

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 287122-0159P	<b>FOR FURTHER ACTION</b>	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US 18/52102	International filing date ( <i>day/month/year</i> ) 21 September 2018 (21.09.2018)	(Earliest) Priority Date ( <i>day/month/year</i> ) 27 September 2017 (27.09.2017)
Applicant RJ LEE GROUP, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- the international application in the language in which it was filed.  
 a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b.  This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c.  With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2.  **Certain claims were found unsearchable** (see Box No. II).

3.  **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

- the text is approved as submitted by the applicant.  
 the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- the text is approved as submitted by the applicant.  
 the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 2  
 as suggested by the applicant.  
 as selected by this Authority, because the applicant failed to suggest a figure.  
 as selected by this Authority, because this figure better characterizes the invention.
- b.  none of the figures is to be published with the abstract.

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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 searched, the appropriate additional search fees must be paid.

Group I: Claims 1-35, directed to a method of processing pyrolysis oil.

Group II: Claims 36-54, directed to an apparatus for processing pyrolysis oils.

**\*\*please see the continuation at the end of this form\*\***

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.:

- 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.

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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - B01D 15/00, B01D 1/00 (2019.01) CPC - C10L 1/00, C10L 1/322, B01 D5/0057, C10K 1/00, C10L 2290/02, Y02E 50/14, B01 D15/00, C10G 25/12, B01J 20/12, C10G 2300/44, Y10S 502/515, B01J 20/34, B01D 11/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) See Search History Document		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched See Search History Document		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) See Search History Document		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y --- A	US 2014/0352204 A1 (TOLERO ENERGY, LLC) 4 December 2014 (04.12.2014) the entire document, and more specifically: para [0002], [0009], [0015]-[0016], [0019]-[0020], [0023]-[0025], [0027]-[0030], [0037], [0041], [0044]; figure 1; claim 23	36, 38-39, 42 and 44-45 ----- 46-54 ----- 1-35, 37, 40-41 and 43
Y --- A	US 2003/0015473 A1 (MURPHY et al.) 23 January 2003 (23.01.2003) the entire document, and more specifically: para [0045], [0057], [0064], [0066], [0072]; abstract	46-54 ----- 1-35
Y --- A	US 2009/0312176 A1 (OSAHENI et al.) 17 December 2009 (17.12.2009) the entire document, and more specifically: para [0001], [0003]-[0004], [0007], [0013]-[0015], [0026], [0038]; figure 1	50-54
A	US 4,747,937 A (HILFMAN et al.) 31 May 1988 (31.05.1988) the entire document, and more specifically: col 2, ln 24-36; col 4, ln 68; col 5, ln 1-3	37, 40-41 and 43
A	US 2014/0250774 A1 (UPM-KYMMENE CORPORATION) 11 September 2014 (11.09.2014); the entire document	1-54
A	MAHFUD et al., "Acetic Acid Recovery from Fast Pyrolysis Oil. An Exploratory Study on Liquid-Liquid Reactive Extraction using Aliphatic Tertiary Amines"; Separation Science and Technology, Volume 43, Issue 11-12 (22 June 2010), pg 3056?3074 (the entire document)	1-54
A	US 2012/0017493 A1 (Traynor et al.) 26 January 2012 (26.01.2016) entire document	1-54
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 "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 "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 "&" document member of the same patent family		
Date of the actual completion of the international search 12 February 2019	Date of mailing of the international search report <b>26 FEB 2019</b>	
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. 571-273-8300	Authorized officer: Lee W. Young  PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774	

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**\*\*continuation of Box III (Lack of Unity) \*\***

The inventions listed as Groups I-II 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:

**Special Technical Features:**

Group I requires adjusting the polarity of said oil; binding unwanted components to clay, eluting the clean oil in the non-polar solvent, and separating the non-polar solvent from the oil, not required by group II.

Group II requires an apparatus for processing pyrolysis oils; a first vessel for holding/receiving a mixture of said oil and a non-polar solvent; use-of-heater/heating for evaporating said non-polar solvent; a condenser, not required by group I.

**Common Technical Features:**

Groups I and II share the technical feature of processing pyrolysis oil; non-polar solvent; clay. However, these shared technical features do not represent a contribution over prior art, because the shared technical feature is being anticipated by WO 2012/062924 A1 to Shell Internationale Research Maatschappij B.V. (hereinafter Shell). Shell teaches processing pyrolysis oil (abstract; pg 3, ln 24-26; a process for the preparation of a biofuel and/or biochemical from a pyrolysis oil); non-polar solvent (pg 24, ln 19-26; solvents, such as hexanes); clay (pg 18, ln 29-31; pg 19, ln 1-2; the use of a filler, such as clays).

As the shared technical features were known in the art at the time of the invention, they cannot be considered common technical features that would otherwise unify the groups. Therefore, Groups I-II lack unity under PCT Rule 13.