
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BJ, BF, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:
1 April 2010

(54) Title: METHOD OF EXTRACTION OF FURFURAL AND GLUCOSE FROM BIOMASS USING ONE OR MORE SUPERCritical FLUIDS

Abstract: Methods of making glucose and/or furfural from biomass require one or more supercritical fluids that may be used to process biomass, cellulose from the biomass, and/or xyllose from the biomass. Examples of supercritical fluids for use in processing biomass include ethanol, water, and carbon dioxide at a temperature and pressure above the critical points for ethanol and carbon dioxide but at a temperature and pressure below that of the critical point for water. A supercritical fluid containing carbon dioxide and water may be used to convert cellulose to glucose or convert xyllose to furfural. The fluid has a temperature and pressure above the critical point of carbon dioxide, but at least one of the temperature and pressure is below the critical point for water.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION/ SUBJECT MATTER

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):

C08H

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 practical, search terms used)

EPO-Internal , CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate of the relevant passages</th>
<th>Relevant to claim No</th>
</tr>
</thead>
</table>

Further documents are listed in the continuation of Box C

See patent family annex

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

A | document member of the same patent family

Date of the actual completion of the international search: 29 January 2010

Date of mailing of the international search report: 08/02/2010

Name and mailing address of the ISA

European Patent Office, P B 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel (+31-70) 340-2040,
Fax (+31-70) 340-3016

Authorized officer

Gerber, Myri am
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>W. SANGARUNLERT ET AL.: &quot;Furfural production by acid hydrolysis and supercritical carbon dioxide extraction from rice husk&quot; KOREAN JOURNAL OF CHEMICAL ENGINEERING, vol. 24, no. 6, 2007, pages 936-941, XP002565485 abstract</td>
<td>1-204</td>
</tr>
<tr>
<td>X</td>
<td>L. LI ET AL.: &quot;Interaction of supercritical fluids with lignocellulosic materials&quot; INDUSTRIAL AND ENGINEERING CHEMISTRY RESEARCH, vol. 27, 1988, pages 1301-1312, XP002565486 abstract</td>
<td>1-204</td>
</tr>
<tr>
<td>X</td>
<td>US 4 493 797 A (AVEDESIAN MICHAEL M [CA]) 15 January 1985 (1985-01-15) claims 1,5</td>
<td>1-204</td>
</tr>
<tr>
<td>Category</td>
<td>Citation of document, with indication, where appropriate, of the relevant passages</td>
<td>Relevant to claim No.</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>X</td>
<td>ERZENGIN M ET AL: &quot;Liquefaction of sunflower stalk by using supercritical extraction&quot; ENERGY CONVERSION AND MANAGEMENT, ELSEVIER SCIENCE PUBLISHERS, OXFORD, GB, vol. 39, no. 11, 1 August 1998 (1998-08-01), pages 1203-1206, XP004120806 ISSN: 0196-8904 abstract</td>
<td>1-204</td>
</tr>
</tbody>
</table>
Continuation of Box II.2

Claims Nos.: –

The present claims relate to an extremely large number of possible methods. Support and disclosure in the sense of Article 6 and 5 PCT is to be found however for only a very small proportion of embodiments of these claimed methods (see examples 1-12). The non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search of the claims (PCT Guidelines 9.19 and 9.23).

The search of the claims was restricted to those claimed methods which appear to be supported, i.e. the fractionation of biomass using water and supercritical carbon dioxide and/or water and supercritical C1-C5-alcohols.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.
### 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 NO.: □ because they relate to subject matter not required to be searched by this Authority, namely:

2. CLAIMS NO.: × 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:
   
   see FURTHER INFORMATION sheet PCT/ISA/210

3. CLAIMS NO.: □ 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:

1. CLAIMS NO.: □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. CLAIMS NO.: □ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. CLAIMS NO.: □ 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. CLAIMS NO.: □ 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.
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>US 2009247633 A1</td>
<td>01-10-2009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FI 844981 A</td>
<td>23-06-1985</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 60132997 A</td>
<td>16-07-1985</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE 8405837 A</td>
<td>23-06-1985</td>
</tr>
</tbody>
</table>