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**Declarations under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

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(54) Title: PRODUCING ENGINEERED FUEL FEEDSTOCKS WITH REDUCED CHLORINE CONTENT

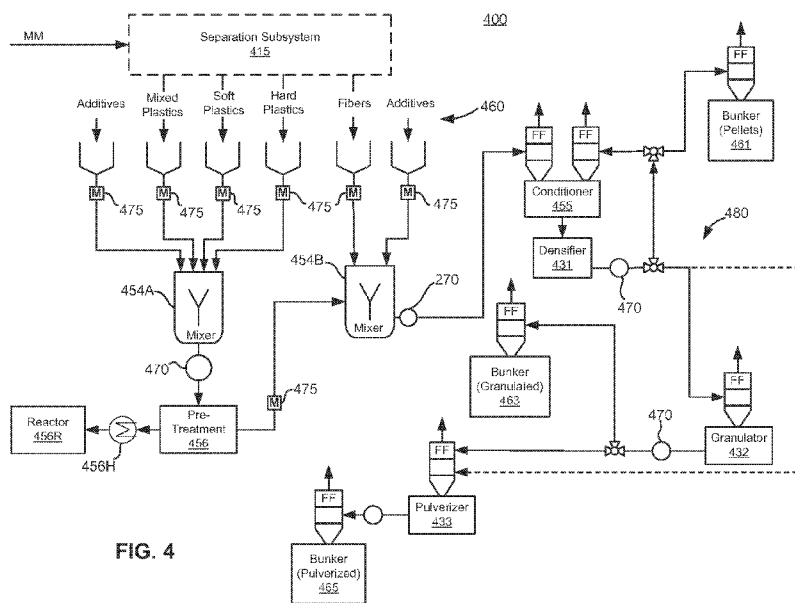


FIG. 4

(57) Abstract: Systems and methods for producing engineered fuels from municipal solid waste material are described herein. In some embodiments, a method includes combining a first waste stream that includes at least one of hard plastic, soft plastic and mixed plastic with a sorbent and increasing the temperature of the combined first waste stream and sorbent to a temperature of at least about 200 °C. The method further includes combining the thermally treated first waste stream and sorbent with a second waste stream that includes fiber, and compressing the combined first waste stream, sorbent, and second waste stream to form a densified engineered fuel feedstock.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/40597

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC(8) - C10L 10/00, 5/48, 1/12 (2013.01)  
 USPC - 44/589, 590, 530  
 According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 IPC(8): C10L 10/00, 5/48, 1/12, 1/18, 1/28, 5/00, 5/06, 5/12, 5/14, 5/40, 5/44, 5/46 (2013.01)  
 USPC: 44/589, 590, 530, 605, 10, 21, 320, 357, 385, 550, 553, 628; 241/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); Espacenet; Google Scholar; DialogPro; IP.com – adsorbent, biomass, CaO, Ca(OH)<sub>2</sub>, calcium, cellulose\*, densif\*, fiber\*, heat, lime, pellet\*, paper, plastic, pvc, sorbent, thermoplastic, torref\*

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/0099890 A1 (BOHLIG, JW et al.) 05 May 2011; paragraphs [0011], [0027], [0029], [0107], [0123], [0125], [0136], [0149], [0154], [0156]	1-10, 40-41
Y	US 2009/0272027 A1 (RUITERS, GHJ) 05 November 2009; figure 1; paragraphs [0074], [0078], [0083], [0085], [0086], [0089], [0090]	1-10, 40-41
Y	US 5980595 A (ANDREWS, MR) 09 November 1999; figure 3; column 4, lines 3-10	1-10, 40-41
Y	US 6635093 B1 (SCHOEN, LAA et al.) 21 October 2003; column 1, lines 4-6; column 1, line 65 to column 2, line 28; column 3, lines 31-47	7-10
A	US 2010/0218419 A1 (BAI, D) 02 September 2010; paragraphs [0028], [0031], [0033], [0048], [0076], [0126], [0127], [0147], [0223], [0242], [0251], [0254]	1-10, 40-41
A	US 4822379 A (THOMPSON, J) 18 April 1989; abstract; column 4, lines 43-68; column 6, lines 23-36	1-10, 40-41
A	US 4529407 A (JOHNSTON, IF et al.) 16 July 1985; abstract; figure; column 8, lines 1-68	1-10, 40-41
A	WO 2008/107042 A2 (NAFID, M et al.) 12 September 2008; abstract; page 12, lines 1-7; page 14, lines 6-9	1-10, 40-41
A	US 2009/0205546 A1 (KLUKO, M) 20 August 2009; entire document	1-10, 40-41
A	US 2003/0221363 A1 (REED, TB) 04 December 2003; entire document	1-10, 40-41

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	
“A” document defining the general state of the art which is not considered to be of particular relevance	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“E” earlier application or patent but published on or after the international filing date	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“O” document referring to an oral disclosure, use, exhibition or other means	“&” document member of the same patent family
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 25 November 2013 (25.11.2013)	Date of mailing of the international search report <b>06 DEC 2013</b>
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Shane Thomas  PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-10 and 40-41 are directed toward a method of producing an engineered fuel feedstock from a processed MSW waste stream.

Group II: Claims 11-21 are directed toward another method of producing an engineered fuel feedstock from a processed MSW waste stream.

Group III: Claims 22-28 and 42-43 are directed toward a method of processing MSW waste streams to form an engineered fuel feedstock.

-\*\*\*-Continued Within the Next Supplemental Box-\*\*\*-

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-10, 40-41

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

\*\*\*-Continued from Box No. III: Observations where unity of invention is lacking-\*\*\*

Group IV: Claim 29 is directed toward a system for forming a densified engineered fuel feedstock.

Group V: Claim 30 is directed toward a system for processing and sorting a municipal solid waste stream.

Group VI: Claims 31-39 are directed toward an engineered fuel feedstock made from a processed MSW waste stream.

The inventions listed as Groups I-VI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I a first waste stream that includes at least one of hard plastic, soft plastic and mixed plastic with a sorbent; increasing the temperature of the combined first waste stream and sorbent to a temperature of at least about 200 degrees C; and combining the thermally treated first waste stream and sorbent with a second waste stream, the second waste stream including fiber, which are not present in Groups II-VI; the special technical features of Group II include heating a first waste stream above a decomposition point to produce a second waste stream and a gas; extracting gas from the second waste stream; and reacting the gas to a less reactive state, which are not present in Groups I and III-VI; the special technical features of Group III include sorting the processed waste stream based on density into a first material of a first density classification having a bulk density greater than about 15 lb/ft<sup>3</sup>, and a second material of a second density classification having a bulk density between about 4 lb/ft<sup>3</sup> and about 15 lb/ft<sup>3</sup>, and a third material of a third density classification having a bulk density less than about 4 lb/ft<sup>3</sup>, which are not present in Groups I-II and IV-VI; the special technical features of Group IV include a first bunker of waste constituents of a first type separated from a mixed municipal solid waste stream; and a second bunker of waste constituents of a second type separated from the mixed municipal solid waste stream, the waste constituents of the first type different than the waste constituents of the second type, which are not present in Groups I-III and V-VI; the special technical features of Group V include a processing sub-system configured to receive a municipal solid waste stream and to remove the non-processable waste; a processing apparatus configured and disposed to receive constituents of the municipal solid waste stream from the processing sub-system and reduce the size of the constituents of the waste stream to an average particle size of less than about 3/4 inch; a separation sub-system configured and disposed to receive the constituents of the waste stream having an average particle size of less than about 3/4 inch, which are not present in Groups I-IV and VI; the special technical features of Group VI include an engineered fuel feedstock made from a processed MSW waste stream, comprising: a plastic content of between about 5 wt. percent and about 50 wt. percent; a fiber content of between about 50 wt. percent and about 95 wt. percent; a sorbent content of between about 1 wt. percent and about 50 wt. percent; and a total chlorine content of less than 400 ppm, which are not present in Groups I-V.

The common technical features of Groups I-VI are a method of producing an engineered fuel feedstock from a processed MSW waste stream, the method comprising: combining a waste stream that includes a plastic, with a sorbent; heating the combined waste stream and sorbent; combining the thermally treated waste stream and sorbent with a second waste stream, compressing the combined first waste streams and sorbent to form a densified engineered fuel feedstock; combining the waste streams in a predetermined ratio to form an engineered fuel feedstock; processing a municipal solid waste stream to remove non-combustible waste; sorting the processed waste; combining the processed waste and an additive; heating the material to form a gas; a mixer configured and disposed to combine the waste constituents of the first type and an additive; a treating apparatus configured and disposed to heat the waste constituents of the first type and the additive to alter the chemical composition of the waste constituents of the first type; a densifier configured and disposed to compress the treated waste constituents of the first type and additive from the treating apparatus with the waste constituents of the second type to form a densified engineered fuel feedstock; and an engineered fuel feedstock made from a processed MSW waste stream, comprising plastic, fiber, and sorbent.

These common technical features are disclosed by US 2011/0099890 A1 to Bohlig, et al (hereinafter 'Bohlig'). Bohlig discloses a method of producing an engineered fuel feedstock from a processed MSW waste stream (engineered fuel feed stocks derived from processed MSW waste streams; abstract), the method comprising: combining a waste stream that includes a plastic, with a sorbent (selecting a plurality components from a processed MSW waste stream, including plastic, and adding a sorbent; paragraphs [0066], [0107]); heating the combined waste stream and sorbent (treatment of the MSW with high heat, where a sorbent is added to the MSW waste; paragraphs [0047], [0051]); combining the thermally treated waste stream and sorbent with a second waste stream (adding additional engineered fuel feed stock components (MSW wastes are components of the feedstock); paragraph [0055]), compressing the combined first waste streams and sorbent to form a densified engineered fuel feedstock (feedstock is compressed to form densified products, including densified cubes, briquette, pellets, sheets, and honeycombs; paragraphs [0045], [0149], [0154]); combining the waste streams in a predetermined ratio to form an engineered fuel feedstock (the added sorbent is in an amount of between about 0.1% (weight sorbent/weight fuel feed stock (w/w)) and 50% (w/w) (predetermined ratio); paragraph [0030]); processing a municipal solid waste stream to remove non-combustible waste (processed MSW contains substantially no glass, metals, grit, or non-combustibles; paragraph [0125]); sorting the processed waste (the MSW can be processed by any method that allows for identification and separation of the component parts according to material type; paragraph [0151]); combining the processed waste and an additive (adding a sorbent (additive) to MSW waste feeds streams; paragraph [0051], [0054]); heating the material to form a gas (treatment of the MSW with high heat would emit gases; paragraph [0047]); a mixer configured and disposed to combine the waste constituents of the first type and an additive (selecting MSW waste components and an amount of sorbent and mixing the components together (in a mixer); paragraph [0060], [0063]); a treating apparatus configured and disposed to heat the waste constituents of the first type and the additive to alter the chemical composition of the waste constituents of the first type (treatment of the MSW with high heat and optionally also high heat under pressure would will also render the MSW biologically inert (change in chemical composition)); a densifier configured and disposed to compress the treated waste constituents of the first type and additive from the treating apparatus with the waste constituents of the second type to form a densified engineered fuel feedstock (feedstock is compressed to form densified products, including densified cubes, briquette, pellets, sheets, and honeycombs; paragraphs [0045], [0149], [0154]); and an engineered fuel feedstock made from a processed MSW waste stream, comprising plastic, fiber, and sorbent (an engineered fuel feed stock is produced by selecting MSW waste components, including plastics and fibers, and adding an amount of a sorbent; components of municipal solid waste include without limitation plastics, fibers; paragraphs [0057]-[0063], [0123], [0125]).

Since the common technical features are previously disclosed by the Bohlig reference, these common features are not special and so Groups I-VI lack unity.