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[Continued on next page]

(54) Title: HYDROTHERMAL HYDROCATALYTIC TREATMENT OF BIOMASS USING WATER TOLERANT CATALYSTS

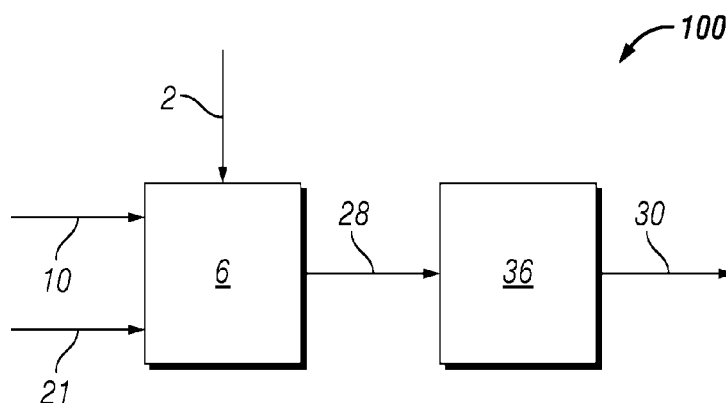


FIG. 1

(57) Abstract: A method of hydrothermal hydrocatalytic treating biomass is provided. Lignocellulosic biomass solids is provided to a hydrothermal digestion unit in the presence of a digestive solvent, and a supported hydrogenolysis catalyst containing (a) sulfur, (b) Mo or W, and (c) Co, Ni or mixture thereof, incorporated into an alumina support, which support is predominantly alpha alumina; (ii) heating the lignocellulosic biomass solids and digestive solvent in the presence of hydrogen, and supported hydrogenolysis catalyst thereby forming a product solution containing plurality of oxygenated hydrocarbons, said alumina support having a specific surface area of up to 30 m2/g and said catalyst retaining a crush strength of at least 50% after being subjected to an aqueous phase stability test compared with before the aqueous phase stability test or a crush strength of at least 0.25 kg after being subjected to an aqueous phase stability test.



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# INTERNATIONAL SEARCH REPORT

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**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. C10G3/00 B01J21/06 B01J35/00 C10G1/06 B01J21/04  
 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)  
 C10G B01J

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

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Y,P	WO 2012/174103 A1 (SHELL OIL CO [US]; SHELL INT RESEARCH [NL]; KOMPLIN GLENN CHARLES [US]) 20 December 2012 (2012-12-20) page 2, lines 18-33 page 14, lines 3-11; claims -----	1-11
Y	WO 2008/054564 A1 (DOW GLOBAL TECHNOLOGIES INC [US]; WALLIN STEN [US]; SERAFIN JULIANA G) 8 May 2008 (2008-05-08) page 1 ----- -/--	1-11

Further documents are listed in the continuation of Box C.       See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search  <b>17 June 2014</b>	Date of mailing of the international search report  <b>27/06/2014</b>
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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  <b>Cagnoli, Michele</b>
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International application No PCT/US2013/076327
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Y	US 3 950 507 A (BORESKOV GEORGY KONSTANTINOVIC ET AL) 13 April 1976 (1976-04-13) column 2, lines 1-3 -----	1-11
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Information on patent family members

International application No PCT/US2013/076327
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