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AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
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DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR,
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MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
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(54) Title: PROCESS TO REDUCE ETHANOL RECYCLED TO ACETIC ACID HYDROGENATION REACTOR

(57) Abstract: The present invention is directed to processes for recovering ethanol obtained from the hydrogenation of acetic acid. Acetic acid is hydrogenated in the presence of a catalyst in a hydrogenation reactor to form a crude ethanol product. The crude ethanol product is separated in one or more columns to recover ethanol. In some embodiments, less than 10 wt.% ethanol is recycled to the hydrogenation reactor.



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/035208

A. CLASSIFICATION OF SUBJECT MATTER
 INV. C07C29/149 C07C29/76 C07C29/80 C07C29/84 C07C67/08
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 ADD.
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 C07C
 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/082322 A1 (JEVTIC RADMILA [US] ET AL) 7 April 2011 (2011-04-07) claims; tables paragraph [0075] paragraph [0089] -----	1-22

Further documents are listed in the continuation of Box C.

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 26 October 2012	Date of mailing of the international search report 09/11/2012
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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 Österle, Carmen
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/035208

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:

see additional sheet

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 an 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.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/ US2012/ 035208

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13

process for producing ethanol comprising separating at least a portion of the second distillate in a third distillation column to yield a third distillate comprising ethyl acetate and a third residue comprising ethanol, wherein the first distillate is returned to the reactor and less than 10% of the ethanol from the crude ethanol stream is returned to the reactor.

2. claims: 14-22

Process for producing ethanol comprising converting a portion of the first residue into a partial vapor feed having less than 30 mol.% of the contents in the vapor phase; separating a portion of the partial vapor feed in a second distillation column to yield a second residue comprising acetic acid and a second distillate comprising ethanol; and recovering ethanol from the second distillate.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/035208

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011082322	A1	NONE	