

24. (Previously Presented) The method of claim 1, wherein the sorbent material has a composition comprising from about 1 to about 30 grams of additive per 100 grams of activated carbon.

25. (Previously Presented) The method of claim 1, wherein the method is a method for reducing mercury in the mercury-containing gas to a desired level, wherein separating the mercury-sorbent from the mercury-containing gas forms a cleaned gas, the method further comprising:

monitoring the mercury content of the cleaned gas; and

controlling, in response to the monitored mercury content of the cleaned gas, an injection rate of injecting the sorbent into the mercury-containing gas, the sorbent composition, or a combination thereof, so that the mercury content of the cleaned gas is maintained at or below the desired level.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/974,343		Filing Date 05/08/2018		☐ 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), (l), 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 \$100 =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*	x \$460 =					
☐ 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	08/14/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0	x \$100 =		0	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 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		0	
		(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".						brenda murphy			
*** 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.**

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/974,343	05/08/2018	Edwin S. Olson	4820.001US9

CONFIRMATION NO. 1072

PUBLICATION NOTICE



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21186
SCHWEGMAN LUNDBERG & WOESSNER, P.A.
P.O. BOX 2938
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Title:SORBENTS FOR THE OXIDATION AND REMOVAL OF MERCURY

Publication No.US-2018-0257030-A1

Publication Date:09/13/2018

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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/974,343	05/08/2018	Edwin S. Olson	4820.001US9	1072
21186	7590	10/29/2018		
SCHWEGMAN LUNDBERG & WOESSNER, P.A.			EXAMINER	
P.O. BOX 2938			ORLANDO, AMBER ROSE	
MINNEAPOLIS, MN 55402				
			ART UNIT	PAPER NUMBER
			1776	
			NOTIFICATION DATE	DELIVERY MODE
			10/29/2018	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

SLW@blackhillsip.com
uspto@slwip.com

Office Action Summary**Application No.**

15/974,343

Applicant(s)

Olson et al.

Examiner

AMBER R ORLANDO

Art Unit

1776

AIA Status

No

-- 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 08/14/2018.
☐ 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) 1-10,14 and 21-25 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-10,14 and 21-25 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 ____ 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

The present application is being examined under the pre-AIA first to invent provisions.

Claim Rejections - 35 USC § 112

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.

Claims 1, 7 and 23-25 are 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.

Claim 1 recites the limitation "the sorbent material" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 7 recites the limitation "the sorbent material" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim 23 recites the limitation "the sorbent" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 24 recites the limitation "the sorbent material" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim 25 recites the limitation "the sorbent" in line 6. There is insufficient antecedent basis for this limitation in the claim.

Claim 25 recites the limitation "the sorbent composition" in line 6. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

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.

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

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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 pre-AIA 35 U.S.C. 103(a) 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.

This application currently names joint inventors. In considering patentability of the claims under pre-AIA 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in

order for the examiner to consider the applicability of pre-AIA 35 U.S.C. 103(c) and potential pre-AIA 35 U.S.C. 102(e), (f) or (g) prior art under pre-AIA 35 U.S.C. 103(a).

Claim 1-3 and 5-8, 14 and 21-25 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Felsvang et al. US 5,435,980 in view of Nelson Jr. US 2004/0003716.

For claim 1, the Felsvang et al. reference discloses a method for separating mercury from a mercury-containing gas, the method comprising: combusting a mixture of coal and an additive that has been added to the coal to form the mercury-containing gas (column 5, lines 23-25, lines 60-65 and column 4, lines 42-45), adding a particulate sorbent material comprising activated carbon into the mercury-containing gas (column 6, lines 11-14 and lines 24-26); chemically reacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent (column 6, lines 24-28); and separating the mercury-sorbent from the mercury-containing gas (column 5, lines 57-65). The reference does not disclose the additive comprising a bromide compound, promoting at least a portion of the sorbent material by chemically reacting the sorbent material with Br_2 , HBr , Br^- , or a combination thereof in-flight, to form a promoted sorbent material.

The Nelson reference discloses the additive comprising a bromide compound (Nelson paragraphs [0017] and [0041]).

It would have been obvious to one having ordinary skill in the art to have modified the Felsvang et al. reference to either replace the Cl with or include in addition to the Cl , a bromide compound including Br_2 , HBr , Br^- , or a combination (Nelson paragraphs [0017] and [0041]) so as to provide an effective carbon sorbent for mercury.

The combination of references above would result in promoting at least a portion of the sorbent material (activated carbon as shown in Felsvang column 4, lines 5-11) by chemically reacting the sorbent material with Br_2 , HBr , Br^- (the combination of the halogen/halide of both Nelson and Felsvang et al. i.e. the Cl or Br compounds as described within Felsvang et al. and Nelson), or a combination thereof in-

flight (Felsvang et al. column 4, lines 39-50 and 5-11), to form a promoted sorbent material. As each of the components are described in the above references the combination of the components would have the same effect, i.e. reacting to form the promoted sorbent. The examiner also points to Felsvang et al. which discloses that the halogen and the activated carbon exhibit a synergistic effect enabling an extremely efficient Hg removal (column 6, lines 8-11).

For claim 2, the Felsvang reference discloses mixing the additive and the coal before combusting the coal (column 4, lines 42-45).

For claim 3, the Nelson reference discloses the additive mixed with the coal is in a liquid (paragraph [0064]).

For claims 5 and 6, and as detailed above, each of the claimed steps is disclosed by the combination of Felsvang and Nelson reference and therefor the result of performing the steps would inherently be the same and would result in the promoted sorbent material comprises active sites, wherein the active sites comprise halide anions bound to the activated carbon and the promoted sorbent material comprises active sites, wherein the active sites comprise carbocations bound to halide anions.

For claims 7 and 8, the promoted sorbent is disclosed by the combination of Felsvang and Nelson as disclosed above. Each of the steps as claimed are also disclosed by Felsvang and Nelson and would inherently have the same results when the method is performed i.e. chemically reacting the sorbent material with the additive in the mercury-containing gas comprises chemically reacting carbene species edge sites in the activated carbon with the additive and carbocations in the activated carbon of the mercury-sorbent accept electrons from mercury atoms of the mercury-sorbent.

For claim 14, the Felsvang et al. reference discloses the activated carbon is chosen from powdered activated carbon, granular activated carbon, carbon black, carbon fiber, aerogel carbon, pyrolysis char, and combinations thereof (column 3, lines 5-23).

For claim 21, the Felsvang et al. reference discloses that the coal and the additive are mixed prior to the combustion step as well as the combustion furnace where combustion occurs (column 3 lines 43-47 and column 4, lines 23-26). The examiner asserts that this would include coal and the additive being mixed at a location upstream of a combustion furnace where combustion occurs. Further while the reference does not explicitly state "at a location upstream of the combustion furnace" it would be well within the level of ordinary skill in the art to modify the Felsvang et al. reference to include the coal and the additive being mixed at a location upstream of the combustion furnace as this does not fundamentally change the reaction step and is merely a rearrangement of parts/steps.

For claims 22 and 23, the Felsvang et al. reference discloses separating greater than 70 wt% of the mercury from the mercury-containing gas on the sorbent (examples 1, 3 and 4). Further the examiner asserts that these limitations are the result of the method. As the method is disclosed by Felsvang et al. and Nelson as shown above, the result of such a combination would occur i.e. separating greater than 70 wt% of the mercury from the mercury-containing gas on the sorbent.

For claim 24, the Felsvang et al. reference does not explicitly state the sorbent material has a composition comprising from about 1 to about 30 grams of additive per 100 grams of activated carbon. The reference does disclose optimizing the amount of Cl and activated carbon introduced (column 6, lines 42-46).

Further the Nelson reference also discloses optimizing of additive so as to obtain a desired mercury reactivity (paragraph [0054]).

It would have been obvious to one having ordinary skill in the art before the invention was made to have modified the Felsvang et al. reference to include state the sorbent material has a composition comprising from about 1 to about 30 grams of additive per 100 grams of activated carbon (Felsvang et al. column 6, lines 42-46 and Nelson paragraph [0054]) so as to adjust the amount of halogen introduced based on the Hg content and to ensure optimum reaction between the halogen and the activated

carbon. Further the courts have held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

For claim 25, the Felsvang et al. reference discloses the method is a method for reducing mercury in the mercury-containing gas to a desired level, wherein separating the mercury-sorbent from the mercury-containing gas forms a cleaned gas (column 5, lines 45-50), the method further comprising: monitoring the mercury content of the cleaned gas; and controlling, in response to the monitored mercury content of the cleaned gas, an introduction rate (amount would include introduction rate) of the sorbent into the mercury-containing gas, the sorbent composition, or a combination thereof, so that, the mercury content of the cleaned gas is maintained at or below the desired level (column 6, lines 42-47).

The Felsvang et al. reference does not disclose injection as a means of introduction.

The Nelson reference discloses injection (abstract).

It would have been obvious to one having ordinary skill in the art to modified Felsvang et al. to have the means of introduction be injection (Nelson abstract) so as to allow for the components of the system to be entered into the system.

Claim 4 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716 as applied in claim 3 above and further in view of Srinivasachar et al. US 6,848,374.

For claim 4, the Felsvang and Nelson combination does not disclose the liquid is a hydrocarbon, a chlorinated hydrocarbon, supercritical carbon dioxide water, salt solution, or a combination thereof.

The Srinivasachar et al. reference discloses the liquid is a salt solution (column 6, lines 5-10).

It would have been obvious to one having ordinary skill in the art before the invention was made to have modified the Felsvang and Nelson combination to include the liquid is a salt solution

(Srinivasachar et al. column 6, lines 5-10) so as to allow the halogen to be sprayed and therefore deposited on the sorbent particles.

Claim 9 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716 as applied in claim 1 above and further in view of Srinivasachar et al. US 6,848,374.

For claim 9, the Felsvang and Nelson combination does not disclose wherein the additive is substantially in vapor form in the mercury-containing gas.

The Srinivasachar et al. reference discloses wherein the additive is substantially in vapor form in the mercury-containing gas (column 6, lines 13-18).

It would have been obvious to one having ordinary skill in the art before the invention was made to have modified the Felsvang and Nelson combination to include wherein the additive is substantially in vapor form in the mercury-containing gas (Srinivasachar et al. column 6, lines 13-18) so as to allow the halogen to be deposited on the sorbent particles via condensing/adsorbing.

Claim 10 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716 as applied in claim 1 above and further in view of Gadkaree US 6,136,749.

The combination of Felsvang et al. and Nelson do not disclose the additive comprises Ca, Na, or a combination thereof.

The Gadkaree reference discloses the additive comprises Ca, Na, or a combination thereof (column 3, lines 58-65 and claim 10).

It would have been obvious to one having ordinary skill in the art to have modified the Felsvang et al. and Nelson combination to include the additive comprises Ca, Na, or a combination thereof (Gadkaree column 3, lines 58-65 and claim 10) so as to enhance the activity of the activated carbon catalyst.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(I)(1) - 706.02(I)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A

web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

Claims 1-10, 14 and 21-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-30 of U.S. Patent No. US 7,435,286 ('286) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '286 except for combusting a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '286 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-25 of U.S. Patent No. US 8,168,147 ('147) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '147 except a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '147 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-60 of U.S. Patent No. US 8,512,655 ('655) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '655 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '655 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-60 of U.S. Patent No. US 8,821,819 ('819) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '819 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '819 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-33 of U.S. Patent No. US 9,757,689 ('689) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '689 except combusting a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '689 reference to include combusting a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-20 of U.S. Patent No. US 9,468,886 ('886) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '886 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '886 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-30 of U.S. Patent No. 8,652,235 ('235) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '235 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '235 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-16 of copending Application No. 15/295594 ('594) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '594 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '594 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 8-20 of copending Application No. 15/589359 ('359).

Although the claims at issue are not identical, they are not patentably distinct from each other because while the current claim set includes different wording the limitations correspond to '359.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-20 of copending Application No. 15/853029 ('029) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '029 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '029 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-20 of copending Application No. 14/712558 ('558). Although the claims at issue are not identical, they are not patentably distinct from each other because while the current claim set includes different wording the limitations correspond to '558.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-20 of copending Application No. 15/951970 ('970).

Although the claims at issue are not identical, they are not patentably distinct from each other because while the current claim set includes different wording, the limitations correspond to '970.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over 1-20 of copending Application No. 15/382114 ('114) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '114 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '114 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over 1-20 of copending Application No. 15/853029 ('029) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '029 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '029 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claims 1-10, 14 and 21-25 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over 1-20 of copending Application No. 15/978,760 ('760) in view of Felsvang et al. US 5,435,980 and Nelson Jr. US 2004/0003716.

The current claim set corresponds to '760 except for a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas.

Felsvang et al. and Nelson references disclose this limitation as shown above.

It would have been obvious to one having ordinary skill in the art to have modified the '760 reference to include a mixture of coal and an additive, the additive comprising a bromide compound that has been added to the coal, to form the mercury-containing gas (Felsvang et al. column 5, 60-65 and column 4, lines 42-45 and Nelson paragraphs [0017] and [0041]) so as to supplement the halogen content of the system so as to increase the mercury sorption capability.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Response to Arguments

Applicant's arguments with respect to claims 1-10, 14 and 21-25 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMBER ROSE ORLANDO whose telephone number is (571)270-3149. The examiner can normally be reached on Monday-Thursday 7:00-5:30.

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, Duane Smith can be reached on (571)272-1166. 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.

AMBER ROSE, ORLANDO
Primary Examiner
Art Unit 1776

Application/Control Number: 15/974,343
Art Unit: 1776

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/AMBER R ORLANDO/
Primary Examiner, Art Unit 1776

Notice of References Cited	Application/Control No. 15/974,343		Applicant(s)/Patent Under Reexamination	
	Examiner AMBER R ORLANDO		Art Unit 1776	Page 1 of 2

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*	B	US-5569436-A	10-1996	Lerner; Bernard J.	B01D53/64	110/235
*	C	US-6136749-A	10-2000	Gadkaree; Kishor P.	B01D53/8665	502/180
*	D	US-6372187-B1	04-2002	Madden; Deborah A.	B01D53/508	110/345
*	E	US-6558454-B1	05-2003	Chang; Ramsay	B01D53/10	110/342
*	F	US-20040003716-A1	01-2004	Nelson, Sidney G. JR.	B01D53/02	95/134
*	G	US-6719828-B1	04-2004	Lovell; John S.	B01D53/02	423/210
*	H	US-20040086439-A1	05-2004	Vosteen, Bernhard	B01D53/64	423/210
*	I	US-6818043-B1	11-2004	Chang; Ramsay	B01D53/64	423/213.2
*	J	US-6848374-B2	02-2005	Srinivasachar; Srivats	B01D53/10	110/165R
*	K	US-20060048646-A1	03-2006	Olson; Edwin S.	B01D53/10	95/134
*	L	US-20070180990-A1	08-2007	Downs; William	B01D53/10	95/134
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	Q					
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	S					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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Notice of References Cited	Application/Control No. 15/974,343		Applicant(s)/Patent Under Reexamination	
	Examiner AMBER R ORLANDO		Art Unit 1776	Page 2 of 2

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*	B	US-20090320678-A1	12-2009	Chang; Ramsay	B01D46/002	95/92
*	C	US-7780765-B2	08-2010	Srinivasachar; Srivats	B01D53/10	110/203
*	D	US-20150098878-A1	04-2015	Olson; Edwin S.	B01J20/12	423/210
*	E	US-20170100692-A1	04-2017	Olson; Edwin S.	B01D53/08	1/1
*	F	US-20170239644-A1	08-2017	Olson; Edwin S.	B01D53/02	1/1
*	G	US-20180133646-A1	05-2018	Pavlish; John H.	B01J20/3416	1/1
*	H	US-20180257031-A1	09-2018	Olson; Edwin S.	B01J20/3416	1/1
*	I	US-4013516-A	03-1977	Greenfield; Charles	C10B47/30	159/905
*	J	US-4699896-A	10-1987	Sing; Kenneth S. W.	B01J21/18	264/29.2
*	K	US-6103205-A	08-2000	Wojtowicz; Marek A.	B01D53/04	423/210
	L					
	M					

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	W	
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*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. 15/974,343	Applicant(s)/Patent Under Reexamination Olson et al.
	Examiner AMBER R ORLANDO	Art Unit 1776

CPC - Searched*		
Symbol	Date	Examiner

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.

Search Notes		
Search Notes	Date	Examiner
Text Search (SEE EAST SEARCH HISTORY)	07/23/2018	AO
IDS Search (EAST and DAV)	07/23/2018	AO
Inventor Search (EAST)	07/23/2018	AO
Inventor Search (EAST)	10/24/2018	AO
Text Search (SEE EAST SEARCH HISTORY)	10/24/2018	AO

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

/AMBER R ORLANDO/ Primary Examiner, Art Unit 1776	
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	45	(95/134.ccls. or 95/142.ccls. or 110/345.ccls. or 423/210.ccls.) and activated carbon and promoter	US-PGPUB; USPAT	ADJ	ON	2013/09/09 09:19
S2	0	(95/134.ccls. or 95/142.ccls. or 110/345.ccls. or 423/210.ccls.) and sorben and promoter and activated carbond and mercury	US-PGPUB; USPAT	ADJ	ON	2013/09/09 09:19
S3	0	(95/134.ccls. or 95/142.ccls. or 110/345.ccls. or 423/210.ccls.) and sorbent and promoter and activated carbond and mercury	US-PGPUB; USPAT	ADJ	ON	2013/09/09 09:20
S7	73	("20020150516" "4786483" "5409522" "5505766" "6383981" "6878358" "20020033097" "4530765" "5346674" "6080281" "4708853" "6027551" "6136072" "6258334" "6818043" "20060057044" "20080207443" "20010002387" "3826618" "4814152" "4820318" "4889698" "5891324" "6528030" "20050227146" "5419834" "7942566" "20080134888" "3662523" "3849267" "4196173" "4500327" "6942840" "20020134242" "20030136509" "20050147549" "20060112823" "20080134888" "6471936" "20010003116" "20050019240" "20060048646" "4956162" "5575982" "6372187" "6375909" "7435286" "7514052" "20050074380" "20090081092" "5288306" "1984164" "4101631" "5695726" "6080281" "6848374" "20050000197" "5300137" "5607496" "5672323" "6214304" "6953494" "5245120" "20070168213" "7938571" "20040003716" "20040013589" "3194629" "3786619" "5827352" "20040109800" "20070295347" "5435980" "6136749" "20030206846").PN.	US-PGPUB; USPAT	ADJ	ON	2015/03/17 12:25
S8	13	"11209163"	US-PGPUB; USPAT	ADJ	ON	2015/03/17 12:28
S9	3	"11209163" and non carbon	US-PGPUB; USPAT	ADJ	ON	2015/03/17 12:28
S10	161	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10, B01D53/10).cpc. and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2015/03/17 13:49
S11	0	(95/134.ccls. or 95/142.ccls. or 110/345.ccls. or 423/210.ccls.) and	US-PGPUB; USPAT	ADJ	ON	2015/03/17 13:50

		sorbent and promoter and activated carbond and mercury				
S12	116	(95/134.ccls. or 95/142.ccls. or 110/345.ccls. or 423/210.ccls.) and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2015/03/17 13:50
S13	172	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10, B01D53/10).cpc. and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2015/08/20 22:04
S14	67	(95/134.ccls. or 95/142.ccls. or 110/345.ccls. or 423/210.ccls.) and activated carbon and promoter	US-PGPUB; USPAT	ADJ	ON	2015/08/20 22:04
S15	67	"6136749"	US-PGPUB; USPAT	ADJ	ON	2016/05/27 09:11
S16	20	"684374"	US-PGPUB; USPAT	ADJ	ON	2016/05/27 09:12
S17	1	"20040003716"	US-PGPUB; USPAT	ADJ	ON	2016/05/27 09:12
S18	68	"6848374"	US-PGPUB; USPAT	ADJ	ON	2016/05/27 09:12
S19	41	"7435286"	US-PGPUB; USPAT	ADJ	ON	2016/05/27 09:13
S20	13	"8168147"	US-PGPUB; USPAT	ADJ	ON	2016/05/27 09:13
S21	69	(95/134.ccls. or 95/142.ccls. or 110/345.ccls. or 423/210.ccls.) and activated carbon and promoter	US-PGPUB; USPAT	ADJ	ON	2016/06/07 09:06
S22	181	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10, B01D53/10).cpc. and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2016/06/07 09:06
S25	28	"5266280"	US-PGPUB; USPAT	ADJ	ON	2016/06/07 13:41
S26	281	sorbent with mercury and (diameter or size) with ("30" or "40" or "50" or "60" or "70") with (sorbent or carbon)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/09/29 15:01
S27	148	sorbent with mercury and (diameter or size) with ("30" or "40" or "50" or "60" or "70") with (sorbent or carbon) and halogen	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/09/29 15:02
S28	159	sorbent with mercury and (diameter or size) with ("30" or "40" or "50" or "60" or "70") with (sorbent or carbon) and halogen\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/09/29 16:18
S29	206	(sorbent or activated carbon) with mercury and (diameter or size) with ("30" or "40" or "50" or "60" or "70") with (sorbent or carbon) and halogen\$4 and	US-PGPUB; USPAT; USOCR; FPRS;	ADJ	ON	2016/09/29 16:22

		activated carbon	EPO; JPO; DERWENT; IBM_TDB			
S30	195	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10, B01D53/10).cpc. and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2016/09/30 13:48
S33	6	"20040003719"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 10:56
S34	49	"2004003716"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 10:57
S35	81	"6848374"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 10:58
S36	56	"7435286"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:02
S37	7	olson.in. and ("40" microns).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:04
S38	0	("40" microns and halocarbon sorbent).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:05
S39	0	(halocarbon sorbent).clm. and "40" microns and olson.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:05
S40	65	"40" microns and olson.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	ON	2016/11/16 11:06

			DERWENT; IBM_TDB			
S41	3907	("40" microns).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:06
S42	29	("40" microns and sorbent).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:06
S43	1	(halocarbon sorbent).clm. and olson.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:08
S44	36	(sorbent).clm. and olson.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:08
S45	0	(sorbent).clm. and olson.in. and "40" micron	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:08
S46	17	"11209163"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:09
S47	2	"20110233133"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:27
S48	7	"20110023427"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:28
S49	15	"2004025274"	US-PGPUB; USPAT; USOCR;	ADJ	ON	2016/11/16 11:32

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S50	11	"20040025274"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:32
S51	15	"2004025274"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:33
S52	40	"6312489"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 11:33
S53	30	("20030024872" "20050045553" "20050144916" "4008060" "4640779" "4655921" "4673503" "4738778" "4746432" "4799944" "5043000" "5051118" "5120296" "5174896" "5320657" "5512075" "5674302" "6152979" "6312489" "6315130" "6336946" "6398836" "6585793" "6598749" "7648546").PN. OR ("7931723").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/11/16 11:36
S54	33	("4200444" "4640779" "5968215" "6059851").PN. OR ("6312489").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/11/16 11:40
S55	5	"8518142"	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/11/16 11:54
S56	4	"8747505"	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/11/16 11:57
S57	2	"14318270"	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/11/16 12:06
S58	13	pac with size with sorbent	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2016/11/16 12:13
S59	197	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10, B01D53/10).cpc. and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2016/11/16 15:23
S60	0	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10,	US-PGPUB; USPAT	ADJ	ON	2016/11/17 12:39

		B01D53/10).cpc. and (halogen or halide of HBr) with sorbent "4198388"				
S61	10	"4198388"	US-PGPUB; USPAT	ADJ	ON	2016/11/17 12:39
S62	0	"2010083696"	US-PGPUB; USPAT	ADJ	ON	2016/11/17 13:32
S63	2	"20100083696"	US-PGPUB; USPAT	ADJ	ON	2016/11/17 13:32
S64	2	absorp\$5 with mea with methanol with acid	US-PGPUB; USPAT	ADJ	ON	2016/11/17 13:36
S65	2	"20070283813"	US-PGPUB; USPAT	ADJ	ON	2016/11/17 13:39
S66	21	"4469596"	US-PGPUB; USPAT	ADJ	ON	2016/11/21 08:29
S67	4	"2003229245"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/05/10 10:36
S68	2	"20030229245"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/05/10 10:36
S69	45	"5,338,458"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/05/10 10:38
S70	45	"5338458"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/05/10 10:38
S71	213	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10, B01D53/10).cpc. and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2017/05/10 11:02
S72	64	("1786483" "1984164" "2317857" "20010002387" "20010003116" "20020134242" "20020150516" "20030136509" "20040003716" "20040013589" "20050019240" "20060048646" "20060191835" "20090062119" "20100047146" "20120183458" "20140056787" "3194629" "3662523" "3786619" "3826618" "3849267" "4196173" "4500327" "4814152" "4820318" "4889698" "4959162" "5300137" "5409522" "5462908" "5505766" "5575982" "5607496" "5672323"	US-PGPUB; USPAT	ADJ	ON	2017/05/10 11:20

		"5695726" "5827352" "5891324" "6027551" "6080281" "6136072" "6136749" "6214304" "6258334" "6372187" "6375909" "6383981" "6471936" "6528030" "6818043" "6848374" "6878358" "6942840" "6953494" "7101631" "7435286" "7479263" "7514052" "7563311" "7611564" "8007749" "8168147" "8168149" "8512655").PN.				
S73	3	("20090235848" "20110076210" "20150246315").PN.	US-PGPUB; USPAT	ADJ	ON	2017/05/10 11:31
S79	3	("20090235848" "20110076210" "20140224121").PN.	US-PGPUB; USPAT	ADJ	ON	2017/06/27 09:36
S80	96	("1984164" "2317857" "20010002387" "20010003116" "20020043496" "20020134242" "20020150516" "20030104937" "20030136509" "20040003716" "20040013589" "20040076570" "20050019240" "20060048646" "20060191835" "20080182747" "20080292512" "20090062119" "20090136401" "20090320678" "20100047146" "20110168018" "20120183458" "20130280156" "20140056787" "20140255279" "20140308188" "20150098878" "3194629" "3662523" "3786619" "3826618" "3849267" "3876393" "4094777" "4101631" "4196173" "4338896" "4500327" "4708853" "4786483" "4814152" "4820318" "4889698" "4956162" "5300137" "5336835" "5409522" "5462908" "5505766" "5575982" "5607496" "5672323" "5695726" "5827352" "5891324" "6027551" "6080281" "6136072" "6136749" "6214304" "6258334" "6372187" "6375909" "6383981" "6471936" "6528030" "6638485" "6808692" "6818043" "6848374" "6878358" "6942840" "6953494" "6960329" "7081434" "7211707" "7435286" "7479263" "7514052" "7521032" "7544338" "7563311" "7611564" "7622092" "7722843" "7767174" "7780765" "8007749" "8168147" "8168149" "8216535" "8512655" "8652235" "8821819" "9011805").PN.	US-PGPUB; USPAT	ADJ	ON	2017/06/27 09:41
S81	593	honeycomb with plug\$4 and plug\$4 with length	US-PGPUB; USPAT	ADJ	ON	2017/06/27 14:45
S82	0	honeycomb with plug\$4 and plug\$4 with length with less than with "5"	US-PGPUB; USPAT	ADJ	ON	2017/06/27 14:45
S83	0	honeycomb with plug\$4 and plug\$4 with length with less than	US-PGPUB; USPAT	ADJ	ON	2017/06/27 14:45
S84	127	honeycomb with plug\$4 and plug\$4 with length with "5"	US-PGPUB; USPAT	ADJ	ON	2017/06/27 14:46
S85	241	honeycomb with plug\$4 and plug\$4 with length with mm	US-PGPUB; USPAT	ADJ	ON	2017/06/27 14:47
S86	41	honeycomb with plug\$4 and plug\$4 with	US-PGPUB;	ADJ	ON	2017/06/27

		length with "3 mm "	USPAT			14:49
S87	28	honeycomb with plug\$4 and plug\$4 with length with "3 mm " and plug\$4 with porosity	US-PGPUB; USPAT	ADJ	ON	2017/06/27 14:52
S88	28	honeycomb and plug\$4 with length with "3 mm " and plug\$4 with porosity	US-PGPUB; USPAT	ADJ	ON	2017/06/27 14:53
S89	43	honeycomb and plug\$4 with porosity with "100"	US-PGPUB; USPAT	ADJ	ON	2017/06/27 15:06
S90	20	honeycomb and plug\$4 with pore (size or diameter) with "100"	US-PGPUB; USPAT	ADJ	ON	2017/06/27 15:07
S91	8	saw with honeycomb with filter	US-PGPUB; USPAT	ADJ	ON	2017/06/29 13:31
S92	230	(B01D53/64, B01D2257/602, B01D2253/104, B01D2253/10, B01D53/10).cpc. and (halogen or halide of HBr) with sorbent	US-PGPUB; USPAT	ADJ	ON	2017/12/01 14:36
S93	2	"20060260468"	US-PGPUB; USPAT	ADJ	ON	2018/07/03 10:34
S94	19	engine with air with inlet with filter\$4 with cone	US-PGPUB; USPAT	ADJ	ON	2018/07/03 15:26
S95	36	engine with air with inlet with filter\$4 with (cone or conical or (diameter with (increas\$4 or decreas\$4)))	US-PGPUB; USPAT	ADJ	ON	2018/07/03 15:27
S96	24	("3771638" "3870495" "3872012" "4157902" "4702754" "5125940" "5522909" "5549724" "5632793").PN. OR ("5888260").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/07/03 15:31
S97	41	("0153535" "0439091" "1398685" "1530163" "1887052" "2087688" "4003836" "4018580" "4032455" "4039308" "4065276" "4261710" "4410341" "4414110" "4699715" "5106397" "5178656" "5522909" "5549722" "5549724" "5888260" "6397842" "6508052" "D401597" "D401942" "D403414" "D403416").PN. OR ("6808552").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/07/03 15:31
S98	15	("D403416").URPN.	USPAT	ADJ	ON	2018/07/03 15:33
S99	0	"20030089233"	USPAT	ADJ	ON	2018/07/04 12:29
S100	3	"20030089233"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/04 12:29
S101	26	"6833023"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/04 12:29
S102	2	"20070168213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/09 13:08
S103	14	carbocations with sorbent with bromine	US-PGPUB; USPAT;	ADJ	ON	2018/07/09 13:14

			USOCR; FPRS; EPO; JPO			
S104	0	a side forming a cross sectional shape of each of the first	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/09 13:47
S105	0	non of side forming	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/09 13:56
S106	0	none of side forming	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/09 13:56
S107	0	none of sides forming	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/09 13:56
S109	13	olson.in. and (alkali and promoter and earth).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/17 16:22
S110	0	olson.in. and (alkali and promoter and earth with vapor).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/17 16:22
S111	10	olson.in. and (alkali and promoter with vapor).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/17 16:22
S112	0	"2015008283"	US-PGPUB; USPAT	ADJ	ON	2018/07/23 06:26
S113	2	"20150082833"	US-PGPUB; USPAT	ADJ	ON	2018/07/23 06:26
S114	24	olson.in. and liquid.clm. and promoted	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/23 07:50
S115	75	remov\$4 with mercury and (br or bromine) with liquid with carbon	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/23 07:54
S116	0	separating greater than "70" wt% of the mercury	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/23 09:17
S117	0	((separating greater) with (of the mercury)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/23 09:17
S118	20	"11209163"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/07/23 09:43

S119	40	(during with after with mercury with sorbent)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/01 17:38
S120	304	sorbent with mercury and sorbent with boiler	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/01 17:39
S121	2	"20070168213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/01 17:41
S122	18	before with burn\$4 with coal with sorbent	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/01 17:42
S123	204	("0174348" "0202092" "0208011" "0224649" "0229159" "0298727" "0346765" "0347078" "0367014" "0537926" "0537998" "0541025" "0625754" "0647622" "0685719" "0688782" "0700888" "0744908" "0846338" "0894110" "0896876" "0911960" "0945331" "0945846" "1112547" "1167471" "1167472" "1183445" "1788466" "1984164" "20020065581" "20020114749" "20020184817" "20030088370" "20030103882" "20040003716" "20040013589" "20040086439" "20040219083" "20050039598" "20060047526" "20060210463" "2016821" "2059388" "2089599" "2511288" "3194629" "3288576" "3437476" "3599610" "3662523" "3725530" "3764496" "3823676" "3838190" "3849267" "3849537" "3956458" "3961020" "3974254" "4040802" "4075282" "4094777" "4101631" "4115518" "4148613" "4174373" "4196173" "4226601" "4233274" "4272250" "4280817" "4305726" "4322218" "4377599" "4387653" "4394354" "4440100" "4472278" "4474896" "4519807" "4519995" "4555392" "4582936" "4602918" "4629721" "4693731" "4716137" "4741278" "4758418" "4764219" "4786483" "4804521" "4807542" "4824441" "4830829" "4873930" "4886519" "4892567" "4915818" "4933158" "4936047" "4964889" "5013358" "5024171" "5049163" "5116793" "5126300" "5137854" "5162598" "5190566" "5238488" "5350728" "5368617" "5409522" "5435980" "5447703" "5460643" "5505746" "5505766" "5571490").PN. OR ("5587003"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/01 17:42

		"5618508" "5635150" "5659100" "5670122" "5733516" "5738834" "5787823" "5810910" "5897688" "5910292" "5989506" "6024931" "6083289" "6240859" "6258334" "6372187" "6375909" "6475451" "6521021" "6528030" "6533842" "6558454" "6610263" "6613110" "6719828" "6732055" "6737031" "6746531" "6790420" "6808692" "6848374" "6878358" "6942840" "6953494" "6962617" "6974564" "6975975" "7468170" "7507083" "7674442" "7758827" "7776301").PN.				
S124	1	"15573128"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/02 12:07
S125	2	"20110207597"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/02 12:08
S126	2	"20070168213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 17:30
S127	71	sorbent with before with coal and remov\$4 with mercury	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 17:30
S128	234	"6953494"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 17:38
S129	121	"5435980"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 17:40
S130	35	promoter with sorbent and "30" g	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 22:19
S131	28	promoter with sorbent with mercury and "30" g	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 22:19
S132	4	promoter with sorbent with mercury and ("30" g).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 22:20
S133	4	promot\$4 with sorbent with mercury and ("30" g).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 22:23

S134	4	promot\$4 with sorbent with mercury and pre.clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 22:41
S135	2	promot\$4 with sorbent with mercury and pre-heater	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/02 22:42
S136	2	promot\$4 with sorbent with mercury and pre heater	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 08:36
S137	57	promot\$4 with sorbent with mercury and pre	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 08:36
S138	24	sorbent with preheat\$4 with coal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 08:39
S139	121	"5435980"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 08:47
S140	23	"11209163"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 11:28
S141	5	"14102896"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 11:48
S142	7	"12429058"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:09
S143	4	"12202595"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:23
S144	20	"12201595"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:24
S145	3	"14564860"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:27

S146	1	"15978760"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:28
S147	1	"15589359"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:32
S148	1	"15853029"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:37
S149	8	"15997091"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:42
S150	6	"14712558"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 12:42
S151	2	"15951970"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 15:18
S152	4	"15382114"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 15:47
S153	1	"15853029"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 15:51
S154	2	"20070168213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 18:18
S155	69	"4279873"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/03 18:42
S156	75	"7435286"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 07:59
S157	4	"15295594"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 08:08

S158	1	("20180257030").PN.	US-PGPUB; USPAT	ADJ	ON	2018/10/04 09:31
S159	86	"5569436"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 09:32
S160	6	"5785935"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 09:33
S161	8	"6475471"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 09:33
S162	53	"6103205"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 11:46
S163	0	pyrolysis with char with mercury with activated	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 11:49
S164	17	pyrolysis with char with mercury	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 11:49
S165	121	pyrolysis with char with activated carbon	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 11:50
S166	0	pyrolysis with char with activated carbon with mercury with sorbent	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 11:50
S167	43	pyrolysis with char with activated carbon and mercury with sorbent	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 11:50
S168	118	pyrolysis with char with tire	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 12:04
S169	58	pyrolysis with char with activated carbon and mercury	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 12:04
S170	8	"20040081724"	US-PGPUB; USPAT; USOCR;	ADJ	ON	2018/10/04 15:07

			FPRS; EPO; JPO			
S171	4	"14128179"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/04 15:10
S172	84	activat\$4 carbon with boiler with coal and remov\$4 with mercury	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/15 13:27
S173	88	activat\$4 carbon with boiler with coal and (remov\$4 or filter\$4 or absorb\$4 or adsorb\$4) with mercury	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/15 13:27
S174	0	mercury with stabiliz\$4 with sulfur dioxide	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/15 14:23
S175	75	"7435286"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/15 15:07
S176	6	"9468886"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/16 06:48
S177	17	"8821819"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/16 06:51
S178	15	"8652235"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/16 06:55
S179	93	"6136749"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/10/24 09:08
S180	4	"9757689"	US-PGPUB; USPAT	ADJ	ON	2018/10/24 12:37

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Modified form PTO/SB/08A(04-07) OMB 851-0031

US Patent & Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)	<i>Complete if Known</i>	
	Application Number	15/974,343
	Filing Date	May 8, 2018
	First Named Inventor	Edwin S. Olson
	Group Art Unit	1776
	Examiner Name	Unknown
Sheet 1 of 1	Attorney Docket No: 4820.001US9	

US PATENT DOCUMENTS

Examiner Initial *	USP Document Number	Publication Date	Name of Patentee or Applicant of cited Document
	US-20090297413A1	12/3/2009	Olson, Edwin S, et al.
	US-20180133646A1	5/17/2018	Pavlish, John H, et al.

FOREIGN PATENT DOCUMENTS

Examiner Initial *	Foreign Document Number	Publication Date	Name of Patentee or Applicant of cited Document	T 1

OTHER DOCUMENTS - NON PATENT LITERATURE DOCUMENTS

Examiner Initial *	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T 1
	"Application Serial No. 14/712,558, Non Final Office Action mailed 07-02-18", 16 pgs	
	"Application Serial No. 14/712,558, Supplemental Amendment filed 06-13-2018", 14 pgs.	
	"Application Serial No. 15/978,760, Preliminary Amendment Filed 5-15-2018", 7 pgs.	
	"Application Serial No. 15/295,594, Response filed 07-03-18 to Restriction Requirement mailed 05-22-18", 9 pgs.	
	"Application Serial No. 15/295,594, Response filed 07-24-18 to Restriction Requirement mailed 06-29-18", 9 pgs.	
	"Application Serial No. 15/295,594, Restriction Requirement mailed 05-22-18", 6 pgs	
	"Application Serial No. 15/295,594, Restriction Requirement mailed 06-29-18", 5 pgs	
	"Application Serial No. 15/295,594, Supplemental Amendment Filed 5-15-2018", 10 pgs.	
	"Application Serial No. 15/449,112, Notice of Allowance mailed 07-12-18", 8 pgs	
	"Application Serial No. 15/589,359, Final Office Action mailed 06-04-18", 13 pgs	
	"Application Serial No. 15/589,359, Response filed 05-18-18 to Non Final Office Action mailed 02-21-18", 14 pgs.	
	"Application Serial No. 15/589,359, Response filed 07-26-18 to Non Final Office Action mailed 06-04-18", 14 pgs.	
	"Application Serial No. 15/978,760, Response filed 07-13-18 to Non Final Office Action mailed 06-29-18", 12 pgs	
	"Application Serial No. 15/978,760, Non Final Office Action mailed 06-29-18", 9 pgs	
	"Application Serial No. 15/997,091, Non Final Office Action mailed 07-27-18", 13 pgs	
	"Canadian Application Serial No. 2,871,422, Office Action mailed 04-24-18", 4 pgs	
	"Supplementary European Search Report, dated December 6, 2012", 2 pgs	

EXAMINER /AMBER R ORLANDO/

DATE CONSIDERED 10/24/2018

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant is to place a check mark here if English language Translation is attached

A/N 15/974,343

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Edwin S. Olson et al.

Examiner: AMBER ROSE ORLANDO

Application No.: 15/974,343

Group Art Unit: 1776

Filed: May 8, 2018

Docket No.: 4820.001US9

Confirmation No.: 1072

Title: SORBENTS FOR THE OXIDATION AND REMOVAL OF MERCURY

AMENDMENT & RESPONSE UNDER 37 C.F.R. § 1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Applicant has received the Non-Final Office Action dated October 29, 2018. Please enter the following.

IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method for separating mercury from a mercury-containing gas, the method comprising:

combusting a mixture of coal and an additive that has been added to the coal, the additive comprising a bromide compound, to form the mercury-containing gas, wherein the combusting of the mixture is performed at a coal combustion facility site;

adding a particulate sorbent material comprising activated carbon into the mercury-containing gas;

promoting at least a portion of the particulate sorbent material by ~~chemically~~-reacting the sorbent material with a promoter that comprises $[[Br_2,]]$ HBr, Br⁻, or a combination thereof, in-flight, in a gas stream at the coal combustion facility site comprising contacting the particulate sorbent material dispersed in the gas stream with the promoter, to form a promoted sorbent material;

~~chemically-reacting-capturing~~ mercury in the mercury-containing gas with the promoted sorbent material, to form a mercury-sorbent; and

separating the mercury-sorbent from the mercury-containing gas.

2. (Original) The method of claim 1, further comprising mixing the additive and the coal before combusting the coal.

3. (Original) The method of claim 2, wherein the additive mixed with the coal is in a liquid.

4. (Original) The method of claim 3, wherein the liquid is a hydrocarbon, a chlorinated hydrocarbon, supercritical carbon dioxide, water, salt solution, or a combination thereof.

5. (Original) The method of claim 1, wherein the promoted sorbent material comprises active sites, wherein the active sites comprise halide anions bound to the activated carbon.

6. (Original) The method of claim 1, wherein the promoted sorbent material comprises active sites, wherein the active sites comprise carbocations bound to halide anions.

-
7. (Currently Amended) The method of claim 1, wherein ~~chemically~~ reacting the particulate sorbent material with the additive promoter in the mercury-containing gas stream comprises ~~chemically~~ reacting carbene species edge sites in the activated carbon with the additive promoter.
8. (Original) The method of claim 1, wherein carbocations in the activated carbon of the mercury-sorbent accept electrons from mercury atoms of the mercury-sorbent.
9. (Original) The method of claim 1, wherein the additive is substantially in vapor form in the mercury-containing gas.
10. (Previously Presented) The method of claim 1, wherein the additive comprises Ca, Na, or a combination thereof.
- 11.-13. (Canceled)
14. (Original) The method of claim 1, wherein the activated carbon is chosen from powdered activated carbon, granular activated carbon, carbon black, carbon fiber, aerogel carbon, pyrolysis char, and combinations thereof.
- 15.-20. (Canceled)
21. (Previously Presented) The method of claim 1, wherein the coal and the additive are mixed at a location upstream of a combustion furnace where combustion occurs.
22. (Previously Presented) The method of claim 1, comprising separating greater than 70 wt% of the mercury from the mercury-containing gas.
23. (Currently Amended) The method of claim 1, comprising separating greater than 70 wt% of the mercury from the mercury-containing gas on the promoted sorbent material.

24. (Currently Amended) The method of claim 1, wherein the promoted sorbent material has a composition comprising from about 1 to about 30 grams of additive per 100 grams of activated carbon.

25. (Currently Amended) The method of claim 1, wherein the method is a method for reducing mercury in the mercury-containing gas to a desired level, wherein separating the mercury-sorbent from the mercury-containing gas forms a cleaned gas, the method further comprising:

monitoring the mercury content of the cleaned gas; and

controlling, in response to the monitored mercury content of the cleaned gas, an injection rate of ~~injecting the particulate sorbent material into the mercury-containing gas, a rate at which the~~ promoter is added to the particulate sorbent composition material, or a combination thereof, so that the mercury content of the cleaned gas is maintained at or below the desired level.

26. (New) The method of claim 1, wherein the additive comprises Br₂, HBr, Br⁻, or a combination thereof.

REMARKS

This responds to the Non-Final Office Action dated October 29, 2018.

Claims 1, 7, and 23-25 are presently amended. No claims are presently canceled, and claims 11-13 and 15-20 were canceled previously. New claim 26 is are presently added. As a result, claims 1-10, 14, and 21-26 are now pending in this application.

Independent claim 1 is presently amended to recite “...a promoter that comprises $[[\text{Br}_2, \text{HBr}, \text{Br}^-]$, or a combination thereof...”

Independent claim 1 is presently amended to recite “...promoting ... in-flight in a gas stream at the coal combustion facility site comprising contacting the particulate sorbent material dispersed in the gas stream with the promoter....” Support can be found in the present published application at paragraphs [0076]-[0086].

Claim 25 is presently amended to recite “...controlling, in response to the monitored mercury content of the cleaned gas, an injection rate of ~~injecting the particulate sorbent material into the mercury-containing gas,~~ a rate at which the promoter is added to the particulate sorbent composition material, or a combination thereof, so that the mercury content of the cleaned gas is maintained at or below the desired level.” Support can be found in the present published application at paragraph [0025].

No new matter is added via the amendments herein.

New claim 26 is added, reciting “...wherein the additive comprises Br_2 , HBr, Br^- , or a combination thereof.” Support can be found in the present published application at paragraphs [0042] (promoter can be bromide, Br^-), [0054] and [0072] (bromine, bromide, or HBr can be promoter), paragraphs [0077]-[0086] (“additive” can mean promoter), and FIG. 11 (the additive can be added to the coal). Claim 26 is dependent on independent claim 1 and, as such, incorporates all the features of claim 1. Accordingly, new dependent claim 26 is patentable for at least the reasons given herein for patentability of independent claim 1.

No new matter is added via the new claims herein.

The Rejection of Claims Under §112

I. The Office Action rejected claims 1, 7, and 23-25 under 35 U.S.C. § 112(b) or 35 U.S.C. § 112 (pre-AIA), second paragraph, as allegedly being indefinite.

This rejection is respectfully traversed.

The Office Action states that claim 1 recites the “the sorbent material” in line 3, which is lacking sufficient antecedent basis.

Claim 1 is presently amended to recite “...the particulate sorbent material...”

The Office Action states that claim 7 recites “the sorbent material” in line 1, which is lacking sufficient antecedent basis.

Claim 7 is presently amended to recite “...wherein ~~chemically~~-reacting the particulate sorbent material with the additivepromoter in the ~~mercury-containing gas~~ stream comprises ~~chemically~~-reacting carbene species edge sites in the activated carbon with the additivepromoter.”

The Office Action states that claim 23 recites “the sorbent” in line 2, which is lacking sufficient antecedent basis.

Claim 23 is presently amended to recite “...comprising separating greater than 70 wt% of the mercury from the mercury-containing gas on the promoted sorbent material.”

The Office Action states that claim 24 recites “the sorbent material” in line 1, which is lacking sufficient antecedent basis.

Claim 24 is presently amended to recite “...wherein the promoted sorbent material has a composition comprising from about 1 to about 30 grams of additive per 100 grams of activated carbon.”

The Office Action states that claim 25 recites “the sorbent” in line 6, which is lacking sufficient antecedent basis.

Claim 25 is presently amended to recite “...an injection rate of ~~injecting~~ the particulate sorbent material ~~into the mercury-containing gas~~....”

The Office action states that claim 25 recites “the sorbent composition” in line 6, which is lacking sufficient antecedent basis.

Claim 25 is presently amended to recite “...a rate at which the promoter is added to the particulate sorbent composition material....”

Applicant therefore respectfully requests reconsideration and withdrawal of the rejection of claims 1, 7, and 23-25 under 35 U.S.C. § 112(b) or 35 U.S.C. § 112 (pre-AIA), second paragraph.

The Rejection of Claims Under §103

II. The Office Action rejected claims 1-3, 5-8, 14, and 21-25 under 35 U.S.C. § 103(a) over U.S. patent no. 5,435,980 (“Felsvang”) in view of U.S. patent publication no. 2004/0003716 (“Nelson”).

This rejection is respectfully traversed.

Independent claim 1 is presently amended to recite “...combusting a mixture of coal and an additive that has been added to the coal, the additive comprising a bromide compound, to form the mercury-containing gas, wherein the combusting of the mixture is performed at a coal combustion facility site; adding a particulate sorbent material comprising activated carbon into the mercury-containing gas; promoting at least a portion of the particulate sorbent material by ~~chemically~~ reacting the sorbent material with a promoter that comprises [Br₂,]HBr, Br⁻, or a combination thereof, in-flight in a gas stream at the coal combustion facility site comprising contacting the particulate sorbent material dispersed in the gas stream with the promoter, to form a promoted sorbent material; ~~chemically reacting capturing~~ mercury in the mercury-containing gas with the promoted sorbent material, to form a mercury-sorbent....”

As amended, any process encompassed by independent claim 1 includes in-flight promotion of activated carbon in the flue gas. Whether the activated carbon is untreated at the time of addition to the mercury-containing gas or the activated carbon is treated with an additive or promoter prior to addition to the mercury containing gas, the injected activated carbon encounters promoters in the flue gas formed from the combustion of the coal comprising the additive including a bromide compound, and is thereby promoted in-flight in the flue gas.

As explained herein at **II(A)**, there would be no motivation for a person of ordinary skill in the art to use Nelson's bromide additives in Felsvang's process. As explained herein at **II(B)(1)**, in-flight promotion with bromide promoters is more effective for mercury removal than treating the sorbent with bromide or bromine additives outside the mercury-containing gas, and as explained herein at **II(B)(2)**, there would be no way for a person of ordinary skill in the art to predict this advantage from the cited references. As explained herein at **II(C)(1)**, in-flight promotion with bromide promoters is more effective for mercury removal than in-flight promotion with chloride-promoters, and as explained herein at **II(C)(2)**, there would be no way for a person of ordinary skill in the art to predict this advantage from the cited references. As explained herein at **II(D)**, even if a person of ordinary skill in the art compared the mercury removal of Felsvang's activated carbons promoted with chloride in the flue gas to activated carbons treated with HCl outside of the flue gas, they would not determine that in-flight promotion provides the same or better mercury removal properties. As explained herein at **II(E)(1)**, activated carbon treated with bromide additives outside the flue gas and subsequently injected into the flue gas containing bromide promoters for in-flight promotion results in greater mercury removal than using activated carbon only treated with bromide additives outside the flue gas or activated carbon only treated with bromide promoters in-flight in the flue gas, and as explained herein at **II(E)(2)**, there would be no way for a person of ordinary skill in the art to predict this advantage from the cited references.

II(A). There would be no motivation for a person of ordinary skill in the art to use Nelson's bromide additives in Felsvang's process.

Independent claim 1 is presently amended to recite "...a promoter that comprises [[Br₂, HBr, Br⁻, or a combination thereof...."]

The Office Action admits that Felsvang fails to describe or suggest a halogen or halide promoter that is Br₂, HBr, or Br⁻. Nelson fails to describe or suggest in-flight promotion of activated carbon with a halide in the flue gas. The Office Action alleges that one of ordinary skill in the art would combine Nelson's additive with Felsvang's method to accomplish the presently claimed method, stating that such a modification of Felsvang would be made "...to promote activated carbon (Nelson paragraphs [0017] and [0041]) so as to provide an effective carbon sorbent for mercury." (Office Action, page 4, last sentence of last full paragraph). Applicant respectfully

disagrees. As explained below, a person of ordinary skill in the art would not be motivated to use Nelson's bromide additives in Felsvang's process.

Felsvang is directed to adding chlorine (Cl_2) or chloride (Cl^-) materials to the coal or combustion products. Felsvang makes clear that addition of chlorine or chloride material increases the amount of chloride supplied to the flue gas, or to the drying-absorption zone, see, Abstract and col. 3, lines 40-44. When Felsvang mentions activated carbon, the interaction between activated carbon and chloride is the focus: "[i]t has been experienced that the increase of the Hg-removing effect of chloride addition to the drying-absorption zone in a process treating flue gases of low chloride content is especially remarkable when activated carbon is present...." Col. 3, line 67 bridging to col. 4, line 4. For a person of ordinary skill in the art to be motivated to replace Felsvang's chloride-treatment with treatment by another material to provide an effective carbon sorbent for mercury, that person would need to think that the material they are using to replace the chloride would result in the same or better mercury-removal efficiency. However, not only does Felsvang fail to describe or suggest that in-flight promotion of activated carbon with chloride provides better mercury removal than treatment of activated carbon outside the flue gas with chloride; further, as shown herein at **II(D)**, treatment of activated carbon outside the flue gas with chloride actually provides better mercury removal than in-flight promotion of activated carbon with chloride, which would lead one of ordinary skill in the art away from using in-flight promotion.

Nelson's Background paragraph [0017] states that "[t]he particular advantages of using bromine rather than iodine or iodides, or chlorine or chlorides, with activated carbons for mercury control have not been previously appreciated." The paragraph then goes on to describe various accomplishments in the prior art, stating that prior art processes fail to use bromine as a sequestration agent on carbon, and concludes with "[r]ather, it serves as a catalyst, taking part in a repeated series of desired chemical reactions, but not becoming permanently consumed by any of them. Perhaps it is understandable that the tenacity of carbon-bromine-mercury complexes could be overlooked." Importantly, paragraph [0017] states that bromine (Br_2) is superior to I_2 or I^- , or Cl_2 or Cl^- , with activated carbons for sequestration, and never states that the claimed promoters HBr or Br^- are more effective with activated carbons than chlorides.

Nelson's paragraph [0041] states:

[0041] I have discovered that the simple act of exposing a carbonaceous material, preferably powdered activated carbon (PAC), to gaseous bromine, $\text{Br}_2(\text{g})$, or to gaseous hydrogen bromide, $\text{HBr}(\text{g})$, significantly increases the carbonaceous material's ability to remove mercury species when injected into high-temperature coal-fired flue-gas compositions. Surprisingly, gaseous bromine produces a much more effective and appropriate carbon sorbent for mercury in hot combustion gases than do iodine or iodide species, or chlorine or chloride species, in contrast to what has been taught in the prior art.

Paragraph [0041] begins by stating that bromine, defined as Br_2 , or hydrogen bromide, defined as HBr , increases the mercury absorption capacity of activated carbon. Then, paragraph [0041] states specifically that bromine (Br_2) produces a more effective mercury-absorbing carbon sorbent than iodine (I_2), or iodide (I^-), or chlorine (Cl_2), or chloride (Cl^-). With the precise definitions given for bromine and hydrogen bromide, and then reference only to bromine, Nelson makes clear that the comparison of efficacy is only with respect to bromine and not hydrogen bromide. Like paragraph [0017], paragraph [0041] also fails to state that HBr or Br^- are more effective with activated carbons than chlorides.

The majority of Nelson's Examples (1-4 and 8) focus only on Br_2 . Nelson's Examples 5-7 demonstrate the use of HBr -treated sorbent; however, none of these Examples or any other parts of Nelson compare the mercury-absorption performance of HBr -treated activated carbon to chloride-treated activated carbon such as HCl -treated activated carbon. Although figures 14 and 15 illustrate HBr -treated activated carbon and Cl_2 -treated activated carbon, Cl_2 -treated activated carbon is not chloride-treated carbon and these figures fail to show any examples of chloride-treated activated carbon.

Nelson's paragraph [0049] states:

[0049] A critical element in the process is that a bromine-containing gas 3 is used to treat the carbonaceous substrate. Preferably this gas comprises elemental bromine, $\text{Br}_2(\text{g})$, although other bromine-containing gases, such as hydrogen bromide, HBr , will also have the advantageous effect of the invention.

Paragraph [0049] says that using Br_2 is a critical element of the process. It states that HBr can also have the "advantageous effect of the invention"; however, it is not clear what advantage this is

referring to. The very next paragraph, [0050], states “[i]n the liquid form at ambient temperatures, elemental bromine is dense and compact, with advantages in transport and storage.” These statements also hold true for HBr in the form of a gas. No Example is given in Nelson comparing the mercury-absorption performance of activated carbons treated with bromides such as HBr to the mercury-absorption performance of chlorides such as HCl. In every statement comparing to other halogens or halides, Nelson states with great particularity, even giving the chemical formula, that bromine (Br₂) has advantageous effects over other halogens and halides but fails to mention bromides in these statements. One of ordinary skill in the art would not interpret paragraph [0049] or any other part of Nelson as describing or suggesting that bromides even have the same effectiveness for mercury sequestration when used to treat activated carbons as chlorides, let alone that bromides are more effective for mercury sequestration when used to treat activated carbons than chlorides or chlorine.

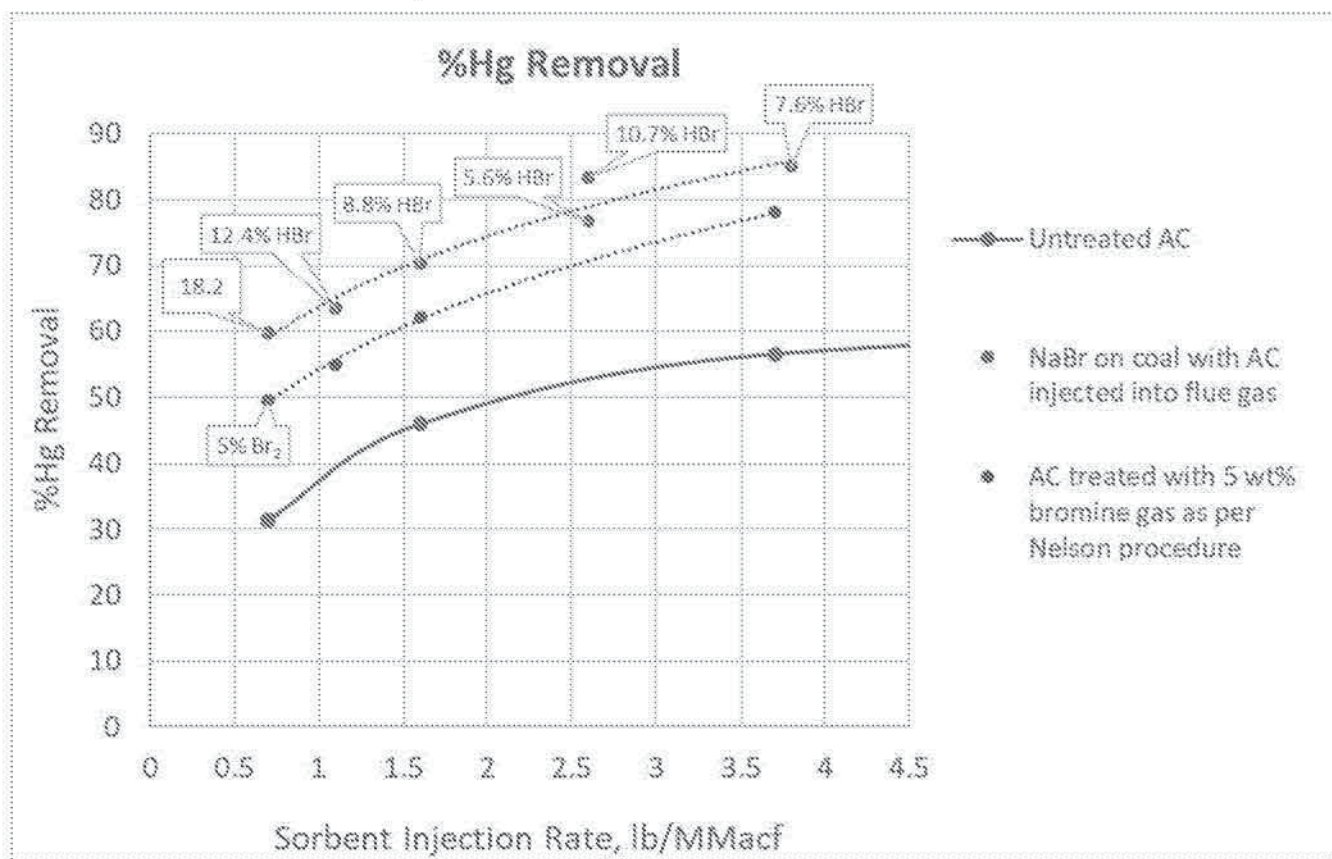
Nelson fails to describe or suggest that treatment of activated carbon with bromides such as HBr could provide any mercury-removal improvement, or even the same mercury-removal activity, compared to activated carbons treated with chlorides. Not only does Felsvang fail to describe or suggest that in-flight promotion of activated carbon with chloride provides better mercury removal than treatment of activated carbon outside the flue gas with chloride; further, as shown herein at **II(D)**, treatment of activated carbon outside the flue gas with chloride actually provides better mercury removal than in-flight promotion of activated carbon with chloride, which would lead one of ordinary skill in the art away from using in-flight promotion. A person of ordinary skill in the art would have no reason to modify Felsvang’s chloride process with a different promoter to form an effective carbon sorbent for mercury if the resulting mercury-removal efficiency could not be reasonably predicted to be the same or greater as that of Felsvang’s original process. Therefore, a person of ordinary skill in the art would not be motivated to combine Nelson’s bromide additive with Felsvang’s chloride method. Independent claim 1 is patentable for at least this reason.

II(B)(1). In-flight promotion with bromide promoters is more effective for mercury removal than treating the sorbent with bromide or bromine additives outside the mercury-containing gas.

The inventors of the present application have discovered that by combusting coal in the presence of a bromide promoter, and by placing an activated carbon sorbent in the mercury-

containing gas, as presently claimed, the activated carbon can be promoted by the promoter in-flight in the mercury-containing gas, and further, that in-flight bromide promotion of the activated carbon is more effective for mercury removal than use of an activated carbon that is treated with bromides or bromine outside the flue gas.

As explained in the 37 CFR § 1.132 declaration by John Pavlish filed with the Non-Final Office Action Response for Application No. 15/978,760 on December 3, 2018 ("first 132 Declaration"), pilot-scale testing was performed with activated carbon alone (untreated) injected into the flue gas, the activated carbon treated with Br_2 outside the flue gas as per the Nelson procedure (see, first 132 Declaration at item 6), and with NaBr added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas. The same activated carbon was used for each sample. See, the first 132 Declaration at items 8-11. The plot given in the first 132 Declaration at item 11 is reproduced below.



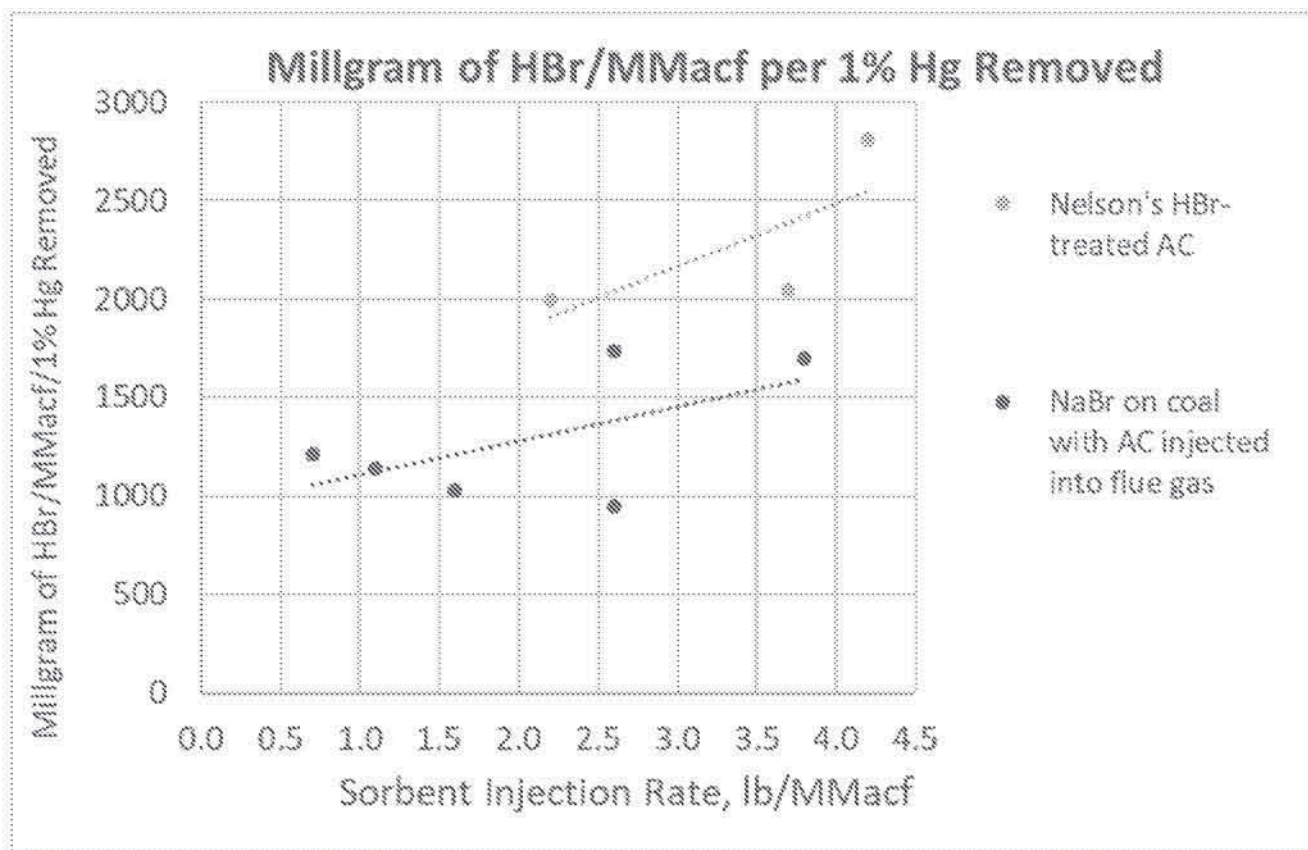
The data in the plot above from item 11 of the first 132 Declaration show that the NaBr added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas (in-flight promotion with Br⁻) provided a higher percent of mercury removal at all tested sorbent injection rates as compared to the activated carbon alone (untreated) and compared to the activated carbon treated with Br₂ outside the flue gas described herein at item 6 as per the Nelson procedure. With NaBr added to the coal and activated carbon injected into the flue gas, there was a significant reduction in the amount of sorbent required to achieve similar mercury removal compared to the activated carbon treated with Br₂ outside the flue gas. For example, to achieve 70% mercury removal, 2.5 lb/MMacf of Br₂-treated carbon was required, as compared to 1.6 lb/MMacf with NaBr added to the coal and activated carbon injected into the flue gas; an additional $(2.5 - 1.6 / 1.6) * 100\%$ or 56% treated sorbent was required to achieve the same level of mercury removal. See, first 132 Declaration at items 2-5 and 12.

The percent mercury removal per 1 wt% HBr versus the sorbent injection rate was compared with NaBr added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas using the pilot-scale plant, and with Nelson's activated carbon treated with HBr outside the flue gas. The data for Nelson's activated carbon treated with HBr outside the flue gas was taken directly from Nelson. The first plot given in the first 132 Declaration at item 13 is reproduced below, but only showing the bromide data.



The data in the plot above, derived from the first plot at item 13 of the first 132 Declaration, show that the NaBr added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas provided a significantly higher (about 2x) percent mercury removal per 1 wt% HBr at all tested sorbent injection rates as compared to Nelson's activated carbon treated with HBr outside the flue gas. See, first 132 Declaration at item 14.

The data from the pilot-scale plant was also plotted to show the milligrams of HBr/MMacf per 1% mercury removal versus the sorbent injection rate with NaBr added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas, and for Nelson's activated carbon treated with HBr outside the flue gas. The second plot given in the first 132 Declaration at item 13 is reproduced below.



The data in the plot above, derived from the second plot at item 13 of the first 132 Declaration, show that NaBr added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas provided a significantly lower milligrams of HBr/MMacf per 1% mercury removal at all tested sorbent injection rates as compared to Nelson's activated carbon treated with HBr outside the flue gas, indicating more efficient (approximately 2x) use of HBr for mercury removal during in-flight promotion of activated carbon than treatment of activated carbon outside the flue gas. See, first 132 Declaration at item 14.

II(B)(2). There is no way a person of ordinary skill in the art could predict from the cited references that in-flight promotion of a sorbent with bromide promoters is more effective for mercury removal than use of a sorbent that is treated with the same promoters outside the flue gas.

The M.P.E.P. at the beginning of § 2143.02 states (emphasis added) "[a] rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in

the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, *and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art.*”

As admitted by the Office Action, Felsvang fails to describe or suggest bromide promoters. Felsvang also fails to describe or suggest that treatment of an activated carbon with a chloride additive outside of flue gas has any advantages over in-flight promotion of an activated carbon with a chloride promoter. Further, as shown herein at **II(D)**, treatment of activated carbon outside the flue gas with chloride provides better mercury removal than in-flight promotion of activated carbon with chloride. Therefore, a person of ordinary skill in the art hypothetically having Felsvang in-hand would have no clue that in-flight promotion of activated carbon with a halide could give the same or better percent mercury removal over halide treatment outside of the flue gas, and would be led away from Felsvang’s in-flight process if they investigated the relative mercury removal of treatment of the activated carbon with chloride outside the flue gas versus in-flight treatment with chloride in the flue gas.

Nelson mentions treating activated carbon outside of flue gas, and then adding the activated carbon to flue gas. Nelson fails to describe or suggest in-flight promotion of an activated carbon with a halide in the flue gas. Therefore, a person of ordinary skill in the art hypothetically having Nelson in-hand would also have no idea that in-flight promotion of activated carbon with a halide could have any advantages over halide treatment outside of the flue gas.

There is no way to predict from the presently cited references the superior mercury capture discovered by the present inventors that occurs when activated carbon is promoted with bromide promoters in-flight in the mercury-containing gas, as occurs when following the present claims. The Office Action states at the end of the last full paragraph on page 4 that Nelson’s additives would be combined with Felsvang’s in-flight promotion “...so as to provide an effective carbon sorbent for mercury.” However, a person of ordinary skill in the art would have no idea that in-flight promotion with bromide promoters could work better than Nelson’s bromide-treatment outside the flue gas. Felsvang fails to describe or suggest that in-flight promotion provides a sorbent with even the same (let alone superior) properties as a sorbent treated outside the flue gas, and, as explained herein at **II(D)**, treatment of activated carbon outside the flue gas with chloride actually provides better mercury removal than in-flight promotion of activated carbon with chloride; similarly, Nelson fails

to describe in-flight promotion, let alone that in-flight promotion provides the same or superior mercury removal ability as compared to treatment outside the flue gas.

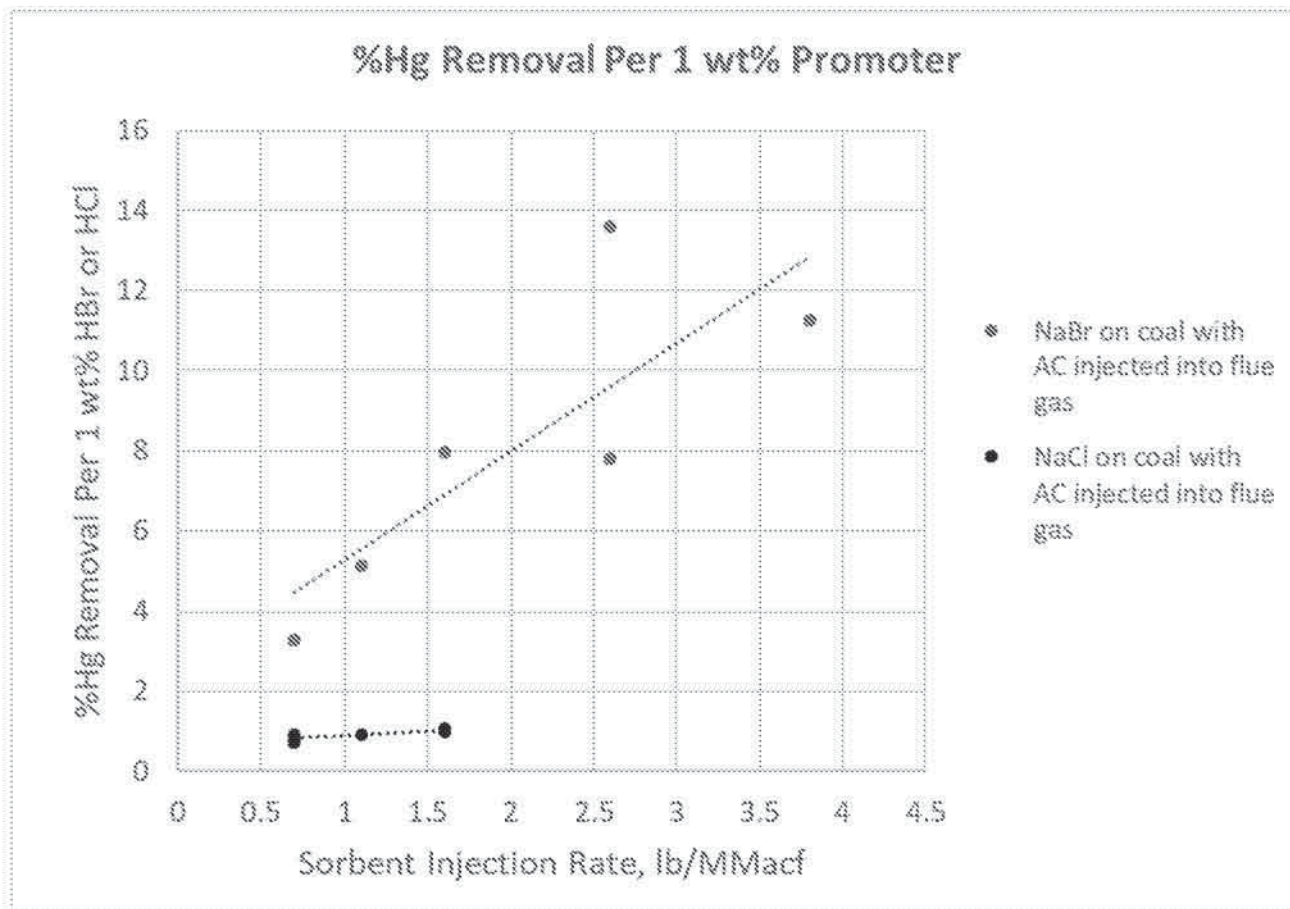
The only way that a person of ordinary skill in the art could discover that in-flight promotion of activated carbon with bromide promoters is more effective for mercury removal than bromide treatment outside the flue gas would not be from the cited references alone; instead, the person of ordinary skill would need to actually modify Felsvang with Nelson as alleged, and then to compare the mercury removal of Felsvang's modified process to Nelson's sorbent treated outside the flue gas.¹ However, the person of ordinary skill carrying out such a combination would be surprised to find that in-flight promotion with bromide is more effective for mercury removal than bromide treatment of the sorbent outside the flue gas. The process giving rise to these surprising results was discovered by the inventors of the present application. Surprising results are a hallmark of patentability; only by having the present application in-hand could such results be predicted, and a need to resort to hindsight analysis to predict the advantages of the combination asserted by the Office Action is indicative that the presently claimed invention is not obvious over the cited references. Accordingly, independent claim 1 is patentable over Felsvang in view of Nelson for at least this additional reason.

II(C)(1). In-flight promotion with bromide promoters is more effective for mercury removal than in-flight promotion with chloride-promoters.

The inventors of the present application have discovered that that in-flight bromide promotion of an activated carbon in a mercury-containing flue gas is significantly more effective for mercury removal than in-flight chloride promotion of an activated carbon.

As explained in the first 132 Declaration, pilot-scale testing was performed with NaBr or NaCl added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas. The same activated carbon was used for each sample. See, the first 132 Declaration at items 8-10. The first plot given in the first 132 Declaration at item 13 is reproduced below, but not showing the data from Nelson's HBr-treated AC.

¹ In the event the Examiner intends to argue that such advantages are inherent in the cited art, Applicant notes that the claimed invention is not specifically disclosed in the prior art. The Examiner cannot reason inherency in a §103 context based on a mere proposed or hypothetical combination of features from cited references. Such reasoning would merely reflect the Examiner's reliance on impermissible hindsight. See, M.P.E.P. § 2112(IV).



The data in the plot above, derived from the first plot at item 13 of the first 132 Declaration, show that the NaBr added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas provided a significantly higher (about 6-8x) percent mercury removal per 1 wt% HBr or HCl at all tested sorbent injection rates compared to the NaCl added to coal prior to introduction to the furnace with injection of untreated activated carbon into the flue gas. See, first 132 Declaration at item 14.

II(C)(2). There would be no way for a person of ordinary skill in the art to predict this advantage from the from the cited references.

As explained herein at II(A), Nelson fails to describe or suggest that treatment of activated carbon with bromides such as HBr could provide any mercury-removal improvement, or even the same mercury-removal activity, compared to Felsvang's activated carbons promoted with chlorides.

The only way that a person of ordinary skill in the art could discover that in-flight promotion with bromide promoters is more effective for mercury removal than in-flight promotion with chloride promoters would not be from the cited references alone; instead, the person of ordinary skill would need to actually modify Felsvang with Nelson as alleged, and then to compare the mercury removal of Felsvang's modified process to Felsvang's original process.² However, the person of ordinary skill carrying out such a combination would be surprised to find that promotion of activated carbon with bromides such as HBr could provide any mercury-removal improvement, or even the same mercury-removal activity, compared to Felsvang's activated carbons promoted with chlorides. The process giving rise to these surprising results was discovered by the inventors of the present application. Surprising results are a hallmark of patentability; only by having the present application in-hand could such results be predicted, and a need to resort to hindsight analysis to predict the advantages of the combination asserted by the Office Action is indicative that the presently claimed invention is not obvious over the cited references. Accordingly, independent claim 1 is patentable over Felsvang in view of Nelson for at least this additional reason.

II(D). Even if a person of ordinary skill in the art compared the mercury removal of Felsvang's activated carbons promoted with chloride in the flue gas to activated carbons treated with HCl outside of the flue gas, they would not determine that in-flight promotion provides the same or better mercury removal properties.

As explained herein at II(A), Felsvang fails to describe or suggest that in-flight promotion of activated carbon with chloride provides better mercury removal than treatment of activated carbon outside of the flue gas. For the sake of argument, even if a person of ordinary skill in the art were to compare mercury removal of Felsvang's activated carbons promoted with chloride in the flue gas to activated carbons treated with HCl outside of the flue gas, they would not find that in-flight promotion provides the same or better mercury-removal properties.

As explained in the first 132 Declaration, pilot-scale testing was performed with activated carbon treated with HCl outside the flue gas as per the Nelson procedure (see, first 132 Declaration

² In the event the Examiner intends to argue that such advantages are inherent in the cited art, Applicant notes that the claimed invention is not specifically disclosed in the prior art. The Examiner cannot reason inherency in a §103 context based on a mere proposed or hypothetical combination of features from cited references. Such reasoning would merely reflect the Examiner's reliance on impermissible hindsight. See, M.P.E.P. § 2112(IV).