 1 항에 있어서,

상기 (c) 단계는,

상기 파쇄물을 진동 밀 또는 볼 밀을 이용하여 미세 분쇄하되, 코발트 화합물이 50 내지 100 메시의 입도를 갖는 분말이 되도록 분쇄하는 (c) - 4 단계와,

상기 미세 분쇄물을 요동되는 스크린 장치 상부에 제공하여 자유 낙하에 의해 코발트 화합물 분말을 선별 수득하는 (c) - 5 단계를 포함하는 것을 특징으로 하는 폐건전지의 코발트 건식 분리 방법.

Electronic Acknowledgement Receipt

EFS ID:	36029017
Application Number:	15569484
International Application Number:	
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Michael E. Whitham/Kyle Comiskey
Filer Authorized By:	Michael E. Whitham
Attorney Docket Number:	03101160US
Receipt Date:	16-MAY-2019
Filing Date:	26-OCT-2017
Time Stamp:	10:54:29
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	03101160US_IDS2.pdf	1034607	no	4
			066c2f154a01c33f1c378573b79c461520da1f92		

Warnings:

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Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Foreign Reference	03101160US_frn1.pdf	974421	no	23
			721d11301449b8ceb3a37a0a9965fd69f032c89		
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3	Foreign Reference	03101160US_frn1-eng.pdf	74452	no	1
			229b5472a4e3cbcf97086e1d969b61ce39fe2148		
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4	Foreign Reference	03101160US_frn2.pdf	217122	no	7
			01da784109301892ce59363b678a335f5a46abc1		
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5	Non Patent Literature	03101160US_npl1.pdf	793541	no	10
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Information:					
6	Non Patent Literature	03101160US_npl1-eng.pdf	81601	no	2
			179722b550d3b58716c56766d92662ff8968a51b		
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7	Non Patent Literature	03101160US_npl2.pdf	2828930	no	58
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8	Non Patent Literature	03101160US_npl3.pdf	1072411	no	6
			3be3293d54c26fdbaeec5b7472146076550f1584		

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9	Non Patent Literature	03101160US_npl3-eng.pdf	136973	no	2
			4eae7033059fe56c224e59e36c3d363bc2bbea7d		

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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/569,484	10/26/2017	Christian HANISCH	03101160US

CONFIRMATION NO. 9373

PUBLICATION NOTICE



OC000000103157742

30743
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

Title:METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION

Publication No.US-2018-0301769-A1

Publication Date:10/18/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET Substitute for Form PTO-1360 (For use with Form PTO/SB/06)							Application Number 15569484		Filing Date				
							Applicant(s) Christian HANISCH						
							* May be used for additional claims or amendments						
CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT			*		*		*	
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www.uspto.gov

U.S. APPLICATION NUMBER NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
15/569,484	Christian HANISCH	03101160US

30743
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

INTERNATIONAL APPLICATION NO.	
PCT/EP2016/059526	
I.A. FILING DATE	PRIORITY DATE
04/28/2016	04/28/2015

CONFIRMATION NO. 9373
371 ACCEPTANCE LETTER



Date Mailed: 07/11/2018

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

10/26/2017

DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 10/26/2017
- English Translation of the IA filed on 10/26/2017
- Copy of the International Search Report filed on 10/26/2017
- Preliminary Amendments filed on 10/26/2017
- Information Disclosure Statements filed on 10/26/2017
- Inventor's Oath or Declaration filed on 11/20/2017
- Request for Immediate Examination filed on 10/26/2017
- U.S. Basic National Fees filed on 10/26/2017
- Assignment filed on 11/20/2017
- Authorize Access to Search Results filed on 10/26/2017
- Priority Documents filed on 10/26/2017
- Authorization to Permit Access filed on 10/26/2017
- Application Data Sheet (37 CFR 1.76) filed on 10/26/2017

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

ROSA M WEST

Telephone: (571) 272-1019

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/569,484	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	520
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(j))	19	minus 20 = *			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s)) If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
			TOTAL			TOTAL	1580
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/569,484	10/26/2017		1620	03101160US	19	2

CONFIRMATION NO. 9373

FILING RECEIPT

30743
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190



Date Mailed: 07/11/2018

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Christian HANISCH, Braunschweig, GERMANY;
Bastian WESTPHAL, Braunschweig, GERMANY;
Wolfgang HASELRIEDER, Braunschweig, GERMANY;
Martin SCHOENITZ, Braunschweig, GERMANY;

Applicant(s)

DUESENFELD GMBH, Braunschweig, GERMANY;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/EP2016/059526 04/28/2016

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

GERMANY 10 2015 207 843.4 04/28/2015

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 07/10/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/569,484**

Projected Publication Date: 10/18/2018

Non-Publication Request: No

Early Publication Request: No

Title

METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
 Stylesheet Version v1.2

EPAS ID: PAT4697332

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT
CONVEYING PARTY DATA	
Name	Execution Date
CHRISTIAN HANISCH	11/08/2017
BASTIAN WESTPHAL	11/08/2017
WOLFGANG HASELRIEDER	11/09/2017
MARTIN SCHOENITZ	11/09/2017
RECEIVING PARTY DATA	
Name:	DUESENFELD GMBH
Street Address:	FRIEDLANDWEG 5
City:	BRAUNSCHWEIG
State/Country:	GERMANY
Postal Code:	38114
PROPERTY NUMBERS Total: 1	
Property Type	Number
Application Number:	15569484
CORRESPONDENCE DATA	
Fax Number:	
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>	
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Address Line 4:	RESTON, VIRGINIA 20190
ATTORNEY DOCKET NUMBER:	03101160US
NAME OF SUBMITTER:	MICHAEL E. WHITHAM
SIGNATURE:	/Michael E. Whitham/
DATE SIGNED:	11/20/2017
This document serves as an Oath/Declaration (37 CFR 1.63).	
Total Attachments: 2	
source=03101160US_dec#page1.tif	

**DECLARATION (37 C.F.R. 1.63) FOR UTILITY PATENT APPLICATION USING AN
APPLICATION DATA SHEET (37 C.F.R. 1.76) AND ASSIGNMENT**

Title of Invention: **METHOD FOR THE TREATMENT OF USED BATTERIES, IN
PARTICULAR RECHARGEABLE BATTERIES AND BATTERY PROCESSING
INSTALLATION**

As a below named inventor, I hereby declare that:

This declaration and assignment document is directed to:

☐ the attached application;

☒ United States application number 15/569,484 filed on October 26, 2017;

☒ PCT international application number PCT/EP2016/059526 filed on April 28, 2016.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I have reviewed and understand the contents of the application, including the claims.

I am aware of the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR Section 1.56.

Whereas, the undersigned inventor(s) has/have made certain inventions, improvements, and discoveries (herein referred to as the "Invention") disclosed in the above-identified patent application;

Whereas, **DUESENFELD GMBH**, having a place of business at Friedlandweg 5, 38114 Braunschweig, DE (herein referred to as "ASSIGNEE"), desires to acquire, and each undersigned inventor desires to grant to ASSIGNEE, the entire worldwide right, title, and interest in and to the Invention and in and to any and all patent applications and patents directed thereto;

Now, therefore, for good and valuable consideration, the receipt and sufficiency thereof being hereby acknowledged, each undersigned inventor ("ASSIGNOR") hereby sells or has sold, assigns or has assigned, and otherwise transfers or has transferred to the ASSIGNEE, its successors, legal representatives, and assigns, the entire worldwide right, title, and interest in and to the Invention, the above-identified United States patent application, and any and all other patent applications and patents for the Invention which may be applied for or granted therefor in the United States and in all foreign countries and jurisdictions, including all divisions, continuations, reissues, reexaminations, renewals, extensions, counterparts, substitutes, and extensions thereof, and all rights of priority resulting from the filing of such applications and granting of such patents. In addition, each undersigned inventor hereby authorizes and requests the Director of the United States Patent and Trademark Office to issue any United States Patent, and foreign patent authorities to issue any foreign patent, granted for the Invention, to ASSIGNEE, its successors, legal representatives, and assigns, the entire worldwide right, title, and interest in and to the same to be held and enjoyed by ASSIGNEE, its successors, legal representatives, and assigns to the full end of the terms for which any and all such patents may be granted, as fully and entirely as would have been held and enjoyed by the undersigned had this Assignment not been made; and each undersigned inventor agrees to execute any and all documents and instruments and perform all

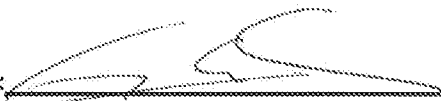
lawful acts reasonably related to recording this Assignment or perfecting title to the invention and all related patents and applications, in ASSIGNEE, its successors, legal representatives, and assigns, whenever requested by ASSIGNEE, its successors, legal representatives, or assigns.

Each undersigned inventor acknowledges their prior and ongoing obligations to sell, assign, and transfer the rights under this Assignment to ASSIGNEE and is unaware of any reason why they may not have the full and unencumbered right to sell, assign, and transfer the rights hereby sold, assigned, and transferred, and has not executed, and will not execute, any document or instrument in conflict herewith. Each undersigned inventor also hereby grants ASSIGNEE, its successors, legal representatives, and assigns, the right to insert in this Assignment any further identification (including, but not limited to, patent Application Number) which may be necessary or desirable for recordation of this Assignment.

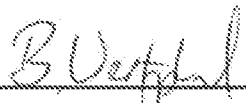
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I hereby authorize and request any attorney of WHITHAM, CURTIS & COOK, P.C., Customer No. 30743, to insert or correct any information concerning the identity of ASSIGNOR, ASSIGNEE, or the above-mentioned application (including the serial no. and the filing date).

(1) Legal Name of Inventor: **Christian HANISCH**

Signature:  Date: 08.11.2017

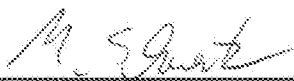
(2) Legal Name of Inventor: **Bastian WESTPHAL**

Signature:  Date: 08.11.2017

(3) Legal Name of Inventor: **Wolfgang HASELRIEDER**

Signature:  Date: 08.11.2017

(4) Legal Name of Inventor: **Martin SCHOENITZ**

Signature:  Date: 08.11.2017

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Hanisch

Confirmation No. (not assigned)

Serial No. (not assigned)

Group Art Unit (not assigned)

Filed Concurrently Herewith

Examiner (not assigned)

For METHOD FOR THE TREATMENT OF USED BATTERIES, IN
PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY
PROCESSING INSTALLATION

This application is a Rule 371 National Stage filing from PCT/EP2016/059526
filed on April 28, 2016, which claims priority to German Application 10 2015 207
843.4 filed April 28, 2015

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

PRELIMINARY AMENDMENT

Sir:

Prior to calculation of the filing fees and examination on the merits, please
amend the above-identified patent application as follows:

Amendments to the Claims: begin on page 2

Remarks: begin on page 6

Listing of the Claims:

The following is a complete listing of all the claims in the application, with an indication of the status of each:

- 1.(currently amended) A method ~~Method~~ for the treatment of used batteries, comprising ~~(10), in particular lithium batteries,~~ containing the steps:
 - (a) comminuting the batteries ~~(10)~~ such that comminuted material ~~(24)~~ is obtained,
 - (b) inactivating the comminuted material ~~(24)~~ such that an inactivated comminuted material ~~(42)~~ is obtained, and
 - (c) filling a transport container ~~(46)~~ with the inactivated comminuted material ~~(42)~~.~~characterised by the fact that~~
 (d) wherein the inactivating step ~~inactivation~~ is performed by drying the comminuted material ~~(24)~~.
- 2.(currently amended) The method ~~Method~~ according to claim 1, wherein ~~characterised by the fact that~~ the comminuted material ~~(24)~~ is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.
- 3.(currently amended) The method according to claim 1, wherein ~~Method according to one of the above claims,~~ ~~characterised by the fact that~~ the drying occurs under vacuum.
- 4.(currently amended) The method according to claim 3, wherein ~~Method according to one of the above claims,~~ ~~characterised by the fact that~~ the vacuum is created by means of a jet pump, and

a pump liquid of the jet pump has at least one of
 a pH value of at least 8, and especially 9, and/or
 contains a substance that precipitates fluoride.

5.(currently amended) The method according to claim 1, further comprising the steps of ~~Method according to one of the above claims, characterised by the steps:~~

(e) removal of the comminuted material (24) from the transport container (46),

(f) one or more of

~~detachment of hard parts, and and/or~~

separation of active material from a the carrier,

~~particularly through air jet sieving or a second comminution stage~~

such that an active material fraction (76) and a carrier fraction (80) are obtained, and

(g) separate packing of the active material fraction (76) and carrier fraction (80) in transport containers (78).

6.(currently amended) The method according to claim 1, wherein Method according to one of the above claims, characterised by the fact that the drying of the comminuted material is only completed if, after the completion of the drying process, no flammable or explosive gas mixture can form above the comminuted material ~~that has been filled in the transport container and/or if the comminuted material is so dry that no flammable or explosive gas mixture can emerge in the transport container or during the subsequent processing.~~

7.(currently amended) A battery ~~Battery~~ processing installation for the treatment of used batteries, comprising in particular lithium batteries, with:

- (a) a comminution unit (48) for comminuting the batteries (40) such that comminuted material (24) is obtained,
- (b) an inactivation device (26) for inactivating the comminuted material (24) and
- (c) a filling device (44) for filling a transport container (46) with the inactivated comminuted material (24),

~~characterised by the fact that~~ wherein

- (d) the inactivation device comprises a drying device, (26) and
- (e) the battery processing installation has a vacuum installation that is connected to the drying device (26) for the purpose of generating a vacuum in the drying device (26).

8.(currently amended) The battery ~~Battery~~ processing installation according to claim 7, wherein ~~characterised by the fact that~~ the drying device (26) is configured to dry the comminuted material (24) until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible.

9.(currently amended) The battery ~~Battery~~ processing installation according to claim 7, wherein ~~or 8, characterised by the fact that~~ the comminution unit and the drying device (26) are arranged in a standard container (54).

10. (canceled)

11. (currently amended) The battery ~~Battery~~ processing installation according to claim 7, wherein ~~10, characterised by the fact that~~

- the vacuum installation (29) has a jet pump with a pump liquid, and
wherein
- the pump liquid is conducted within a circuit and
- the pump liquid contains a substance that reacts with hydrogen fluoride.

12. (currently amended) The battery ~~Battery~~ processing installation according to claim 7 further comprising: one of the claims 7 to 11, characterised by

- a hard metal detachment device and/or a light fraction detachment device,
- a separation device, ~~especially a classification device (74), for separating active material from a the carrier, in particular by means of air-jet-sieving and/or a second comminution stage~~ such that an active material fraction

(76) and a carrier fraction occur, ~~in particular aluminium and copper foils, and~~

- a second filling device (44) for the separate filling of the active material fraction (76) and the carrier fraction (80), ~~in particular aluminium and copper foils.~~

13. (New) The battery processing installation of claim 12 wherein the active material fraction and the carrier fraction are respectively aluminum and copper foils.

14. (New) The battery processing installation of claim 12, wherein the separation device is an air jet sieving device.

15. (New) The battery processing installation of claim 12 wherein the separation device is a second comminution stage.

16. (New) The battery processing installation of claim 7 wherein the batteries are lithium batteries.

17. (New) The method according to claim 1 wherein the batteries are lithium batteries.

18. (New) The method according to claim 5 wherein separation of the active material from the carrier is performed by air jet sieving.

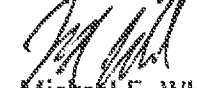
19. (New) The method according to claim 5 wherein separation of the active material from the carrier is performed using a second comminution stage.

20. (New) The method according to claim 4 wherein the pH value is at least 9.

REMARKS

Claim 10 is cancelled. Claims 1-9 and 11-12 are amended. Claims 13-20 are added. The amendments eliminate multiple dependent claim format, provide for antecedent basis, and amend the language to a form more suited to US practice. Please calculate the filing fee based on claims 1-9 and 11-20, and proceed to examination on the merits.

Respectfully submitted,


Michael E. Whitham
Reg. No. 32,635

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11491 Sunset Hills Road, Suite 340
Reston, VA 20190

Tel. (703) 787-9400
Fax. (703) 787-7557

Customer No.: 30743

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIS, AND BATTERY PROCESING INSTALLATION			
First Named Inventor/Applicant Name:	Christian HANISCH			
Filer:	Michael E. Whitham/Kyle Comiskey			
Attorney Docket Number:	03101160US			
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
NATIONAL STAGE FEE	1631	1	280	280
NATL STAGE SEARCH FEE - REPORT PROVIDED	1642	1	480	480
NATIONAL STAGE EXAM - ALL OTHER CASES	1633	1	720	720
Pages:				
Claims:				
Miscellaneous-Filing:				
OATH/DECL > 30 MOS FROM 371 COMMENCEMENT	1617	1	140	140
Petition:				
258				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1620

Electronic Acknowledgement Receipt

EFS ID:	30767446
Application Number:	15569484
International Application Number:	PCT/EP2016/059526
Confirmation Number:	9373
Title of Invention:	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIS, AND BATTERY PROCESING INSTALLATION
First Named Inventor/Applicant Name:	Christian HANISCH
Customer Number:	30743
Filer:	Michael E. Whitham/Kyle Comiskey
Filer Authorized By:	Michael E. Whitham
Attorney Docket Number:	03101160US
Receipt Date:	26-OCT-2017
Filing Date:	
Time Stamp:	12:14:32
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 1620
RAM confirmation Number	102617INTEFSW00013110502041
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		03101160US_app.pdf	1220144	yes	60
			5a9ec60acde03fa84252a612aaca1b57931609c0		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	3	
	Specification - Not in English		4	32	
	Specification		33	50	
	Claims		51	54	
	Abstract		55	55	
	Drawings-only black and white line drawings		56	58	
	Documents submitted with 371 Applications		59	60	
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
2	Application Data Sheet	03101160US_ADS.pdf	1823198	no	9
			932894798705dfec771682d7da6ae9859ca173cf		
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	03101160US_IDS.pdf	1035130	no	4
			1e4280bdeed390b13e9cdfbc06c3c918a6dfbac01		
Warnings:					
Information:					
261					

4	Foreign Reference	03101160US_frn1.pdf	908180	no	21
			600a11f658014655747042b000043fbd2895e98c		
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5	Foreign Reference	03101160US_frn2.pdf	1652744	no	10
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7		03101160US_prelim.pdf	90006	yes	6
			5bb88166fb023d5d151472c6418ef3cf5da21db7		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Preliminary Amendment		1	1	
	Claims		2	5	
	Applicant Arguments/Remarks Made in an Amendment		6	6	
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8	Fee Worksheet (SB06)	fee-info.pdf	37101	no	2
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371		Attorney Docket No. 03101160US
International Application No. PCT/EP2016/059526		International Filing Date 2016-04-28
Title of Invention METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		Priority Date Claimed 2015-04-28
First Named Inventor Christian HANISCH		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.		
1. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.		
2. ☒ A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).		
3. An English language translation of the International Application (35 U.S.C. 371(c)(2))		
a. ☐ is attached hereto.		
b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).		
4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))		
a. ☐ is attached.		
b. ☐ was previously filed in the international phase under PCT Rule 4.17(iv).		
Items 5 to 8 below concern amendments made in the international phase.		
<u>PCT Article 19 and 34 amendments</u>		
5. ☐ Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).		
6. ☐ English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).		
7. ☐ English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).		
<u>Cancellation of amendments made in the international phase</u>		
8a. ☐ Do not enter the amendment made in the international phase under PCT Article 19.		
8b. ☐ Do not enter the amendment made in the international phase under PCT Article 34.		
NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).		
The following items 9 to 17 concern a document(s) or information included.		
9. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.		
10. ☒ A preliminary amendment.		
11. ☒ An Application Data Sheet under 37 CFR 1.76.		
12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).		
13. ☐ A power of attorney and/or change of address letter.		
14. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.3 and 37 CFR 1.821-1.825.		
15. ☐ Assignment papers (cover sheet and document(s)). Name of Assignee: _____		
16. ☐ 37 CFR 3.73(c) Statement (when there is an Assignee).		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No. PCT/EP2016/059526	ATTORNEY DOCKET No. 03101160US
17. ☒ Other items or information: INTERNATIONAL SEARCH REPORT		
The following fees have been submitted.		CALCULATIONS PTO USE ONLY
18. ☒ Basic national fee (37 CFR 1.492(a)) \$280		\$ 280
19. ☒ Examination fee (37 CFR 1.492(c)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) \$0 All other situations \$720		\$ 720
20. ☒ Search fee (37 CFR 1.492(b)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) \$0 Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority \$120 International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB \$480 All other situations \$600		\$ 480
TOTAL OF 18, 19, and 20 =		\$ 1480
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Total Sheets	Extra Sheets	Number of each addition 50 or fraction thereof (round up to a whole number)
- 100 =	/ 50 =	x \$400
		\$
Surcharge of \$140.00 for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).		\$ 140
CLAIMS	NUMBER FILED	NUMBER EXTRA
Total claims	- 20 =	x \$80
Independent claims	- 3 =	x \$420
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		+ \$780
Processing fee of \$140.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).		+
TOTAL OF ABOVE CALCULATIONS =		\$ 1620
☐ Applicant asserts small entity status. See 37 CFR 1.27. Fees above are reduced by 1/3.		
☐ Applicant certifies micro entity status. See 37 CFR 1.29. Fees above are reduced by 1/2. Applicant must attach form PTO/SB/15A or B or equivalent.		
TOTAL NATIONAL FEE =		\$ 1620
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.		+
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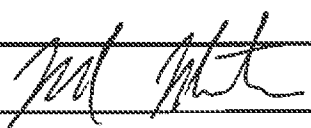
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Signature		Date	<u>10/26/17</u>
Name (Print/Type)	<u>Michael E. Whitham</u>	Registration No. (Attorney/Agent)	<u>32635</u>

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

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(81) Bestimmungsstaaten (soweit nicht anders angegeben, für
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Erklärungen gemäß Regel 4.17:

— hinsichtlich der Berechtigung des Anmelders, ein Patent zu
beantragen und zu erhalten (Regel 4.17 Ziffer (i))

[Fortsetzung auf der nächsten Seite]

(54) Title: METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES,
AND BATTERY PROCESSING INSTALLATION

(54) Bezeichnung: VERFAHREN ZUM BEHANDELN GEBRAUCHTER BATTERIEN, INSBESONDERE WIEDER
AUFLADBARER BATTERIEN UND BATTERIE-VERARBEITUNGSANLAGE

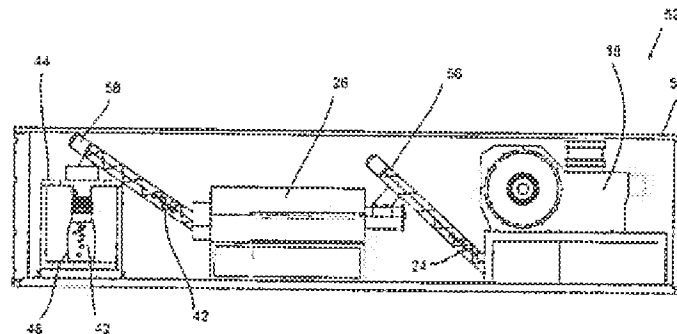


Fig. 2

(57) Abstract: The invention relates to a method for the treatment of used batteries (10), in particular lithium batteries, having the steps: comminuting the batteries (10) such that comminuted material (24) is obtained, inactivating the comminuted material (24) such that inactivated comminuted material (42) is obtained, and filling a transport container (46) with the inactivated comminuted material (42). It is provided according to the invention that the inactivation is performed by drying the comminuted material (24), and the comminuted material (24) is dried until an electrolyte content is so low that an electrochemical reaction is not possible.

(57) Zusammenfassung:

[Fortsetzung auf der nächsten Seite]

WO 2016/174156 A1



Veröffentlicht

mit internationalem Recherchebericht (Artikel 21 Absatz 3)

Die Erfindung betrifft ein Verfahren zum Behandeln gebrauchter Batterien (10), insbesondere Lithium-Batterien, mit den Schritten: Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird, Inaktivieren des Zerkleinerungsguts (24), sodass ein inaktiviertes Zerkleinerungsgut (42) erhalten wird, und Abfüllen des inaktivierten Zerkleinerungsguts (42) in einen Transportbehälter (46). Erfindungsgemäß ist vorgesehen, dass das Inaktivieren durch Trocknen des Zerkleinerungsguts (24) erfolgt und das Zerkleinerungsgut (24) solange getrocknet wird, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist.

Verfahren zum Behandeln gebrauchter Batterien, insbesondere wieder aufladbarer Batterien und Batterie-Verarbeitungsanlage

Die Erfindung betrifft ein Verfahren zum Behandeln gebrauchter Batterien, insbesondere gebrauchter Lithium-Batterien, beispielsweise Lithium-Ionen-Batterien, mit den Schritten (a) Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird, (b) Inaktivieren des Zerkleinerungsguts, sodass ein inaktiviertes Zerkleinerungsgut erhalten wird, und (c) Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter.

10

Gemäß einem zweiten Aspekt betrifft die Erfindung eine Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien, insbesondere zum Behandeln gebrauchter Lithium-Batterien, mit (a) einer Zerkleinerungseinheit zum Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird, (b) einer Inaktivierungsvorrichtung zum Inaktivieren des Zerkleinerungsguts und (c) einer Abfüllvorrichtung zum Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter.

Aus der US 2005/0241943 A1 ist ein Verfahren zum Aufarbeiten gebrauchter Batterien bekannt, bei dem die Batterien vor einem Zerkleinerungsschritt erwärmt werden, sodass Kunststoffbestandteile der Batterien zerstört werden. Nachteilig an einem derartigen Vorgehen ist, dass die verbleibenden Komponenten der Batterien mit Abbauprodukten des Kunststoffs verunreinigt sein können.

25

Aus der DE 10 2012 024 876 A1 ist ein System zum Überführen transportkritischer Elektrolytzellen zunächst unter Inertgas zerkleinert und danach mit einem Desaktivierungspulver bestäubt werden, um eine Selbstentzündung des elektrochemisch aktiven Materials zu verhindern. Nachteilig daran ist, dass das entstehende Material dennoch ein vergleichsweise hohes Gefährdungspotential besitzt und dass das Bestäubungspulver selbst ein Explosionsrisiko darstellt und dass die Bildung einer entzündlichen und explosiven Atmosphäre in dem Transportbehälter nicht ausgeschlossen werden kann.

Aus der DE 10 2011 110 083 A1 ist ein Verfahren zum Wiedergewinnen von Aktivmaterial aus einer galvanischen Zelle bekannt, bei dem die galvanischen Zellen zunächst mechanisch zerkleinert, dann vorgetrocknet und nachfolgend gesichtet werden. Schließlich wird der Binder in einem Ofen zersetzt. Eine derartige Vorrichtung eignet sich sehr gut zum effizienten Recyceln größerer Mengen von galvanischen Elementen. Für den Teillast-Betrieb ist diese Anlage jedoch vergleichsweise komplex aufgebaut.

10 Der Erfindung liegt die Aufgabe zugrunde, Nachteile im Stand der Technik zu vermindern.

Die Erfindung löst das Problem durch ein gattungsgemäßes Verfahren, bei dem das Inaktivieren zumindest auch durch Trocknen des Zerkleinerungsguts erfolgt. Gemäß einem zweiten Aspekt löst die Erfindung das Problem durch eine gattungsgemäße Batterie-Verarbeitungsanlage, bei der die Aktivierungsvorrichtung eine Trocknungsvorrichtung umfasst.

Vorteilhaft an der Erfindung ist, dass durch das Trocknen dem Zerkleinerungsgut so viel Elektrolyt entzogen werden kann, dass eine elektrochemische Reaktion nicht mehr oder nur noch zu vernachlässigbar kleinem Ausmaß möglich ist. Zudem bildet sich keine entzündliche oder explosive Gasphase über den Batteriefragmenten, da diesen insbesondere die organischen Karbonate des Elektrolyten entzogen wurden. Das Zerkleinerungsgut ist daher weitgehend inert und kann, insbesondere dann, wenn es unter Vakuum verpackt wird, sicher transportiert werden.

Ein weiterer Vorteil ist es, dass zum Inaktivieren des Zerkleinerungsmaterials kein zusätzliches Material hinzugegeben werden muss. Das verringert den Aufwand beim Aufarbeiten der Batterien, verringert das Gewicht des inaktivierten Zerkleinerungsguts und erhöht die Reinheit in den folgenden Trenn- und Recyclingschritten. Insbesondere in potentiell folgenden hydrometallurgischen Aufarbeitungsschritten ist eine hohe Produktreinheit ohne Eintrag von Fremdionen

vorteilhaft.

Vorteilhaft ist zudem, dass ein transportsicheres Zerkleinerungsgut erhalten wird. So ist der Gehalt an organischen Carbonaten vorzugsweise so klein, dass die Bildung von Fluorophosphaten in relevanter Menge ausgeschlossen werden kann. Fluorophosphate sind oft starke Nervengifte, deren Bildung sicher verhindert werden muss. Zudem ist sichergestellt, dass es aufgrund des geringen Elektrolytgehalts nicht zu einer durch eine elektrochemische Reaktion ausgelöste, selbstverstärkend fortschreitende Wärmeentwicklung kommen kann.

10

Im Rahmen der vorliegenden Beschreibung wird unter dem Trocknen insbesondere das Entfernen zumindest eines Lösungsmittels des Leitsalzes verstanden. Insbesondere wird das Trocknen so durchgeführt, dass Kohlensäuredimethylester und/oder Kohlensäureethylmethylester entfernt wird.

15

Unter der Batterie wird insbesondere eine Lithium-Batterie verstanden. Eine Lithium-Batterie ist ein Akkumulator, bei dem die elektrochemische Reaktion Lithium und/oder Lithium-Ionen und/oder eine Lithium-Verbindung involviert.

20 Unter einer Batterie-Verarbeitungsanlage wird insbesondere auch eine Akku-Verarbeitungsanlage zum Verarbeiten von Akkumulatoren verstanden.

Unter dem Transportbehälter wird insbesondere auch eine oder eine Transportverpackung verstanden. Vorzugsweise wird die Transportverpackung durch Vakuumverschweißung verschlossen. Gut geeignet als Transportverpackung ist insbesondere Aluminium-Verbundfolie.

25

Günstig ist, wenn das Trocknen nach dem Zerkleinern der Batterien erfolgt. Zwar ist es möglich und stellt eine Ausführungsform der Erfindung dar, dass die Batterien im unzerkleinerten Zustand einem Vakuum ausgesetzt werden, sodass zumindest Teile des Elektrolyten verdampfen, wobei das entstehende Gas entweder durch ein Sicherheitsventil im Akkumulator entweicht oder die Batterie durch die Druckdifferenz zwischen der äußeren Umgebung und dem Innendruck

30

zerstört wird, sodass verdampfender Elektrolyt austreten kann. Da der Elektrolyt zumeist zwischen eng gewickelten oder gestapelten und verpressten Schichten aus Elektroden und Separator und in deren Poren vorliegt und mit anderen Bestandteilen der Batterien verbunden vorliegt, kann dieses Vorgehen jedoch zeit-

5 intensiv sein. Es ist daher oft günstiger und stellt eine bevorzugte Ausführungsform der Erfindung dar, dass die Batterien mechanisch zerkleinert werden, beispielsweise durch Schneiden, Scheren, Pralleinwirkung, Zertrennen und/oder Quetschen. So steht für den Stoffübergang in die Gasphase eine größere Grenzfläche zur Verfügung.

10

Das Trocknen kann beispielsweise durch Vakuumtrocknung, Kontakttrocknung, Konvektionstrocknung und/oder Strahlungstrocknung erfolgen. Günstig ist es, wenn das Trocknen unter Rühren und/oder Umwälzen des Zerkleinerungsguts erfolgt.

15

Vor dem Zerkleinern werden die gebrauchten Batterien vorzugsweise demontiert. Das heißt, dass größere Batteriesysteme in ihre kleineren Unterbausteine, die Module oder Stacks, demontiert werden oder sogar die Zellen, die das elektrochemisch wirksame Material enthalten, von der Ansteuerelektronik getrennt

20 werden. Die Ansteuerelektronik umfasst beispielsweise Halbleiterbauelemente und/oder Sensoren und dient der Ladesteuerung der Batterien.

Gemäß einer bevorzugten Ausführungsform erfolgt das Trocknen unter Vakuum. Vorzugweise ist das Vakuum so groß gewählt, dass der Dampfdruck von Koh-

25 lensäuredimethylester bei 80°C, insbesondere bei 70°C, unterschritten wird. Günstig ist es, wenn das Trocknen unter einem Druck von höchstens 300 hPa, insbesondere höchstens 100 hPa erfolgt. Bei so niedrigen Drücken verdampfen wesentliche Bestandteile der meisten Elektrolyten, insbesondere Kohlendimethylester und Kohlendimethylester, bereits bei Temperaturen von

30 weniger als 80°C. Niedrige Temperaturen haben den Vorteil, dass die Bildung von Fluorwasserstoff behindert wird. Fluorwasserstoff stellt eine potentielle Gefährdung für die Batterie-Verarbeitungsanlage sowie die Umgebung dar. Es ist daher günstig, das Entstehen von Fluorwasserstoff zu verhindern.

Vorzugsweise erfolgt das Trocknen bei einer Temperatur, die unterhalb einer Zersetzungstemperatur liegt. Unter der Zersetzungstemperatur wird insbesondere die kleinste Temperatur verstanden, für die gilt, dass nach dem Halten
5 des Zerkleinerungsguts auf dieser Temperatur für eine Stunde zumindest 80 Masseprozent des Binders sich in gasförmige Bestandteile zersetzt haben. Die Zersetzungstemperatur kann damit gemessen werden, indem die Temperatur des Zerkleinerungsguts sukzessive erhöht wird und erfasst wird, wann es zu einem Masseverlust, insbesondere durch Gasentwicklung aufgrund einer Zerset-
10 zung des Binders, kommt und das angegebene Kriterium erfüllt ist. Gegebenenfalls muss der Versuch mit jeweils einer neuen Probe an Zerkleinerungsgut bei jeweils erhöhter Temperatur mehrfach durchgeführt werden.

Günstig ist es, wenn das Trocknen unter einer Atmosphäre erfolgt, in der der Wasser-Partialdruck kleiner ist als 50 Pa, insbesondere kleiner als 10 Pa. Ein
15 geringer Wasser-Partialdruck führt zu einer geringen Reaktionsrate von Lithium-Verbindungen zu Lithium-Hydroxid und damit zu nur geringer Wasserstoff-Entwicklung. Das verhindert die Bildung von zündfähigen Wasserstoff-Sauerstoff-Gemischen und trägt zur Anlagensicherheit bei.

20 Günstig ist es zudem, wenn der Sauerstoff-Partialdruck höchstens 10 Millibar, insbesondere höchstens 5 Millibar beträgt. Die Reaktion von Sauerstoff mit oxidierbaren Bestandteilen der Batterien wird so weitgehend unterdrückt. Es ist möglich, den niedrigen Sauerstoff-Partialdruck durch einen geringen Druck beim Trocknen zu erreichen. Alternativ oder zusätzlich kann das Trocknen in einer
25 Inertgas-Atmosphäre erfolgen.

Bevorzugt ist ein Verfahren, bei dem das Trocknen des Zerkleinerungsguts erst beendet wird, wenn sich nach Beenden des Trocknens kein entzündliches oder explosives Gasgemisch über dem abgefüllten Zerkleinerungsgut mehr bilden
30 kann und/oder wenn das Zerkleinerungsgut so trocken ist, dass sich im Transportbehälter oder während der Weiterverarbeitung ein entzündliches oder explosives Gasgemisch ergeben kann. Unter dem Merkmal, dass das Trocknen been-

det wird, wenn sich nach Beenden des Trocknens kein entzündliches oder explosives Gasgemisch über dem abgefüllten Zerkleinerungsgut bilden kann, wird insbesondere verstanden, dass sich in einem Transportbehälter in Form eines 50-Literbehälter, der zur Hälfte (bezogen auf sein Volumen) mit dem Zerkleinerungsgut gefüllt ist, innerhalb von einer Woche bei 50°C und 1013 hPa kein zündfähiges Gasgemisch bildet. Ob das Kriterium erfüllt ist, wird in Vorversuchen ermittelt. Bildet sich ein zündfähiges Gasgemisch, muss das Trocknen länger und/oder bei niedrigerem Druck durchgeführt werden. Die Vorversuche werden so lange wiederholt, bis eine Trocknungsdauer und/oder ein Trocknungsdruck ermittelt ist, bei der das Merkmal bei einem Testsatz von drei Transportbehälter für alle drei Transportbehälter erfüllt ist.

Vorzugsweise wird das Zerkleinerungsgut so lange getrocknet, bis ein Elektrolytgehalt im Zerkleinerungsgut so klein ist, dass eine elektrochemische Reaktion unmöglich ist. In anderen Worten ist der Elektrolytgehalt kleiner als ein Schwellenwert, wobei der Schwellenwert so gewählt ist, dass die Zellspannung bei Unterschreiten dieses Schwellenwerts auf höchstens ein Viertel abgesunken ist. Dieser Schwellenwert wird beispielsweise dadurch bestimmt, dass die Zellenspannung einer Batterie in Abhängigkeit vom Elektrolytgehalt bestimmt wird. Kurz vor dem Erreichen des Schwellenwerts bricht die Zellspannung zusammen, das heißt, dass sie um zumindest 75% absinkt. Ist der Schwellenwert unterschritten, enthält die Batterie so wenig Elektrolyt, dass in guter Näherung keine elektrochemische Reaktion mehr möglich ist.

Vorzugsweise wird das Zerkleinerungsgut so lange getrocknet, dass eine Menge von 50 kg an Zerkleinerungsmaterial, das kompaktiert in einem 50 Liter-Fass enthalten ist, keine oder eine nur so geringe Wärmeentwicklung zeigt, dass ein thermisches Durchgehen, also eine thermisch induzierte Kettenreaktion, für zumindest zwei Monate ausgeschlossen ist und dass eine etwaige Wasserstoff-Entwicklung zudem so gering ausgebildet ist, dass nach zwei Wochen kein Überdruck entsteht, wenn zu Beginn ein Unterdruck von 500 hPa herrscht.

Günstig ist es, wenn das Zerkleinerungsgut so lange getrocknet wird, bis der

Elektrolytgehalt an organischen Komponenten, die bei 80°C flüchtig sind, höchstens 3 Gew.-%, höchstens insbesondere 2 Gew.-%, besonders bevorzugt höchstens 1,5 Gew.-%, beträgt.

- 5 Vorzugsweise wird das Trocknen so lange durchgeführt, dass der akkumulierte Gehalt an organischen Karbonaten aus dem Elektrolyten, die bei 80°C flüchtig sind, in der Atmosphäre über dem Zerkleinerungsgut 3 Vol.-% unterschreitet.

- Insbesondere wird das Trocknen so lange durchgeführt, bis der Gehalt an Kohlen säuredimethylester 4 Vol.-%, insbesondere 3 Vol.-%, unterschreitet und/oder der Gehalt an Cyclohexylbenzol 1 Vol.-%, insbesondere 0,5 Vol.-%, unterschreitet.

- Vorzugsweise erfolgt das Trocknen unmittelbar nach dem Zerkleinern. Hierunter
15 wird insbesondere verstanden, dass zwischen dem Beginn des Zerkleinerns der Batterien und dem Zeitpunkt, zu dem zumindest ein Teil des dadurch entstandenen Zerkleinerungsguts anfängt zu Trocknen, höchstens fünf Minuten beträgt, insbesondere höchstens eine Minute. Durch die schnelle Trocknung nach dem Zerkleinern wird die Masse an Material klein gehalten, die potentiell elektrochemisch reagieren könnte, zudem wird die elektrochemische Reaktionszeit potentieller exothermer Reaktionen klein gehalten. Das senkt das Risiko für die Anlage
20 und die Umgebung.

- Besonders günstig ist es, wenn das Vakuum mittels einer Strahlpumpe erzeugt wird. Strahlpumpen sind, insbesondere bei geeigneter Wahl des Strahlmediums,
25 weitgehend unempfindlich gegen aggressive abzupumpende Gase. Günstig ist es, wenn das Strahlmedium, das eine Flüssigkeit ist, einen pH-Wert von zumindest 8, insbesondere von zumindest 9, beispielsweise zumindest 12, hat. In diesem Fall können sich unerwünschte Bestandteile des Gases, das abgepumpt
30 wird, zersetzen oder zu weniger schädlichen Substanzen reagieren. So kann beispielsweise Kohlen säuredimethylester und/oder Kohlen säureethylmethylester durch eine Verseifungsreaktion abgebaut werden. Etwaig im Strahlenmedium

enthaltener Fluorwasserstoff kann im basischen Milieu in einer Säure-Base-Reaktion zu einem ungefährlichen Salz umgesetzt werden.

5 Vorzugsweise enthält das Strahlenmedium eine Fluor fällende Substanz. Beispielsweise kann das Strahlenmedium Natriumkarbonat oder Calciumkarbonat enthalten. Die bei der Reaktion mit einer Fluorverbindung, insbesondere Fluorwasserstoff, entstehenden Salze werden vorzugsweise abgetrennt, insbesondere abgefiltert oder aussedimentiert. Auf diese Weise wird zumindest weitgehend verhindert, dass Fluorwasserstoff oder andere giftige fluorhaltige Verbindungen in die Umgebung abgegeben werden können.

Vorzugsweise erfolgt das Trocknen bei einer Temperatur von höchstens 80°C. In diesem Fall entsteht kaum Fluorwasserstoff. Das erhöht die Lebensdauer der Batterie-Verarbeitungsanlage und verringert die Umweltgefährdung.

15 Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren die Schritte des Kondensierens von Bestandteilen des Elektrolyten durch Abkühlen und/oder Druckerhöhen, sodass ein Elektrolytkondensat entsteht. Beispielsweise wird das Kondensieren an einer Stelle durchgeführt, die bezüglich des Gasflusses zwischen dem Trockner und der Vakuumpumpe liegt. Vom Trockner kommende Gase müssen daher in diesem Fall zunächst einen Kondensator passieren, bevor sie zur Vakuumpumpe gelangen können. Das führt dazu, dass gasförmiger Elektrolyt, der in dem Gas vorliegt, das beim Trocknen entsteht, zumindest zu einem überwiegenden Teil im Kondensator abgeschieden wird, bevor das verbleibende Gas zur Pumpe gelangt. So kann Elektrolyt zurückgewonnen werden.

20
25

Zudem verringert sich der Gasstrom durch die Vakuumpumpe, was deren Lebensdauer verlängert und deren Energieverbrauch reduziert.

30 Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren alternativ den Schritt der Gasreinigung durch Adsorption der flüchtigen organischen Bestandteile an einem AktivkohlfILTER vor oder nach der Verdichtereinheit.

Vorzugsweise umfasst das erfindungsgemäße Verfahren alternativ oder zusätzlich den Schritt eines Reinigens des Gases, das beim Trocknen entsteht, bevor dieses die Vakuumpumpe erreicht. Das kann beispielsweise auch dadurch erfolgen, dass das Gas einen Aktivkohlefilter und/oder einen Filter passiert, in dem mit Fluorwasserstoff reagierende Substanzen enthalten sind, beispielsweise ein

5 mit Calciumsalz wie Calciumkarbonat oder ein Kaliumsalz wie Kaliumkarbonat.

Vorzugsweise umfasst das erfindungsgemäße Verfahren den Schritt eines Trocknens bei einer Trocken-Temperatur und für eine Trocken-Dauer, die so gewählt sind, dass sich der Binder, der Aktivmaterial der Lithium-Batterie an einen

10 Träger bindet, zumindest zum überwiegenden Teil zersetzt. Günstig ist es, wenn dieser Trocknungsschritt, der auch als Hochtemperatur-Trocknen bezeichnet werden kann, räumlich getrennt von einem ersten, oben beschriebenen Trocknungsschritt durchgeführt wird. Der letztgenannte Trocknungsschritt kann auch

15 als Niedertemperatur-Trocknen bezeichnet werden.

Vorzugsweise wird das Hochtemperatur-Trocknen, bei dem sich der Binder zersetzt, so durchgeführt, dass die entstehenden Zersetzungsgase sich nicht mit den Gasen mischen, die beim Niedrigtemperatur-Trocknen entstehen. Es ist

20 möglich, dass das Hochtemperatur-Trocknen und das Niedertemperatur-Trocknen bei unterschiedlichen Drücken erfolgt. Beispielsweise kann das Hochtemperatur-Trocknen bei Normaldruck erfolgen.

Unter dem Aktivmaterial wird der Stoff verstanden, der beim Betrieb der Batterien elektrochemisch reagiert. Unter dem Träger für das Aktivmaterial wird insbesondere eine Trägerfolie verstanden, auf der das Aktivmaterial in Form von

25 Partikeln aufgebracht ist. Beispielsweise handelt es sich bei der Trägerfolie um eine Folie aus Aluminium oder eine Aluminiumlegierung. Der Binder ist der Stoff, der das Aktivmaterial mit dem Träger verbindet, beispielsweise enthält der Binder

30 Polyvinylidenfluorid.

Günstig ist es, wenn beim Zerkleinern der Batterien flüssiger Stickstoff zugege-

ben wird. Das kühlt die Batterien, die Zerkleinerungsmaschine und das Zerkleinerungsgut und verdrängt zudem Sauerstoff und Wasserdampf aus der Atmosphäre.

- 5 Günstig ist es, wenn das Zerkleinern bei dem Wasserdampf-Partialdruck von höchstens 20 Pa und/oder einem Sauerstoff-Partial von höchstens 40 hPa, insbesondere höchstens 15 hPa erfolgt.

10 Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren die Schritte eines Entnehmens des Zerkleinerungsguts aus dem Transportbehälter, eines Abtrennens von Hartteilen und/oder eines Separierens von Aktivmaterial vom Träger, insbesondere durch eine zweite Zerkleinerungsstufe und/oder Luftstrahl-
sieden, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entstehen, und
15 eines getrennten Verpackens von Aktivmaterialfraktion und Trägerfraktion in jeweilige Transportbehältnisse. Günstig ist es, wenn diese Transportbehältnisse luftdicht ausgebildet sind. Durch das Trennen von Aktivmaterialfraktion und Trägerfraktion ist ein Transport in der Regel ohne Genehmigungen möglich. Ein weiterer Vorteil ist, dass derartig getrennte Fraktionen nur eine geringe Gefährdung darstellen.

20

Das Entnehmen des Zerkleinerungsguts aus dem Transportbehälter erfolgt vorzugsweise unter Vakuum und/oder unter Schutzgas.

25 Es ist möglich, nicht aber notwendig, dass das Zerkleinerungsgut unter Vakuum in den Transportbehälter abgefüllt wird. Günstig ist es, wenn der Transportbehälter ein Vakuumbehälter ist, insbesondere ein evakuierter Vakuumbehälter, sodass im Transportbehälter nach dem Verschließen ein Unterdruck oder Vakuum herrscht. Alternativ kann der Transportbehälter mit einem Inertgas gefüllt werden.

30

In einer bevorzugten Batterie-Verarbeitungsanlage sind die Trennungseinheit und die Trockenvorrichtung in einem gemeinsamen Standard-Container angeordnet. Das hat den Vorteil, dass die Batterie-Verarbeitungsanlage besonders

einfach transportiert werden kann.

Die Trockenvorrichtung ist eingerichtet zum Trocknen des Zerkleinerungs-
guts für eine so lange Zeit, bis ein Elektrolytgehalt so klein ist, dass eine elektro-
chemische Reaktion unmöglich ist. Wird die Trockenvorrichtung im Chargenbe-
trieb betrieben, was eine mögliche Ausführungsform darstellt, so wird das Trock-
nen beispielsweise für eine vorgegebene Zeitspanne durchgeführt. Alternativ
oder zusätzlich wird der Gehalt an organischen Substanzen, beispielsweise an
organischen Carbonaten, in der Atmosphäre in der Trockenvorrichtung kontinu-
ierlich gemessen und das Trocknen beendet, wenn eine vorgegebene Schwel-
len-Konzentration unterschritten wird.

Gemäß einer bevorzugten Ausführungsform umfasst die Batterie-Verarbei-
tungsanlage, insbesondere die Vakuumanlage, einen Kondensator, der einge-
richtet ist zum Kondensieren von organischen Bestandteilen der Atmosphäre im
Trockner, insbesondere von organischen Carbonaten, beispielsweise von Dime-
thylcarbonat, Ethylmethylcarbonat und/oder Ethylencarbonat. Vorzugsweise ist
der Kondensator in Materialflussrichtung vor einer Vakuumpumpe angeordnet,
mittels der der Trockner evakuiert wird. Günstig ist es, wenn der Kondensator
gekühlt ist, vorzugsweise auf eine Temperatur von höchstens 90°C, vorzugs-
weise höchstens 80°C, insbesondere höchstens 70°C. Um den Kühlaufwand
klein zu halten wird der Kondensator, sofern er gekühlt wird, auf eine Tempera-
tur von zumindest -10°C, insbesondere zumindest 10 °C, gekühlt.

Günstig ist es, wenn die Trockenvorrichtung ein Rührwerkzeug aufweist, bei-
spielsweise einen Ankerrührer oder einen Stabrührer, dessen Rührstäbe quer zu
einer Rührwelle angebracht sein können. Alternativ oder zusätzlich ist das Rühr-
werkzeug ein externes Rührwerkzeug, das den Trockner als Ganzes bewegt.

Vorzugsweise besitzt die Batterie-Verarbeitungsanlage eine Vakuumanlage, die
mit der Trockenvorrichtung zum Erzeugen eines Vakuums in der Trockenvorrich-
tung verbunden ist. Besonders günstig ist es, wenn auch die Vakuumanlage im
Standard-Container angeordnet ist. Bei dem Standard-Container handelt es sich

vorzugsweise um einen Container nach ISO-Norm 668, vorzugsweise um einen 40-Fuß-Container oder einen 20-Fuß-Container.

Beispielweise umfasst die Vakuumanlage eine Strahlpumpe, bei der ein Strahl-
5 medium zum Erzeugen des Unterdrucks verwendet wird.

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage eine Hartmetallabtrenn-
vorrichtung und/oder eine Leichtfraktionabtrennvorrichtung, eine Separiervor-
richtung, insbesondere eine Klassiervorrichtung, zum Separieren von Aktivmate-
10 rial vom Träger, insbesondere durch eine zweite Zerkleinerungsstufe und/oder
Luftstrahlsieben, sodass eine Aktivmaterialfraktion und eine Trägerfraktion ent-
steht, und eine zweite Abfüllvorrichtung zum getrennten Abfüllen von Aktivmate-
rialfraktion und Trägerfraktion. Günstig ist es, wenn diese Abfüllvorrichtung zum
Abfüllen unter Unterdruck und/oder unter Inertgas ausgebildet ist.

15 Unter einer Hartmetallabtrennvorrichtung wird insbesondere eine Vorrichtung
zur Abtrennung von Fragmenten peripherer Bestandteile des Betriebssystems,
der Batteriezellhülle und der Strom-Kontakte verstanden. Beispielsweise um-
fasst die Hartmetallabtrennvorrichtung eine Magnetseparationsvorrichtung
20 und/oder einen Siebter, insbesondere einen Querstromsiebter und/oder einen
Zickzack-Siebter. Unter der Separiervorrichtung wird insbesondere eine Vorrich-
tung zum zur Abtrennen der Separatorfolie verstanden.

Die Leichtfraktionabtrennvorrichtung umfasst vorzugsweise einen Zickzack-Sich-
25 ter und/oder einen Lufttrenner, wobei es günstig ist, wenn die Luft im Kreislauf
geführt wird. Das reduziert die Staubexposition der Umwelt mit gesundheits-
schädlichem Staub.

Vorzugsweise sind die zweite Abfüllvorrichtung und die Separiervorrichtungen in
30 einem gemeinsamen Standard-Container angeordnet, beispielsweise im oben
beschriebenen ersten Standard-Container, oder einem zweiten Standard-Contai-
ner. Günstig ist es, wenn der Container staubdicht gekapselt ist.

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage eine Schleuse zwischen der Zerkleinerungseinheit und der Inaktivierungsvorrichtung, insbesondere der Trocknungsvorrichtung. Beispielsweise handelt es sich um eine Zellenradschleuse. Durch die Schleuse wird der Sauerstoffeintrag in die Inaktivierungsvorrichtung, insbesondere die Trocknungsvorrichtung, vermindert.

Im Folgenden wird die Erfindung anhand der beigefügten Zeichnungen näher erläutert. Dabei zeigt

- 10 Figur 1 ein Ablaufdiagramm eines erfindungsgemäßen Verfahrens,
- Figur 2 einen Querschnitt durch eine erfindungsgemäße Batterie-Verarbeitungsanlage und
- 15 Figur 3 einen Querschnitt durch weitere, optionale Bestandteile einer erfindungsgemäßen Batterie-Verarbeitungsanlage.

Figur 1 zeigt das Ablaufdiagramm eines erfindungsgemäßen Verfahrens. Zunächst werden Batterien 10.1, 10.2, ..., insbesondere Batteriesysteme bestehend aus mehreren Batteriemodulen oder Batteriestacks, welche wiederum aus mehreren Batteriezellen bestehen, in einer Entladeeinheit 12 entladen. Danach folgt an einer Demontagestation 14 die Demontage der Batterien 10, wenn diese erforderlich ist, weil die Batteriesysteme ansonsten aus geometrischen oder gravimetrischen Gründen nicht in die Zerkleinerungseinheit befördert werden können. Dazu werden die Batteriesysteme geöffnet und soweit demontiert, dass die Module/Stacks einzeln entfernt werden können. Gegebenenfalls können auch die Zellen von der Ansteuerelektronik getrennt werden. Die entstehenden Untereinheiten (Module/Stacks) und/oder Zellen 16.1, 16.2, ... werden einer Zerkleinerungseinheit 18 zugeführt, die beispielsweise eine Rotorschere mit einem Rotor und einen mit Statoren oder mehreren Rotoren, oder eine Schneidmühle mit einem Rotor und mehreren Rotoren umfasst.

Die Zerkleinerungseinheit 18 zerkleinert die Batterien 10 unter Schutzgas 20,

das beispielsweise einer Schutzgasflasche entnommen wird. Alternativ oder zusätzlich kann flüssiger Stickstoff aus einer Flüssigstickstoffquelle 19 zugeführt werden. Bei dem Schutzgas kann es sich beispielsweise um Stickstoff, ein Edelgas, Kohlendioxid, Lachgas oder ein sonstiges, vorzugsweise nicht giftiges Gas handeln.

Beim Zerkleinern entsteht Zerkleinerungsgut 24, das einer Inaktivierungsvorrichtung in Form einer Trockenvorrichtung 26 zugeführt wird. Zwischen der Zerkleinerungseinheit 18 und der Trockenvorrichtung 26 ist eine Schleuse 28 angeordnet, die soweit gasdicht ist, dass die Druckvorrichtung 26 in guter Näherung von der Zerkleinerungseinheit 18 gasdicht getrennt ist.

Die Trockenvorrichtung 26 ist mit einer Vakuumanlage 29 verbunden, die eine Vakuumpumpe 30 aufweist und ein Vakuum erzeugt. In der Trockenvorrichtung 26 herrscht ein Druck p_{26} von $p_{26} \approx 100$ hPa, vorzugsweise 50 hPa. Es sei darauf hingewiesen, dass im Rahmen der vorliegenden Beschreibung unter einer Vakuumpumpe insbesondere ganz allgemein eine Vorrichtung verstanden wird, die ein Vakuum erzeugt. Es ist dabei möglich und bevorzugt, nicht aber notwendig, dass die Vakuumpumpe gleichzeitig als Verdichter wirkt, so dass von ihr Gas unter einem Druck abgegeben wird, der größer ist als der Umgebungsdruck.

In dem in Figur 1 gezeigten Fall handelt es sich bei der Vakuumpumpe um einen Verdichter, der Gas 31, das in der Trockenvorrichtung 26 vorliegt, ansaugt und verdichtet. Alternativ oder zusätzlich kann die Vakuumanlage 29 eine Strahlpumpe aufweisen, bei der ein Strahlmedium in Form einer Flüssigkeit mit hoher Geschwindigkeit durch Venturi-Düse geleitet wird. Das Strahlmedium ist alkalisch und hat einen pH-Wert von zumindest pH 13 und ist beispielsweise eine 10%ige Kaliumhydroxidlösung.

Die Vakuumanlage 29 umfasst eine Gasreinigungsvorrichtung 32, die zwischen der Trockenvorrichtung 26 und der Vakuumpumpe 30 angeordnet ist und die im

vorliegenden Fall einen Kondensator 34 und/oder einen Aktivkohlefilter 36 umfasst. Der Kondensator wird bei einer Temperatur von -10°C betrieben, so dass Kohlensäuredimethylester und Kohlensäureethylmethylester kondensieren und in einen Kondensatbehälter 38 abgegeben werden können. Zudem wird etwaig
5 vorhandenes Wasser ausgefroren. Ein Steuerventil 40 ist ausgebildet zum Öffnen, wenn der Druck p_{26} zu groß wird und zum Zufahren, wenn der Druck p_{26} zu klein wird, das heißt, dass ein vorgegebener Schwellenwert unterschritten wird.

Vorzugsweise ist das Trocknungsgut während der Trocknung bewegt. Dies kann
10 beispielsweise durch Rühren mit einem Rührwerkzeug 41, wie einem Ankerrührer oder einem Stabrührer mit senkrecht zur Rührwelle angebrachten Stäben passieren. Alternativ durch einen bewegten Trocknungsbehälter.

Durch das Trocknen des Zerkleinerungsguts entsteht inaktiviertes Zerkleinerungsgut 42, das einer Abfüllvorrichtung 44 zugeführt wird. Dort wird das inaktivierte Zerkleinerungsgut 42 unter Vakuum und/oder unter Schutzgas in einen Transportbehälter 46 abgefüllt. Der Transportbehälter 46 ist vorzugsweise gasdicht. Es ist möglich, nicht aber notwendig, dass der Transportbehälter 46 vor dem Abtransport mit Inertgas aufgefüllt wird, so dass er unter Normaldruck
20 steht. Alternativ ist es auch möglich, dass der Transportbehälter unter Vakuum verschlossen und transportiert wird. Es ist möglich, dass alternativ zum Transportbehälter eine vakuumverschweißte Folie, beispielsweise eine Aluminiumverbundfolie, gewählt wird.

Über eine Spülleitung 48 wird der Zerkleinerungseinheit 18 Schutzgas 20 von der Vakuumpumpe 30 zugeführt. Arbeitet die Vakuumpumpe 30 wie im vorliegenden Fall, der eine bevorzugte Ausführungsform darstellt, zudem als Kompressor, kann das Schutzgas auf eine Druckgasflasche 50 gezogen werden. Alternativ oder zusätzlich kann das Schutzgas 20, gegebenenfalls nach zusätzlicher
30 Reinigung, in die Umgebung abgegeben werden.

Figur 2 zeigt schematisch einen Querschnitt durch eine erfindungsgemäße Batterie-Verarbeitungsanlage 52, die einen Standard-Container 54 aufweist, in dem

die Zerkleinerungseinheit 18, die Trockenvorrichtung 26 und die Abfüllvorrichtung 44 angeordnet sind. Hinter der Zerkleinerungseinheit 18 ist ein erster gasdichter Förderer 56 angeordnet, der beispielsweise eine Förderschnecke oder einen Rohrkettentransporter umfasst. Der erste Förderer 56 fördert das Zerkleinerungsgut 24 zur Trockenvorrichtung 26, die mit der in Figur 2 nicht sichtbaren Vakuum-Erzeugungsvorrichtung verbunden ist. In Materialstromrichtung hinter der Trockenvorrichtung 26 ist ein zweiter Förderer 58 angeordnet, der vorzugsweise ebenfalls gasdicht ausgebildet ist und eine Förderschnecke oder einen Rohrkettentransporter enthalten kann. Der zweite Förderer fördert das inaktivierte Zerkleinerungsgut 42 zur Abfüllvorrichtung 44.

Figur 3 zeigt optionale, in der vorliegenden Ausführungsform vorhandene Einheiten der erfindungsgemäßen Batterie-Verarbeitungsanlage 52, die einen Aufschlusszerkleinerer 60 sowie einen Sieb 62 umfasst. Der Aufschlusszerkleinerer 60 enthält eine Transportbehälter-Entleervorrichtung 64, mittels der aus dem Transportbehälter 46 inaktiviertes Zerkleinerungsgut 42 entnommen werden kann. Der Aufschlusszerkleinerer 60 erzeugt Aufschlussmaterial 66, das dem Sieb 62 zugeführt wird. Es kann sich bei dem Sieb beispielsweise um einen Zickzack-Sieb handeln.

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage 52 einen Zerkleinerer, der vorzugsweise im Materialfluss vor der Klassiervorrichtung 74 steht und ein schnell laufendes Zerkleinerungswerkzeug enthält, wobei eine Rotorumfangsgeschwindigkeit größer ist als 1 m/s, vorzugsweise größer als 10 m/s. Dieser Zerkleinerer zerkleinert das Zerkleinerungsmaterial und beansprucht es mechanisch so, dass sich die elektrochemisch aktive Beschichtung mindestens teilweise vom Träger löst. Das Vorhandensein eines solchen Zerkleinerers ist ein allgemeines bevorzugtes Merkmal einer erfindungsgemäßen Batterie-Verarbeitungsanlage.

Im Sieb entstehen eine Leichtfraktion mit Separatorfolie und feinem Beschichtungsmaterial und eine Schwergutfraktion mit Trägerfolien (Aluminium- und Kupfer) mit größerem leicht anhaftender Beschichtung. Beide Fraktionen werden auf

jeweils ein Sieb zur weiteren Trennung in Beschichtung und Separatorfolie beziehungsweise Beschichtung und Metallfolien gegeben. Die entstehenden Fraktionen werden getrennt weiter verarbeitet.

- 5 Das Aufschlussmaterial 66 wird dem Sieb 62 mittels einem dritten Förderer 68 zugeführt. Ein vierter Förderer 70 führt gesichtetes Material 72, insbesondere das Material der Leichtfraktion, das den Sieb 62 verlässt, einer Klassiervorrichtung 74 zu. Die Klassiervorrichtung 74 umfasst vorzugsweise ein Luftstrahlsieb, das gleichzeitig als Trennvorrichtung zum Trennen des Aktivmaterials von dem Träger fungiert. Durch das Trennen entsteht eine Aktivmaterialfraktion 76,
10 die in ein Transportbehältnis 78 abgefüllt wird.

- Es entsteht zudem eine Trägerfraktion 80, die in der vorliegenden Ausführungsform mit einem fünften Förderer 82 einer Abfülleinheit 84 zugeführt wird, die die
15 Trägerfraktion 80 in einen Behälter 86 füllt. Die Abfülleinheit 84 ist zusammen mit einer zweiten Abfülleinheit 88 Teil einer zweiten Abfüllvorrichtung.

Bezugsleistenliste

10	Batterie	50	Druckgasflasche
12	Entladeeinheit	52	Batterie-Verarbeitungsanlage
14	Demotagesstation	54	Standard-Container
16	Zelle	56	erster Förderer
18	Zerkleinerungseinheit	58	zweiter Förderer
19	Flüssigstickstoffquelle		
20	Schutzgas	60	Aufschlusszerkleinerer
22	Schutzgasflasche	62	Sichter
24	Zerkleinerungsgut	64	Transportbehälter- Entleervorrichtung
26	Trockenvorrichtung	66	Aufschlussmaterial
28	Schleuse	68	dritter Förderer
29	Vakuumanlage		
		70	vierter Förderer
30	Vakuumpumpe	72	gesiebtetes Material
31	Gas	74	Klassiervorrichtung
32	Gasreinigungsvorrichtung	76	Aktivmaterialfraktion
34	Kondensator	78	Transportbehältnis
36	Aktivkohlefilter		
38	Kondensatbehälter	80	Trägerfraktion
		82	fünfter Förderer
40	Steuerventil	84	Abfülleinheit
41	Rührwerkzeug	86	Behälter
42	inaktives Zerkleinerungsgut	88	zweite Abfülleinheit
44	Abfüllvorrichtung		
46	Transportbehälter	p	Druck
48	Spüleitung		

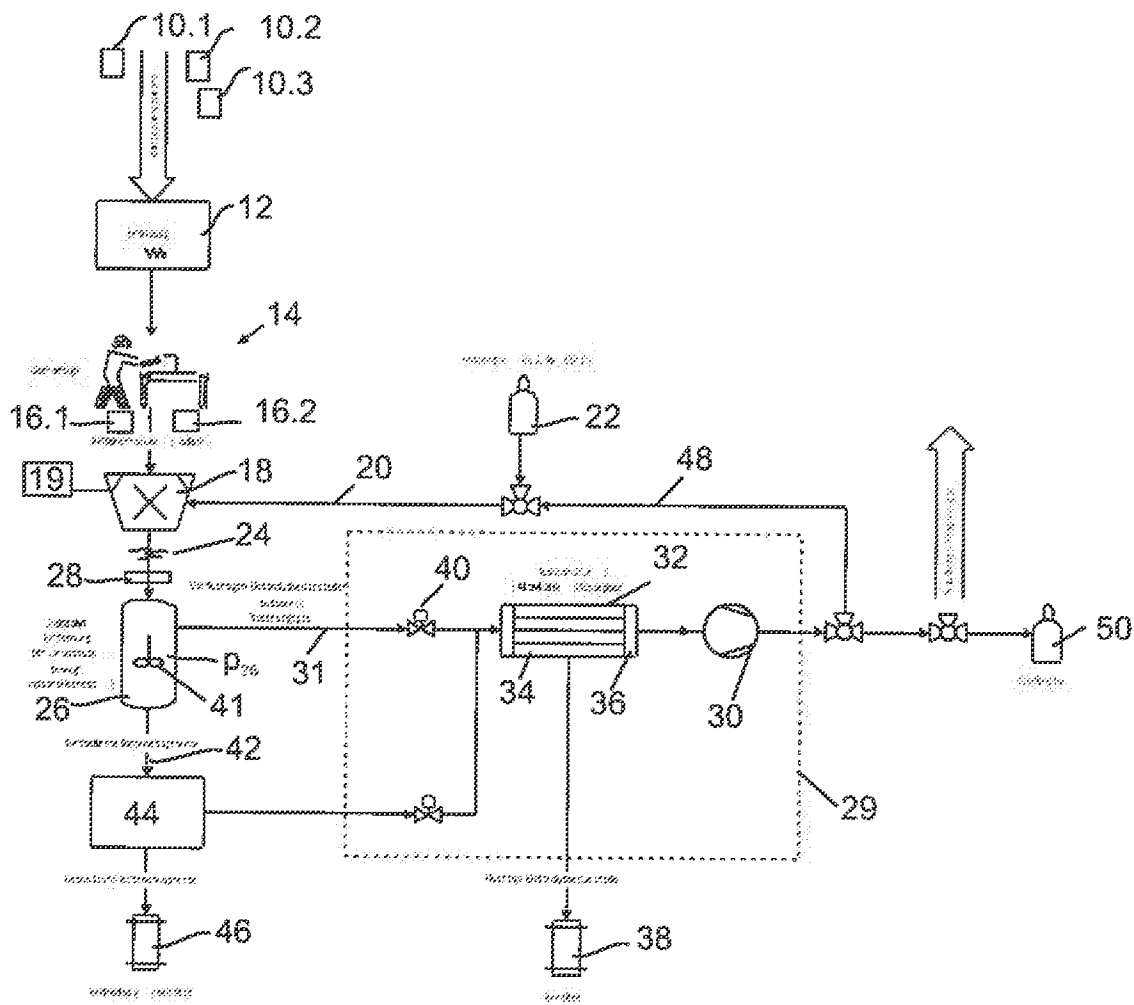
Patentansprüche.

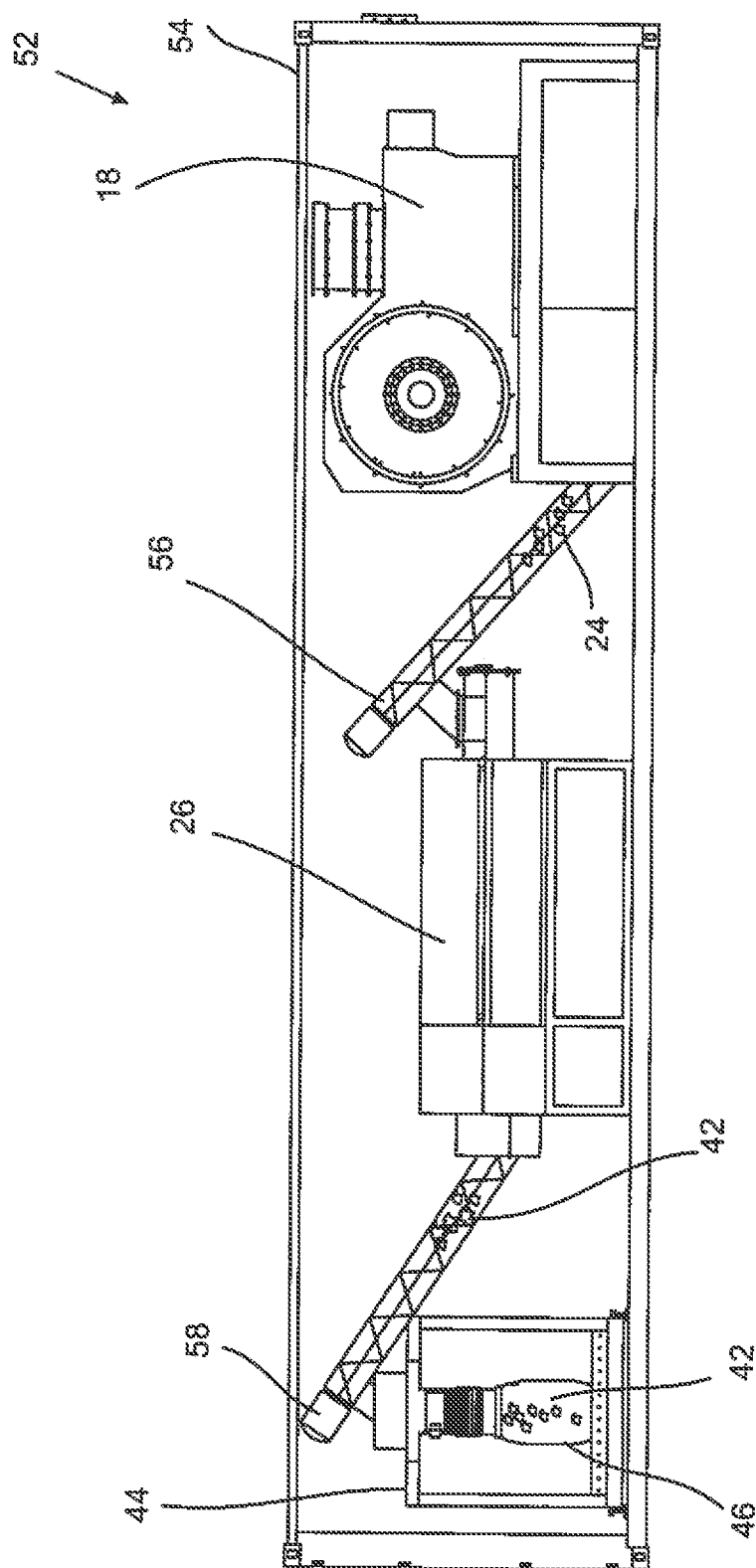
1. Verfahren zum Behandeln gebrauchter Batterien (10), insbesondere
5 Lithium-Batterien, mit den Schritten:
 - (a) Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird,
 - (b) Inaktivieren des Zerkleinerungsguts (24), sodass ein inaktiviertes Zerkleinerungsgut (42) erhalten wird, und
 - 10 (c) Abfüllen des inaktivierten Zerkleinerungsguts (42) in einen Transportbehälter (46),
dadurch gekennzeichnet, dass
 - (d) das Inaktivieren durch Trocknen des Zerkleinerungsguts (24) erfolgt.
- 15 2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass das Zerkleinerungsgut (24) solange getrocknet wird, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist.
3. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass das Trocknen unter Vakuum erfolgt.
20
4. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass
das Vakuum mittels einer Strahlpumpe erzeugt wird und
25 ein Strahlmedium der Strahlpumpe
einen pH-Wert von zumindest 8, insbesondere 9, hat und/oder
eine Fluor fällende Substanz enthält.

5. Verfahren nach einem der vorstehenden Ansprüche, gekennzeichnet durch die Schritte:
- (e) Entnehmen des Zerkleinerungsguts (24) aus dem Transportbehälter (46),
 - 5 (f) Abtrennen von Hartteilen und/oder
Separieren von Aktivmaterial vom Träger, insbesondere durch Luftstrahlsieben oder durch eine zweite Zerkleinerungsstufe, sodass eine Aktivmaterialfraktion (76) und eine Trägerfraktion (80) entsteht, und
 - (g) getrenntes Verpacken von Aktivmaterialfraktion (76) und Trägerfraktion (80) in Transportbehältnisse (78).
- 10
6. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass das Trocknen des Zerkleinerungsguts erst beendet wird, wenn sich nach Beenden des Trocknens kein entzündliches oder explosives Gasgemisch über dem abgefüllten Zerkleinerungsgut mehr bilden kann und/o-
- 15 oder wenn das Zerkleinerungsgut so trocken ist, dass sich im Transportbehälter oder während der Weiterverarbeitung ein entzündliches oder explosives Gasgemisch ergeben kann.
- 20 7. Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien, insbesondere Lithium-Batterien, mit:
- (a) einer Zerkleinerungseinheit (18) zum Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird,
 - (b) einer Inaktivierungsvorrichtung (26) zum Inaktivieren des Zerkleinerungsguts (24) und
 - 25 (c) einer Abfüllvorrichtung (44) zum Abfüllen des inaktivierten Zerkleinerungsguts (24) in einen Transportbehälter (46),
dadurch gekennzeichnet, dass
 - (d) die Inaktivierungsvorrichtung eine Trockenvorrichtung (26) umfasst und
 - 30 (e) die Batterie-Verarbeitungsanlage eine Vakuumanlage, die mit der Trockenvorrichtung (26) zum Erzeugen eines Vakuums in der Trockenvorrichtung (26) verbunden ist, aufweist.

8. Batterie-Verarbeitungsanlage nach Anspruch 7, dadurch gekennzeichnet,
dass die Trockenvorrichtung (26) eingerichtet ist zum Trocknen des Zer-
kleinerungsguts (24) solange, bis ein Elektrolytgehalt so klein ist, dass eine
elektrochemische Reaktion unmöglich ist.
9. Batterie-Verarbeitungsanlage nach Anspruch 7 oder 8, dadurch gekenn-
zeichnet, dass
die Zerkleinerungseinheit und die Trockenvorrichtung (26) in einem Stan-
dard-Container (54) angeordnet sind.
10. Batterie-Verarbeitungsanlage nach einem der Ansprüche 7 bis 9, gekenn-
zeichnet durch eine Vakuumanlage, die mit der Trockenvorrichtung (26)
zum Erzeugen eines Vakuums in der Trockenvorrichtung (26) verbunden
ist.
11. Batterie-Verarbeitungsanlage nach Anspruch 10, dadurch gekennzeichnet,
dass
- die Vakuumanlage (29) eine Strahlpumpe mit einem Strahlmedium um-
fasst,
 - das Strahlmedium im Kreis geführt ist und
 - das Strahlmedium eine mit Fluorwasserstoff reagierende Substanz ent-
hält.
12. Batterie-Verarbeitungsanlage nach einem der Ansprüche 7 bis 11, gekenn-
zeichnet durch
- eine Hartmetallabtrennvorrichtung und/oder eine Leichtfraktionsabtrenn-
vorrichtung,
 - eine Separiervorrichtung, insbesondere eine Klassiervorrichtung (74),
zum Separieren von Aktivmaterial vom Träger, insbesondere durch Luft-
strahlsieben und/oder durch eine zweite Zerkleinerungsstufe, sodass
eine Aktivmaterialfraktion (76) und eine Trägerfraktion entsteht, insbe-
sondere Aluminium- und Kupferfolien, und

- eine zweite Abfüllvorrichtung (44) zum getrennten Abfüllen von Aktivmaterialfraktion (76) und Trägerfraktion (80), insbesondere Aluminium- und Kupferfolien.



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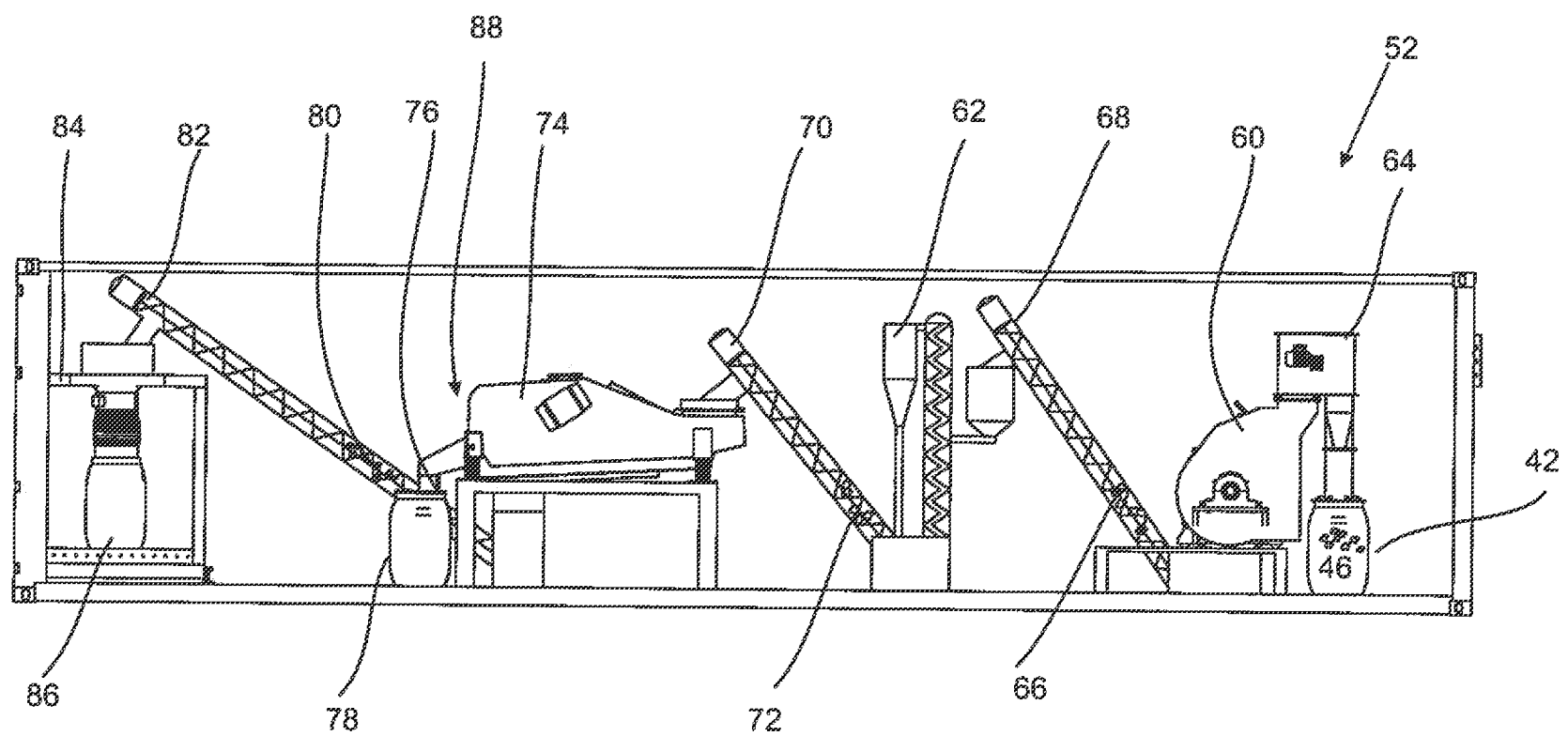


Fig. 3

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen

PCT/EP2016/059526

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES INV. H01M6/52 C22B13/00 H01M10/54 ADD.		
Nach der internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC		
B. RESEARCHIERTE GEBIETE Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole) H01M C22B		
Recherchierte, aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen		
Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe) EPO-Internal, WPI Data		
C. ALS WESENTLICH ANGESEHENE UNTERLAGEN		
Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Bez. Anspruch Nr.
X	WO 2010/102377 A1 (ELLIOTT K W) 16. September 2010 (2010-09-16) Absätze [0015] - [0040]; Abbildungen 1, 3 -----	1-12
X	DE 10 2011 110083 A1 (TECH UNI BRAUNSCHWEIG CAROLO WILHELMINA [DE]) 14. Februar 2013 (2013-02-14) in der Anmeldung erwähnt Absätze [0021], [0022], [0034] - [0039]; Abbildung 1 -----	1-3, 5-8, 10, 12
☐ Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen ☒ Siehe Anhang Patentfamilie		
* Besondere Kategorien von angegebenen Veröffentlichungen "A" Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist "E" Frühere Anmeldung oder Patent, die bzw. das jedoch erst am oder nach dem internationalen Anmeldedatum veröffentlicht worden ist "L" Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweifelhaft erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgeführt) "O" Veröffentlichung, die sich auf eine mündliche Offenbarung, eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht "P" Veröffentlichung, die vor dem internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist "T" Spätere Veröffentlichung, die nach dem internationalen Anmeldedatum oder dem Prioritätsdatum veröffentlicht worden ist und mit der Anmeldung nicht kollidiert, sondern nur zum Verständnis des der Erfindung zugrundeliegenden Prinzips oder der ihr zugrundeliegenden Theorie angegeben ist "X" Veröffentlichung von besonderer Bedeutung, die beanspruchte Erfindung kann allein aufgrund dieser Veröffentlichung nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden "Y" Veröffentlichung von besonderer Bedeutung, die beanspruchte Erfindung kann nicht als auf erfinderischer Tätigkeit beruhend betrachtet werden, wenn die Veröffentlichung mit einer oder mehreren Veröffentlichungen dieser Kategorie in Verbindung gebracht wird und diese Verbindung für einen Fachmann naheliegend ist "Z" Veröffentlichung, die Mitglied derselben Patentfamilie ist		
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Name und Postanschrift der internationalen Recherchenbehörde Europäisches Patentamt, P.B. 8818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-2016		Bevollmächtigter Bediensteter Hofer, Astrid

Formblatt PCT/ISA210 (Blatt 2) (April 2009)

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen

PCT/EP2016/059526

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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VERIFICATION OF A TRANSLATION

I, Megan Skinner B.A.

Freelance translator and interpreter for the language combinations German-English and Dutch-English hereby declare that I am knowledgeable in the German language, in which the international application with the above application number was filed. Furthermore, I hereby confirm that the English translation of the enclosed application WO 2016/174156 - is a true and complete translation to the best of my knowledge and belief.

I hereby declare that all the statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. Moreover, I hereby confirm that these statements were made in the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, pursuant to Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the subsequent patent application.



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Date: 20th October 2017

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Method for the treatment of used batteries, in particular rechargeable batteries, and battery processing installation

The invention refers to a method for the treatment of used batteries, in particular
5 used lithium batteries, such as lithium ion batteries, with the steps

(a) comminuting the batteries such that comminuted material is obtained,
(b) inactivating of the comminuted material such that an inactive comminuted
material is obtained, and (c) filling a transport container with the inactive
comminuted material.

10

According to a second aspect, the invention refers to a battery processing
installation for the treatment of used batteries, in particular for the treatment of
used lithium batteries with (a) a comminuting device for comminuting the
batteries such that comminuted material is obtained, (b) an inactivation device
15 for inactivating the comminuted material and (c) a filling device for filling a
transport container with the inactivated comminuted material.

US 2005/0241943 A1 describes a method for processing used batteries in
which the batteries are heated prior to a comminuting step, thereby destroying
20 plastic components in the batteries. The disadvantage of this type of procedure
is that the remaining components of the batteries may be contaminated with
degradation products of the plastic.

DE 10 2012 024 876 A1 describes a system for transferring transport-critical
25 electrolyte cells, in which they are initially comminuted under inert gas and then
dusted with a deactivation powder so as to prevent the electrochemically active
material from spontaneously combusting. The disadvantage of this is that the
resulting material still poses a comparatively high hazard potential and that the
dusting power itself poses a risk of explosion and that the formation of a
30 flammable and explosive atmosphere in the transport container cannot be ruled
out.

DE 10 2011 110 083 A1 describes a method for recovering active material from

a galvanic cell, in which the galvanic cells are initially mechanically comminuted, then pre-dried and subsequently sifted. Finally, the binder is broken down in an oven. This type of device is very well-suited to the efficient recycling of larger amounts of galvanic elements. However, for partial load operation, the
5 construction of this installation is comparatively complex.

The invention aims to reduce disadvantages of the prior art.

The invention solves the problem by means of a method according to the
10 preamble, in which the inactivation occurs at least also by way of drying the comminuted material. According to a second aspect, the invention solves the problem through a battery processing installation according to the preamble, the activation device of which comprises a drying device.

15 The advantage of the invention is that the amount of electrolyte that can be obtained from the comminuted material through drying is such that an electrochemical reaction is no longer possible, or only to a negligibly small extent. In addition, no flammable or explosive gas phase forms above the battery fragments, as the organic carbonates of the electrolyte have been
20 removed [from the fragments]. The comminuted material is therefore largely inert and can be transported safely, especially if it is packed under vacuum.

A further advantage is that no additional material has to be added to inactivate the comminuted material. This decreases the complexity of the battery
25 processing, reduces the weight of the inactivated comminuted material and increases the purity in the subsequent separation and recycling steps. In particular, in potential subsequent hydrometallurgical processing steps, a high degree of product purity that does not require the input of foreign ions is advantageous.

30

In addition, it is advantageous that a comminuted material is obtained that can be transported safely. The organic carbonate content is preferably so small that the formation of a significant amount of fluorophosphates can be ruled out.

Fluorophosphates are often strong neurotoxins, the formation of which must be reliably prevented. Furthermore, due to the low electrolyte content, it is guaranteed that a self-amplifying and intensifying build-up of heat triggered by an electrochemical reaction cannot occur.

5

Within the scope of the present description, the term drying should be understood particularly to mean the removal of at least one solvent in the conducting salt. In particular, the drying is executed such that dimethyl carbonate and/or ethyl methyl carbonate is removed.

10

The battery should be understood especially to mean a lithium battery. A lithium battery is a rechargeable battery whose electrochemical reaction involves lithium and/or lithium ions and/or a lithium compound.

15 A battery processing installation should also be understood particularly to mean a rechargeable battery processing installation for processing rechargeable batteries.

The transport container should also be understood particularly to mean transport
20 packaging. The transport packaging is preferably sealed by way of a vacuum seal. Aluminium composite foil is especially well-suited as transport packaging.

It is beneficial if the drying occurs after the comminuting of the batteries. It is indeed possible and represents a preferred embodiment that the batteries are
25 exposed to a vacuum when in an uncomminuted state such that at least parts of the electrolyte vaporise, wherein the resulting gas either escapes through a safety valve in the rechargeable battery or the battery is destroyed by the pressure difference between the external environment and the internal pressure, enabling a vaporising electrolyte to escape. However, since the electrolyte is
30 predominantly located between tightly wound or stacked and pressed layers of electrodes and separators and in their pores, and it is connected to other components of the batteries, this procedure can be very time-consuming. It is thus often more beneficial and represents a preferred embodiment of the

invention for the batteries to be mechanically comminuted, for example through cutting, cropping, impact, separating and/or compressing. This means that a larger interface is available for the transition of materials into the gas phase.

- 5 The drying may occur by way of vacuum drying, contact drying, convection drying and/or infra-red drying. It is favourable if the drying occurs while the comminuted material is being agitated and/or circulated.

10 Prior to being comminuted, the used batteries are preferably dismantled. This means that larger battery systems are dismantled into their smaller subcomponents, the modules or stacks, or even that the cells which contain the electrochemically active material are separated from the control electronics. The control electronics comprise, for example, semiconductor elements and/or sensors and are responsible for the charge control of the batteries.

15

According to a preferred embodiment, the drying occurs under vacuum. The size of the vacuum is preferably selected such that the vapour pressure of dimethyl carbonate at 80°C, especially at 70°C, is not reached. It is beneficial if the drying occurs at a maximum pressure of 300 hPa, in particular a maximum of 20 100 hPa. At such low pressures, considerable parts of most electrolytes vaporise, especially dimethyl carbonate and ethyl methyl carbonate, and do so at temperatures of less than 80°C. The advantage of low temperatures is that the formation of hydrogen fluoride is hindered. Hydrogen fluoride poses a potential risk for the battery processing installation and the surroundings. It is 25 therefore beneficial to prevent the development of hydrogen fluoride.

The drying preferably occurs at a temperature that is lower than a decomposition temperature. The decomposition temperature should be understood particularly to mean the lowest temperature at which at least 80 30 percent by mass of the binder has decomposed into gaseous components after keeping the comminuted material at this temperature for an hour. The decomposition temperature can be measured by successively increasing the temperature of the comminuted material and recording when a loss of mass

occurs, especially through the build-up of gas due to a decomposition of the binder, and the specified criteria is fulfilled. If necessary, the experiment must be conducted several times, each time using a new sample of comminuted material at an increased temperature.

5

It is favourable if the drying occurs under an atmosphere in which the partial pressure of the water vapor is lower than 50 Pa, in particular lower than 10 Pa. A low partial pressure of the water vapor leads to a low reaction rate of lithium compounds to lithium hydroxide and thus only to a low build-up of hydrogen.

- 10 This prevents the formation of flammable hydrogen-oxygen mixtures and contributes to the safety of the installation.

- In addition, it is favourable if the partial pressure of oxygen has a maximum value of 10 millibars, especially a maximum value of 5 millibars. This largely
15 inhibits the reaction of oxygen with oxidisable components of the batteries. It is possible to achieve the low partial pressure of oxygen by means of drying at a low pressure. Alternatively or additionally, the drying may occur in an inert gas atmosphere.

- 20 A method is preferred in which the drying of the comminuted material is only completed if, after the completion of the drying process, no flammable or explosive gas mixture can form above the comminuted material that has been filled [in the container] and/or when the comminuted material is so dry that a flammable or explosive gas mixture can emerge in the transport container or
25 during the subsequent processing. The property that the drying is completed if, after the completion of the drying process, no flammable or explosive gas mixture can form above the comminuted material that has been filled [in the container] should be understood particularly to mean that, within the space of one week at 50°C and 1013 hPa, no flammable gas mixture forms in a transport
30 container in the form of a 50 litre container that has been half-filled (relative to its volume) with the comminuted material. Pre-tests determine whether the criteria has been fulfilled. If a flammable gas mixture does form, the drying must be conducted for a longer time and/or at a lower pressure. The preliminary tests

are repeated until a drying time and/or drying pressure has been identified at which, in a set of tests of three transport containers, the requirements for the property have been fulfilled for all three transport containers.

- 5 The comminuted material is preferably dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible. In other words, the electrolyte content is lower than a threshold value, the threshold value being selected such that, if this threshold value is not achieved, the cell voltage is reduced to a maximum of one quarter. This threshold value is
 10 determined, for example, by defining the cell voltage of a battery in relation to the electrolyte content. Shortly before achieving the threshold value, the cell voltage collapses, i.e. it decreases by at least 75%. If the threshold value is not achieved, the battery contains so little electrolyte that, to a good approximation, an electrochemical reaction is no longer possible.

15

- The comminuted material is preferably dried for so long that a 50kg amount of comminuted material, which is contained in a compacted form in a 50 litre drum, does not experience a build-up of heat, or the build-up of heat is so low that a thermal runaway, i.e. a thermally induced chain reaction, is ruled out for at least
 20 two months, and that any build-up of hydrogen is also so low that after two weeks, no excess pressure occurs if a negative pressure of 500 hPa is present to begin with.

- It is beneficial if the comminuted material is dried until the electrolyte content of
 25 organic components that are volatile at 80°C has a maximum value of 3% by weight, in particular a maximum of 2% by weight, especially preferably a maximum of 1.5% by weight.

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

In particular, 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.

- 5 The drying preferably occurs immediately after comminution. This should be understood to mean that the time between the beginning of the comminution of the batteries and the point at which at least a part of the resulting comminuted material begins to dry is a maximum of five minutes, especially a maximum of one minute. The rapid drying after comminution means that the mass of material
10 that may potentially experience an electrochemical reaction remains small; the electrochemical reaction time of potential exothermic reactions also remains small. This reduces the risk for the installation and the surroundings.

- It is especially favourable if the vacuum is created by means of an injector, i.e. a
15 venturi pump or an ejector-jet pump. Ejector-jet pumps are largely resistant to aggressive gases that are due to be pumped, particularly if an appropriate pump fluid, i.e. pump liquid, is selected. It is beneficial if the pump fluid, which is a liquid, has a pH value of at least 8, in particular of at least 9, for example at least 12. In this case, unwanted components of the gas that is being pumped can
20 decompose or react to become less damaging substances. In this way, for example, dimethyl carbonates and/or ethyl methyl carbonates can be broken down by a saponification reaction. Any hydrogen fluoride contained in the pump fluid can be converted in the alkaline environment into a non-hazardous salt by way of an acid-base reaction.

- 25 The pump fluid preferably contains a substance that precipitates fluoride. For example, the pump fluid may contain sodium carbonate or calcium carbonate. The salts that result from the reaction with a fluorine compound, in particular hydrogen fluoride, are preferably separated, in particular filtered or removed by
30 sedimentation. This at least largely prevents hydrogen fluoride or other poisonous fluorine compounds from being emitted into the surroundings.

The drying preferably occurs at a maximum temperature of 80°C; this produces

almost no hydrogen fluoride. This increases the service life of the battery processing installation and reduces the environmental risk.

According to a preferred embodiment, the method comprises the steps of
5 condensing components of the electrolyte by cooling and/or increasing the pressure such that an electrolyte condensate occurs. For example, the condensation is conducted at a point that lies between the dryer and the vacuum pump relative to the flow of gas. In this case, gases coming from the dryer must initially pass through a condenser before reaching the vacuum pump. This
10 causes the gaseous electrolyte in the gas, which is produced during the drying, to be at least largely separated in the condenser before the remaining gas reaches the pump. Electrolyte can be recovered in this way. In addition, the flow of gas through the vacuum pump decreases, which increases the vacuum pump's service life and reduces its energy consumption.

15 According to a preferred embodiment, the method alternatively comprises the step of purifying the gas through the adsorption of the volatile organic components of an activated carbon filter in front of or behind the compressor unit.

20 Alternatively or additionally, the method according to the invention preferably comprises the step of purifying the gas produced during the drying before it reaches the vacuum pump. This may also occur, for example, by the gas through passing an activated carbon filter and/or a filter that contains
25 substances which react with hydrogen fluoride, such as a calcium salt like calcium carbonate or a potassium salt such as potassium carbonate.

The method according to the invention preferably comprises the step of drying at a drying temperature and for a drying time that have been selected such that the
30 binder which binds the active material of the lithium battery to a carrier at least largely decomposes. It is favourable if this drying step, which can also be described as high temperature drying, occurs in a separate space from a first drying step, described above. The latter drying step can also be described as

low temperature drying.

The high temperature drying, during which the binder decomposes, is preferably conducted such that the resulting decomposition gases do not mix with the
5 gases resulting from the low temperature drying. It is possible that the high temperature drying and the low temperature drying occur at different pressures. For example, the high temperature drying can be executed at normal pressure.

The active material should be understood to mean the material that reacts
10 electrochemically during operation of the batteries. The carrier for the active material should be understood particularly to mean a carrier foil to which the active material is applied in the form of particles. For example, the carrier foil refers to a foil made of aluminium or an aluminium alloy. The binder is the material which binds the active material with the carrier; for example, the binder
15 contains polyvinylidene fluoride.

It is beneficial if liquid nitrogen is added when comminuting the batteries. This cools the batteries, the comminuting machine and the comminuting material, and also drives oxygen and water vapour out of the atmosphere.
20

It is beneficial if the comminution occurs when the partial pressure of water vapor is a maximum of 20 Pa and/or the partial pressure of the oxygen is a maximum of 40 hPa, especially a maximum of 15 hPa.

25 According to a preferred embodiment, the method comprises the steps of removing the comminuted material from the transport container; detaching hard parts and/or separating active material from the carrier, particularly via a second comminuting stage and/or air jet sieving, thereby producing an active material fraction and a carrier fraction; and a separate packing of the active material
30 fraction and carrier fraction in suitable transport containers. It is beneficial if these transport containers are designed to be airtight. By separating an active material fraction and a carrier fraction, transportation generally does not require any permits. An additional advantage is that fractions separated in this way only

pose a small risk.

The removal of the comminuted material from the transport container is preferably conducted under vacuum and/or shielding gas.

5

It is possible, but not necessary, for the the transport container to be filled with communitied material under vacuum. It is beneficial if the transport container is a vacuum container, in particular an evacuated vacuum container, such that a negative pressure or vacuum occurs in the transport container once it has been sealed. Alternatively, the transport container may be filled with an inert gas.

10

In a preferred battery processing installation, the separation unit and the drying device are arranged in a joint standard container. The advantage of this is that it renders the battery processing installation especially easy to transport.

15

The drying device is configured to dry the comminuted material until an electrolyte content is so low that an electrochemical reaction is impossible. If the drying device is operated in batch mode, which represents a preferred embodiment, the drying shall be performed, for example, for a pre-determined period of time. Alternatively or additionally, the content of organic substances, such as organic carbonates, in the atmosphere in the drying device is continually measured and the drying stopped once the concentration is lower than a pre-determined threshold concentration.

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According to a preferred embodiment, the battery processing installation, in particular the vacuum installation, comprises a condenser that is configured to condense organic components of the atmosphere in the dryer, especially organic carbonates such as dimethyl carbonate, ethyl methyl carbonate and/or ethylene carbonate. The condenser is preferably arranged in the direction of material flow in front of a vacuum pump, by means of which the dryer is evacuated. It is beneficial if the condenser is cooled, preferably to a maximum temperature of 90°C, preferably a maximum of 80°C, especially preferably a

30

maximum of 70°C. In order to keep the energy required for cooling low, the condenser, insofar as it is cooled, is cooled to a temperature of at least -10°C, in particular at least 10 °C.

- 5 It is beneficial if the drying device comprises an agitator, for example an anchor agitator or a rod agitator, whose stirring rods can be arranged transversely to an agitator shaft. Alternatively or additionally, the agitator is an external agitator that moves the dryer as a whole.
- 10 The battery processing installation preferably has a vacuum installation that is connected to the drying device for the purpose of generating a vacuum in the drying device. It is especially favourable if the vacuum installation is also arranged in the standard container. The standard container preferably refers to a container that conforms to ISO standard 668, preferably a 40 foot container or a
15 20 foot container.

For example, the vacuum installation comprises an injector or venturi pump, i.e., a jet pump with a pump liquid that is used to generate the negative pressure.

- 20 The battery processing installation preferably has a hard metal detachment device and/or a light fraction separation device; a separation device, especially a classification device, for separating active material from the carrier, in particular by means of a second comminution stage and/or air jet sieving, such that an active material fraction and a carrier fraction occur; and a second filling
25 device for the separate filling of the active material fraction and the carrier fraction. It is beneficial if this filling device is designed for filling under negative pressure and/or inter gas.

- 30 A hard metal detachment device should be understood particularly to mean a device for detaching fragments of peripheral components of the operating system, the battery cell casing and the electrical contacts. For example, the hard metal detachment device has a magnet separation device and/or a separator, in particular a cross-flow separator and/or a zigzag separator. The separation

device should be understood particularly to mean a device for detaching the separator foil.

5 The light fraction separation device preferably has a zigzag separator and/or an air separator, wherein it is favourable if the air is conducted within a circuit. This reduces the exposure of the environment to harmful dust.

10 The second filling device and the separation devices are preferably arranged in a joint standard container, for example in the first standard container described above or a second standard container. It is beneficial if the container is sealed so as to be dust-tight.

15 The battery processing installation preferably has an airlock between the comminution unit and the inactivation device, especially the drying device. For example, this refers to a rotary airlock. The airlock reduces the amount of oxygen introduced into the inactivation device, especially the drying device.

In the following, the invention will be explained in more detail by way of the attached drawings. They show

20

Figure 1 a flow diagram of a method according to the invention,

Figure 2 a cross-section through a battery processing installation according to the invention and

25

Figure 3 a cross-section through further optional components of a battery processing installation according to the invention.

30 Figure 1 shows a flow diagram of a method according to the invention. Batteries 10.1, 10.2, ..., in particular battery systems made up of several battery modules or battery stacks, which are in turn made up of several battery cells, are initially discharged in a discharge unit 12. This is followed by the dismantling of the batteries 10 at a dismantling station 14, if this is necessary because the battery

systems cannot otherwise be delivered into the comminution unit for geometric or gravimetric reasons. In order to do this, the battery systems are opened and dismantled to the point at which the modules/stacks can be individually removed. If required, the cells can also be separated from the drive electronics.

- 5 The resulting sub-units (modules/stacks) and/or cells 16.1, 16.2, ... are fed into a comminution unit 18, which comprises, for example, a rotary shear with a rotor and a stator or several rotors, or a cutting mill with a rotor and several rotors.

10 The comminution unit 18 comminutes the batteries 10 under shielding gas 20, which is extracted, for example, from a shielding gas cylinder. Alternatively or additionally, liquid nitrogen from a liquid nitrogen source 19 may be injected. The shielding gas may refer, for example, to nitrogen, a noble gas, carbon dioxide, nitrous oxide or another gas which is preferably not toxic.

- 15 Comminuted material 24 is produced during the comminuting; the material is fed into an inactivation device in the form of a drying device 26. An airlock 28 is arranged between the comminution unit 18 and the drying device 26, the airlock being so gas-tight that the pressure device 26 is - to a good approximation - separated from the comminution unit 18 so as to be gas-tight.

20 The drying device 26 is connected to a vacuum installation 29 that comprises a vacuum pump 30 and creates a vacuum. A pressure p_{26} from $p_{26} = 100$ hPa, preferably 50 hPa, is present in the drying device 26. It should be noted that, within the scope of the present description, the vacuum pump should be
25 understood particularly generally to mean a device that creates a vacuum. It is possible and preferred, but not necessary, for the vacuum pump to simultaneously work as a compressor, such that gas is emitted from it under a pressure that is greater than the ambient pressure.

- 30 In the case depicted in figure 1, the vacuum pump is a compressor which sucks in and compresses gas 31 that is present in the drying device 26. Alternatively or additionally, the vacuum installation 29 may have a jet pump which uses a pump liquid in the form of a liquid that is conducted at a high speed through

Venturi nozzles. The pump liquid is alkaline and has a pH value of at least pH 1 and is, for example, a 10% potassium hydroxide solution.

5 The vacuum installation 29 comprises a gas purification device 32 that is arranged between the drying device 26 and the vacuum pump 30, and which has a condenser 34 and/or an activated carbon filter 36 in the present case. The condenser is operated at a temperature of -10°C so that dimethyl carbonate and ethyl methyl carbonate condense and can be dispensed into a condensate container 38. In addition, any water present is separated by freezing. A control
10 valve 40 is designed to open if the pressure p_{26} becomes too great and to close if the pressure p_{26} becomes too small, i.e. when a pre-determined threshold value is not reached.

The drying material is preferably moved during drying. This may be achieved via
15 agitating with an agitator 41, such as an anchor agitator or a rod agitator with rods arranged perpendicular to the agitator shaft. Alternatively, it can be achieved by way of a drying container that is moved.

The drying of the comminuted material results in inactivated comminuted
20 material 42, which is fed into a filling device 44. A transport container 46 is then filled with the inactivated comminuted material 42 under vacuum and/or shielding gas. The transport container 46 is preferably gas-tight. It is possible, but not necessary, for the transport container 46 to be filled with inert gas prior to transportation such that it is under normal pressure. Alternatively, it is also
25 possible for the transport container to be sealed under vacuum and transported. It is possible that, instead of the transport container, a vacuum-sealed foil is selected, such as an aluminium compound foil.

The comminution unit 18 is fed with shielding gas 20 from the vacuum pump 30
30 via a flushing line 48. If the vacuum pump 30 also functions as a compressor - as in the present case - which represents a preferred embodiment, the shielding gas can be stored in a pressurised gas cylinder 50. Alternatively or additionally, the shielding gas 20 can be given off into the surroundings, following additional

cleaning if necessary.

Figure 2 schematically depicts a cross-section through a battery processing installation 52 according to the invention, which comprises a standard container 54 in which the comminution unit 18, the drying device 26 and the filling device 44 are arranged. A first gas-tight conveyor 56 is arranged behind the comminution unit 18; the conveyor comprises, for example, a screw conveyor or a tube chain conveyor. The first conveyor 56 delivers the comminuted material 24 to the drying device 26, which is connected to the vacuum generation device, not depicted in figure 2. A second conveyor 58 is arranged behind the drying device 26 in the direction of material flow; preferably, the conveyor is also designed to be gas-tight and may include a screw conveyor or a tube chain conveyor. The second conveyor delivers the inactivated comminuted material 42 to the filling device 44.

Figure 3 depicts optional units - available in the present embodiment - of the battery processing installation 52 according to the invention which comprise a breakdown comminutor 60, as well as a separator 62. The breakdown comminutor 60 contains a transport container draining device 64, by means of which inactivated comminuted material 42 can be removed from the transport container 46. The breakdown comminutor 60 produces breakdown material 66, which is fed into the separator 62. The separator may refer, for example, to a zigzag separator.

The battery processing installation 52 preferably comprises a comminutor, which is preferably situated in the material flow in front of the classification device 74 and includes a rapid comminution tool, wherein a peripheral speed of the rotor is greater than 1 m/s, preferably greater than 10 m/s. This comminutor comminutes the comminuted material and subjects it to such mechanical stress that the electrochemically active coating at least partially detaches from the carrier. The presence of such a comminutor is a generally preferred feature of a battery processing installation according to the invention.

A light fraction with a separator foil and fine coating material, and a heavy material fraction with carrier foils (aluminium and copper) with bigger, weakly adhering coating occur in the separator. Both fractions are each placed on a sieve for further separation into coating and separator foil, or coating and metal foil. The further processing of the resulting fractions is conducted separately.

The breakdown material 66 is fed to the separator 62 by means of a third conveyor 68. A fourth conveyor 70 guides sifted material 72, in particular the material of the light fraction that leaves the separator 62, into a classification device 74. The classification device 74 preferably has an air jet sieve, which simultaneously functions as a separation device for separating the active material from the carrier. The separation results in an active material fraction 76, with which a transport container 78 is filled.

In addition, a carrier fraction 80 is produced, which - in the present embodiment - is fed into a filling unit 84 using a fifth conveyor 82; the filling unit fills a container 86 with the carrier fraction 80. The filling unit 84 comes together with a second filling unit 88 to form part of a second filling device.

Reference list

- | | | | |
|----|---------------------------------|----|--|
| 10 | battery | 56 | first conveyor |
| 12 | discharge unit | 58 | second conveyor |
| 14 | dismantling station | | |
| 16 | cell | 60 | breakdown comminutor |
| 18 | comminution unit | 62 | separator |
| 19 | liquid nitrogen source | 64 | transport container
draining device |
| 20 | shielding gas | 66 | breakdown material |
| 22 | shielding gas cylinder | 68 | third conveyor |
| 24 | comminuted material | | |
| 26 | drying device | 70 | fourth conveyor |
| 28 | airlock | 72 | sifted material |
| 29 | vacuum installation | 74 | classification device |
| | | 76 | active material fraction |
| 30 | vacuum pump | 78 | transport container |
| 31 | gas | | |
| 32 | gas purification device | 80 | carrier fraction |
| 34 | condenser | 82 | fifth conveyor |
| 36 | activated charcoal filter | 84 | filling unit |
| 38 | condensate container | 86 | container |
| | | 88 | second filling unit |
| 40 | control valve | | |
| 41 | agitator | p | pressure |
| 42 | inactive comminuted material | | |
| 44 | filling device | | |
| 46 | transport container | | |
| 48 | flushing line | | |
| 50 | pressurised gas cylinder | | |
| 52 | battery processing installation | | |
| 54 | standard container | | |

Patent claims:

- 5 1. Method for the treatment of used batteries (10), in particular lithium batteries, containing the steps:

 - (a) comminuting the batteries (10) such that comminuted material (24) is obtained,
 - (b) inactivating the comminuted material (24) such that an inactivated comminuted material (42) is obtained, and
 - 10 (c) filling a transport container (46) with the inactivated comminuted material (42),

characterised by the fact that

 - (d) the inactivation is performed by drying the comminuted material (24).
- 15 2. Method according to claim 1, characterised by the fact that the comminuted material (24) is dried until an electrolyte content is so low that an electrochemical reaction is impossible.
- 20 3. Method according to one of the above claims, characterised by the fact that the drying occurs under vacuum.
- 25 4. Method according to one of the above claims, characterised by the fact that the vacuum is created by means of a jet pump and a pump liquid of the jet pump

 - has a pH value of at least 8, especially 9, and/or
 - contains a substance that precipitates fluoride.

5. Method according to one of the above claims, characterised by the steps:
- (e) removal of the comminuted material (24) from the transport container (46),

- (f) detachment of hard parts and/or

5 separation of active material from the carrier, particularly through air jet sieving or a second comminution stage such that an active material fraction (76) and a carrier fraction (80) are obtained, and

- (g) separate packing of the active material fraction (76) and carrier fraction (80) in transport containers (78).

10

6. Method according to one of the above claims, characterised by the fact that the drying of the comminuted material is only completed if, after the completion of the drying process, no flammable or explosive gas mixture can form above the comminuted material that has been filled in the container
- 15 and/or if the comminuted material is so dry that no flammable or explosive gas mixture can emerge in the transport container or during the subsequent processing.

15

7. Battery processing installation for the treatment of used batteries, in particular lithium batteries, with:

20

- (a) a comminution unit (18) for comminuting the batteries (10) such that comminuted material (24) is obtained,

- (b) an inactivation device (26) for inactivating the comminuted material (24) and

25 (c) a filling device (44) for filling a transport container (46) with the inactivated comminuted material (24),

characterised by the fact that

- (d) the inactivation device comprises a drying device (26) and

(e) the battery processing installation has a vacuum installation that is connected to the drying device (26) for the purpose of generating a vacuum in the drying device (26).

- 5 8. Battery processing installation according to claim 7, characterised by the fact that the drying device (26) is configured to dry the comminuted material (24) until an electrolyte content is so low that an electrochemical reaction is impossible.
- 10 9. Battery processing installation according to claim 7 or 8, characterised by the fact that the comminution unit and the drying device (26) are arranged in a standard container (54).
- 15 10. Battery processing installation according to one of the claims 7 to 9, characterised by a vacuum installation that is connected to the drying device (26) for the purpose of generating a vacuum in the drying device (26).
- 20 11. Battery processing installation according to claim 10, characterised by the fact that
 - the vacuum installation (29) has a jet pump with a pump liquid,
 - the pump liquid is conducted within a circuit and
 - the pump liquid contains a substance that reacts with hydrogen fluoride.
- 25 12. Battery processing installation according to one of the claims 7 to 11, characterised by
 - a hard metal detachment device and/or a light fraction detachment device,
 - a separation device, especially a classification device (74), for separating active material from the carrier, in particular by means of air jet sieving
 - 30 and/or a second comminution stage such that an active material fraction

(76) and a carrier fraction occur, in particular aluminium and copper foils, and

- a second filling device (44) for the separate filling of the active material fraction (76) and the carrier fraction (80), in particular aluminium and copper foils.

5

Abstract

The invention relates to a method for the treatment of used batteries (10), in particular lithium batteries, containing the steps: comminuting the batteries (10) such that comminuted material (24) is obtained, inactivating the comminuted material (24) such that inactivated comminuted material (42) is obtained, and filling a transport container (46) with the inactivated comminuted material (42). It is provided according to the invention that the inactivation is performed by drying the comminuted material (24) and the comminuted material (24) is dried until an electrolyte content is so low that an electrochemical reaction is not possible.

Figure 1

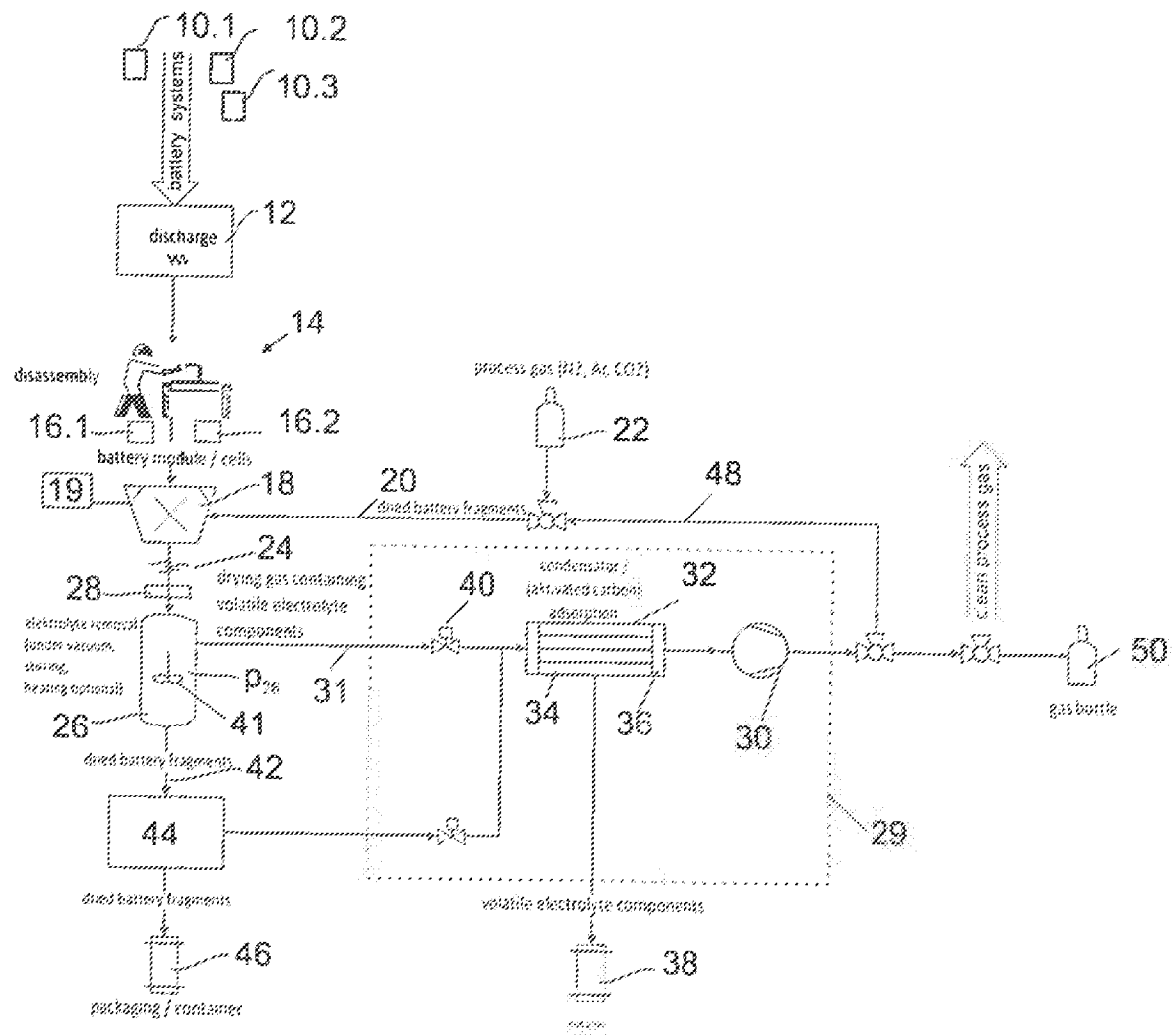


Fig. 1

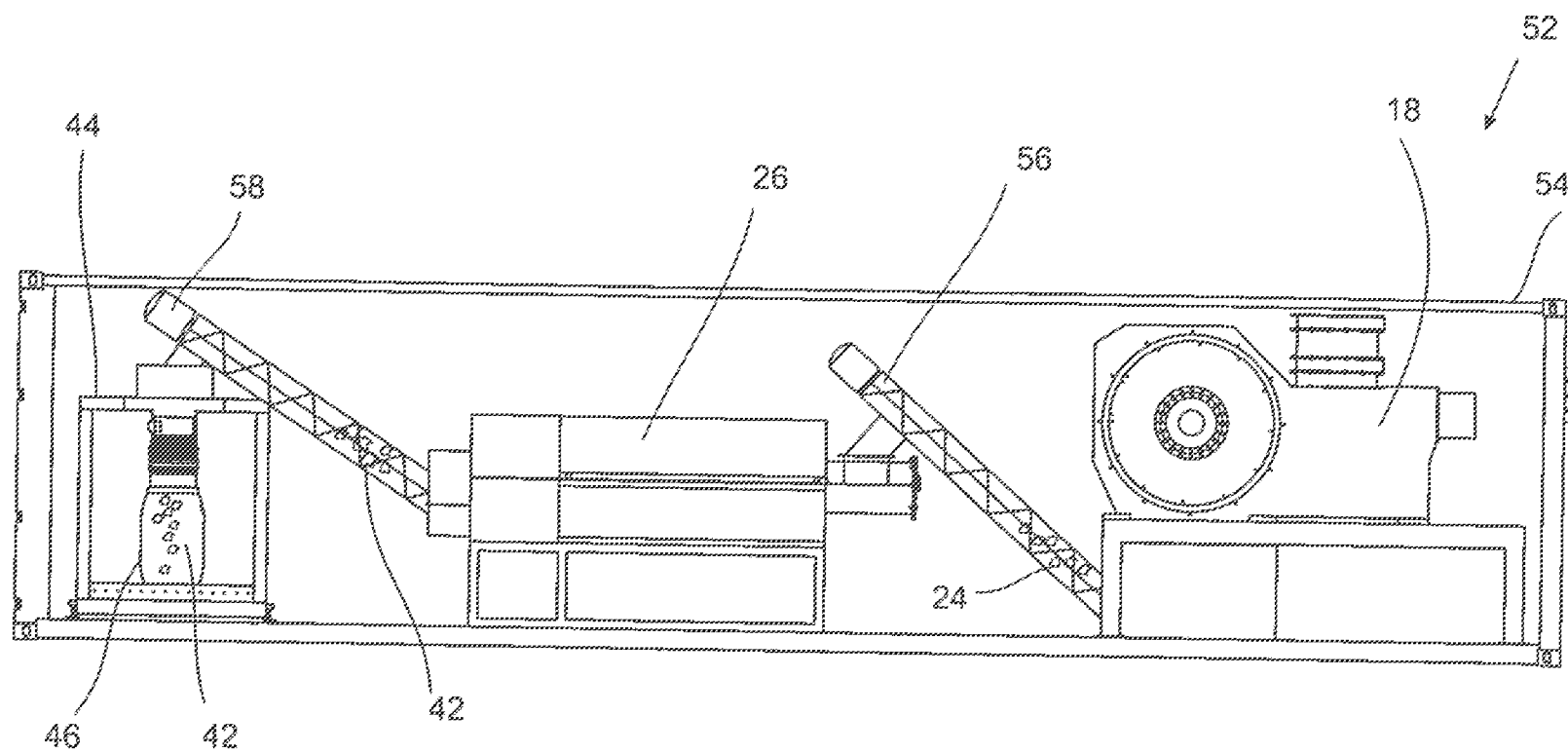


Fig. 2

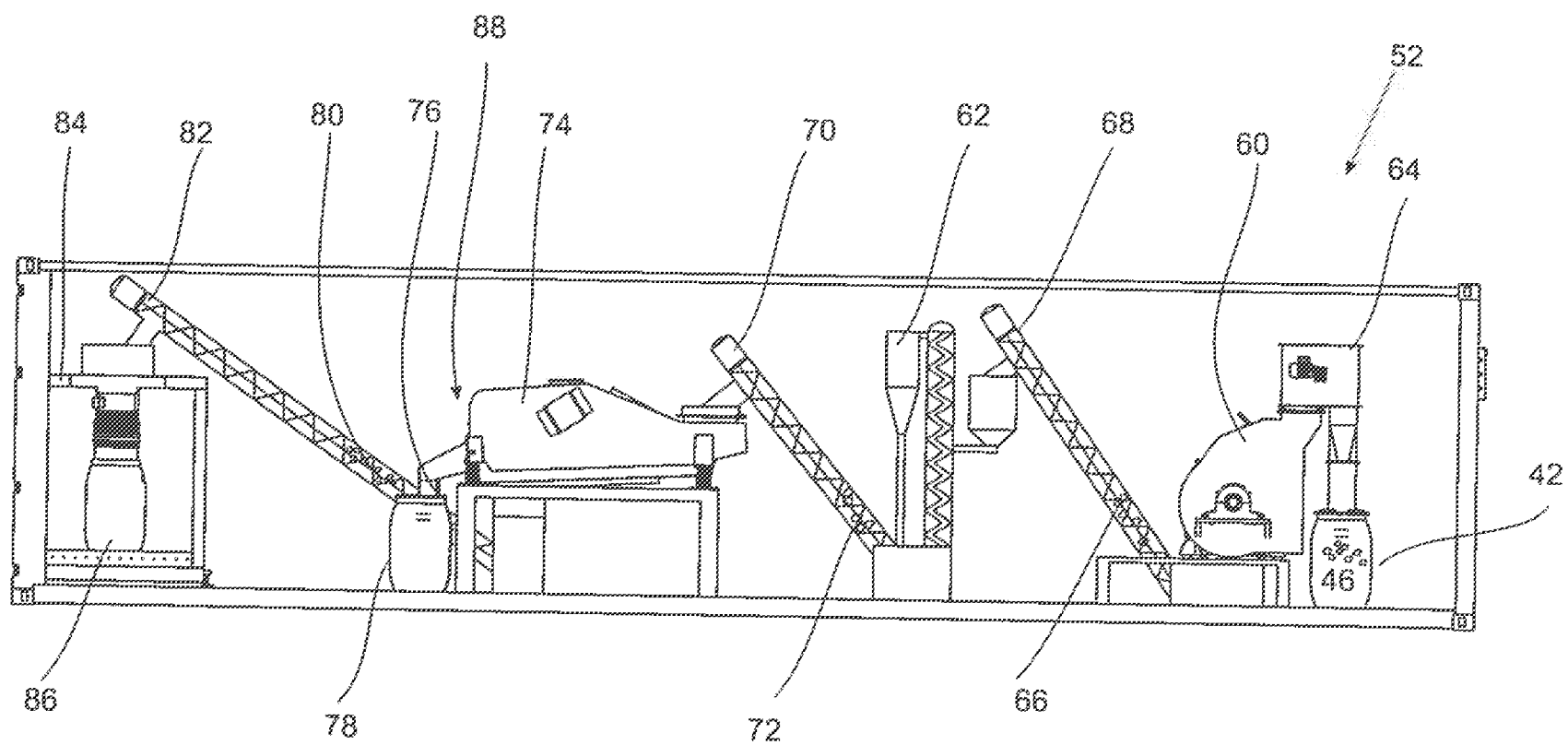


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/059526

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01M6/52 C22B13/00 H01M10/54
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01M C22B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	WO 2010/102377 A1 (ELLIOTT K W) 16 September 2010 (2010-09-16) paragraphs [0015] - [0040]; figures 1, 3 -----	1-12
X	DE 10 2011 110083 A1 (TECH UNI BRAUNSCHWEIG CAROLO WILHELMINA [DE]) 14 February 2013 (2013-02-14) cited in the application paragraphs [0021], [0022], [0034] - [0039]; figure 1 -----	1-3, 5-8, 10, 12

☐ Further documents are listed in the continuation of Box C

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* Special categories of cited documents

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010102377 A1	16-09-2010	CA 2730320 A1	16-09-2010
		CA 2778136 A1	16-09-2010
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DE 102011110083 A1	14-02-2013	CN 103959553 A	30-07-2014
		DE 102011110083 A1	14-02-2013
		EP 2742559 A1	18-06-2014
		US 2014290438 A1	02-10-2014
		WO 2013023640 A1	21-02-2013

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

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☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		

Application Information:

Title of the Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		
Attorney Docket Number	03101160US	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	3	Suggested Figure for Publication (if any)	

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For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		

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Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
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10 2015 207 843.4	DE	2015-04-28		
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1	Remove
<p>If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.</p> <p style="text-align: right;">Clear</p>		
☒ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:		
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>		
Name of the Deceased or Legally Incapacitated Inventor: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		
If the Applicant is an Organization check here. ☒		
Organization Name	DUESENFELD GMBH	
Mailing Address Information For Applicant:		
Address 1	Friedlandweg 5	
Address 2		
City	Braunschweig	State/Province
Country	DE	Postal Code
Phone Number		Fax Number
Email Address		
Additional Applicant Data may be generated within this form by selecting the Add button. Add		

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				<input type="button" value="Remove"/>
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1		<input type="text"/>		
Address 2		<input type="text"/>		
City	<input type="text"/>	State/Province	<input type="text"/>	
Country ⁱ	<input type="text"/>	Postal Code	<input type="text"/>	
Phone Number	<input type="text"/>	Fax Number	<input type="text"/>	
Email Address	<input type="text"/>			
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				<input type="button" value="Add"/>

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Michael E. Whitham/		Date (YYYY-MM-DD)	2017-10-25
First Name	Michael	Last Name	Whitham	Registration Number
				32635
Additional Signature may be generated within this form by selecting the Add button.				<input type="button" value="Add"/>

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	03101160US
		Application Number	
Title of Invention	METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES, AND BATTERY PROCESSING INSTALLATION		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor		
	Art Unit		
	Examiner Name		
	Attorney Docket Number		

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9780419	B2	2017-10-03	LION ENGINEERING GMBH	

If you wish to add additional U.S. Patent citation information please click the Add button.

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U.S.PATENT APPLICATION PUBLICATIONS						Remove
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20050241943	A1	2005-11-03	KAWASAKI JUKOGYO KABUSHIKI KAISHA	

If you wish to add additional U.S. Published Application citation information please click the Add button.

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FOREIGN PATENT DOCUMENTS							Remove	
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	2010/102377	WO	A1	2010-09-16	STEVENS, WAYNE, C.		
	2	10 2011 110 083	DE	A1	2013-02-14	TECH UNI BRAUNSCHWEIG CAROLO WILHELMINA		
	3	10 2012 024 876	DE	A1	2014-06-26	ELECTROCYCLING GMBH; VOLKSWAGEN AKTIENGESELLSCHAFT		

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	
Art Unit	
Examiner Name	
Attorney Docket Number	

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1		

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	
Art Unit	
Examiner Name	
Attorney Docket Number	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael E. Whitham/	Date (YYYY-MM-DD)	2017-10-25
Name/Print	Michael E. Whitham	Registration Number	32635

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

From the INTERNATIONAL BUREAU

PCTNOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92*bis*.1 and
Administrative Instructions, Section 422)

To:

PLÖGER, Jan
Gramm, Lins & Partner Patent- und Rechtsanwälte
PartGmbH
Theodor-Heuss-Strasse 1
38122 Braunschweig
ALLEMAGNE

Date of mailing (<i>day/month/year</i>) 11 October 2017 (11.10.2017)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 5569-002 PCT-1	
International application No. PCT/EP2016/059526	International filing date (<i>day/month/year</i>) 28 April 2016 (28.04.2016)

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

Name and Address LION ENGINEERING GMBH Rebenring 33 38106 Braunschweig Germany	State of Nationality DE	State of Residence DE
	Telephone No.	
	Facsimile No.	
	E-mail address	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☐ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address DUESENFELD GMBH Friedlandweg 5 38114 Braunschweig Germany	State of Nationality DE	State of Residence DE
	Telephone No.	
	Facsimile No.	
	E-mail address ☐ Notifications by e-mail authorized	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office	☐ the International Preliminary Examining Authority
☒ the International Searching Authority	☒ the designated Offices concerned
☐ the Authority(ies) specified for supplementary search	☐ the elected Offices concerned
	☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Gagliardi Ghislaine
Facsimile No. +41 22 338 89 75	e-mail pct.team5@wipo.int Telephone No. +41 22 338 74 05

PCT-ANTRAG

Ausdruck (Original in elektronischem Format)

0	Vom Anmeldeamt auszufüllen	
0-1	Internationales Aktenzeichen	PCT/EP2016/059526
0-2	Internationales Anmeldedatum	28 APR 2016 (28.04.2016)
0-3	Name des Anmeldeamts und "PCT International Application"	RO/EP
0-4	Formular PCT/RO/101 PCT-Antrag	
0-4-1	Erstellt mit	PCT Online Filing Version 3.5.000.244e MT/FOP 20141031/0.20.5.20
0-5	Antragssuchen Der Unterzeichnete beantragt, daß die vorliegende internationale Anmeldung nach dem Vertrag über die internationale Zusammenarbeit auf dem Gebiet des Patentwesens behandelt wird	
0-6	(Vom Anmelder gewähltes) Anmeldeamt	Europäisches Patentamt (EPA) (RO/EP)
0-7	Aktenzeichen des Anmelders oder Anwalts	5569-002 PCT-1
I	Bezeichnung der Erfindung	Verfahren zum Behandeln gebrauchter Batterien, insbesondere wieder aufladbarer Batterien und Batterie-Verarbeitungsanlage
II	Anmelder	
II-1	Diese Person ist	Nur Anmelder
II-2	Anmelder für	Alle Bestimmungsstaaten
II-4	Name	LION ENGINEERING GMBH
II-5	Anschrift	Rebenring 33 38106 Braunschweig Deutschland
II-6	Staatsangehörigkeit (Staat)	DE
II-7	Sitz/Wohnsitz (Staat)	DE
II-11	Registrierungsnummer des Anmelders beim Amt	li
III-1	Anmelder und/oder Erfinder	
III-1-1	Diese Person ist	Erfinder nur
III-1-3	Erfinder für	Alle Bestimmungsstaaten
III-1-4	Name (FAMILIENNAME, Vorname)	HANISCH, Christian
III-1-5	Anschrift	Sophienstraße 14 38118 Braunschweig Deutschland

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III-2	Anmelder und/oder Erfinder	
III-2-1	Diese Person ist	Erfinder nur
III-2-3	Erfinder für	Alle Bestimmungsstaaten
III-2-4	Name (FAMILIENNAME, Vorname)	WESTPHAL, Bastian
III-2-5	Anschrift	Karlstraße 92 38106 Braunschweig Deutschland
III-3	Anmelder und/oder Erfinder	
III-3-1	Diese Person ist	Erfinder nur
III-3-3	Erfinder für	Alle Bestimmungsstaaten
III-3-4	Name (FAMILIENNAME, Vorname)	HASELRIEDER, Wolfgang
III-3-5	Anschrift	Görgesstraße 3 38118 Braunschweig Deutschland
III-4	Anmelder und/oder Erfinder	
III-4-1	Diese Person ist	Erfinder nur
III-4-3	Erfinder für	Alle Bestimmungsstaaten
III-4-4	Name (FAMILIENNAME, Vorname)	SCHOENITZ, Martin
III-4-5	Anschrift	Wabestraße 31 38106 Braunschweig Deutschland
IV-1	Anwalt oder gemeinsamer Vertreter oder besondere Zustellanschrift	
	Die unten bezeichnete Person ist/wird hiermit bestellt, um für den (die) Anmelder vor den zuständigen inter- nationalen Behörden zu handeln, und zwar in folgender Eigenschaft:	Anwalt
IV-1-1	Name (FAMILIENNAME, Vorname)	PLÖGER, Dr.-Ing., Jan
IV-1-2	Anschrift	Gramm, Lins & Partner Patent- und Rechtsanwälte PartGmbB Theodor-Heuss-Strasse 1 38122 Braunschweig Deutschland
IV-1-3	Telefonnr.	0531-28140-0
IV-1-4	Telefaxnr.	0531-28140-28
IV-1-5	E-Mail	braunschweig@grammpatent.de
V	BESTIMMUNGEN	
V-1	Die Einreichung dieses Antrags umfaßt gemäß Regel 4.9 Absatz a die Bestimmung aller Vertragsstaaten, für die der PCT am internationalen Anmeldedatum verbindlich ist, und, insoweit verfügbar, für jede Art von Schutzrecht und sowohl für ein regionales als auch für ein nationales Patent	

PCT-ANTRAG

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VI-1	Priorität einer früheren nationalen Anmeldung beansprucht		
VI-1-1	Anmeldedatum	28. April 2015 (28.04.2015)	
VI-1-2	Nummer	10 2015 207 843.4	
VI-1-3	Staat oder Mitglied der WTO	DE	
VI-2	Einbeziehung durch Verweis : Ist ein in Artikel 11 Absatz 1 Ziffer iii Buchstabe d oder e genannter Bestandteil der internationalen Anmeldung oder ein in Regel 20.5 Absatz a genannter Teil der Beschreibung, der Ansprüche oder der Zeichnungen nicht anderswo in der internationalen Anmeldung, aber vollständig in einer früheren Anmeldung enthalten, deren Priorität, zu dem Datum, an dem ein oder mehrere in Artikel 11 Absatz 1 Ziffer iii genannte Bestandteile zuerst beim Anmeldeamt eingegangen sind, beansprucht wird, so wird dieser Bestandteil oder Teil, vorbehaltlich der Bestätigung nach Regel 20.6, für die Zwecke der Regel 20.6 in diese internationale Anmeldung einbezogen.		
VII-1	Gewählte Internationale Recherchenbehörde	Europäisches Patentamt (EPA) (ISA/EP)	
VIII	Erklärungen	Anzahl der Erklärungen	
VIII-1	Erklärung hinsichtlich der Identität des Erfinders	—	
VIII-2	Erklärung hinsichtlich der Berechtigung des Anmelders, zum Zeitpunkt des internationalen Anmeldedatums, ein Patent zu beantragen und zu erhalten	1	
VIII-3	Erklärung hinsichtlich der Berechtigung des Anmelders, zum Zeitpunkt des internationalen Anmeldedatums, die Priorität einer früheren Anmeldung zu beanspruchen	—	
VIII-4	Erfindererklärung (nur im Hinblick auf die Bestimmung der Vereinigten Staaten von Amerika)	—	
VIII-5	Erklärung hinsichtlich unschädlicher Offenbarungen oder Ausnahmen von der Neuheitsschädlichkeit	—	

PCT-ANTRAG

Ausdruck (Original in elektronischem Format)

VIII-2-1	Erklärung: Berechtigung, ein Patent zu beantragen und zu erhalten Erklärung hinsichtlich der Berechtigung des Anmelders, zum Zeitpunkt des internationalen Anmeldedatums, ein Patent zu beantragen und zu erhalten (Regeln 4.17 Ziffer ii und 51bis.1 Absatz a Ziffer ii), für den Fall, daß eine Erklärung nach Regel 4.17 Ziffer iv nicht einschlägig ist: Name (FAMILIENNAME, Vorname)	In bezug auf diese internationale Anmeldung LION ENGINEERING GMBH ist kraft des nachfolgend Aufgeführten berechtigt, ein Patent zu beantragen und zu erhalten:
VIII-2-1(i)		LION ENGINEERING GMBH ist berechtigt, als Arbeitgeber des Erfinders, HASELRIEDER, Wolfgang
VIII-2-1(i)		LION ENGINEERING GMBH ist berechtigt, als Arbeitgeber des Erfinders, SCHOENITZ, Martin
VIII-2-1(i)		LION ENGINEERING GMBH ist berechtigt, als Arbeitgeber des Erfinders, HANISCH, Christian
VIII-2-1(i)		LION ENGINEERING GMBH ist berechtigt, als Arbeitgeber des Erfinders, WESTPHAL, Bastian

PCT-ANTRAG

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IX	Kontrollliste	Anzahl der Blätter	Elektronische Datei(en) beigelegt
IX-1	Antrag (inklusive Erklärungsblätter)	5	✓
IX-2	Beschreibung	18	✓
IX-3	Ansprüche	4	✓
IX-4	Zusammenfassung	1	✓
IX-5	Zeichnung(en)	3	✓
IX-7	INSGESAMT	31	
	Beigelegte Unterlagen	Unterlage(n) in Papierform beigelegt	Elektronische Datei(en) beigelegt
IX-8	Blatt für die Gebührenberechnung	—	✓
IX-20	Nr. der Abb. der Zeichn., die mit der Zusammenf. veröffentlicht werden soll	2	
IX-21	Sprache der int. Anmeldung	Deutsch	
X-1	Unterschrift des Anmelders, des Anwalts oder des Gemeinsamen Vertreters	(PKCS7 digitale Unterschrift)	
X-1-1	Name (FAMILIENNAME, Vorname)	PLÖGER, Dr.-Ing., Jan	
X-1-3	Eigenschaft (sofern sich dies nicht eindeutig aus dem Antrag ergibt)	(Vertreter)	

VOM ANMELDEAMT AUSZUFÜLLEN

10-1	Datum des tatsächlichen Eingangs dieser internationalen Anmeldung	28 APR 2016 (28.04.2016)
10-2	Zeichnung(en):	
10-2-1	Eingegangen X	
10-2-2	Nicht eingegangen	
10-3	Geändertes Eingangsdatum aufgrund nachträglich, jedoch fristgerecht eingeg. Unterlage(n) oder Zeichnung(en) zur Vervollständigung dieser int. Anmeldung	
10-4	Datum des fristgerechten Eingangs der Berichtigung nach PCT Artikel 11(2)	
10-5	Internationale Recherchenbehörde	ISA/EP
10-6	Übermittlung des Recherchenexemplars bis zur Zahlung der Recherchegebühr aufgeschoben	

VOM INTERNATIONALEN BÜRO AUSZUFÜLLEN

11-1	Datum des Eingangs des Aktenexemplars beim Internationalen Büro	
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Informationen zur Recherchenstrategie

Pilotphase (vgl. ABI. EPA 2015, A86)

Die Art der auf diesem Blatt enthaltenen Informationen kann sich während des Pilotprojekts zur Verbesserung des Nutzens dieses neuen Dienstes ändern.

Anmeldenummer

PCT/EP2016/059526

ERFINDUNGSBEZEICHNUNG: VERFAHREN ZUM BEHANDELN GEBRAUCHTER BATTERIEN, INSBESONDERE WIEDER AUFLADBARER BATTERIEN UND BATTERIE-VERARBEITUNGSANLAGE

ANMELDER: LION ENGINEERING GMBH

IPC-KLASSIFIKATION: H01M6/52, C22B13/00, H01M10/54

PRÜFER: Hofer, Astrid

KONSULTIERTE DATENBANKEN: EPODOC, WPI

KLASSIFIKATIONSSYMBOLS, DIE DEN RECHERCHENUMFANG DEFINIEREN:

IPC:

CPC: H01M6/52, C22B13/00, H01M10/54

FI/F-TERMS:

SCHLAGWÖRTER ODER SONSTIGE ELEMENTE, IN DENEN DIE ERFINDUNG VORKOMMT:
Die Anmeldung offenbart eine Methode zum Recycling gebrauchter Batterien basierend auf den Schritten Zerkleinern, Inaktivieren und Abfüllen der Batterieteile, wobei die Batterien durch Verdampfung des Elektrolyts mittels Trocknung unter Vakuum inaktiviert werden. Zusätzlich werden Zersetzungsgase durch das Strahlmedium einer Strahlpumpe ausgefällt.

PCT

Ausdruck (Original in elektronischem Format)

VIII-2-1	Erklärung: Berechtigung, ein Patent zu beantragen und zu erhalten Erklärung hinsichtlich der Berechtigung des Anmelders, zum Zeitpunkt des internationalen Anmeldedatums, ein Patent zu beantragen und zu erhalten (Regeln 4.17 Ziffer ii und 51bis.1 Absatz a Ziffer ii), für den Fall, daß eine Erklärung nach Regel 4.17 Ziffer iv nicht einschlägig ist: Name (FAMILIENNAME, Vorname)	In bezug auf diese internationale Anmeldung LION ENGINEERING GMBH ist kraft des nachfolgend Aufgeführten berechtigt, ein Patent zu beantragen und zu erhalten:
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VIII-2-1(i)		LION ENGINEERING GMBH ist berechtigt, als Arbeitgeber des Erfinders, WESTPHAL, Bastian

BUNDESREPUBLIK DEUTSCHLAND



Prioritätsbescheinigung DE 10 2015 207 843.4 über die Einreichung einer Patentanmeldung

Aktenzeichen: 10 2015 207 843.4

Anmeldetag: 28. April 2015

Anmelder/Inhaber: Lion Engineering GmbH, 38106 Braunschweig, DE

Bezeichnung: Verfahren zum Behandeln gebrauchter Batterien,
insbesondere wieder aufladbarer Batterien und
Batterie-Verarbeitungsanlage

IPC: H01M 10/54; H01M 6/52

Die angehefteten Stücke sind eine richtige und genaue Wiedergabe der Teile der am 28. April 2015 eingereichten elektronischen Dokumente dieser Patentanmeldung unabhängig von gegebenenfalls durch das Druckverfahren bedingten Farbabweichungen.

München, den 29. April 2016
Deutsches Patent- und Markenamt
Die Präsidentin

Im Auftrag

Weiss

Lion Engineering GmbH
Rebenring 33
38106 Braunschweig
Deutschland

Anwaltsakte:
5569-002 DE-1
Datum:
28. April 2015

Verfahren zum Behandeln gebrauchter Batterien, insbesondere wieder aufladbarer Batterien und Batterie-Verarbeitungsanlage

- 5 Die Erfindung betrifft ein Verfahren zum Behandeln gebrauchter Batterien, insbesondere gebrauchter Lithium-Batterien, beispielsweise Lithium-Ionen-Batterien, mit den Schritten (a) Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird, (b) Inaktivieren des Zerkleinerungsguts, sodass ein inaktiviertes Zerkleinerungsgut erhalten wird, und (c) Abfüllen des inaktivierten Zerkleinerungsguts in
- 10 einen Transportbehälter.

- Gemäß einem zweiten Aspekt betrifft die Erfindung eine Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien, insbesondere zum Behandeln gebrauchter Lithium-Batterien, mit (a) einer Zerkleinerungseinheit zum Zerkleinern
- 15 der Batterien, sodass Zerkleinerungsgut erhalten wird, (b) einer Inaktivierungsvorrichtung zum Inaktivieren des Zerkleinerungsguts und (c) einer Abfüllvorrichtung zum Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter.

- 20 Aus der US 2005/0241943 A1 ist ein Verfahren zum Aufarbeiten gebrauchter Batterien bekannt, bei dem die Batterien vor einem Zerkleinerungsschritt erwärmt werden, sodass Kunststoffbestandteile der Batterien zerstört werden. Nachteilig an einem derartigen Vorgehen ist, dass die verbleibenden Komponenten der Batterien mit Abbauprodukten des Kunststoffs verunreinigt sein können.

- 25 Aus der DE 10 2012 024 876 A1 ist ein System zum Überführen transportkritischer Elektrolytzellen in einen transportfähigen Zustand bekannt, bei dem die Elektro-

lytzellen zunächst unter Inertgas zerkleinert und danach mit einem Desaktivierungspulver bestäubt werden, um eine Selbstentzündung des elektrochemisch aktiven Materials zu verhindern. Nachteilig daran ist, dass das entstehende Material dennoch ein vergleichsweise hohes Gefährdungspotential besitzt und dass

5 das Bestäubungspulver selbst ein Explosionsrisiko darstellt und dass die Bildung einer entzündlichen und explosiven Atmosphäre in dem Transportbehälter nicht ausgeschlossen werden kann.

Der Erfindung liegt die Aufgabe zugrunde, Nachteile im Stand der Technik zu vermindern.

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Die Erfindung löst das Problem durch ein gattungsgemäßes Verfahren, bei dem das Inaktivieren zumindest auch durch Trocknen des Zerkleinerungsguts erfolgt. Gemäß einem zweiten Aspekt löst die Erfindung das Problem durch eine gattungsgemäße Batterie-Verarbeitungsanlage, bei der die Aktivierungsvorrichtung

15 eine Trocknungsvorrichtung umfasst.

15

Vorteilhaft an der Erfindung ist, dass durch das Trocknen dem Zerkleinerungsgut so viel Elektrolyt entzogen werden kann, dass eine elektrochemische Reaktion nicht mehr oder nur noch zu vernachlässigbar kleinem Ausmaß möglich ist. Zudem bildet sich keine entzündliche oder explosive Gasphase über den Batteriefragmenten, da diesen insbesondere die organischen Karbonate des Elektrolyten entzogen wurden. Das Zerkleinerungsgut ist daher weitgehend inert und kann, insbesondere dann, wenn es unter Vakuum verpackt wird, sicher transportiert

20 werden.

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Ein weiterer Vorteil ist es, dass zum Inaktivieren des Zerkleinerungsmaterials kein zusätzliches Material hinzugegeben werden muss. Das verringert den Aufwand beim Aufarbeiten der Batterien, verringert das Gewicht des inaktivierten Zerkleinerungsguts und erhöht die Reinheit in den folgenden Trenn- und Recyclingschrit-

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ten. Insbesondere in potentiell folgenden hydrometallurgischen Aufarbeitungsschritten ist eine hohe Produktreinheit ohne Eintrag von Fremdionen vorteilhaft.

5 Im Rahmen der vorliegenden Beschreibung wird unter dem Trocknen insbesondere das Entfernen zumindest eines Lösungsmittels des Leitsalzes verstanden. Insbesondere wird das Trocknen so durchgeführt, dass Kohlensäuredimethylester und/oder Kohlensäureethylmethylester entfernt wird.

10 Unter der Batterie wird insbesondere eine Lithium-Batterie verstanden. Eine Lithium-Batterie ist ein Akkumulator, bei dem die elektrochemische Reaktion Lithium und/oder Lithium-Ionen und/oder eine Lithium-Verbindung involviert.

15 Unter einer Batterie-Verarbeitungsanlage wird insbesondere auch eine Akku-Verarbeitungsanlage zum Verarbeiten von Akkumulatoren verstanden.

20 Unter dem Transportbehälter wird insbesondere auch eine oder eine Transportverpackung verstanden. Vorzugsweise wird die Transportverpackung durch Vakuumverschweißung verschlossen. Gut geeignet als Transportverpackung ist insbesondere Aluminium-Verbundfolie.

25 Günstig ist, wenn das Trocknen nach dem Zerkleinern der Batterien erfolgt. Zwar ist es möglich und stellt eine Ausführungsform der Erfindung dar, dass die Batterien im unzerkleinerten Zustand einem Vakuum ausgesetzt werden, sodass zumindest Teile des Elektrolyten verdampfen, wobei das entstehende Gas entweder durch ein Sicherheitsventil im Akkumulator entweicht oder die Batterie durch die Druckdifferenz zwischen der äußeren Umgebung und dem Innendruck zerstört wird, sodass verdampfender Elektrolyt austreten kann. Da der Elektrolyt zumeist zwischen eng gewickelten oder gestapelten und verpressten Schichten aus Elektroden und Separator und in deren Poren vorliegt und mit anderen Bestandteilen
30 der Batterien verbunden vorliegt, kann dieses Vorgehen jedoch zeitintensiv sein.

Es ist daher oft günstiger und stellt eine bevorzugte Ausführungsform der Erfindung dar, dass die Batterien mechanisch zerkleinert werden, beispielsweise durch Schneiden, Scheren, Pralleinwirkung, Zertrennen und/oder Quetschen. So steht für den Stoffübergang in die Gasphase eine größere Grenzfläche zur Verfügung.

Das Trocknen kann beispielsweise durch Vakuumtrocknung, Kontakttrocknung, Konvektionstrocknung und/oder Strahlungstrocknung erfolgen. Günstig ist es, wenn das Trocknen unter Rühren und/oder Umwälzen des Zerkleinerungsguts erfolgt.

Vor dem Zerkleinern werden die gebrauchten Batterien vorzugsweise demontiert. Das heißt, dass größere Batteriesysteme in ihre kleineren Unterbausteine, die Module oder Stacks, demontiert werden oder sogar die Zellen, die das elektrochemisch wirksame Material enthalten, von der Ansteuerelektronik getrennt werden. Die Ansteuerelektronik umfasst beispielsweise Halbleiterbauelemente und/oder Sensoren und dient der Ladesteuerung der Batterien.

Gemäß einer bevorzugten Ausführungsform erfolgt das Trocknen unter Vakuum. Vorzugweise ist das Vakuum so groß gewählt, dass der Dampfdruck von Kohlendisäuredimethylester bei 80°C, insbesondere bei 70°C, unterschritten wird. Günstig ist es, wenn das Trocknen unter einem Druck von höchstens 300 hPa, insbesondere höchstens 100 hPa erfolgt. Bei so niedrigen Drücken verdampfen wesentliche Bestandteile der meisten Elektrolyten, insbesondere Kohlendisäuredimethylester und Kohlendisäureethylmethylester, bereits bei Temperaturen von weniger als 80°. Niedrige Temperaturen haben den Vorteil, dass die Bildung von Fluorwasserstoff behindert wird. Fluorwasserstoff stellt eine potentielle Gefährdung für die Batterie-Verarbeitungsanlage sowie die Umgebung dar. Es ist daher günstig, das Entstehen von Fluorwasserstoff zu verhindern.

Günstig ist es, wenn das Trocknen unter einer Atmosphäre erfolgt, in der der

Wasser-Partialdruck kleiner ist als 50 Pa, insbesondere kleiner als 10 Pa. Ein geringer Wasser-Partialdruck führt zu einer geringen Reaktionsrate von Lithium-Verbindungen zu Lithium-Hydroxid und damit zu nur geringer Wasserstoff-Entwicklung. Das verhindert die Bildung von zündfähigen Wasserstoff-Sauerstoff-Gemischen und trägt zur Anlagensicherheit bei.

Günstig ist es zudem, wenn der Sauerstoff-Partialdruck höchstens 10 Millibar, insbesondere höchstens 5 Millibar beträgt. Die Reaktion von Sauerstoff mit oxidierbaren Bestandteilen der Batterien wird so weitgehend unterdrückt. Es ist möglich, den niedrigen Sauerstoff-Partialdruck durch einen geringen Druck beim Trocknen zu erreichen. Alternativ oder zusätzlich kann das Trocknen in einer Inertgas-Atmosphäre erfolgen.

Bevorzugt ist ein Verfahren, bei dem das Trocknen des Zerkleinerungsguts beendet wird, bevor sich ein entzündliches oder explosives Gasmisch über dem abgefüllten Zerkleinerungsgut bildet und/oder bevor das Zerkleinerungsgut so trocken ist, dass sich während der Weiterverarbeitung ein entzündliches oder explosives Gasmisch ergibt.

Vorzugsweise wird das Zerkleinerungsgut so lange getrocknet, bis ein Elektrolytgehalt im Zerkleinerungsgut so klein ist, dass eine elektrochemische Reaktion unmöglich ist. In anderen Worten ist der Elektrolytgehalt kleiner als ein Schwellenwert, wobei der Schwellenwert so gewählt ist, dass die Zellspannung bei Unterschreiten dieses Schwellenwerts auf höchstens ein Viertel abgesunken ist. Dieser Schwellenwert wird beispielsweise dadurch bestimmt, dass die Zellenspannung einer Batterie in Abhängigkeit vom Elektrolytgehalt bestimmt wird. Kurz vor dem Erreichen des Schwellenwerts bricht die Zellspannung zusammen, das heißt, dass sie um zumindest 75% absinkt. Ist der Schwellenwert unterschritten, enthält die Batterie so wenig Elektrolyt, dass in guter Näherung keine elektrochemische Reaktion mehr möglich ist.

Vorzugsweise wird das Zerkleinerungsgut so lange getrocknet, dass eine Menge von 50 kg an Zerkleinerungsmaterial, das kompaktiert in einem 50-Liter-Fass enthalten ist, keine oder eine nur so geringe Wärmeentwicklung zeigt, dass ein thermisches Durchgehen, also eine thermisch induzierte Kettenreaktion, für zumindest zwei Monate ausgeschlossen ist und dass eine etwaige Wasserstoff-Entwicklung zudem so gering ausgebildet ist, dass nach zwei Wochen kein Überdruck entsteht, wenn zu Beginn ein Unterdruck von 500 hPa herrscht.

Günstig ist es, wenn das Zerkleinerungsgut so lange getrocknet wird, bis der Elektrolytgehalt an organischen Komponenten, die bei 80°C flüchtig sind, höchstens 3 Gew.-%, höchstens insbesondere 2 Gew.-% beträgt.

Vorzugsweise wird das Trocknen so lange durchgeführt, dass der akkumulierte Gehalt an organischen Karbonaten aus dem Elektrolyten, die bei 80°C flüchtig sind, in der Atmosphäre über dem Zerkleinerungsgut 3 Vol.-% unterschreitet.

Insbesondere wird das Trocknen so lange durchgeführt, bis der Gehalt an Kohlendisäuredimethylester 4 Vol.-%, insbesondere 3 Vol.-%, unterschreitet und/oder der Gehalt an Cyclohexylbenzol 1 Vol.-%, insbesondere 0,5 Vol.-%, unterschreitet.

Vorzugsweise erfolgt das Trocknen unmittelbar nach dem Zerkleinern. Hierunter wird insbesondere verstanden, dass zwischen dem Beginn des Zerkleinerns der Batterien und dem Zeitpunkt, zu dem zumindest ein Teil des dadurch entstandenen Zerkleinerungsguts anfängt zu Trocknen, höchstens fünf Minuten beträgt, insbesondere höchstens eine Minute. Durch die schnelle Trocknung nach dem Zerkleinern wird die Masse an Material klein gehalten, die potentiell elektrochemisch reagieren könnte, zudem wird die elektrochemische Reaktionszeit potentieller exothermer Reaktionen klein gehalten. Das senkt das Risiko für die Anlage und die Umgebung.

Besonders günstig ist es, wenn das Vakuum mittels einer Strahlpumpe erzeugt wird. Strahlpumpen sind, insbesondere bei geeigneter Wahl des Strahlmediums, weitgehend unempfindlich gegen aggressive abzupumpende Gase. Günstig ist es, wenn das Strahlmedium, das eine Flüssigkeit ist, einen pH-Wert von zumindest 8, insbesondere von zumindest 9, beispielsweise zumindest 12, hat. In diesem Fall können sich unerwünschte Bestandteile des Gases, das abgepumpt wird, zersetzen oder zu weniger schädlichen Substanzen reagieren. So kann beispielsweise Kohlendimethylester und/oder Kohlendäureethylmethylester durch eine Verseifungsreaktion abgebaut werden. Etwaig im Strahlenmedium enthaltener Fluorwasserstoff kann im basischen Milieu in einer Säure-Base-Reaktion zu einem ungefährlichen Salz umgesetzt werden.

Vorzugsweise enthält das Strahlenmedium eine Fluor fällende Substanz. Beispielsweise kann das Strahlenmedium Natriumkarbonat oder Kalziumkarbonat enthalten. Die bei der Reaktion mit einer Fluorverbindung, insbesondere Fluorwasserstoff, entstehenden Salze werden vorzugsweise abgetrennt, insbesondere abgefiltert oder aussedimentiert. Auf diese Weise wird zumindest weitgehend verhindert, dass Fluorwasserstoff oder andere giftige fluorhaltige Verbindungen in die Umgebung abgegeben werden können.

Vorzugsweise erfolgt das Trocknen bei einer Temperatur von höchstens 80°. In diesem Fall entsteht kaum Fluorwasserstoff. Das erhöht die Lebensdauer der Batterie-Verarbeitungsanlage und verringert die Umweltgefährdung.

Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren die Schritte des Kondensierens von Bestandteilen des Elektrolyten durch Abkühlen und/oder Druckerhöhen, sodass ein Elektrolytkondensat entsteht. Beispielsweise wird das Kondensieren an einer Stelle durchgeführt, die bezüglich des Gasflusses zwischen dem Trockner und der Vakuumpumpe liegt. Vom Trockner kommende Gase müssen daher in diesem Fall zunächst einen Kondensator passieren, bevor

sie zur Vakuumpumpe gelangen können. Das führt dazu, dass gasförmiger Elektrolyt, der in dem Gas vorliegt, das beim Trocknen entsteht, zumindest zu einem überwiegenden Teil im Kondensator abgeschieden wird, bevor das verbleibende Gas zur Pumpe gelangt. So kann Elektrolyt zurückgewonnen werden. Zudem verringert sich der Gasstrom durch die Vakuumpumpe, was deren Lebensdauer verlängert und deren Energieverbrauch reduziert.

10 Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren alternativ den Schritt der Gasreinigung durch Adsoption der flüchtigen organischen Bestandteile an einem Aktivkohlfiter vor oder nach der Verdichtereinheit.

Vorzugsweise umfasst das erfindungsgemäße Verfahren alternativ oder zusätzlich den Schritt eines Reinigens des Gases, das beim Trocknen entsteht, bevor dieses die Vakuumpumpe erreicht. Das kann beispielsweise auch dadurch erfolgen, dass das Gas einen Aktivkohlfiter und/oder einen Filter passiert, in dem mit Fluorwasserstoff reagierende Substanzen enthalten sind, beispielsweise ein Kalziumsalz wie Kalziumkarbonat.

20 Vorzugsweise umfasst das erfindungsgemäße Verfahren den Schritt eines Trocknens bei einer Trocken-Temperatur und für eine Trocken-Dauer, die so gewählt sind, dass sich der Binder, der Aktivmaterial der Lithium-Batterie an einen Träger bindet, zumindest zum überwiegenden Teil zersetzt. Günstig ist es, wenn dieser Trocknungsschritt, der auch als Hochtemperatur-Trocknen bezeichnet werden kann, räumlich getrennt von einem ersten, oben beschriebenen Trocknungsschritt durchgeführt wird. Der letztgenannte Trocknungsschritt kann auch als Niedertemperatur-Trocknen bezeichnet werden.

30 Vorzugsweise wird das Hochtemperatur-Trocknen, bei dem sich der Binder zersetzt, so durchgeführt, dass die entstehenden Zersetzungsgase sich nicht mit den Gasen mischen, die beim Niedrigtemperatur-Trocknen entstehen. Es ist möglich,

dass das Höchsttemperatur-Trocknen und das Niedertemperatur-Trocknen bei unterschiedlichen Drücken erfolgt. Beispielsweise kann das Hochtemperatur-Trocknen bei Normaldruck erfolgen.

- 5 Unter dem Aktivmaterial wird der Stoff verstanden, der beim Betrieb der Batterien elektrochemisch reagiert. Unter dem Träger für das Aktivmaterial wird insbesondere eine Trägerfolie verstanden, auf der das Aktivmaterial in Form von Partikeln aufgebracht ist. Beispielsweise handelt es sich bei der Trägerfolie um eine Folie aus Aluminium oder eine Aluminiumlegierung. Der Binder ist der Stoff, der das
- 10 Aktivmaterial mit dem Träger verbindet, beispielsweise enthält der Binder Polyvinylidenfluorid.

- Günstig ist es, wenn beim Zerkleinern der Batterien flüssiger Stickstoff zugegeben wird. Das kühlt die Batterien, die Zerkleinerungsmaschine und das Zerkleinerungsgut und verdrängt zudem Sauerstoff und Wasserdampf aus der Atmosphäre.
- 15

Günstig ist es, wenn das Zerkleinern bei dem Wasserdampf-Partialdruck von höchstens 20 Pa und/oder einem Sauerstoff-Partial von höchstens 40 hPa, insbesondere höchstens 15 hPa erfolgt.

20

- Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren die Schritte eines Entnehmens des Zerkleinerungsguts aus dem Transportbehälter, eines Abtrennens von Hartteilen und/oder eines Separierens von Aktivmaterial vom Träger, insbesondere durch eine zweite Zerkleinerungsstufe und/oder Luftstrahlsieben, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entstehen, und eines getrennten Verpackens von Aktivmaterialfraktion und Trägerfraktion in jeweilige Transportbehältnisse. Günstig ist es, wenn diese Transportbehältnisse luftdicht ausgebildet sind. Durch das Trennen von Aktivmaterialfraktion und Trägerfraktion ist ein Transport in der Regel ohne Genehmigungen möglich. Ein weiterer
- 25
- 30 Vorteil ist, dass derartig getrennte Fraktionen nur eine geringe Gefährdung darstellen.

In einer bevorzugten Batterie-Verarbeitungsanlage sind die Trennungseinheit und die Trockenvorrichtung in einem gemeinsamen Standard-Container angeordnet. Das hat den Vorteil, dass die Batterie-Verarbeitungsanlage besonders einfach
5 transportiert werden kann.

Günstig ist es, wenn die Trockenvorrichtung ein Rührwerkzeug aufweist, beispielsweise einen Ankerrührer oder einen Stabrührer, dessen Rührstäbe quer zu einer Rührwelle angebracht sein können. Alternativ oder zusätzlich ist das Rührwerkzeug ein externes Rührwerkzeug, das den Trockner als Ganzes bewegt.
10

Vorzugsweise besitzt die Batterie-Verarbeitungsanlage eine Vakuumanlage, die mit der Trockenvorrichtung zum Erzeugen eines Vakuums in der Trockenvorrichtung verbunden ist. Besonders günstig ist es, wenn auch die Vakuumanlage im
15 Standard-Container angeordnet ist. Bei dem Standard-Container handelt es sich vorzugsweise um einen 40-Fuß-Container. Beispielsweise umfasst die Vakuumanlage eine Strahlpumpe, bei der ein Strahlmedium zum Erzeugen des Unterdrucks verwendet wird.

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage eine Hartmetallabtrennvorrichtung und/oder eine Leichtfraktionabtrennvorrichtung, eine Separiervorrichtung, insbesondere eine Klassiervorrichtung, zum Separieren von Aktivmaterial vom Träger, insbesondere durch eine zweite Zerkleinerungsstufe und/oder Luftstrahlsieben, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entsteht,
20 und eine zweite Abfüllvorrichtung zum getrennten Abfüllen von Aktivmaterialfraktion und Trägerfraktion. Günstig ist es, wenn diese Abfüllvorrichtung zum Abfüllen unter Unterdruck und/oder unter Inertgas ausgebildet ist.
25

Unter einer Hartmetallabtrennvorrichtung wird insbesondere eine Vorrichtung zur
30 Abtrennung von Fragmenten peripherer Bestandteile des Betriebssystems, der Batteriezellhülle und der Strom-Kontakte verstanden. Beispielsweise umfasst die

Hartmetallabtrennvorrichtung eine Magnetseparationsvorrichtung und/oder einen Sieb, insbesondere einen Querstromsieb und/oder einen Zickzack-Sieb. Unter der Separiervorrichtung wird insbesondere eine Vorrichtung zum zur Abtrennen der Separatorfolie verstanden.

5

Die Leichtfraktionabtrennvorrichtung umfasst vorzugsweise einen Zickzack-Sieb und/oder einen Lufttrenner, wobei es günstig ist, wenn die Luft im Kreislauf geführt wird. Das reduziert die Staubexposition der Umwelt mit gesundheits-schädlichem Staub.

10

Vorzugsweise sind die zweite Abfüllvorrichtung und die Separiervorrichtungen in einem gemeinsamen Standard-Container angeordnet, beispielsweise im oben be-schrieben ersten Standard-Container, oder einem zweiten Standard-Container. Günstig ist es, wenn der Container staubdicht gekapselt ist.

15

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage eine Schleuse zwischen der Zerkleinerungseinheit und der Inaktivierungsvorrichtung. Beispielsweise han-delt es sich um eine Zellenradschleuse.

20

Im Folgenden wird die Erfindung anhand der beigefügten Zeichnungen näher er-läutert. Dabei zeigt

Figur 1 ein Ablaufdiagramm eines erfindungsgemäßen Verfahrens,

25

Figur 2 einen Querschnitt durch eine erfindungsgemäße Batterie-Verarbei-tungsanlage und

Figur 3 einen Querschnitt durch weitere, optionale Bestandteile einer erfin-dungsgemäßen Batterie-Verarbeitungsanlage.

30

Figur 1 zeigt das Ablaufdiagramm eines erfindungsgemäßen Verfahrens. Zunächst werden Batterien 10.1, 10.2, ..., insbesondere Batteriesysteme bestehend aus mehreren Batteriemodulen oder Batteriestacks, welche wiederum aus mehreren Batteriezellen bestehen, in einer Entladeeinheit 12 entladen. Danach folgt an einer Demontagestation 14 die Demontage der Batterien 10, wenn diese erforderliche ist, weil die Batteriesysteme ansonsten aus geometrischen oder gravimetrischen Gründen nicht in die Zerkleinerungseinheit befördert werden können. Dazu werden die Batteriesysteme geöffnet und soweit demontiert, dass die Module/Stacks einzeln entfernt werden können. Gegebenenfalls können auch die Zellen von der Ansteuerelektronik getrennt werden. Die entstehenden Untereinheiten (Module/Stacks) und/oder Zellen 16.1, 16.2, ... werden einer Zerkleinerungseinheit 18 zugeführt, die beispielsweise eine Rotorschere mit einem Rotor und einen mit Statoren oder mehreren Rotoren, oder eine Schneidmühle mit einem Rotor und mehreren Rotoren umfasst.

Die Zerkleinerungseinheit 18 zerkleinert die Batterien 10 unter Schutzgas 20, das beispielsweise einer Schutzgasflasche entnommen wird. Alternativ oder zusätzlich kann flüssiger Stickstoff aus einer Flüssigstickstoffquelle 19 zugeführt werden. Bei dem Schutzgas kann es sich beispielsweise um Stickstoff, ein Edelgas, Kohlendioxid, Lachgas oder ein sonstiges, vorzugsweise nicht giftiges Gas handeln.

Beim Zerkleinern entsteht Zerkleinerungsgut 24, das einer Inaktivierungsvorrichtung in Form einer Trockenvorrichtung 26 zugeführt wird. Zwischen der Zerkleinerungseinheit 18 und der Trockenvorrichtung 26 ist eine Schleuse 28 angeordnet, die soweit gasdicht ist, dass die Druckvorrichtung 26 in guter Näherung von der Zerkleinerungseinheit 18 gasdicht getrennt ist.

Die Trockenvorrichtung 26 ist mit einer Vakuumanlage 29 verbunden, die eine Vakuumpumpe 30 aufweist und ein Vakuum erzeugt. In der Trockenvorrichtung 26 herrscht ein Druck p_{26} von $p_{26} \approx 100$ hPa, vorzugsweise 50 hPa. Es sei darauf

hingewiesen, dass im Rahmen der vorliegenden Beschreibung unter einer Vakuumpumpe insbesondere ganz allgemein eine Vorrichtung verstanden wird, die ein Vakuum erzeugt. Es ist dabei möglich und bevorzugt, nicht aber notwendig, dass die Vakuumpumpe gleichzeitig als Verdichter wirkt, so dass von ihr Gas unter
5 einem Druck abgegeben wird, der größer ist als der Umgebungsdruck.

In dem in Figur 1 gezeigten Fall handelt es sich bei der Vakuumpumpe um einen Verdichter, der Gas 31, das in der Trockenvorrichtung 26 vorliegt, ansaugt und verdichtet. Alternativ oder zusätzlich kann die Vakuumanlage 29 eine Strahlpumpe aufweisen, bei der ein Strahlmedium in Form einer Flüssigkeit mit hoher Geschwindigkeit durch Venturi-Düse geleitet wird. Das Strahlmedium ist alkalisch und hat einen pH-Wert von zumindest pH 13 und ist beispielsweise eine 10%ige Kaliumhydroxidlösung.

10 Die Vakuumanlage 29 umfasst eine Gasreinigungsvorrichtung 32, die zwischen der Trockenvorrichtung 26 und der Vakuumpumpe 30 angeordnet ist und die im vorliegenden Fall einen Kondensator 34 und/oder einen Aktivkohlefilter 36 umfasst. Der Kondensator wird bei einer Temperatur von -10 °C betrieben, so dass Kohlensäuredimethylester und Kohlensäureethylmethylester kondensieren und in
20 einen Kondensatbehälter 38 abgegeben werden können. Zudem wird etwaig vorhandenes Wasser ausgefroren. Ein Steuerventil 40 ist ausgebildet zum Öffnen, wenn der Druck p_{26} zu groß wird und zum Zufahren, wenn der Druck p_{26} zu klein wird, das heißt, dass ein vorgegebener Schwellenwert unterschritten wird.

25 Vorzugsweise ist das Trocknungsgut während der Trocknung bewegt. Dies kann beispielsweise durch langsames Rühren mit einem Rührwerkzeug 41, wie einem Ankerrührer oder einem Stabrührer mit senkrecht zur Rührwelle angebrachten Stäben passieren. Alternativ durch einen bewegten Trocknungsbehälter.

30 Durch das Trocknen des Zerkleinerungsguts entsteht inaktiviertes Zerkleiner-

5 rungsut 42, das einer Abfüllvorrichtung 44 zugeführt wird. Dort wird das inaktivierte Zerkleinerungsgut 42 unter Vakuum und/oder unter Schutzgas in einen Transportbehälter 46 abgefüllt. Der Transportbehälter 46 ist vorzugsweise gasdicht. Es ist möglich, nicht aber notwendig, dass der Transportbehälter 46 vor dem Abtransport mit Inertgas aufgefüllt wird, so dass er unter Normaldruck steht. Alternativ ist es auch möglich, dass der Transportbehälter unter Vakuum verschlossen und transportiert wird. Es ist möglich, dass alternativ zum Transportbehälter eine vakuumverschweißte Folie, beispielsweise eine Aluminiumverbundfolie, gewählt wird.

10 Über eine Spülleitung 48 wird der Zerkleinerungseinheit 18 Schutzgas 20 von der Vakuumpumpe 30 zugeführt. Arbeitet die Vakuumpumpe 30 wie im vorliegenden Fall, der eine bevorzugte Ausführungsform darstellt, zudem als Kompressor, kann das Schutzgas auf eine Druckgasflasche 50 gezogen werden. Alternativ oder zusätzlich kann das Schutzgas 20, gegebenenfalls nach zusätzlicher Reinigung, in die Umgebung abgegeben werden.

20 Figur 2 zeigt schematisch einen Querschnitt durch eine erfindungsgemäße Batterie-Verarbeitungsanlage 52, die einen Standard-Container 54 aufweist, in dem die Zerkleinerungseinheit 18, die Trockenvorrichtung 26 und die Abfüllvorrichtung 44 angeordnet sind. Hinter der Zerkleinerungseinheit 18 ist ein erster gasdichter Förderer 56 angeordnet, der beispielsweise eine Förderschnecke oder einen Rohrkettenförderer umfasst. Der erste Förderer 56 fördert das Zerkleinerungsgut 24 zur Trockenvorrichtung 26, die mit der in Figur 2 nicht sichtbaren Vakuum-Erzeugungsvorrichtung verbunden ist. In Materialstromrichtung hinter der Trockenvorrichtung 26 ist ein zweiter Förderer 58 angeordnet, der vorzugsweise ebenfalls gasdicht ausgebildet ist und eine Förderschnecke oder einen Rohrkettenförderer enthalten kann. Der zweite Förderer fördert das inaktivierte Zerkleinerungsgut 42 zur Abfüllvorrichtung 44.

Figur 3 zeigt optionale, in der vorliegenden Ausführungsform vorhandene Einheiten der erfindungsgemäßen Batterie-Verarbeitungsanlage 52, die einen Aufschlusszerkleinerer 60 sowie einen Siebter 62 umfasst. Der Aufschlusszerkleinerer 60 enthält eine Transportbehälter-Entleervorrichtung 64, mittels der aus dem

5 Transportbehälter 46 inaktiviertes Zerkleinerungsgut 42 entnommen werden kann. Der Aufschlusszerkleinerer 60 erzeugt Aufschlussmaterial 66, das dem Siebter 62 zugeführt wird. Es kann sich bei dem Siebter beispielsweise um einen Zickzack-Siebter handeln.

10 Vorzugsweise umfasst die Batterie-Verarbeitungsanlage 52 einen Zerkleinerer, der vorzugsweise im Materialfluss vor der Klassiervorrichtung 74 steht und ein schnell laufendes Zerkleinerungswerkzeug enthält, wobei eine Rotorumfangsgeschwindigkeit größer ist als 1 m/s, vorzugsweise größer als 10 m/s. Dieser Zerkleinerer zerkleinert das Zerkleinerungsmaterial und beansprucht es mechanisch

15 so, dass sich die elektrochemisch aktive Beschichtung mindestens teilweise vom Träger löst. Das Vorhandensein eines solchen Zerkleinerers ist ein allgemeines bevorzugtes Merkmal einer erfindungsgemäßen Batterie-Verarbeitungsanlage.

Im Siebter entstehen eine Leichtfraktion mit Separatorfolie und feinem Beschichtungsmaterial und eine Schwergutfraktion mit Trägerfolien (Aluminium- und Kupfer) mit größerem leicht anhaftender Beschichtung. Beide Fraktionen werden auf

20 jeweils ein Sieb zur weiteren Trennung in Beschichtung und Separatorfolie beziehungsweise Beschichtung und Metallfolien gegeben. Die entstehenden Fraktionen werden getrennt weiter verarbeitet.

25 Das Aufschlussmaterial 66 wird dem Siebter 62 mittels einem dritten Förderer 68 zugeführt. Ein vierter Förderer 70 führt gesichtetes Material 72, insbesondere das Material der Leichtfraktion, das den Siebter 62 verlässt, einer Klassiervorrichtung 74 zu. Die Klassiervorrichtung 74 umfasst vorzugsweise ein Luftstrahlsieb, das

30 gleichzeitig als Trennvorrichtung zum Trennen des Aktivmaterials von dem Träger fungiert. Durch das Trennen entsteht eine Aktivmaterialfraktion 76, die in ein

Transportbehältnis 78 abgefüllt wird.

Es entsteht zudem eine Trägerfraktion 80, die in der vorliegenden Ausführungs-
form mit einem fünften Förderer 82 einer Abfülleinheit 84 zugeführt wird; die die
5 Trägerfraktion 80 in einen Behälter 86 füllt. Die Abfülleinheit 84 ist zusammen mit
einer zweiten Abfülleinheit 88 Teil einer zweiten Abfüllvorrichtung.

Bezugsleistenliste

10	Batterie	50	Druckgasflasche
12	Entladeeinheit	52	Batterie-Verarbeitungsanlage
14	Demotagesstation	54	Standard-Container
16	Zelle	56	erster Förderer
18	Zerkleinerungseinheit	58	zweiter Förderer
19	Flüssigstickstoffquelle		
20	Schutzgas	60	Aufschlusszerkleinerer
22	Schutzgasflasche	62	Sichter
24	Zerkleinerungsgut	64	Transportbehälter- Entleervorrichtung
26	Trockenvorrichtung	66	Aufschlussmaterial
28	Schleuse	68	dritter Förderer
29	Vakuumanlage		
30	Vakuumpumpe	70	vierter Förderer
31	Gas	72	gesichtetes Material
32	Gasreinigungsvorrichtung	74	Klassiervorrichtung
34	Kondensator	76	Aktivmaterialfraktion
36	Aktivkohlefilter	78	Transportbehältnis
38	Kondensatbehälter		
40	Steuerventil	80	Trägerfraktion
41	Rührwerkzeug	82	fünfter Förderer
42	inaktives Zerkleinerungsgut	84	Abfülleinheit
44	Abfüllvorrichtung	86	Behälter
46	Transportbehälter	88	zweite Abfülleinheit
48	Spüleleitung	p	Druck

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Anwaltsakte:
5569-002 DE-1

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Patentansprüche:

1. Verfahren zum Behandeln gebrauchter Batterien (10), insbesondere
5 Lithium-Batterien, mit den Schritten:
 - (a) Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird,
 - (b) Inaktivieren des Zerkleinerungsguts (24), sodass ein inaktiviertes Zerkleinerungsgut (42) erhalten wird, und
 - 10 (c) Abfüllen des inaktivierten Zerkleinerungsguts (42) in einen Transportbehälter (46),
dadurch gekennzeichnet, dass
 - (d) das Inaktivieren durch Trocknen des Zerkleinerungsguts (24) erfolgt.
- 15 2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass das Trocknen unter Vakuum erfolgt.
3. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass das Zerkleinerungsgut (24) solange getrocknet wird, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist.
20
4. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass
das Vakuum mittels einer Strahlpumpe erzeugt wird und
25 ein Strahlmedium der Strahlpumpe
einen pH-Wert von zumindest 8, insbesondere 9, hat und/oder
eine Fluor fällende Substanz enthält.

5. Verfahren nach einem der vorstehenden Ansprüche, gekennzeichnet durch die Schritte:
- (e) Entnehmen des Zerkleinerungsguts (24) aus dem Transportbehälter (46),
 - 5 (f) Abtrennen von Hartteilen und/oder
Separieren von Aktivmaterial vom Träger, insbesondere durch Luftstrahlsieben oder durch eine zweite Zerkleinerungsstufe, sodass eine Aktivmaterialfraktion (76) und eine Trägerfraktion (80) entsteht, und
 - (g) getrenntes Verpacken von Aktivmaterialfraktion (76) und Trägerfraktion (80) in Transportbehältnisse (78).
6. Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien, insbesondere Lithium-Batterien, mit:
- 15 (a) einer Zerkleinerungseinheit (18) zum Zerkleinern der Batterien (10),
sodass Zerkleinerungsgut (24) erhalten wird,
 - (b) einer Inaktivierungsvorrichtung (26) zum Inaktivieren des Zerkleinerungsguts (24) und
 - (c) einer Abfüllvorrichtung (44) zum Abfüllen des inaktivierten Zerkleinerungsguts (24) in einen Transportbehälter (46),
 - 20 dadurch gekennzeichnet, dass
 - (d) die Inaktivierungsvorrichtung eine Trockenvorrichtung (26) umfasst.
7. Batterie-Verarbeitungsanlage nach Anspruch 6, dadurch gekennzeichnet, dass
- 25 die Zerkleinerungseinheit und die Trockenvorrichtung (26) in einem Standard-Container (54) angeordnet sind.
8. Batterie-Verarbeitungsanlage nach Anspruch 6 oder 7, gekennzeichnet durch eine Vakuumanlage, die mit der Trockenvorrichtung (26) zum Erzeugen eines Vakuums in der Trockenvorrichtung (26) verbunden ist.
- 30

9. Batterie-Verarbeitungsanlage nach Anspruch 8, dadurch gekennzeichnet, dass

- die Vakuumanlage (29) eine Strahlpumpe mit einem Strahlmedium umfasst,
- das Strahlmedium im Kreis geführt ist und
- das Strahlmedium eine mit Fluorwasserstoff reagierende Substanz enthält

10. Batterie-Verarbeitungsanlage nach einem der Ansprüche 6 bis 9, gekennzeichnet durch

- eine Hartmetallabtrennvorrichtung und/oder eine Leichtfraktionsabtrennvorrichtung,
- eine Separiervorrichtung, insbesondere eine Klassiervorrichtung (74), zum Separieren von Aktivmaterial vom Träger, insbesondere durch Luftstrahlsieben und/oder durch eine zweite Zerkleinerungsstufe, sodass eine Aktivmaterialfraktion (76) und eine Trägerfraktion entsteht, insbesondere Aluminium- und Kupferfolien, und
- eine zweite Abfüllvorrichtung (44) zum getrennten Abfüllen von Aktivmaterialfraktion (76) und Trägerfraktion (80), insbesondere Aluminium- und Kupferfolien.

PL/be



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Zusammenfassung

Die Erfindung betrifft ein Verfahren zum Behandeln gebrauchter Batterien (10), insbesondere Lithium-Batterien, mit den Schritten: Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird, Inaktivieren des Zerkleinerungsguts (24), sodass ein inaktiviertes Zerkleinerungsgut (42) erhalten wird, und Abfüllen des inaktivierten Zerkleinerungsguts (42) in einen Transportbehälter (46). Erfindungsgemäß ist vorgesehen, dass das Inaktivieren durch Trocknen des Zerkleinerungsguts (24) erfolgt.

Figur 1

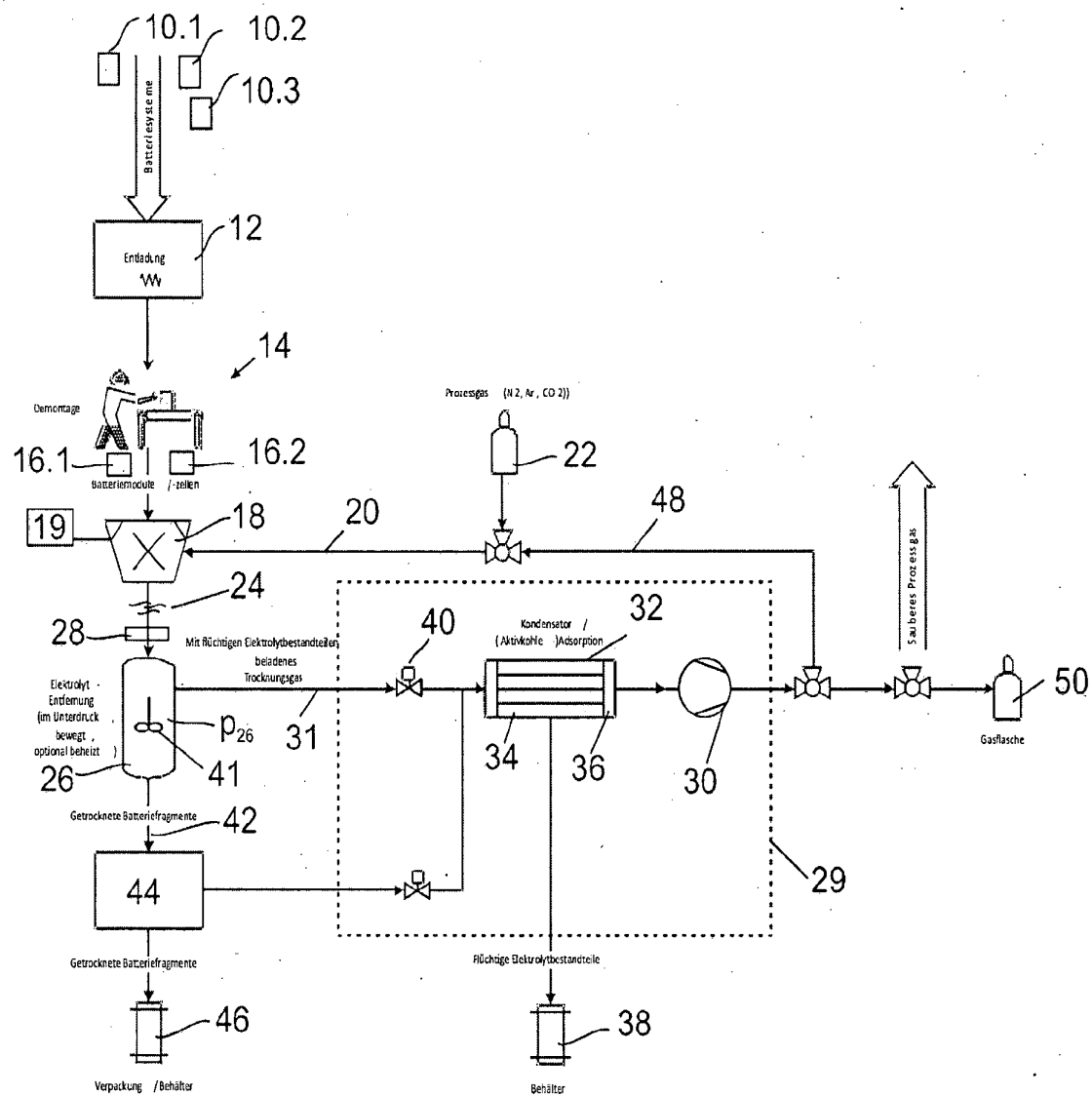


Fig. 1

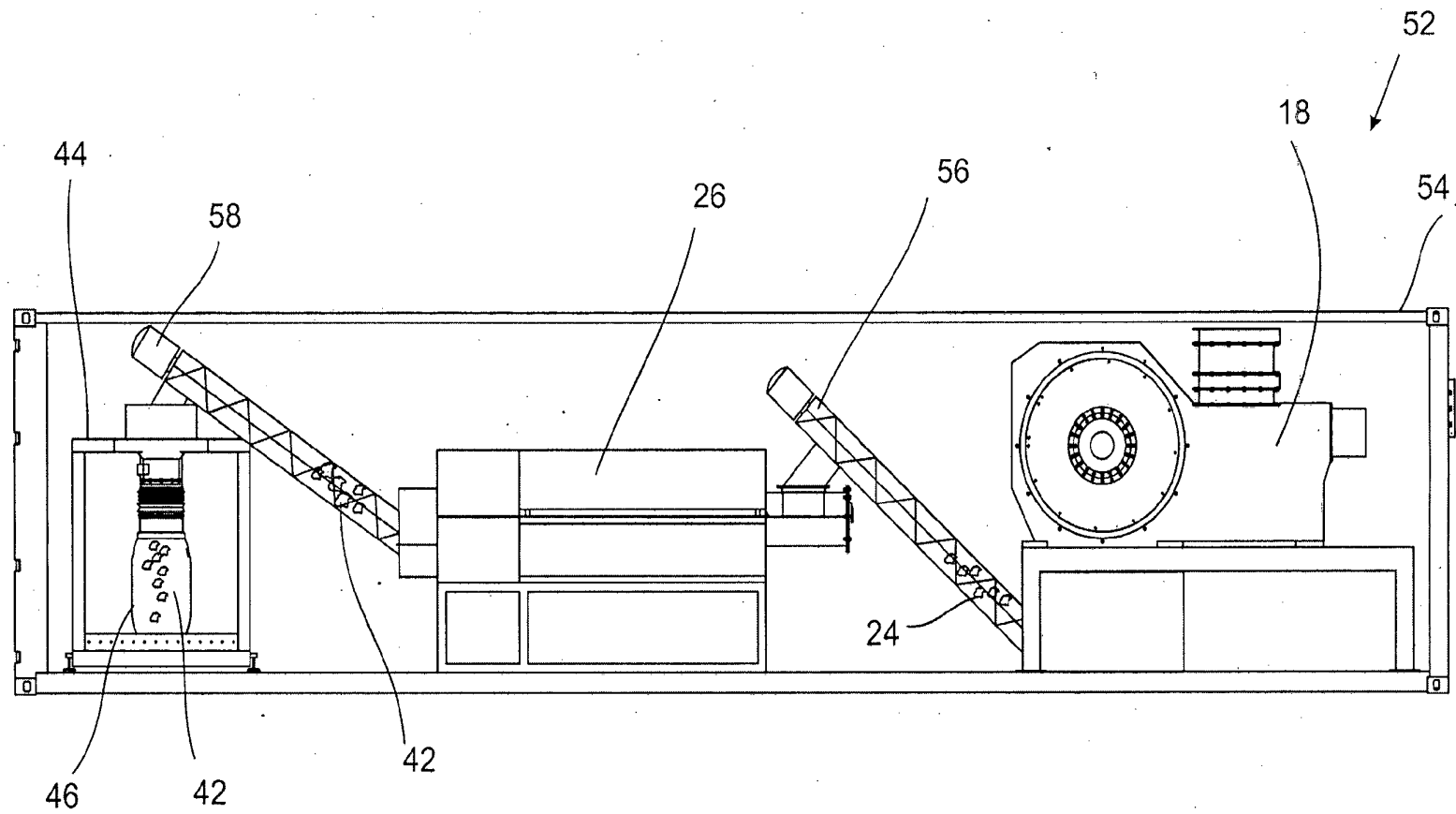


Fig. 2

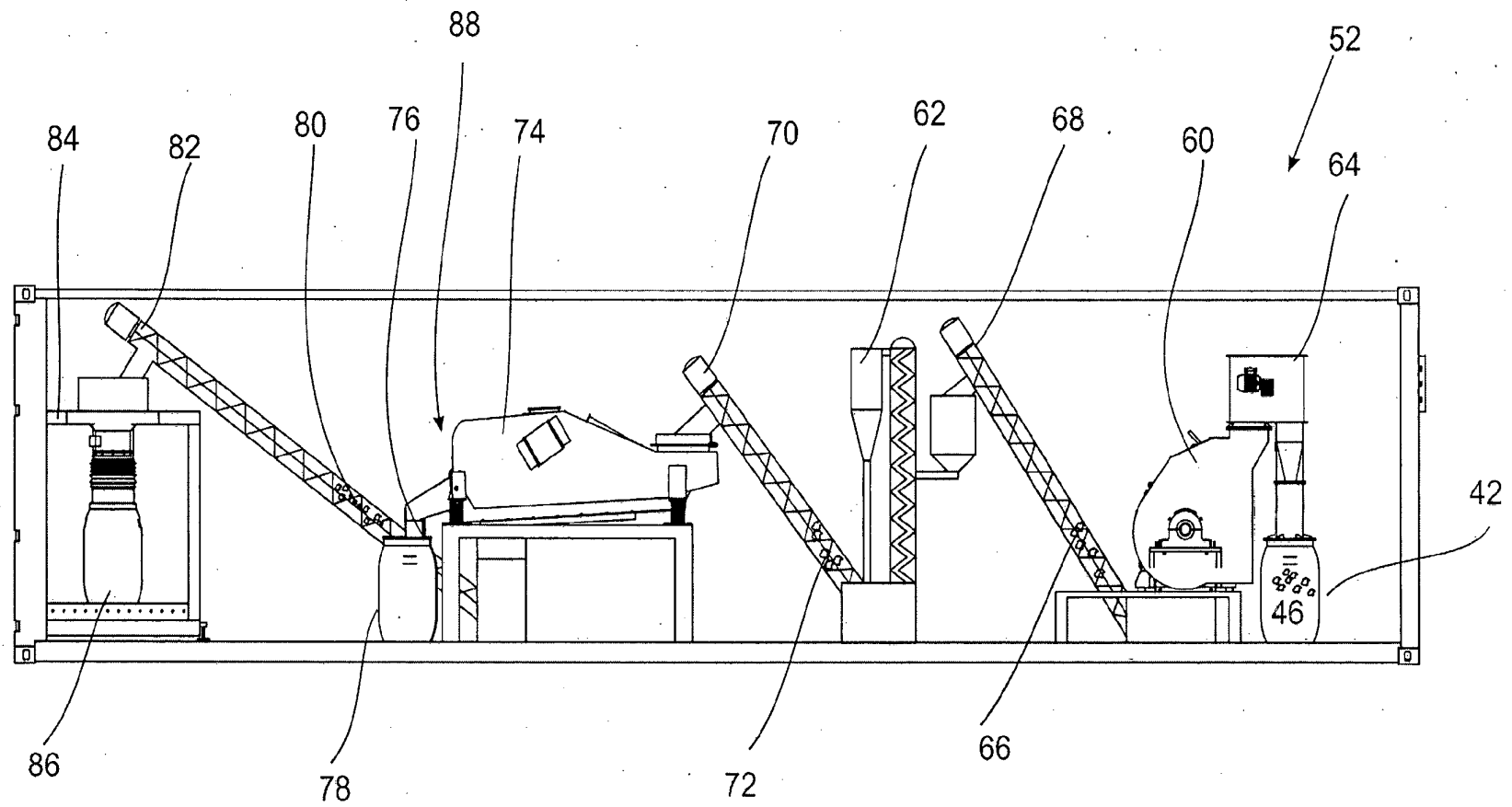


Fig. 3

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Erklärungen gemäß Regel 4.17:

— hinsichtlich der Berechtigung des Anmelders, ein Patent zu
beantragen und zu erhalten (Regel 4.17 Ziffer ii)

[Fortsetzung auf der nächsten Seite]

(54) Title: METHOD FOR THE TREATMENT OF USED BATTERIES, IN PARTICULAR RECHARGEABLE BATTERIES,
AND BATTERY PROCESSING INSTALLATION

(54) Bezeichnung : VERFAHREN ZUM BEHANDELN GEBRAUCHTER BATTERIEN, INSBESONDERE WIEDER
AUFLADBARER BATTERIEN UND BATTERIE-VERARBEITUNGSANLAGE

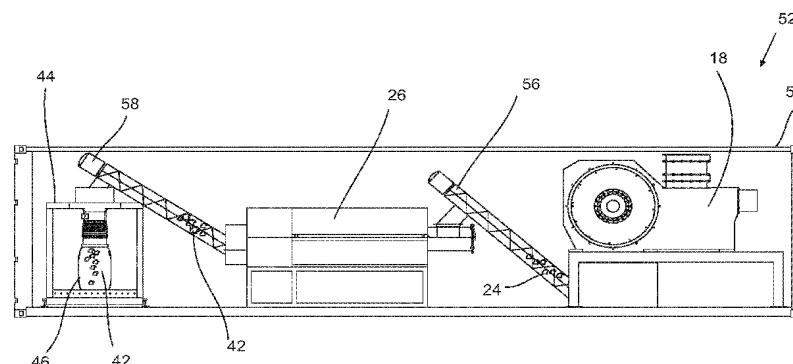


Fig. 2

(57) Abstract: The invention relates to a method for the treatment of used batteries (10), in particular lithium batteries, having the steps: comminuting the batteries (10) such that comminuted material (24) is obtained, inactivating the comminuted material (24) such that inactivated comminuted material (42) is obtained, and filling a transport container (46) with the inactivated comminuted material (42). It is provided according to the invention that the inactivation is performed by drying the comminuted material (24), and the comminuted material (24) is dried until an electrolyte content is so low that an electrochemical reaction is not possible.

(57) Zusammenfassung:

[Fortsetzung auf der nächsten Seite]



WO 2016/174156 A1

**Veröffentlicht:**

— mit internationalem Recherchenbericht (Artikel 21 Absatz 3)

Die Erfindung betrifft ein Verfahren zum Behandeln gebrauchter Batterien (10), insbesondere Lithium-Batterien, mit den Schritten: Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird, Inaktivieren des Zerkleinerungsguts (24), sodass ein inaktiviertes Zerkleinerungsgut (42) erhalten wird, und Abfüllen des inaktivierten Zerkleinerungsguts (42) in einen Transportbehälter (46). Erfindungsgemäß ist vorgesehen, dass das Inaktivieren durch Trocknen des Zerkleinerungsguts (24) erfolgt und das Zerkleinerungsgut (24) solange getrocknet wird, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist.

Verfahren zum Behandeln gebrauchter Batterien, insbesondere wieder aufladbarer Batterien und Batterie-Verarbeitungsanlage

Die Erfindung betrifft ein Verfahren zum Behandeln gebrauchter Batterien, insbesondere gebrauchter Lithium-Batterien, beispielsweise Lithium-Ionen-Batterien, mit den Schritten (a) Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird, (b) Inaktivieren des Zerkleinerungsguts, sodass ein inaktiviertes Zerkleinerungsgut erhalten wird, und (c) Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter.

Gemäß einem zweiten Aspekt betrifft die Erfindung eine Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien, insbesondere zum Behandeln gebrauchter Lithium-Batterien, mit (a) einer Zerkleinerungseinheit zum Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird, (b) einer Inaktivierungsvorrichtung zum Inaktivieren des Zerkleinerungsguts und (c) einer Abfüllvorrichtung zum Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter.

Aus der US 2005/0241943 A1 ist ein Verfahren zum Aufarbeiten gebrauchter Batterien bekannt, bei dem die Batterien vor einem Zerkleinerungsschritt erwärmt werden, sodass Kunststoffbestandteile der Batterien zerstört werden. Nachteilig an einem derartigen Vorgehen ist, dass die verbleibenden Komponenten der Batterien mit Abbauprodukten des Kunststoffs verunreinigt sein können.

Aus der DE 10 2012 024 876 A1 ist ein System zum Überführen transportkritischer Elektrolytzellen zunächst unter Inertgas zerkleinert und danach mit einem Desaktivierungspulver bestäubt werden, um eine Selbstentzündung des elektrochemisch aktiven Materials zu verhindern. Nachteilig daran ist, dass das entstehende Material dennoch ein vergleichsweise hohes Gefährdungspotential besitzt und dass das Bestäubungspulver selbst ein Explosionsrisiko darstellt und dass die Bildung einer entzündlichen und explosiven Atmosphäre in dem Transportbehälter nicht ausgeschlossen werden kann.

Aus der DE 10 2011 110 083 A1 ist ein Verfahren zum Wiedergewinnen von Aktivmaterial aus einer galvanischen Zelle bekannt, bei dem die galvanischen Zellen zunächst mechanisch zerkleinert, dann vorgetrocknet und nachfolgend gesichtet werden. Schließlich wird der Binder in einem Ofen zersetzt. Eine derartige Vorrichtung eignet sich sehr gut zum effizienten Recyceln größerer Mengen von galvanischen Elementen. Für den Teillast-Betrieb ist diese Anlage jedoch vergleichsweise komplex aufgebaut.

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10 Der Erfindung liegt die Aufgabe zugrunde, Nachteile im Stand der Technik zu vermindern.

Die Erfindung löst das Problem durch ein gattungsgemäßes Verfahren, bei dem das Inaktivieren zumindest auch durch Trocknen des Zerkleinerungsguts erfolgt.

- 15 Gemäß einem zweiten Aspekt löst die Erfindung das Problem durch eine gattungsgemäße Batterie-Verarbeitungsanlage, bei der die Aktivierungsvorrichtung eine Trocknungsvorrichtung umfasst.

Vorteilhaft an der Erfindung ist, dass durch das Trocknen dem Zerkleinerungsgut so viel Elektrolyt entzogen werden kann, dass eine elektrochemische Reaktion nicht mehr oder nur noch zu vernachlässigbar kleinem Ausmaß möglich ist. Zudem bildet sich keine entzündliche oder explosive Gasphase über den Batteriefragmenten, da diesen insbesondere die organischen Karbonate des Elektrolyten entzogen wurden. Das Zerkleinerungsgut ist daher weitgehend inert und kann, insbesondere dann, wenn es unter Vakuum verpackt wird, sicher transportiert werden.

- 20
25
30 Ein weiterer Vorteil ist es, dass zum Inaktivieren des Zerkleinerungsmaterials kein zusätzliches Material hinzugegeben werden muss. Das verringert den Aufwand beim Aufarbeiten der Batterien, verringert das Gewicht des inaktivierten Zerkleinerungsguts und erhöht die Reinheit in den folgenden Trenn- und Recyclingschritten. Insbesondere in potentiell folgenden hydrometallurgischen Aufarbeitungsschritten ist eine hohe Produktreinheit ohne Eintrag von Fremdionen

vorteilhaft.

Vorteilhaft ist zudem, dass ein transportsicheres Zerkleinerungsgut erhalten wird. So ist der Gehalt an organischen Carbonaten vorzugsweise so klein, dass die Bildung von Fluorophosphaten in relevanter Menge ausgeschlossen werden kann. Fluorophosphate sind oft starke Nervengifte, deren Bildung sicher verhindert werden muss. Zudem ist sichergestellt, dass es aufgrund des geringen Elektrolytgehalts nicht zu einer durch eine elektrochemische Reaktion ausgelöste, selbstverstärkend fortschreitende Wärmeentwicklung kommen kann.

Im Rahmen der vorliegenden Beschreibung wird unter dem Trocknen insbesondere das Entfernen zumindest eines Lösungsmittels des Leitsalzes verstanden. Insbesondere wird das Trocknen so durchgeführt, dass Kohlensäuredimethylester und/oder Kohlensäureethylmethylester entfernt wird.

Unter der Batterie wird insbesondere eine Lithium-Batterie verstanden. Eine Lithium-Batterie ist ein Akkumulator, bei dem die elektrochemische Reaktion Lithium und/oder Lithium-Ionen und/oder eine Lithium-Verbindung involviert.

Unter einer Batterie-Verarbeitungsanlage wird insbesondere auch eine Akku-Verarbeitungsanlage zum Verarbeiten von Akkumulatoren verstanden.

Unter dem Transportbehälter wird insbesondere auch eine oder eine Transportverpackung verstanden. Vorzugsweise wird die Transportverpackung durch Vakuumverschweißung verschlossen. Gut geeignet als Transportverpackung ist insbesondere Aluminium-Verbundfolie.

Günstig ist, wenn das Trocknen nach dem Zerkleinern der Batterien erfolgt.

Zwar ist es möglich und stellt eine Ausführungsform der Erfindung dar, dass die Batterien im unzerkleinerten Zustand einem Vakuum ausgesetzt werden, sodass zumindest Teile des Elektrolyten verdampfen, wobei das entstehende Gas entweder durch ein Sicherheitsventil im Akkumulator entweicht oder die Batterie durch die Druckdifferenz zwischen der äußeren Umgebung und dem Innendruck

zerstört wird, sodass verdampfender Elektrolyt austreten kann. Da der Elektrolyt zumeist zwischen eng gewickelten oder gestapelten und verpressten Schichten aus Elektroden und Separator und in deren Poren vorliegt und mit anderen Bestandteilen der Batterien verbunden vorliegt, kann dieses Vorgehen jedoch zeit-

5 intensiv sein. Es ist daher oft günstiger und stellt eine bevorzugte Ausführungsform der Erfindung dar, dass die Batterien mechanisch zerkleinert werden, beispielsweise durch Schneiden, Scheren, Pralleinwirkung, Zertrennen und/oder Quetschen. So steht für den Stoffübergang in die Gasphase eine größere Grenzfläche zur Verfügung.

10

Das Trocknen kann beispielsweise durch Vakuumtrocknung, Kontakttrocknung, Konvektionstrocknung und/oder Strahlungstrocknung erfolgen. Günstig ist es, wenn das Trocknen unter Rühren und/oder Umwälzen des Zerkleinerungsguts erfolgt.

15

Vor dem Zerkleinern werden die gebrauchten Batterien vorzugsweise demon-

tiert. Das heißt, dass größere Batteriesysteme in ihre kleineren Unterbausteine, die Module oder Stacks, demontiert werden oder sogar die Zellen, die das elektrochemisch wirksame Material enthalten, von der Ansteuerelektronik getrennt

20 werden. Die Ansteuerelektronik umfasst beispielsweise Halbleiterbauelemente und/oder Sensoren und dient der Ladesteuerung der Batterien.

Gemäß einer bevorzugten Ausführungsform erfolgt das Trocknen unter Vakuum. Vorzugweise ist das Vakuum so groß gewählt, dass der Dampfdruck von Koh-

25 lensäuredimethylester bei 80°C, insbesondere bei 70°C, unterschritten wird. Günstig ist es, wenn das Trocknen unter einem Druck von höchstens 300 hPa, insbesondere höchstens 100 hPa erfolgt. Bei so niedrigen Drücken verdampfen wesentliche Bestandteile der meisten Elektrolyten, insbesondere Kohlendioxid, Kohlendioxid und Kohlendioxid, bereits bei Temperaturen von

30 weniger als 80°C. Niedrige Temperaturen haben den Vorteil, dass die Bildung von Fluorwasserstoff behindert wird. Fluorwasserstoff stellt eine potentielle Gefährdung für die Batterie-Verarbeitungsanlage sowie die Umgebung dar. Es ist daher günstig, das Entstehen von Fluorwasserstoff zu verhindern.

Vorzugsweise erfolgt das Trocknen bei einer Temperatur, die unterhalb einer Zersetzungstemperatur liegt. Unter der Zersetzungstemperatur wird insbesondere die kleinste Temperatur verstanden, für die gilt, dass nach dem Halten
5 des Zerkleinerungsguts auf dieser Temperatur für eine Stunde zumindest 80 Masseprozent des Binders sich in gasförmige Bestandteile zersetzt haben. Die Zersetzungstemperatur kann damit gemessen werden, indem die Temperatur des Zerkleinerungsguts sukzessive erhöht wird und erfasst wird, wann es zu einem Masseverlust, insbesondere durch Gasentwicklung aufgrund einer Zerset-
10 zung des Binders, kommt und das angegebene Kriterium erfüllt ist. Gegebenenfalls muss der Versuch mit jeweils einer neuen Probe an Zerkleinerungsgut bei jeweils erhöhter Temperatur mehrfach durchgeführt werden.

Günstig ist es, wenn das Trocknen unter einer Atmosphäre erfolgt, in der der Wasser-Partialdruck kleiner ist als 50 Pa, insbesondere kleiner als 10 Pa. Ein
15 geringer Wasser-Partialdruck führt zu einer geringen Reaktionsrate von Lithium-Verbindungen zu Lithium-Hydroxid und damit zu nur geringer Wasserstoff-Entwicklung. Das verhindert die Bildung von zündfähigen Wasserstoff-Sauerstoff-Gemischen und trägt zur Anlagensicherheit bei.

20 Günstig ist es zudem, wenn der Sauerstoff-Partialdruck höchstens 10 Millibar, insbesondere höchstens 5 Millibar beträgt. Die Reaktion von Sauerstoff mit oxidierbaren Bestandteilen der Batterien wird so weitgehend unterdrückt. Es ist möglich, den niedrigen Sauerstoff-Partialdruck durch einen geringen Druck beim Trocknen zu erreichen. Alternativ oder zusätzlich kann das Trocknen in einer
25 Inertgas-Atmosphäre erfolgen.

Bevorzugt ist ein Verfahren, bei dem das Trocknen des Zerkleinerungsguts erst beendet wird, wenn sich nach Beenden des Trocknens kein entzündliches oder explosives Gasgemisch über dem abgefüllten Zerkleinerungsgut mehr bilden
30 kann und/oder wenn das Zerkleinerungsgut so trocken ist, dass sich im Transportbehälter oder während der Weiterverarbeitung ein entzündliches oder explosives Gasgemisch ergeben kann. Unter dem Merkmal, dass das Trocknen been-

det wird, wenn sich nach Beenden des Trocknens kein entzündliches oder explosives Gasgemisch über dem abgefüllten Zerkleinerungsgut bilden kann, wird insbesondere verstanden, dass sich in einem Transportbehälter in Form eines 50-Literbehälter, der zur Hälfte (bezogen auf sein Volumen) mit dem Zerkleinerungsgut gefüllt ist, innerhalb von einer Woche bei 50°C und 1013 hPa kein zündfähiges Gasgemisch bildet. Ob das Kriterium erfüllt ist, wird in Vorversuchen ermittelt. Bildet sich ein zündfähiges Gasgemisch, muss das Trocknen länger und/oder bei niedrigerem Druck durchgeführt werden. Die Vorversuche werden so lange wiederholt, bis eine Trocknungsdauer und/oder ein Trocknungsdruck ermittelt ist, bei der das Merkmal bei einem Testsatz von drei Transportbehälter für alle drei Transportbehälter erfüllt ist.

Vorzugsweise wird das Zerkleinerungsgut so lange getrocknet, bis ein Elektrolytgehalt im Zerkleinerungsgut so klein ist, dass eine elektrochemische Reaktion unmöglich ist. In anderen Worten ist der Elektrolytgehalt kleiner als ein Schwellenwert, wobei der Schwellenwert so gewählt ist, dass die Zellspannung bei Unterschreiten dieses Schwellenwerts auf höchstens ein Viertel abgesunken ist. Dieser Schwellenwert wird beispielsweise dadurch bestimmt, dass die Zellspannung einer Batterie in Abhängigkeit vom Elektrolytgehalt bestimmt wird. Kurz vor dem Erreichen des Schwellenwerts bricht die Zellspannung zusammen, das heißt, dass sie um zumindest 75% absinkt. Ist der Schwellenwert unterschritten, enthält die Batterie so wenig Elektrolyt, dass in guter Näherung keine elektrochemische Reaktion mehr möglich ist.

Vorzugsweise wird das Zerkleinerungsgut so lange getrocknet, dass eine Menge von 50 kg an Zerkleinerungsmaterial, das kompaktiert in einem 50 Liter-Fass enthalten ist, keine oder eine nur so geringe Wärmeentwicklung zeigt, dass ein thermisches Durchgehen, also eine thermisch induzierte Kettenreaktion, für zumindest zwei Monate ausgeschlossen ist und dass eine etwaige Wasserstoff-Entwicklung zudem so gering ausgebildet ist, dass nach zwei Wochen kein Überdruck entsteht, wenn zu Beginn ein Unterdruck von 500 hPa herrscht.

Günstig ist es, wenn das Zerkleinerungsgut so lange getrocknet wird, bis der

Elektrolytgehalt an organischen Komponenten, die bei 80°C flüchtig sind, höchstens 3 Gew.-%, höchstens insbesondere 2 Gew.-%, besonders bevorzugt höchstens 1,5 Gew.-%, beträgt.

- 5 Vorzugsweise wird das Trocknen so lange durchgeführt, dass der akkumulierte Gehalt an organischen Karbonaten aus dem Elektrolyten, die bei 80°C flüchtig sind, in der Atmosphäre über dem Zerkleinerungsgut 3 Vol.-% unterschreitet.

- 10 Insbesondere wird das Trocknen so lange durchgeführt, bis der Gehalt an Kohlendisäuredimethylester 4 Vol.-%, insbesondere 3 Vol.-%, unterschreitet und/oder der Gehalt an Cyclohexylbenzol 1 Vol.-%, insbesondere 0,5 Vol.-%, unterschreitet.

- 15 Vorzugsweise erfolgt das Trocknen unmittelbar nach dem Zerkleinern. Hierunter wird insbesondere verstanden, dass zwischen dem Beginn des Zerkleinerns der Batterien und dem Zeitpunkt, zu dem zumindest ein Teil des dadurch entstandenen Zerkleinerungsguts anfängt zu Trocknen, höchstens fünf Minuten beträgt, insbesondere höchstens eine Minute. Durch die schnelle Trocknung nach dem Zerkleinern wird die Masse an Material klein gehalten, die potentiell elektrochemisch reagieren könnte, zudem wird die elektrochemische Reaktionszeit potentieller exothermer Reaktionen klein gehalten. Das senkt das Risiko für die Anlage und die Umgebung.
- 20

- 25 Besonders günstig ist es, wenn das Vakuum mittels einer Strahlpumpe erzeugt wird. Strahlpumpen sind, insbesondere bei geeigneter Wahl des Strahlmediums, weitgehend unempfindlich gegen aggressive abzapfende Gase. Günstig ist es, wenn das Strahlmedium, das eine Flüssigkeit ist, einen pH-Wert von zumindest 8, insbesondere von zumindest 9, beispielsweise zumindest 12, hat. In diesem Fall können sich unerwünschte Bestandteile des Gases, das abgepumpt wird, zersetzen oder zu weniger schädlichen Substanzen reagieren. So kann beispielsweise Kohlendisäuredimethylester und/oder Kohlendisäureethylmethylester durch eine Verseifungsreaktion abgebaut werden. Etwaig im Strahlmedium
- 30

enthaltener Fluorwasserstoff kann im basischen Milieu in einer Säure-Base-Reaktion zu einem ungefährlichen Salz umgesetzt werden.

5 Vorzugsweise enthält das Strahlenmedium eine Fluor fällende Substanz. Beispielsweise kann das Strahlenmedium Natriumkarbonat oder Calciumkarbonat enthalten. Die bei der Reaktion mit einer Fluorverbindung, insbesondere Fluorwasserstoff, entstehenden Salze werden vorzugsweise abgetrennt, insbesondere abgefiltert oder aussedimentiert. Auf diese Weise wird zumindest weitgehend verhindert, dass Fluorwasserstoff oder andere giftige fluorhaltige Verbindungen in die Umgebung abgegeben werden können.

10 Vorzugsweise erfolgt das Trocknen bei einer Temperatur von höchstens 80°C. In diesem Fall entsteht kaum Fluorwasserstoff. Das erhöht die Lebensdauer der Batterie-Verarbeitungsanlage und verringert die Umweltgefährdung.

15 Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren die Schritte des Kondensierens von Bestandteilen des Elektrolyten durch Abkühlen und/oder Druckerhöhen, sodass ein Elektrolytkondensat entsteht. Beispielsweise wird das Kondensieren an einer Stelle durchgeführt, die bezüglich des Gasflusses zwischen dem Trockner und der Vakuumpumpe liegt. Vom Trockner kommende Gase müssen daher in diesem Fall zunächst einen Kondensator passieren, bevor sie zur Vakuumpumpe gelangen können. Das führt dazu, dass gasförmiger Elektrolyt, der in dem Gas vorliegt, das beim Trocknen entsteht, zumindest zu einem überwiegenden Teil im Kondensator abgeschieden wird, bevor das verbleibende Gas zur Pumpe gelangt. So kann Elektrolyt zurückgewonnen werden.

20 25 Zudem verringert sich der Gasstrom durch die Vakuumpumpe, was deren Lebensdauer verlängert und deren Energieverbrauch reduziert.

30 Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren alternativ den Schritt der Gasreinigung durch Adsorption der flüchtigen organischen Bestandteile an einem Aktivkohlfiter vor oder nach der Verdichtereinheit.

Vorzugsweise umfasst das erfindungsgemäße Verfahren alternativ oder zusätzlich den Schritt eines Reinigens des Gases, das beim Trocknen entsteht, bevor dieses die Vakuumpumpe erreicht. Das kann beispielsweise auch dadurch erfolgen, dass das Gas einen Aktivkohlefilter und/oder einen Filter passiert, in dem mit Fluorwasserstoff reagierende Substanzen enthalten sind, beispielsweise ein

5 Calziumsalz wie Calziumkarbonat oder ein Kaliumsalz wie Kaliumkarbonat.

Vorzugsweise umfasst das erfindungsgemäße Verfahren den Schritt eines Trocknens bei einer Trocken-Temperatur und für eine Trocken-Dauer, die so gewählt sind, dass sich der Binder, der Aktivmaterial der Lithium-Batterie an einen

10 Träger bindet, zumindest zum überwiegenden Teil zersetzt. Günstig ist es, wenn dieser Trocknungsschritt, der auch als Hochtemperatur-Trocknen bezeichnet werden kann, räumlich getrennt von einem ersten, oben beschriebenen Trocknungsschritt durchgeführt wird. Der letztgenannte Trocknungsschritt kann auch

15 als Niedertemperatur-Trocknen bezeichnet werden.

Vorzugsweise wird das Hochtemperatur-Trocknen, bei dem sich der Binder zersetzt, so durchgeführt, dass die entstehenden Zersetzungsgase sich nicht mit den Gasen mischen, die beim Niedrigtemperatur-Trocknen entstehen. Es ist

20 möglich, dass das Hochtemperatur-Trocknen und das Niedertemperatur-Trocknen bei unterschiedlichen Drücken erfolgt. Beispielsweise kann das Hochtemperatur-Trocknen bei Normaldruck erfolgen.

Unter dem Aktivmaterial wird der Stoff verstanden, der beim Betrieb der Batterien elektrochemisch reagiert. Unter dem Träger für das Aktivmaterial wird insbesondere eine Trägerfolie verstanden, auf der das Aktivmaterial in Form von

25 Partikeln aufgebracht ist. Beispielsweise handelt es sich bei der Trägerfolie um eine Folie aus Aluminium oder eine Aluminiumlegierung. Der Binder ist der Stoff, der das Aktivmaterial mit dem Träger verbindet, beispielsweise enthält der Binder

30 Polyvinylidenfluorid.

Günstig ist es, wenn beim Zerkleinern der Batterien flüssiger Stickstoff zugege-

ben wird. Das kühlt die Batterien, die Zerkleinerungsmaschine und das Zerkleinerungsgut und verdrängt zudem Sauerstoff und Wasserdampf aus der Atmosphäre.

- 5 Günstig ist es, wenn das Zerkleinern bei dem Wasserdampf-Partialdruck von höchstens 20 Pa und/oder einem Sauerstoff-Partial von höchstens 40 hPa, insbesondere höchstens 15 hPa erfolgt.

10 Gemäß einer bevorzugten Ausführungsform umfasst das Verfahren die Schritte eines Entnehmens des Zerkleinerungsguts aus dem Transportbehälter, eines Abtrennens von Hartteilen und/oder eines Separierens von Aktivmaterial vom Träger, insbesondere durch eine zweite Zerkleinerungsstufe und/oder Luftstrahlsieben, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entstehen, und eines getrennten Verpackens von Aktivmaterialfraktion und Trägerfraktion in je-
15 weilige Transportbehältnisse. Günstig ist es, wenn diese Transportbehältnisse luftdicht ausgebildet sind. Durch das Trennen von Aktivmaterialfraktion und Trägerfraktion ist ein Transport in der Regel ohne Genehmigungen möglich. Ein weiterer Vorteil ist, dass derartig getrennte Fraktionen nur eine geringe Gefährdung darstellen.

20

Das Entnehmen des Zerkleinerungsguts aus dem Transportbehälter erfolgt vorzugsweise unter Vakuum und/oder unter Schutzgas.

25 Es ist möglich, nicht aber notwendig, dass das Zerkleinerungsgut unter Vakuum in den Transportbehälter abgefüllt wird. Günstig ist es, wenn der Transportbehälter ein Vakuumbehälter ist, insbesondere ein evakuierter Vakuumbehälter, sodass im Transportbehälter nach dem Verschließen ein Unterdruck oder Vakuum herrscht. Alternativ kann der Transportbehälter mit einem Inertgas gefüllt werden.

30

In einer bevorzugten Batterie-Verarbeitungsanlage sind die Trennungseinheit und die Trockenvorrichtung in einem gemeinsamen Standard-Container angeordnet. Das hat den Vorteil, dass die Batterie-Verarbeitungsanlage besonders

einfach transportiert werden kann.

Die Trockenvorrichtung ist eingerichtet zum Trocknen des Zerkleinerungsguts für eine so lange Zeit, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist. Wird die Trockenvorrichtung im Chargenbetrieb betrieben, was eine mögliche Ausführungsform darstellt, so wird das Trocknen beispielsweise für eine vorgegebene Zeitspanne durchgeführt. Alternativ oder zusätzlich wird der Gehalt an organischen Substanzen, beispielsweise an organischen Carbonaten, in der Atmosphäre in der Trockenvorrichtung kontinuierlich gemessen und das Trocknen beendet, wenn eine vorgegebene Schwellen-Konzentration unterschritten wird.

Gemäß einer bevorzugten Ausführungsform umfasst die Batterie-Verarbeitungsanlage, insbesondere die Vakuumanlage, einen Kondensator, der eingerichtet ist zum Kondensieren von organischen Bestandteilen der Atmosphäre im Trockner, insbesondere von organischen Carbonaten, beispielsweise von Dimethylcarbonat, Ethylmethylcarbonat und/oder Ethylencarbonat. Vorzugsweise ist der Kondensator in Materialflussrichtung vor einer Vakuumpumpe angeordnet, mittels der der Trockner evakuiert wird. Günstig ist es, wenn der Kondensator gekühlt ist, vorzugsweise auf eine Temperatur von höchstens 90°C, vorzugsweise höchstens 80°C, insbesondere höchstens 70°C. Um den Kühlaufwand klein zu halten wird der Kondensator, sofern er gekühlt wird, auf eine Temperatur von zumindest -10°C, insbesondere zumindest 10 °C, gekühlt.

Günstig ist es, wenn die Trockenvorrichtung ein Rührwerkzeug aufweist, beispielsweise einen Ankerrührer oder einen Stabrührer, dessen Rührstäbe quer zu einer Rührwelle angebracht sein können. Alternativ oder zusätzlich ist das Rührwerkzeug ein externes Rührwerkzeug, das den Trockner als Ganzes bewegt.

Vorzugsweise besitzt die Batterie-Verarbeitungsanlage eine Vakuumanlage, die mit der Trockenvorrichtung zum Erzeugen eines Vakuums in der Trockenvorrichtung verbunden ist. Besonders günstig ist es, wenn auch die Vakuumanlage im Standard-Container angeordnet ist. Bei dem Standard-Container handelt es sich

vorzugsweise um einen Container nach ISO-Norm 668, vorzugsweise um einen 40-Fuß-Container oder einen 20-Fuß-Container.

5 Beispielweise umfasst die Vakuumanlage eine Strahlpumpe, bei der ein Strahlmedium zum Erzeugen des Unterdrucks verwendet wird.

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage eine Hartmetallabtrennvorrichtung und/oder eine Leichtfraktionabtrennvorrichtung, eine Separiervorrichtung, insbesondere eine Klassiervorrichtung, zum Separieren von Aktivmaterial vom Träger, insbesondere durch eine zweite Zerkleinerungsstufe und/oder 10 Luftstrahlsieben, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entsteht, und eine zweite Abfüllvorrichtung zum getrennten Abfüllen von Aktivmaterialfraktion und Trägerfraktion. Günstig ist es, wenn diese Abfüllvorrichtung zum Abfüllen unter Unterdruck und/oder unter Inertgas ausgebildet ist.

15

Unter einer Hartmetallabtrennvorrichtung wird insbesondere eine Vorrichtung zur Abtrennung von Fragmenten peripherer Bestandteile des Betriebssystems, der Batteriezellhülle und der Strom-Kontakte verstanden. Beispielsweise umfasst die Hartmetallabtrennvorrichtung eine Magnetseparationsvorrichtung 20 und/oder einen Siebter, insbesondere einen Querstromsiebter und/oder einen Zickzack-Siebter. Unter der Separiervorrichtung wird insbesondere eine Vorrichtung zum zur Abtrennen der Separatorfolie verstanden.

25 Die Leichtfraktionabtrennvorrichtung umfasst vorzugsweise einen Zickzack-Siebter und/oder einen Lufttrenner, wobei es günstig ist, wenn die Luft im Kreislauf geführt wird. Das reduziert die Staubexposition der Umwelt mit gesundheitsschädlichem Staub.

Vorzugsweise sind die zweite Abfüllvorrichtung und die Separiervorrichtungen in 30 einem gemeinsamen Standard-Container angeordnet, beispielsweise im oben beschrieben ersten Standard-Container, oder einem zweiten Standard-Container. Günstig ist es, wenn der Container staubdicht gekapselt ist.

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage eine Schleuse zwischen der Zerkleinerungseinheit und der Inaktivierungsvorrichtung, insbesondere der Trocknungsvorrichtung. Beispielsweise handelt es sich um eine Zellenradschleuse. Durch die Schleuse wird der Sauerstoffeintrag in die Inaktivierungsvorrichtung, insbesondere die Trocknungsvorrichtung, vermindert.

Im Folgenden wird die Erfindung anhand der beigefügten Zeichnungen näher erläutert. Dabei zeigt

- 10 Figur 1 ein Ablaufdiagramm eines erfindungsgemäßen Verfahrens,
- Figur 2 einen Querschnitt durch eine erfindungsgemäße Batterie-Verarbeitungsanlage und
- 15 Figur 3 einen Querschnitt durch weitere, optionale Bestandteile einer erfindungsgemäßen Batterie-Verarbeitungsanlage.

Figur 1 zeigt das Ablaufdiagramm eines erfindungsgemäßen Verfahrens. Zunächst werden Batterien 10.1, 10.2, ..., insbesondere Batteriesysteme bestehend aus mehreren Batteriemodulen oder Batteriestacks, welche wiederum aus mehreren Batteriezellen bestehen, in einer Entladeeinheit 12 entladen. Danach folgt an einer Demontagestation 14 die Demontage der Batterien 10, wenn diese erforderlich ist, weil die Batteriesysteme ansonsten aus geometrischen oder gravimetrischen Gründen nicht in die Zerkleinerungseinheit befördert werden können. Dazu werden die Batteriesysteme geöffnet und soweit demontiert, dass die Module/Stacks einzeln entfernt werden können. Gegebenenfalls können auch die Zellen von der Ansteuerelektronik getrennt werden. Die entstehenden Untereinheiten (Module/Stacks) und/oder Zellen 16.1, 16.2, ... werden einer Zerkleinerungseinheit 18 zugeführt, die beispielsweise eine Rotorschere mit einem Rotor und einen mit Statoren oder mehreren Rotoren, oder eine Schneidmühle mit einem Rotor und mehreren Rotoren umfasst.

Die Zerkleinerungseinheit 18 zerkleinert die Batterien 10 unter Schutzgas 20,

das beispielsweise einer Schutzgasflasche entnommen wird. Alternativ oder zusätzlich kann flüssiger Stickstoff aus einer Flüssigstickstoffquelle 19 zugeführt werden. Bei dem Schutzgas kann es sich beispielsweise um Stickstoff, ein Edelgas, Kohlendioxid, Lachgas oder ein sonstiges, vorzugsweise nicht giftiges Gas handeln.

Beim Zerkleinern entsteht Zerkleinerungsgut 24, das einer Inaktivierungsvorrichtung in Form einer Trockenvorrichtung 26 zugeführt wird. Zwischen der Zerkleinerungseinheit 18 und der Trockenvorrichtung 26 ist eine Schleuse 28 angeordnet, die soweit gasdicht ist, dass die Druckvorrichtung 26 in guter Näherung von der Zerkleinerungseinheit 18 gasdicht getrennt ist.

Die Trockenvorrichtung 26 ist mit einer Vakuumanlage 29 verbunden, die eine Vakuumpumpe 30 aufweist und ein Vakuum erzeugt. In der Trockenvorrichtung 26 herrscht ein Druck p_{26} von $p_{26} \approx 100$ hPa, vorzugsweise 50 hPa. Es sei darauf hingewiesen, dass im Rahmen der vorliegenden Beschreibung unter einer Vakuumpumpe insbesondere ganz allgemein eine Vorrichtung verstanden wird, die ein Vakuum erzeugt. Es ist dabei möglich und bevorzugt, nicht aber notwendig, dass die Vakuumpumpe gleichzeitig als Verdichter wirkt, so dass von ihr Gas unter einem Druck abgegeben wird, der größer ist als der Umgebungsdruck.

In dem in Figur 1 gezeigten Fall handelt es sich bei der Vakuumpumpe um einen Verdichter, der Gas 31, das in der Trockenvorrichtung 26 vorliegt, ansaugt und verdichtet. Alternativ oder zusätzlich kann die Vakuumanlage 29 eine Strahlpumpe aufweisen, bei der ein Strahlmedium in Form einer Flüssigkeit mit hoher Geschwindigkeit durch Venturi-Düse geleitet wird. Das Strahlmedium ist alkalisch und hat einen pH-Wert von zumindest pH 13 und ist beispielsweise eine 10%ige Kaliumhydroxidlösung.

Die Vakuumanlage 29 umfasst eine Gasreinigungsvorrichtung 32, die zwischen der Trockenvorrichtung 26 und der Vakuumpumpe 30 angeordnet ist und die im

vorliegenden Fall einen Kondensator 34 und/oder einen Aktivkohlefilter 36 umfasst. Der Kondensator wird bei einer Temperatur von $-10\text{ }^{\circ}\text{C}$ betrieben, so dass Kohlensäuredimethylester und Kohlensäureethylmethylester kondensieren und in einen Kondensatbehälter 38 abgegeben werden können. Zudem wird etwaig
5 vorhandenes Wasser ausgefroren. Ein Steuerventil 40 ist ausgebildet zum Öffnen, wenn der Druck p_{26} zu groß wird und zum Zufahren, wenn der Druck p_{26} zu klein wird, das heißt, dass ein vorgegebener Schwellenwert unterschritten wird.

Vorzugsweise ist das Trocknungsgut während der Trocknung bewegt. Dies kann
10 beispielsweise durch Rühren mit einem Rührwerkzeug 41, wie einem Ankerrührer oder einem Stabrührer mit senkrecht zur Rührwelle angebrachten Stäben passieren. Alternativ durch einen bewegten Trocknungsbehälter.

Durch das Trocknen des Zerkleinerungsguts entsteht inaktiviertes Zerkleinerungsgut 42, das einer Abfüllvorrichtung 44 zugeführt wird. Dort wird das inaktivierte Zerkleinerungsgut 42 unter Vakuum und/oder unter Schutzgas in einen Transportbehälter 46 abgefüllt. Der Transportbehälter 46 ist vorzugsweise gasdicht. Es ist möglich, nicht aber notwendig, dass der Transportbehälter 46 vor
15 dem Abtransport mit Inertgas aufgefüllt wird, so dass er unter Normaldruck steht. Alternativ ist es auch möglich, dass der Transportbehälter unter Vakuum verschlossen und transportiert wird. Es ist möglich, dass alternativ zum Transportbehälter eine vakuumverschweißte Folie, beispielsweise eine Aluminiumverbundfolie, gewählt wird.

Über eine Spülleitung 48 wird der Zerkleinerungseinheit 18 Schutzgas 20 von der Vakuumpumpe 30 zugeführt. Arbeitet die Vakuumpumpe 30 wie im vorliegenden Fall, der eine bevorzugte Ausführungsform darstellt, zudem als Kompressor, kann das Schutzgas auf eine Druckgasflasche 50 gezogen werden. Alternativ oder zusätzlich kann das Schutzgas 20, gegebenenfalls nach zusätzlicher
20 Reinigung, in die Umgebung abgegeben werden.

Figur 2 zeigt schematisch einen Querschnitt durch eine erfindungsgemäße Batterie-Verarbeitungsanlage 52, die einen Standard-Container 54 aufweist, in dem

die Zerkleinerungseinheit 18, die Trockenvorrichtung 26 und die Abfüllvorrichtung 44 angeordnet sind. Hinter der Zerkleinerungseinheit 18 ist ein erster gasdichter Förderer 56 angeordnet, der beispielsweise eine Förderschnecken oder einen Rohrkettenförderer umfasst. Der erste Förderer 56 fördert das Zerkleinerungsgut 24 zur Trockenvorrichtung 26, die mit der in Figur 2 nicht sichtbaren Vakuum-Erzeugungsvorrichtung verbunden ist. In Materialstromrichtung hinter der Trockenvorrichtung 26 ist ein zweiter Förderer 58 angeordnet, der vorzugsweise ebenfalls gasdicht ausgebildet ist und eine Förderschnecke oder einen Rohrkettenförderer enthalten kann. Der zweite Förderer fördert das inaktivierte Zerkleinerungsgut 42 zur Abfüllvorrichtung 44.

Figur 3 zeigt optionale, in der vorliegenden Ausführungsform vorhandene Einheiten der erfindungsgemäßen Batterie-Verarbeitungsanlage 52, die einen Aufschlusszerkleinerer 60 sowie einen Siebter 62 umfasst. Der Aufschlusszerkleinerer 60 enthält eine Transportbehälter-Entleervorrichtung 64, mittels der aus dem Transportbehälter 46 inaktiviertes Zerkleinerungsgut 42 entnommen werden kann. Der Aufschlusszerkleinerer 60 erzeugt Aufschlussmaterial 66, das dem Siebter 62 zugeführt wird. Es kann sich bei dem Siebter beispielsweise um einen Zickzack-Siebter handeln.

Vorzugsweise umfasst die Batterie-Verarbeitungsanlage 52 einen Zerkleinerer, der vorzugsweise im Materialfluss vor der Klassiervorrichtung 74 steht und ein schnell laufendes Zerkleinerungswerkzeug enthält, wobei eine Rotorumfangsgeschwindigkeit größer ist als 1 m/s, vorzugsweise größer als 10 m/s. Dieser Zerkleinerer zerkleinert das Zerkleinerungsmaterial und beansprucht es mechanisch so, dass sich die elektrochemisch aktive Beschichtung mindestens teilweise vom Träger löst. Das Vorhandensein eines solchen Zerkleinerers ist ein allgemeines bevorzugtes Merkmal einer erfindungsgemäßen Batterie-Verarbeitungsanlage.

Im Siebter entstehen eine Leichtfraktion mit Separatorfolie und feinem Beschichtungsmaterial und eine Schwergutfraktion mit Trägerfolien (Aluminium- und Kupfer) mit größerem leicht anhaftender Beschichtung. Beide Fraktionen werden auf

jeweils ein Sieb zur weiteren Trennung in Beschichtung und Separatorfolie beziehungsweise Beschichtung und Metallfolien gegeben. Die entstehenden Fraktionen werden getrennt weiter verarbeitet.

- 5 Das Aufschlussmaterial 66 wird dem Sichter 62 mittels einem dritten Förderer 68 zugeführt. Ein vierter Förderer 70 führt gesichtetes Material 72, insbesondere das Material der Leichtfraktion, das den Sichter 62 verlässt, einer Klassiervorrichtung 74 zu. Die Klassiervorrichtung 74 umfasst vorzugsweise ein Luftstrahlsieb, das gleichzeitig als Trennvorrichtung zum Trennen des Aktivmaterials von
10 dem Träger fungiert. Durch das Trennen entsteht eine Aktivmaterialfraktion 76, die in ein Transportbehältnis 78 abgefüllt wird.

- Es entsteht zudem eine Trägerfraktion 80, die in der vorliegenden Ausführungsform mit einem fünften Förderer 82 einer Abfülleinheit 84 zugeführt wird, die die
15 Trägerfraktion 80 in einen Behälter 86 füllt. Die Abfülleinheit 84 ist zusammen mit einer zweiten Abfülleinheit 88 Teil einer zweiten Abfüllvorrichtung.

Bezugsleistenliste

10	Batterie	50	Druckgasflasche
12	Entladeeinheit	52	Batterie-Verarbeitungsanlage
14	Demotagesstation	54	Standard-Container
16	Zelle	56	erster Förderer
18	Zerkleinerungseinheit	58	zweiter Förderer
19	Flüssigstickstoffquelle		
20	Schutzgas	60	Aufschlusszerkleinerer
22	Schutzgasflasche	62	Sichter
24	Zerkleinerungsgut	64	Transportbehälter- Entleervorrichtung
26	Trockenvorrichtung	66	Aufschlussmaterial
28	Schleuse	68	dritter Förderer
29	Vakuumanlage		
30	Vakuumpumpe	70	vierter Förderer
31	Gas	72	gesichtetes Material
32	Gasreinigungsvorrichtung	74	Klassiervorrichtung
34	Kondensator	76	Aktivmaterialfraktion
36	Aktivkohlefilter	78	Transportbehältnis
38	Kondensatbehälter		
40	Steuerventil	80	Trägerfraktion
41	Rührwerkzeug	82	fünfter Förderer
42	inaktives Zerkleinerungsgut	84	Abfülleinheit
44	Abfüllvorrichtung	86	Behälter
46	Transportbehälter	88	zweite Abfülleinheit
48	Spüleleitung		
		p	Druck

Patentansprüche.

1. Verfahren zum Behandeln gebrauchter Batterien (10), insbesondere
5 Lithium-Batterien, mit den Schritten:
 - (a) Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird,
 - (b) Inaktivieren des Zerkleinerungsguts (24), sodass ein inaktiviertes Zerkleinerungsgut (42) erhalten wird, und
 - 10 (c) Abfüllen des inaktivierten Zerkleinerungsguts (42) in einen Transportbehälter (46),
dadurch gekennzeichnet, dass
 - (d) das Inaktivieren durch Trocknen des Zerkleinerungsguts (24) erfolgt.
- 15 2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass das Zerkleinerungsgut (24) solange getrocknet wird, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist.
3. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass das Trocknen unter Vakuum erfolgt.
20
4. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass
das Vakuum mittels einer Strahlpumpe erzeugt wird und
25 ein Strahlmedium der Strahlpumpe
einen pH-Wert von zumindest 8, insbesondere 9, hat und/oder
eine Fluor fällende Substanz enthält.

5. Verfahren nach einem der vorstehenden Ansprüche, gekennzeichnet durch die Schritte:
- (e) Entnehmen des Zerkleinerungsguts (24) aus dem Transportbehälter (46),
 - 5 (f) Abtrennen von Hartteilen und/oder
Separieren von Aktivmaterial vom Träger, insbesondere durch Luftstrahlsieben oder durch eine zweite Zerkleinerungsstufe, sodass eine Aktivmaterialfraktion (76) und eine Trägerfraktion (80) entsteht, und
 - (g) getrenntes Verpacken von Aktivmaterialfraktion (76) und Trägerfraktion (80) in Transportbehältnisse (78).
- 10
6. Verfahren nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass das Trocknen des Zerkleinerungsguts erst beendet wird, wenn sich nach Beenden des Trocknens kein entzündliches oder explosives Gas-
- 15 gemisch über dem abgefüllten Zerkleinerungsgut mehr bilden kann und/oder wenn das Zerkleinerungsgut so trocken ist, dass sich im Transportbehälter oder während der Weiterverarbeitung ein entzündliches oder explosives Gasgemisch ergeben kann.
- 20
7. Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien, insbesondere Lithium-Batterien, mit:
- (a) einer Zerkleinerungseinheit (18) zum Zerkleinern der Batterien (10), sodass Zerkleinerungsgut (24) erhalten wird,
 - (b) einer Inaktivierungsvorrichtung (26) zum Inaktivieren des Zerkleinerungsguts (24) und
 - 25 (c) einer Abfüllvorrichtung (44) zum Abfüllen des inaktivierten Zerkleinerungsguts (24) in einen Transportbehälter (46),
dadurch gekennzeichnet, dass
 - (d) die Inaktivierungsvorrichtung eine Trockenvorrichtung (26) umfasst und
 - 30 (e) die Batterie-Verarbeitungsanlage eine Vakuumanlage, die mit der Trockenvorrichtung (26) zum Erzeugen eines Vakuums in der Trockenvorrichtung (26) verbunden ist, aufweist.

8. Batterie-Verarbeitungsanlage nach Anspruch 7, dadurch gekennzeichnet, dass die Trockenvorrichtung (26) eingerichtet ist zum Trocknen des Zerkleinerungsguts (24) solange, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist.
9. Batterie-Verarbeitungsanlage nach Anspruch 7 oder 8, dadurch gekennzeichnet, dass die Zerkleinerungseinheit und die Trockenvorrichtung (26) in einem Standard-Container (54) angeordnet sind.
10. Batterie-Verarbeitungsanlage nach einem der Ansprüche 7 bis 9, gekennzeichnet durch eine Vakuumanlage, die mit der Trockenvorrichtung (26) zum Erzeugen eines Vakuums in der Trockenvorrichtung (26) verbunden ist.
11. Batterie-Verarbeitungsanlage nach Anspruch 10, dadurch gekennzeichnet, dass
- die Vakuumanlage (29) eine Strahlpumpe mit einem Strahlmedium umfasst,
 - das Strahlmedium im Kreis geführt ist und
 - das Strahlmedium eine mit Fluorwasserstoff reagierende Substanz enthält.
12. Batterie-Verarbeitungsanlage nach einem der Ansprüche 7 bis 11, gekennzeichnet durch
- eine Hartmetallabtrennvorrichtung und/oder eine Leichtfraktionsabtrennvorrichtung,
 - eine Separiervorrichtung, insbesondere eine Klassiervorrichtung (74), zum Separieren von Aktivmaterial vom Träger, insbesondere durch Luftstrahlsieben und/oder durch eine zweite Zerkleinerungsstufe, sodass eine Aktivmaterialfraktion (76) und eine Trägerfraktion entsteht, insbesondere Aluminium- und Kupferfolien, und

- eine zweite Abfüllvorrichtung (44) zum getrennten Abfüllen von Aktivmaterialfraktion (76) und Trägerfraktion (80), insbesondere Aluminium- und Kupferfolien.

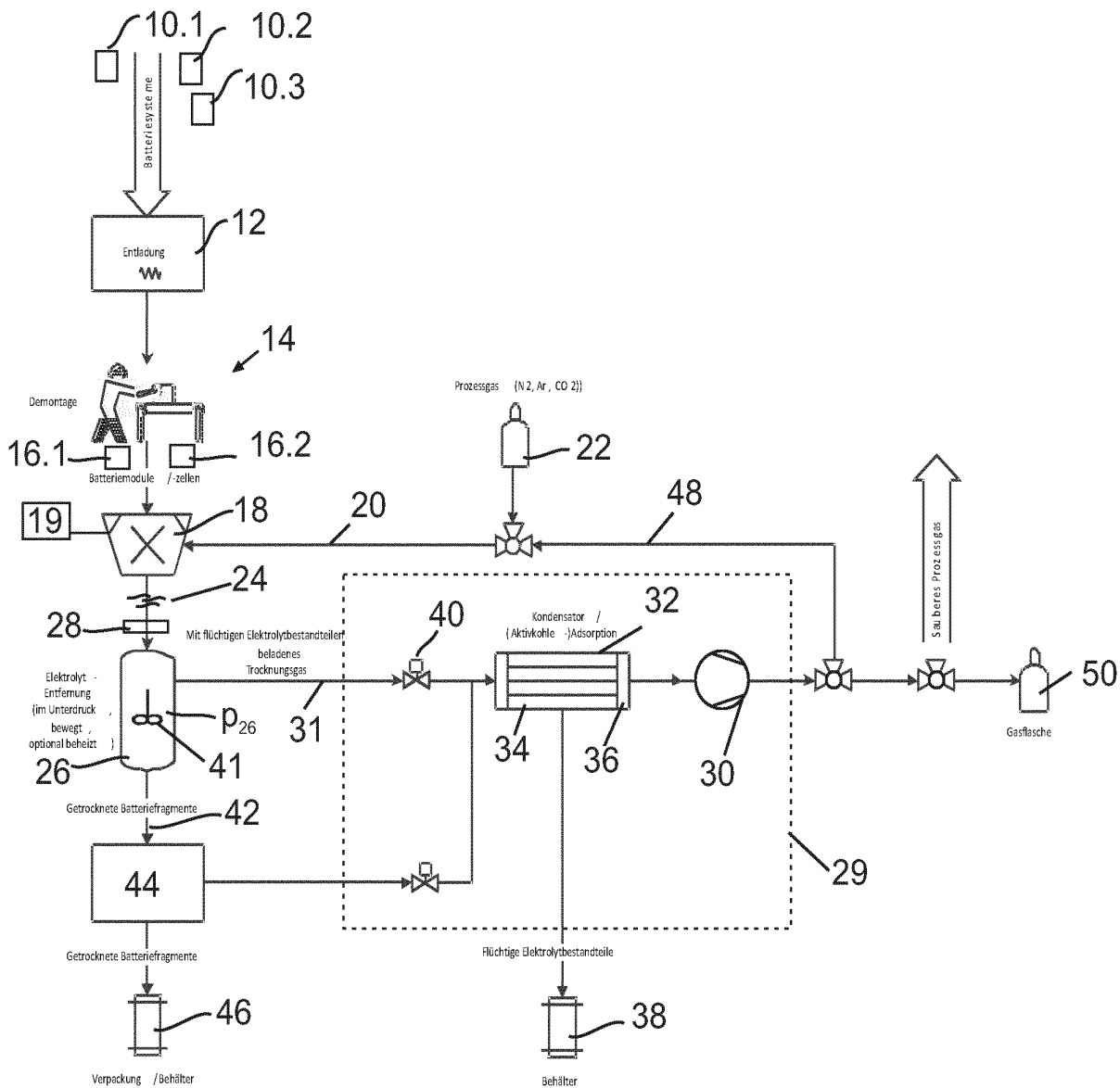


Fig. 1

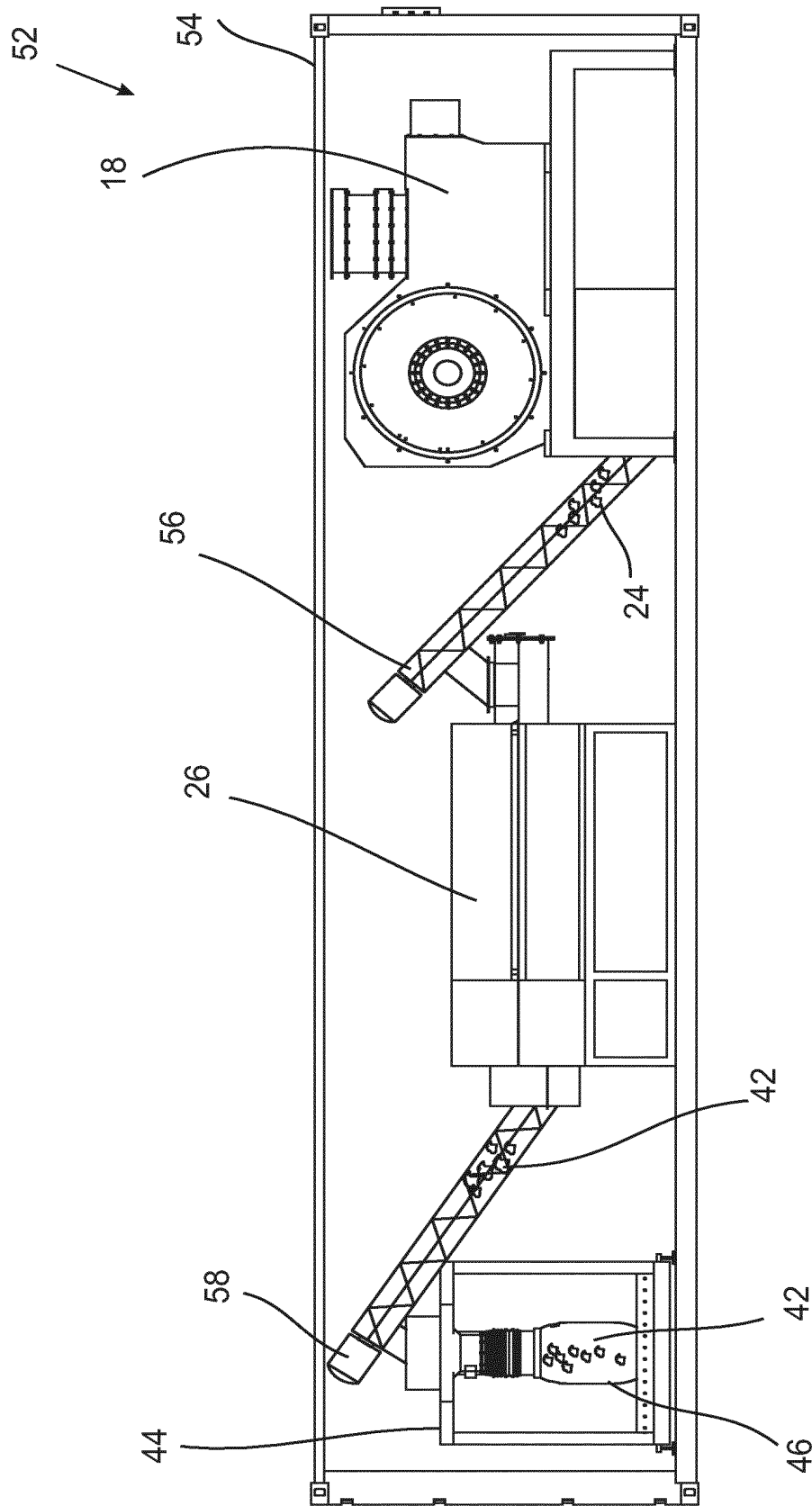


Fig. 2

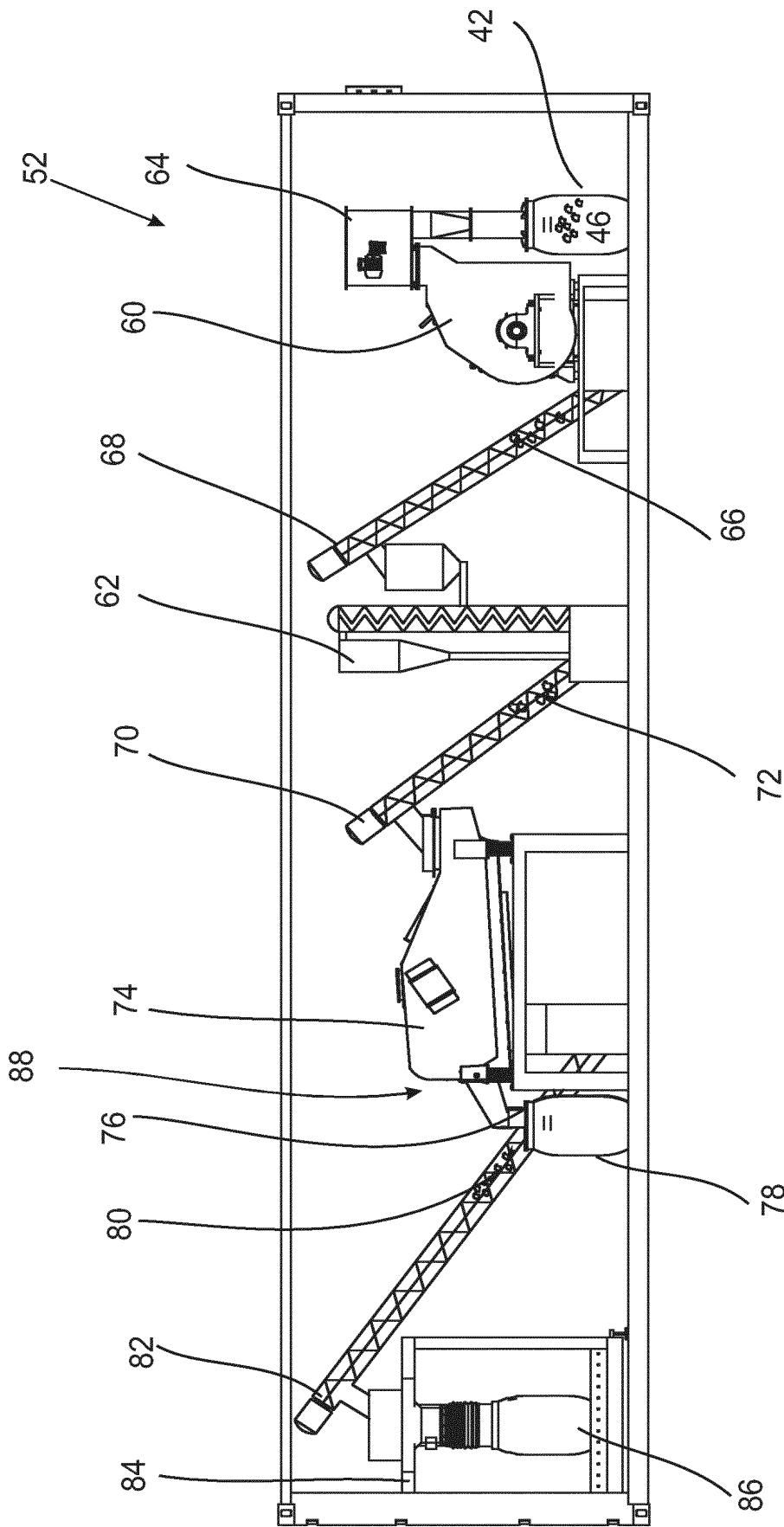


Fig. 3

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 5569-002 PCT-1	FOR FURTHER ACTION	See item 4 below
International application No. PCT/EP2016/059526	International filing date (<i>day/month/year</i>) 28 April 2016 (28.04.2016)	Priority date (<i>day/month/year</i>) 28 April 2015 (28.04.2015)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant DUESENFELD GMBH		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).																								
2.	This REPORT consists of a total of 8 sheets, including this cover sheet. In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	<p>This report contains indications relating to the following items:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: center;">☒</td> <td style="width: 25%;">Box No. I</td> <td style="width: 70%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	☒	Box No. I	Basis of the report	☐	Box No. II	Priority	☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	☐	Box No. IV	Lack of unity of invention	☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	☐	Box No. VI	Certain documents cited	☐	Box No. VII	Certain defects in the international application	☒	Box No. VIII	Certain observations on the international application
☒	Box No. I	Basis of the report																							
☐	Box No. II	Priority																							
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																							
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☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																							
☐	Box No. VI	Certain documents cited																							
☐	Box No. VII	Certain defects in the international application																							
☒	Box No. VIII	Certain observations on the international application																							
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).																								

<p style="text-align: center;">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p>	<p>Date of issuance of this report 31 October 2017 (31.10.2017)</p> <p>Authorized officer Nora Lindner</p> <p>e-mail: pct.team5@wipo.int</p>
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From the INTERNATIONAL SEARCHING AUTHORITY

To:

PCTWRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference 5569-002 PCT-1		Date of mailing (day/month/year)	13 July 2016
		FOR FURTHER ACTION See paragraph 2 below	
International application No. PCT/EP2016/059526	International filing date (day/month/year) 28 April 2016	Priority date (day/month/year) 28 April 2015	
International Patent Classification (IPC) or both national classification and IPC H01M 6/52(2006.01)i; C22B 13/00(2006.01)i; H01M 10/54(2006.01)i			
Applicant LION ENGINEERING GMBH			

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/	Date of completion of this opinion	Authorized officer

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2016/059526

Box No. I	Basis of the opinion
1.	<p>With regard to the language, this opinion has been established on the basis of:</p> <p>☒ the international application in the language in which it was filed.</p> <p>☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).</p>
2.	<p>☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).</p>
3.	<p>☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of a sequence listing:</p> <p>a. ☐ forming part of the international application as filed:</p> <p>☐ in the form of an Annex C/ST.25 text file.</p> <p>☐ on paper or in the form of an image file.</p> <p>b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.</p> <p>c. ☐ furnished subsequent to the international filing date for the purposes of international search only:</p> <p>☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).</p> <p>☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).</p>
4.	<p>☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.</p>
5.	<p>Additional comments:</p>

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/EP2016/059526**Box No. V**

**Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)

Claims 4, 9, 11 YESClaims 1-3, 5-8, 10, 12 NO

Inventive step (IS)

Claims _____ YES

Claims 1-12 NO

Industrial applicability (IA)

Claims 1-12 YES

Claims _____ NO

2. Citations and explanations :

See Supplemental Box

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2016/059526

Box No. VIII **Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

See Supplemental Box

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/EP2016/059526**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1	WO 2010/102377 A1 (ELLIOTT K W) 16 September 2010 (2010-09-16)
D2	DE 10 2011 110083 A1 (TECH UNI BRAUNSCHWEIG CAROLO WILHELMINA [DE]) 14 February 2013 (2013-02-14), cited in the application

- [1] The present application fails to satisfy the requirements of PCT Article 33(2) because the subject matter of claims 1-3, 5-8, 10 and 12 is not novel.
- [1.1] D1 discloses, in figures 1 and 2 and paragraphs 15-40, a method for the handling of used batteries, having the steps:
- (a) comminuting the batteries such that comminuted material is obtained (paragraph 15),
 - (b) inactivating the comminuted material such that an inactivated comminuted material is obtained (paragraph 16) and
 - (c) filling the inactivated comminuted material into a transport container, characterized in that
 - (d) the inactivation is performed by drying the comminuted material, wherein
 - the comminuted material is dried until an electrolyte content is so low that an electrochemical reaction is impossible (paragraph 37),
 - the drying is performed in a vacuum (paragraph 19) and
 - (f) separating off hard parts and/or separating active material from the carrier, such that an active material fraction and a carrier fraction are formed (paragraph 25).
- D1 does not explicitly disclose that the comminuted material and the active material fraction and carrier fraction are filled or packed into transport containers. Since the products of the process in D1 are referred to as end products for industrial recycling, it can be assumed that such products are packed into a container, and are therefore implicitly disclosed by D1.
- Claims 2 and 6 are defined in terms of the result to be achieved (in this regard, see also Box VII). The same result is also disclosed in D1 in paragraph 37 by the expression "sufficiently dried".
- The subject matter of claims 1-3, 5 and 6 is therefore not novel (PCT Article 33(2)).
- [1.2] Furthermore, D1 discloses, in figures 1 and 2 and paragraphs 15-40, a battery processing installation for the handling of used batteries, having:
- (a) a comminution unit for comminuting the batteries such that comminuted material is obtained (paragraph 15),
 - (b) an inactivation device for inactivating the comminuted material (paragraph 16) and
 - (c) a filling device for filling the inactivated comminuted material into a transport container, characterized in that
 - (d) the inactivation device comprises a drying device (see reference line 20 in figure 1) and
 - (e) the battery processing installation has a vacuum installation which is connected to the drying device for the purposes of generating a vacuum in the drying device (see reference sign 48 in figure 1), and wherein the comminuted material is dried until an electrolyte content is so low that an electrochemical reaction is impossible (paragraph 37) and
 - a hard-metal separating-off device and a light-fraction separating-off device,
 - a separation device for separating active material from the carrier, such that an active material fraction and a carrier fraction are formed (paragraph 25).

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INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/EP2016/059526**Supplemental Box**

The filling with the products is considered to be implicitly disclosed in D1 (see section 1.1). The result to be achieved is disclosed in paragraph 37 (see section 1.1 and Box VII).

The subject matter of claims 7, 8, 10 and 12 is therefore not novel (PCT Article 33(2)).

- [1.3] D2 has been cited as prior art by the applicant in the description, with the disadvantage of the complexity of the installation. Since D2 however has all of the features of the present invention defined in the claims, D2 is considered to be prejudicial to novelty.

- [1.4] D2, in paragraphs 21, 22 and 34-39 and figure 1, discloses a method for the handling of used batteries, in particular lithium batteries, having the steps:
- (a) comminuting the batteries such that comminuted material is obtained (reference sign 12 in figure 1),
 - (b) inactivating the comminuted material such that an inactivated comminuted material is obtained, and
 - (c) filling the inactivated comminuted material into a transport container, characterized in that
 - (d) the inactivation is performed by drying the comminuted material in a vacuum (paragraphs 21 and 22) for the purposes of removing the electrolyte, and
 - (e) separating off hard parts and/or separating active material from the carrier, such that an active material fraction and a carrier fraction are formed (paragraph 39).

As already stated in paragraph 1.1, the filling or packing of the fractions is regarded as being implicitly disclosed.

The subject matter of claims 1-3, 5 and 6 is therefore not novel (PCT Article 33(2)).

- [1.5] Furthermore, D2, in 21, 22 and 34-39 and figure 1, discloses a battery processing installation for the handling of used batteries, having:
- (a) a comminution unit for comminuting the batteries such that comminuted material is obtained (reference sign 12 in figure 1),
 - (b) an inactivation device for inactivating the comminuted material (28) and
 - (c) a filling device for filling the inactivated comminuted material into a transport container (30), characterized in that
 - (d) the inactivation device comprises a drying device (28), and
 - (e) the battery processing installation has a vacuum installation (32), which is connected to the drying device for the purposes of generating a vacuum in the drying device, and
 - a hard-metal separating-off device and a light-fraction separating-off device,
 - a separating device for separating active material from the carrier by air jet sieving, such that an act of material fraction and a carrier fraction are formed (paragraph 39).

The subject matter of claims 7, 8, 10 and 12 is therefore not novel (PCT Article 33(2)).

- [2] The present application does not meet the requirements of PCT Article 33(1) because the subject matter of claims 4, 9 and 11 does not involve an inventive step (PCT Article 33(3)).
- [2.1] D1, in paragraph 19, discloses that the jet pump has a pH monitoring system which ensures the solubility of the vapours. With regard to paragraph 42, in which D1 discloses that the volatile substances react with sodium hydroxide, a person skilled in the art would set the pH value of the medium to be alkaline, which thus reacts with hydrogen fluoride. The subject matter of claim 4 is therefore not inventive.
- [2.2] Furthermore, dependent claim 11 defines a minor structural detail which is not mentioned in D1. Circulating the jet medium of a jet pump is however an alternative of the kind that a person skilled in the art would normally implement as a matter of routine, especially since the resulting advantages are readily foreseeable. The subject matter of claim 11 is therefore also not inventive in relation to D1.
- [2.3] The feature of the arrangement of the installation in a standard container is merely one of several obvious possibilities from which a person skilled in the art would choose, according to the circumstances, without exercising inventive skill. The subject matter of claim 9 is therefore not inventive.

Box VIII**Certain observations on the international application**

- [3] Claims 2 and 6 do not meet the requirements of PCT Article 6 because the subject matter for which protection is sought is not clearly defined. The claims attempt to define the subject matter in terms of the result to be

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Supplemental Box

achieved, but in so doing merely state the problem to be solved, without indicating the technical features necessary for achieving this result.

- [4] Although claims 7 and 10 have been drafted as separate, independent claims, they in fact appear to relate to one and the same subject matter. Hence, the claims are not concise and therefore do not meet the requirements of PCT Article 6.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 5569-002 PCT-1	FOR FURTHER ACTION		See item 4 below
International application No. PCT/EP2016/059526	International filing date (<i>day/month/year</i>) 28 April 2016 (28.04.2016)	Priority date (<i>day/month/year</i>) 28 April 2015 (28.04.2015)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant DUESENFELD GMBH			

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).		
2.	This REPORT consists of a total of 8 sheets, including this cover sheet.		
In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.			
3.	This report contains indications relating to the following items:		
☒	Box No. I	Basis of the report	
☐	Box No. II	Priority	
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	
☐	Box No. IV	Lack of unity of invention	
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	
☐	Box No. VI	Certain documents cited	
☐	Box No. VII	Certain defects in the international application	
☒	Box No. VIII	Certain observations on the international application	
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland		Date of issuance of this report 31 October 2017 (31.10.2017)
Facsimile No. +41 22 338 82 70		Authorized officer Nora Lindner
		e-mail: pct.team5@wipo.int

Form PCT/IB/373 (January 2004)

VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS

Absender: INTERNATIONALE RECHERCHENBEHÖRDE

An:

siehe Formular PCT/ISA/220

PCT

SCHRIFTLICHER BESCHIED DER INTERNATIONALEN RECHERCHENBEHÖRDE (Regel 43bis.1 PCT)

Absendedatum
(Tag/Monat/Jahr) siehe Formular PCT/ISA/210 (Blatt 2)

Aktenzeichen des Anmelders oder Anwalts siehe Formular PCT/ISA/220		WEITERES VORGEHEN siehe Punkt 2 unten
Internationales Aktenzeichen PCT/EP2016/059526	Internationales Anmeldedatum (Tag/Monat/Jahr) 28.04.2016	Prioritätsdatum (Tag/Monat/Jahr) 28.04.2015
Internationale Patentklassifikation (IPC) oder nationale Klassifikation und IPC INV. H01M6/52 C22B13/00 H01M10/54		
Anmelder LION ENGINEERING GMBH		

1. Dieser Bescheid enthält Angaben zu folgenden Punkten:

- ☒ Feld Nr. I Grundlage des Bescheids
- ☐ Feld Nr. II Priorität
- ☐ Feld Nr. III Keine Erstellung eines Gutachtens über Neuheit, erfinderische Tätigkeit und gewerbliche Anwendbarkeit
- ☐ Feld Nr. IV Mangelnde Einheitlichkeit der Erfindung
- ☒ Feld Nr. V Begründete Feststellung nach Regel 43bis.1 a) i) hinsichtlich der Neuheit, der erfinderischen Tätigkeit und der gewerblichen Anwendbarkeit; Unterlagen und Erklärungen zur Stützung dieser Feststellung
- ☐ Feld Nr. VI Bestimmte angeführte Unterlagen
- ☐ Feld Nr. VII Bestimmte Mängel der internationalen Anmeldung
- ☒ Feld Nr. VIII Bestimmte Bemerkungen zur internationalen Anmeldung

2. WEITERES VORGEHEN

Wird ein Antrag auf internationale vorläufige Prüfung gestellt, so gilt dieser Bescheid als schriftlicher Bescheid der mit der internationalen vorläufigen Prüfung beauftragten Behörde ("IPEA"); dies trifft nicht zu, wenn der Anmelder eine andere Behörde als diese als IPEA wählt und die gewählte IPEA dem Internationale Büro nach Regel 66.1 bis b) mitgeteilt hat, dass schriftliche Bescheide dieser Internationalen Recherchenbehörde nicht anerkannt werden.

Wenn dieser Bescheid wie oben vorgesehen als schriftlicher Bescheid der IPEA gilt, so ist der Anmelder aufgefordert, bei der IPEA vor Ablauf von 3 Monaten ab dem Tag, an dem das Formblatt PCT/ISA/220 abgesandt wurde oder vor Ablauf von 22 Monaten ab dem Prioritätsdatum, je nachdem, welche Frist später abläuft, eine schriftliche Stellungnahme und, wo dies angebracht ist, Änderungen einzureichen.

Weitere Optionen siehe Formblatt PCT/ISA/220.

Name und Postanschrift der Internationalen Recherchenbehörde  Europäisches Patentamt P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	Datum der Fertigstellung dieses Bescheids siehe Formular PCT/ISA/210	Bevollmächtigter Bediensteter Hofer, Astrid Tel. +31 70 340-0
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Feld Nr. I Grundlage des Bescheids

1. Hinsichtlich der **Sprache** beruht der Bescheid auf
- ☒ der internationalen Anmeldung in der Sprache, in der sie eingereicht wurde.
 - ☐ einer Übersetzung der internationalen Anmeldung in die folgende Sprache , bei der es sich um die Sprache der Übersetzung handelt, die für die Zwecke der internationalen Recherche eingereicht worden ist (Regeln 12.3 a) und 23.1 b)).
2. ☐ Dieser Bescheid wurde erstellt unter Berücksichtigung der **Berichtigung eines offensichtlichen Fehlers**, die nach Regel 91 von dieser Behörde genehmigt wurde bzw. dieser Behörde mitgeteilt wurde (Regel 43*bis*.1 a)).
3. ☐ Hinsichtlich der **Nucleotid- und/oder Aminosäuresequenz**, die in der internationalen Anmeldung offenbart wurde, ist der Bescheid auf der Grundlage eines Sequenzprotokolls erstellt worden, das
- a) ☐ im Anmeldezeitpunkt Bestandteil der internationalen Anmeldung war und
 - ☐ in Form einer Textdatei gemäß Anhang C/ST.25 vorlag.
 - ☐ in Papierform oder in Form einer Bilddatei vorlag.
 - b) ☐ zusammen mit der internationalen Anmeldung gemäß Regel 13*ter*.1 a) PCT nur für die Zwecke der internationalen Recherche in Form einer Textdatei gemäß Anhang C/ST.25 eingereicht wurde.
 - c) ☐ nach dem internationalen Anmeldedatum nur für die Zwecke der internationalen Recherche eingereicht wurde, und zwar
 - ☐ in Form einer Textdatei gemäß Anhang C/ST.25 (Regel 13*ter*.1 a)).
 - ☐ in Papierform oder in Form einer Bilddatei (Regel 13*ter*.1 b) und Abschnitt 713 der Verwaltungsvorschriften).
4. ☐ In dem Fall, dass mehr als eine Version oder Kopie eines Sequenzprotokolls eingereicht wurde, wurden zusätzlich die erforderlichen Erklärungen eingereicht, dass die Informationen in den nachgereichten oder zusätzlichen Kopien denen entsprechen, die im Anmeldezeitpunkt Bestandteil der Anmeldung waren, bzw. dass sie nicht über den Offenbarungsgehalt der Anmeldung im Anmeldezeitpunkt hinausgehen.
5. Zusätzliche Bemerkungen:

**Feld Nr. V Begründete Feststellung nach Regel 43bis.1 a) i) hinsichtlich der Neuheit, der
erfinderischen Tätigkeit und der gewerblichen Anwendbarkeit; Unterlagen und Erklärungen zur
Stützung dieser Feststellung**

1. Feststellung

Neuheit	Ja: Ansprüche <u>4, 9, 11</u> Nein: Ansprüche <u>1-3, 5-8, 10, 12</u>
Erfinderische Tätigkeit	Ja: Ansprüche Nein: Ansprüche <u>1-12</u>
Gewerbliche Anwendbarkeit	Ja: Ansprüche: <u>1-12</u> Nein: Ansprüche:

2. Unterlagen und Erklärungen:

siehe Beiblatt

Feld Nr. VIII Bestimmte Bemerkungen zur internationalen Anmeldung

Zur Klarheit der Patentansprüche, der Beschreibung und der Zeichnungen oder zu der Frage, ob die Ansprüche in vollem Umfang durch die Beschreibung gestützt werden, ist folgendes zu bemerken:

siehe Beiblatt

Zu Punkt V

Begründete Feststellung hinsichtlich der Neuheit, der erfinderischen Tätigkeit und der gewerblichen Anwendbarkeit; Unterlagen und Erklärungen zur Stützung dieser Feststellung

Es wird auf die folgenden Dokumente verwiesen:

D1 WO 2010/102377 A1 (ELLIOTT K W) 16. September 2010 (2010-09-16)

D2 DE 10 2011 110083 A1 (TECH UNI BRAUNSCHWEIG CAROLO WILHELMINA [DE]) 14. Februar 2013 (2013-02-14) in der Anmeldung erwähnt

- 1 Die vorliegende Anmeldung erfüllt nicht die Erfordernisse des Artikels 33 (2) PCT, weil der Gegenstand des der Ansprüche 1-3, 5-8, 10, 12 nicht neu ist.
- 1.1 D1 offenbart in Abbildungen 1 und 2 und Absätze 15-40 ein Verfahren zum Behandeln gebrauchter Batterien, mit den Schritten:
- (a) Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird (Absatz 15),
 - (b) Inaktivieren des Zerkleinerungsguts, sodass ein inaktiviertes Zerkleinerungsgut erhalten wird (Absatz 16), und
 - (c) Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter, dadurch gekennzeichnet, dass
 - (d) das Inaktivieren durch Trocknen des Zerkleinerungsguts erfolgt wobei
 - das Zerkleinerungsgut solange getrocknet wird, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist (Absatz 37),
 - das Trocknen unter Vakuum erfolgt (Absatz 19) und
 - (f) Abtrennen von Hartteilen und oder Separieren von Aktivmaterial vom Träger, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entsteht (Absatz 25).

D1 offenbart nicht explizit, dass das Zerkleinerungsgut sowie die die Aktivmaterialfraktion und Trägerfraktion in Transportbehältnisse abgefüllt bzw. verpackt wird. Da die Produkte des Prozesses in D1 als Endprodukte zur industriellen Wiederverwertung genannt werden, kann davon ausgegangen werden, dass diese Produkte in einem Behältnis verpackt werden und daher von D1 implizit offenbart werden.

Ansprüche 2 und 6 sind durch das zu erreichende Ergebnis definiert (siehe dazu auch Punkt VII). Das selbe Ergebnis wird auch in D1 in Absatz 37 durch den Ausdruck "genügend getrocknet" offenbart.

Der Gegenstand der Ansprüche 1-3, 5, 6 ist somit nicht neu im Sinne des Artikels 33 (2) PCT.

- 1.2 Weiters offenbart D1 in Abbildungen 1 und 2 und Absätze 15-40 eine Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien mit:
- (a) einer Zerkleinerungseinheit zum Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird (Absatz 15),
 - (b) einer Inaktivierungsvorrichtung zum Inaktivieren des Zerkleinerungsguts (Absatz 16) und
 - (c) einer Abfüllvorrichtung zum Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter, dadurch gekennzeichnet, dass
 - (d) die Inaktivierungsvorrichtung eine Trockenvorrichtung (siehe Referenzzeichen 20 in Abbildung 1) umfasst und
 - (e) die Batterie-Verarbeitungsanlage eine Vakuumanlage, die mit der Trockenvorrichtung zum Erzeugen eines Vakuums in der Trockenvorrichtung verbunden ist, aufweist (siehe Referenzzeichen 48 in Abbildung 1) und wobei das Zerkleinerungsgut solange getrocknet wird, bis ein Elektrolytgehalt so klein ist, dass eine elektrochemische Reaktion unmöglich ist (Absatz 37) sowie
- eine Hartmetallabtrennvorrichtung und eine Leichtfraktionsabtrennvorrichtung,
 - eine Separiervorrichtung zum Separieren von Aktivmaterial vom Träger, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entsteht (Absatz 25).

Das Abfüllen der Produkte wird als implizit von D1 offenbart betrachtet (siehe Abschnitt 1.1). Das zu erreichende Ergebnis wird in Absatz 37 offenbart (siehe Abschnitt 1.1 und Punkt VII).

Der Gegenstand der Ansprüche 7, 8, 10, 12 ist somit nicht neu im Sinne des Artikels 33 (2) PCT.

- 1.3 D2 wurde vom Anmelder als Stand der Technik in der Beschreibung genannt mit dem Nachteil der Komplexität der Anlage. Da D2 jedoch alle Merkmale der in den Ansprüchen definierten gegenwärtigen Erfindung aufweist, wird D2 als neuheitsschädlich betrachtet.

- 1.4 D2 offenbart in Absätzen 21, 22, 34-39 und Abbildung 1 ein Verfahren zum Behandeln gebrauchter Batterien, insbesondere Lithium-Batterien, mit den Schritten:
- (a) Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird (Referenzzeichen 12 in Abbildung 1),
 - (b) Inaktivieren des Zerkleinerungsguts, sodass ein inaktiviertes Zerkleinerungsgut erhalten wird, und
 - (c) Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter, dadurch gekennzeichnet, dass
 - (d) das Inaktivieren durch Trocknen des Zerkleinerungsguts unter Vakuum (Absätze 21, 22) zum Entfernen des Elektrolyts und
 - (c) Abtrennen von Hartteilen und oder Separieren von Aktivmaterial vom Träger, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entsteht (Absatz 39).

Wie bereits in Absatz 1.1 ausgeführt, wird die Abfüllung bzw. Verpackung der Fraktionen als implizit offenbart angesehen.

Der Gegenstand der Ansprüche 1-3, 5, 6 ist somit nicht neu im Sinne des Artikels 33 (2) PCT.

- 1.5 Weiters offenbart D2 in 21, 22, 34-39 und Abbildung 1 eine Batterie-Verarbeitungsanlage zum Behandeln gebrauchter Batterien mit:
- (a) einer Zerkleinerungseinheit zum Zerkleinern der Batterien, sodass Zerkleinerungsgut erhalten wird (Referenzzeichen 12 in Abbildung 1),
 - (b) einer Inaktivierungsvorrichtung zum Inaktivieren des Zerkleinerungsguts (28) und
 - (c) einer Abfüllvorrichtung zum Abfüllen des inaktivierten Zerkleinerungsguts in einen Transportbehälter (30), dadurch gekennzeichnet, dass
 - (d) die Inaktivierungsvorrichtung eine Trockenvorrichtung (28) umfasst und
 - (e) die Batterie-Verarbeitungsanlage eine Vakuumanlage (32), die mit der Trockenvorrichtung zum Erzeugen eines Vakuums in der Trockenvorrichtung verbunden ist, aufweist sowie
- eine Hartmetallabtrennvorrichtung und eine Leichtfraktionsabtrennvorrichtung,
 - eine Separiervorrichtung zum Separieren von Aktivmaterial vom Träger durch Luftstrahlsieben, sodass eine Aktivmaterialfraktion und eine Trägerfraktion entsteht (Absatz 39).

Der Gegenstand der Ansprüche 7, 8, 10, 12 ist somit nicht neu im Sinne des Artikels 33 (2) PCT.

- 2 Die vorliegende Anmeldung erfüllt nicht die Erfordernisse des Artikels 33 (1) PCT, weil der Gegenstand der Ansprüche 4, 9, 11 nicht auf einer erfinderischen Tätigkeit im Sinne des Artikels 33 (3) PCT beruht.
- 2.1 D1 offenbart in Absatz 19 dass die Strahlpumpe ein pH-Kontrollsystem aufweist, das die Löslichkeit der Dämpfe sicherstellt. Mit Hinblick auf Absatz 42, in dem D1 offenbart dass die flüchtigen Substanzen mit Natriumhydroxid reagieren, würde die Fachperson den pH-Wert des Mediums alkalisch einstellen welches somit mit Fluorwasserstoff reagiert. Der Gegenstand des Anspruchs 4 ist somit nicht erfinderisch.
- 2.2 Des weiteren wird im abhängigen Anspruch 11 ist eine geringfügiges bauliches Detail definiert, welches nicht in D1 erwähnt wird. Die Kreisführung des Strahlmediums einer Strahlpumpe liegt jedoch innerhalb dessen, was eine Fachperson im Rahmen der üblichen Praxis zu tun pflegt, zumal die damit erreichten Vorteile ohne Weiteres im Voraus abzusehen sind. Folglich ist auch der Gegenstand des Anspruchs 11 nicht erfinderisch über D1.
- 2.3 Beim Merkmal der Anordnung der Anlage in einem Standard-Container handelt es sich nur um eine von mehreren naheliegenden Möglichkeiten, aus denen der Fachmann ohne erfinderisches Zutun den Umständen entsprechend eine wählen würde. Der Gegenstand des Anspruchs 9 ist somit nicht erfinderisch.

Zu Punkt VIII

Bestimmte Bemerkungen zur internationalen Anmeldung

- 3 Die Ansprüche 2 und 6 entsprechen nicht den Erfordernissen des Artikels 6 PCT, da der Gegenstand des Schutzbegehrens nicht klar definiert ist. In den Ansprüchen wird versucht, den Gegenstand durch das zu erreichende Ergebnis zu definieren; damit wird aber lediglich die zu lösende Aufgabe angegeben, ohne die für die Erzielung dieses Ergebnisses notwendigen technischen Merkmale zu nennen.
- 4 Die Ansprüche 7 und 10 wurden zwar als separate Ansprüche abgefasst, scheinen sich aber de facto auf ein und denselben Gegenstand zu beziehen. Aus diesem Grund sind die Ansprüche nicht knapp gefasst und erfüllen somit nicht die Erfordernisse des Artikels 6 PCT.