



New connection on: : 11-04-2018 : 00:00:56 - Last disconnection on: : 10-04-2018 : 20:25:40

V 4.0.0.44358(LP,U,linux) (Rev:43856 2017-04-27 09:03:29+0200#(D201802))(RPM D201802)

Welcome to EPOQUE Rebuild under the Production Environment

[PATENW: SS 2] ..fi epodoc

 Database: EPODOC

[EPODOC: SS 7] lignocel+ and hydrol+ and enzyme and (steam or vapor)

Results in EPODOC 25

[SS 8] 7 and hydrolas+

Results in EPODOC 1

[SS 9] ..li



1/1 © EPODOC / EPO

PN - [CN106399394](#) A 20170215

PR - CN201611134776 20161211

AP - CN201611134776 20161211

DT - I

CNOI - [C12P19/14](#) ; [C12P7/10](#)

CCA - [Y02E50/16](#)

PA - GUANGXI COFCO BIO-ENERGY CO LTD

TI - Method for preparing ethanol from banana trees

AB - The invention discloses a method for preparing ethanol from banana trees. The method comprises the following steps: collecting the banana trees, mechanically dehydrating the banana trees, crushing the dehydrated banana trees, carrying out pressure maintaining boiling, and carrying out **steam** explosion; preparing a banana tree powder slurry mash, adjusting the pH value of the mash, and carrying out **lignocellulose enzyme hydrolysis** to form sugar; adjusting the pH value of the sugar, adding 15-25% of yeast mash, and carrying out continuous fermentation to form finished yeast mash; and boiling the finished yeast mash, condensing the boiled finished yeast mash to obtain an alcohol-containing liquid, and distilling the alcohol-containing liquid at 78.3 DEG C to obtain ethanol with the purity being 99% or more. The ethanol is prepared from the banana trees in order to make agriculture and forestry wastes become industrial product raw materials, and the optimum substrate content and optimum cellulase are determined through carrying out enzymatic **hydrolysis** on the banana trees by using

different kinds of cellulose **hydrolases** at different substrate contents, so the proportion of banana raw material fibers converted into ethanol is increased, and commercialization of raw material production is realized, thereby the method for preparing ethanol from banana trees is industrialized, and the product market competitiveness is improved.

[SS 9] 7 and ferment+

Results in EPODOC 13

[SS 10] ..li



1/13 © EPODOC / EPO

PN - [CN106399394](#) A 20170215
 PR - CN201611134776 20161211
 AP - CN201611134776 20161211
 DT - I
 CNOI - [C12P19/14](#) ; [C12P7/10](#)
 CCA - [Y02E50/16](#)
 PA - GUANGXI COFCO BIO-ENERGY CO LTD
 TI - Method for preparing ethanol from banana trees
 AB - The invention discloses a method for preparing ethanol from banana trees. The method comprises the following steps: collecting the banana trees, mechanically dehydrating the banana trees, crushing the dehydrated banana trees, carrying out pressure maintaining boiling, and carrying out **steam** explosion; preparing a banana tree powder slurry mash, adjusting the pH value of the mash, and carrying out **lignocellulose enzyme hydrolysis** to form sugar; adjusting the pH value of the sugar, adding 15-25% of yeast mash, and carrying out continuous **fermentation** to form finished yeast mash; and boiling the finished yeast mash, condensing the boiled finished yeast mash to obtain an alcohol-containing liquid, and distilling the alcohol-containing liquid at 78.3 DEG C to obtain ethanol with the purity being 99% or more. The ethanol is prepared from the banana trees in order to make agriculture and forestry wastes become industrial product raw materials, and the optimum substrate content and optimum cellulase are determined through carrying out enzymatic **hydrolysis** on the banana trees by using different kinds of cellulose **hydrolases** at different substrate contents, so the proportion of banana raw material fibers converted into ethanol is increased, and commercialization of raw material production is realized, thereby the method for preparing ethanol from banana trees is industrialized, and the product market competitiveness is improved.

2/13 © EPODOC / EPO

PN - [UA83951](#) C2 20080826
 PR - UA20070003590 20040831
 AP - UA20070003590 20040831
 DT - I
 PA - BIOTECH PROGRESS A S [CZ]
 TI - PROCESS AND APPARATUS FOR COMPREHENSIVE TREATMENT OF RENEWABLE RAW MATERIALS
 AB - By means of the continuous pressure **hydrolysis** of **lignocellulose** material and subsequent

enzymatic **hydrolysis** of solid unhydrolysed residues is obtained glucose, to which starch raw materials are added and all of which undergoes amylolytic cleavage and spirituous **fermentation**. Ethanol, furfural, acetic and ligin are obtained. The device, which comprises the filling unit, **hydrolyses**, expanders, distilling and rectifying columns is represented in that the continuous worm pressure filling unit (13) consists of segments formed by the body (94) with single-threaded conveyer worms (86) place on the shaft (85). Between the worms there is at least one **steam** ring (88), which conically widens on the input side of the raw material. In the outlet filler (93) with the reducing part leading into the first **hydrolyser** (22) a pressure identical to that of the first **hydrolyser** (22) is achieved. The last **hydrolyser** (24) is connected to the first rectifying column (43) for furfural and to the section of the cellulolytic **enzyme hydrolysis**, amylolytic cleavage, and ethanol **fermentation**.

3/13 © EPODOC / EPO

PN - [US2013330782](#) A1 20131212

PR - US201113754412
20110729; US20100369445P
20100730; WO2011US45958 20110729

AP - US201113754412 20110729

DT - **

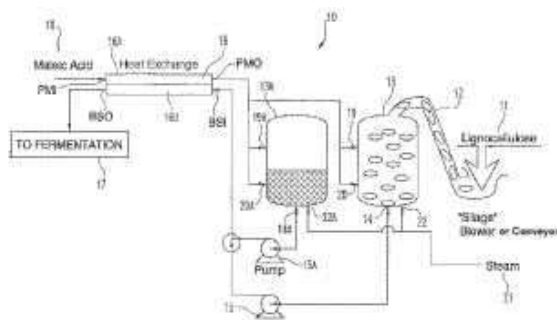
CT - || R141 (A1)
[US4200734](#) A 19800429 [
] (MUEHLENBROCK DALE R [US], et al);
[US2010203605](#) A1 20100812 [] (KIM JIN
WOO [KR], et al);
[WO2009158621](#) A1 20091230 [] (PURDUE
RESEARCH FOUNDATION [US], et al);
[US2009240088](#) A1 20090924 [] (FENTON
MARCUS BRIAN MAYHALL [GB], et al);
[US2009035826](#) A1 20090205 [] (TOLAN
JEFFREY S [CA], et al);
[US5536325](#) A 19960716 [] (BRINK DAVID L
[US])

CTNP - || R141 (A1)
[] - Alfa Laval brochure, retrieved from the
Internet: Alfa Laval Thermal HEAT
EXCHANGER FACTS, vol. 7, 1997, pages 1-
4 <http://canalev.com/wp-content/uploads/2012/01/FACTS-7.pdf>,
[] - Mosier et al., Biotechnol. Prog. 2001,
Vol 17, pages 474-480,
[] - Ehrhardt et al., Rheology of Dilute Acid
Hydrolyzed Corn Stover at High Solids
Concentration, Appl. Biochem Biotechnol,
2010 Feb;160(4):1102-15, published online:
March 31, 2009,

CCI - [C12P19/02](#) ; [C12P19/14](#) ; [C12N1/22](#) ;
[C12P7/10](#)

CUI - [C08B1/00](#)

CCA - [Y02E50/16](#) ; [Y02E50/17](#) ; [Y02P20/124](#) ;



Schematic representation of enzyme kinetic liquid in a tank heat exchanger to recover thermal energy.

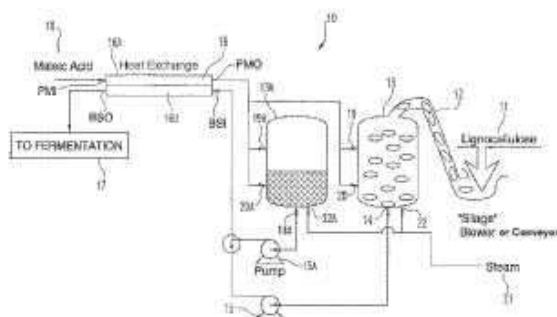
Fig. 1

Y02P20/59

- PA - PURDUE RESEARCH FOUNDATION [US];
PURDUE RESEARCH FOUNDATION [US]
- TI - LIQUEFACTION BIOMASS PROCESSING WITH
HEATRECOVERY
- AB - Described are processes that include the non-enzymatic, **hydrolytic** liquefaction of **lignocellulosic** biomass to form digest slurries and heat recovery from such digest slurries. Due to enhanced flow properties of the digest slurries such heat recovery can be efficiently conducted in spiral, plate and frame or other heat exchanger designs, with the recovered heat going to unit operations of the process such as heating incoming pretreatment media for the liquefaction. Processes can also involve additional **hydrolytic** digestion of some or all of the initial slurry components with **enzyme** and/or additional heat recovery from the initial slurry by direct contact heat exchange in which a portion of the digest slurry liquids is flashed to **vapor** and that **vapor** is condensed onto incoming **lignocellulosic** biomass to the process. Processes as described can be integrated into ethanol manufacture by **fermentation** of sugars from the digested compositions.

4/13 © EPODOC / EPO

- PN - [CA2806451](#) A1 20120202
- PR - US20100369445P
20100730; WO2011US45958
20110729
- AP - CA20112806451 20110729
- DT - I
- CCI - [C12P19/02](#) ; [C12P19/14](#) ; [C12N1/22](#) ;
[C12P7/10](#)
- CUI - [C08B1/00](#)
- CCA - [Y02E50/16](#) ; [Y02E50/17](#) ; [Y02P20/124](#) ;
[Y02P20/59](#)
- PA - PURDUE RESEARCH FOUNDATION [US]
- TI - LIQUEFACTION BIOMASS PROCESSING
WITH HEAT RECOVERY
- AB - Described are processes that include the non-enzymatic, **hydrolytic** liquefaction of **lignocellulosic** biomass to form digest slurries and heat



Schematic representation of enzyme mimetic liquefaction using heat exchanger to recover thermal energy.

Fig. 1

recovery from such digest slurries. Due to enhanced flow properties of the digest slurries such heat recovery can be efficiently conducted in spiral, plate and frame or other heat exchanger designs, with the recovered heat going to unit operations of the process such as heating incoming pretreatment media for the liquefaction. Processes can also involve additional **hydrolytic** digestion of some or all of the initial slurry components with **enzyme** and/or additional heat recovery from the initial slurry by direct contact heat exchange in which a portion of the digest slurry liquids is flashed to **vapor** and that **vapor** is condensed onto incoming **lignocellulosic** biomass to the process. Processes as described can be integrated into ethanol manufacture by **fermentation** of sugars from the digested compositions.

5/13 © EPODOC / EPO

PN - [US2012220005](#) A1 20120830

PR - WO2009JP04318 20090902

AP - US200913393518 20090902

DT - *; Rep

CT - || R141 (A1)
[US2008032344](#) A1 [];
[US2008057555](#) A1 [];
[US2012108798](#) A1 [];
[US2003199049](#) A1 [];
[US2012006320](#) A1 []

CTNP - || R141 (A1)
 [] Ghose "Rapid Ethanol Fementation of Cellulose Hydrolysate. I. Batch Versus Contiuous Systems" Biotechnology and Bioengineering, Vol 21, 1387-1400, 1979
 [] Mabee "Updates on Softwood-to-Ethanol Process Development" Applied Biochemistry and Biotechnology Vol 129-132, 2006, 55-70
 [] Pan "Biorefining of Softwoods Using Ethanol Organosolv Pulping: Preliminary Evaluation of Process Streams for the Manufacture of Fuel-Grade Ethanol and Co-Products" Biotechnology and Bioengineering Vol 90 Issue 40 2005, 473-481
 [] Xu "Enzymatic hydrolysis of pretreated soybean straw", Biomass & Bioenergy, 31 (2007) 162-167

CCI - [C12M45/02](#) ; [C12M45/20](#) ; [C12P7/10](#) ; [C12P7/14](#)

CCA - [Y02E50/16](#) ; [Y02E50/17](#) ; [C12P2201/00](#)

- PA - KUMAGAI CHIKANORI [JP]; TANIYAMA NORIYUKI [JP]; NAKAMURA YOSHITOSHI [JP]; UNIV TOKUSHIMA [JP]; KAWASAKI HEAVY IND LTD [JP]
- TI - METHOD FOR PRODUCING ETHANOL FROM **LIGNOCELLULOSIC** BIOMASS
- AB - An object of the invention is to provide an inexpensive and efficient ethanol production method using **lignocellulosic** biomass as a raw material. The method for producing ethanol from **lignocellulosic** biomass of the present invention includes a **lignocellulose** decomposition step of subjecting **lignocellulosic** biomass to a **steam** explosion treatment or **hydrolysis** in a subcritical state followed by a flash treatment; a lignin removal step of immersing a solid residue resulting from the decomposition step in ethanol to remove lignin; and a C6 saccharification/simultaneous **fermentation** step of saccharifying the solid residue resulting from the lignin removal step with an **enzyme** and further **fermenting** the resulting product into ethanol with a C6 **fermentation** microorganism. By combining the **steam** explosion treatment and the lignin removal process by ethanol immersion, higher rates are achieved for the saccharification and **fermentation** of the biomass.

6/13 © EPODOC / EPO

- PN - [WO2012016180](#) A2 20120202
- PNFP - WO2012016180 A3 20120607
- PR - US20100369445P 20100730
- AP - WO2011US45958 20110729
- DT - *; Rep
- CT - |US| ISR (A3)
[US7754457](#) B2 20100713 [Y] (FOODY BRIAN [CA], et al);
[US2004231661](#) A1 20041125 [Y] (GRIFFIN ROBERT [CA], et al);
[US2009215137](#) A1 20090827 [Y] (HAWKINS ANDREW C [US], et al);
[US5348871](#) A 19940920 [Y] (SCOTT CHARLES D [US], et al)
- CCI - [C12P19/02](#) ; [C12P19/14](#) ; [C12N1/22](#) ; [C12P7/10](#)
- CUI - [C08B1/00](#)
- CCA - [Y02E50/16](#) ; [Y02E50/17](#) ; [Y02P20/124](#) ; [Y02P20/59](#)
- PA - (A2 A3)
 PURDUE RESEARCH FOUNDATION [US];
 LADISCH MICHAEL R [US]; MOSIER NATHAN [US]; KIM YOUNGMI [US];
 ROOYEN JUSTIN VAN [US]
- TI - (A2 A3)
 LIQUEFACTION BIOMASS PROCESSING WITH HEAT RECOVERY
- AB - (A2 A3)
 Described are processes that include the non-enzymatic, **hydrolytic** liquefaction of **lignocellulosic** biomass to form digest slurries and heat

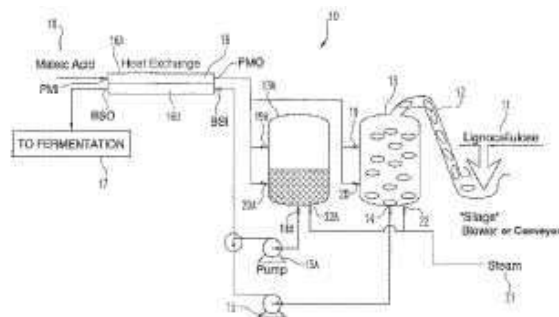


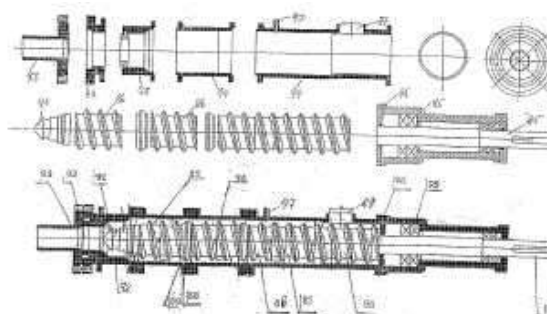
Fig. 1

recovery from such digest slurries. Due to enhanced flow properties of the digest slurries such heat recovery can be efficiently conducted in spiral, plate and frame or other heat exchanger designs, with the recovered heat going to unit operations of the process such as heating incoming pretreatment media for the liquefaction. Processes can also involve additional **hydrolytic** digestion of some or all of the initial slurry components with **enzyme** and/or additional heat recovery from the initial slurry by direct contact heat exchange in which a portion of the digest slurry liquids is flashed to **vapor** and that **vapor** is condensed onto incoming **lignocellulosic** biomass to the process. Processes as described can be integrated into ethanol manufacture by **fermentation** of sugars from the digested compositions.

TXT - ccmt

7/13 © EPODOC / EPO

- PN - [EA200700523](#) A1 20071026
- PNFP - EA011136 B1 20081230
- PR - WO2004CZ00054 20040831
- AP - EA20070000523 20040831
- DT - I
- CT - || STSE (B1)
[WO9625553](#) A1 19960822 [] (F & S MARKET SPOL S R O [CZ], et al);
[US4564595](#) A 19860114 [] (NEVES ALAN M [US]);
[US2002197686](#) A1 20021226 [] (LIGHTNER GENE E [US]);
[EP1130085](#) A1 20010905 [] (CT INVESTIG ENERGETICAS CIEMAT [ES])
- CCI - [C12P19/02](#) ; [C13K1/02](#) ; [C13K1/06](#) ; [C12P7/10](#)
- CCA - [Y02E50/16](#)
- PA - (B1)
BIOTECH PROGRESS A S [CZ]
- TI - (B1)
METHOD AND DEVICES FOR CONTINUOUS PROCESSING OF RENEWABLE RAW MATERIALS
- AB - (B1)



By means of the continuous pressure **hydrolysis** of **lignocellulose** material and subsequent enzymatic **hydrolysis** of solid unhydrolysed residues is obtained glucose, to which starch raw materials are added and all of which undergoes amylolytic cleavage and spirituous **fermentation**. Ethanol, furfural, acetic and ligin are obtained. The device, which comprises the filling unit, **hydrolysers**, expanders, distilling and rectifying columns is represented in that the continuous worm pressure filling unit (13) consists of segments formed by the body (94) with single-threaded conveyer worms (86) place on the shaft (85). Between the worms there is at least one **steam** ring (88), which conically widens on the input side of the raw material. In the outlet filler (93) with the reducing part leading into the first **hydrolyser** (22) a pressure identical to that of the first **hydrolyser** (22) is achieved. The last **hydrolyser** (24) is connected to the first rectifying column (43) for furfural and to the section of the cellulolytic **enzyme hydrolysis**, amylolytic cleavage, and ethanol **fermentation**.

8/13 © EPODOC / EPO

PN - [WO2004104062](#) A2 20041202

PNFP - WO2004104062 A3 20060216

PR - US20030438244 20030514

AP - WO2004US13621 20040430

DT - **

CT - |US| ISR (A3)
[XP002993324](#) A[X];
[WO0053791](#) A1 20000914 [Y] (VERSER DAN [US], et al)

CTNP - |US| ISR (A3)
[X] - WOICIECHOWSKI A.L. ET AL, "Experimental design to enhance the production of L-(+)-lactic acid from steam-exploded wood hydrolysate using Rhizopus oryzae in a mixed-acid fermentation", PROCESS BIOCHEMISTRY, (1999), vol. 34, pages 949 - 955, XP002993324

CCI - [C12P7/56](#)

PA - (A2 A3)
WESSEX INC [US]; AGBLEVOR FOSTER A [US]; EVANS TIMOTHY G [US]

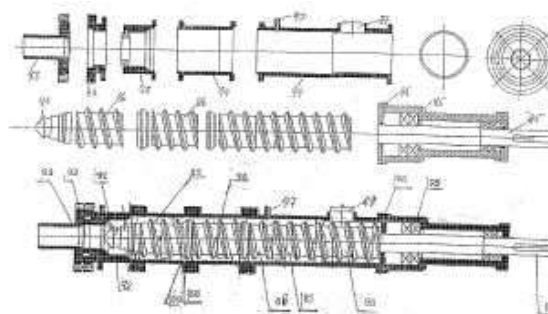
TI - (A2 A3)

METHOD FOR PRODUCTION OF LACTIC ACID

- AB - (A2 A3)
- A method for production of lactic acid involving extracting protein from a natural renewable feedstock, preferably extracted from **lignocellulose** sources such as soybean hull, separating the feedstock into liquid and solid substrate feedstock, **steam** exploding the solid substrate feedstock by placing the solid feedstock in a pressure chamber, pressurizing the **steam** chamber with saturated **steam**, maintaining the pressure until the solid feedstock reaches temperatures in excess of the boiling point of water at atmospheric pressure, and explosively decompressing the pressure to a pressure no greater than atmospheric pressure. **Hydrolyzing** the **steam**-exploded feedstock by either acid **hydrolysis** or **enzyme hydrolysis**, and **fermenting** the resulting **hydrolyzed** feedstock to produce lactic acid. The **hydrolyzing** and **fermenting** steps may be carried out simultaneously, followed by recovering the lactate from the resultant material.

9/13 © EPODOC / EPO

- PN - [US2007298477](#) A1 20071227
- PR - WO2004CZ00054 20040831
- AP - US20040574363 20040831
- DT - **
- CT - || R141 (A1)
[US4564595](#) A [];
[US2002197686](#) A1 []
- CCI - [C12P19/02](#) ; [C13K1/02](#) ; [C13K1/06](#) ;
[C12P7/10](#)
- CCA - [Y02E50/16](#)
- PA - BIOTECH PROGRESS A S [CZ]
- TI - Method And Devices For The Continuous Processing Of Renewable Raw Materials
- AB - By means of the continuous pressure **hydrolysis** of **lignocellulose** material and subsequent enzymatic **hydrolysis** of solid unhydrolysed residues is obtained glucose, to which starch raw materials are added and all of which undergoes amylolytic cleavage and spirituous **fermentation** . Ethanol, furfural, acetic and ligin are obtained. The device, which comprises the filling unit, **hydrolyzers**, expanders, distilling and rectifying columns is represented in that the continuous worm pressure filling unit (13) consists of segments formed by the body (94) with single-threathed conveyer worms (86) place on the shaft (85). Between the worms there is at least one **steam** ring (88), which conically widens on the input



side of the raw material. In the outlet filler (93) with the reducing part leading into the first **hydrolyser** (22) a pressure identical to that of the first **hydrolyser** (22) is achieved. The last **hydrolyser** (24) is connected to the first rectifying column (43) for furfural and to the section of the cellulolytic **enzyme hydrolysis**, amylolytic cleavage, and ethanol **fermentation** .

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- PN - [US2004229327](#) A1 20041118
- PNFP - US7217545 B2 20070515
- PR - US20030438244 20030514
- AP - US20030438244 20030514
- DT - *; Rep
- CT - || STSE (B2)
[WO0053791](#) A1 20000914 [] (VERSER DAN [US], et al)
 - || R141 (A1)
[US5932455](#) A [];
[US6280985](#) B1 [];
[US5464760](#) A [];
[US6319382](#) B1 []
- CTNP - || STSE (B2)
 [] Woiciechowski et al (Process Biochemistry 34:949-955 (1999))
- CCI - [C12P7/56](#)
- PA - (B2)
 WESSEX INC [US]
- TI - (A1 B2)
 Method for production of lactic acid
- AB - (A1 B2)
 A method for production of lactic acid involving extracting protein from a natural renewable feedstock, preferably extracted from **lignocellulose** sources such as soybean hull, separating the feedstock into liquid and solid substrate feedstock, **steam** exploding the solid substrate feedstock by placing the solid feedstock in a pressure chamber, pressurizing the **steam** chamber with saturated **steam**, maintaining the pressure until the solid feedstock reaches temperatures in excess of the boiling point of water at atmospheric pressure, and explosively decompressing the pressure to a pressure no greater than atmospheric pressure. **Hydrolyzing** the **steam**-exploded feedstock by either acid **hydrolysis** or **enzyme hydrolysis**, and **fermenting** the resulting **hydrolyzed** feedstock to produce lactic acid. The **hydrolyzing** and **fermenting** steps may be carried out simultaneously, followed by recovering the lactate from the resultant material.

11/13 © EPODOC / EPO

- PN - [EP0217687](#) A1 19870408
- PNFP - EP0217687 B1 19910116

PR - FR19850012827 19850826

AP - EP19860401722 19860731

DT - *; Rep

CT - || STSE (A1)
[US2203360](#) A 19400604 [YD] (PARTANSKY ALEXANDER M);
[US2431163](#) A 19471118 [YD] (BOEHM ROBERT M, et al);
[US2421985](#) A 19470610 [YD] (BOEHM ROBERT M, et al);
[FR919525](#) A 19470311 [Y];
[US2444823](#) A 19480706 [A] (HALL HORACE E, et al);
[FR2460331](#) A1 19810123 [A] (AMERICAN CAN CO [US]);
[FR889580](#) A 19440113 [A] (PHRIX ARBEITSGEMEINSCHAFT);
[FR541535](#) A 19220728 [A] (LEFRANC & CIE);
[GB222549](#) A 19240929 [A] (HERBERT REGINALD NORBURY, et al);
[US2386374](#) A 19451009 [A] (CHARLES WEIZMANN);
[DE920724](#) C 19541129 [A] (TORNESCHER HEFE GES M B H);
[EG376698](#) A 00000000 [A];
[FR2490677](#) A1 19820326 [A] (INST FRANCAIS DU PETROLE [FR])

CCI - [C12N1/22](#) ; [C12P7/28](#)

PA - (A1)
INST FRANCAIS DU PETROLE [FR]

TI - (A1)
Process for producing acetone and butanol from **lignocellulosic** compounds.

- (B1)
PROCESS FOR PRODUCING ACETONE AND BUTANOL FROM **LIGNOCELLULOSIC** COMPOUNDS

AB - (A1)
A **lignocellulosic** substance which is subjected to pretreatment with **steam**, an **enzyme hydrolysis** and an acetone-butyl **fermentation** in the presence of calcium and/or magnesium ions in order to remove the inhibitors present in the **hydrolysate**.

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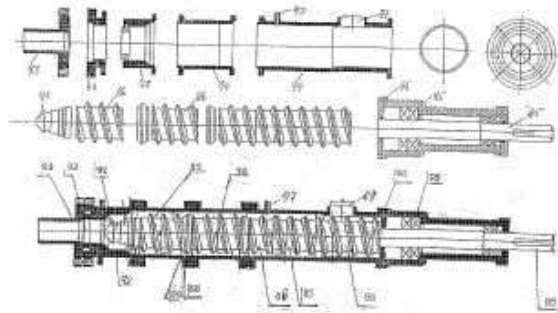
PN - [WO2006024242](#) A1 20060309

PR - WO2004CZ00054 20040831

AP - WO2004CZ00054 20040831

DT - *; Rep

CT - |EP| ISR (A1)
[WO9625553](#) A1 19960822 [A] (F & S MARKET SPOL S R O [CZ], et al)
[A] 1-11
* page 3, line 29 - page 4, line 14 *
* figure 4 *;
[US4564595](#) A 19860114 [A] (NEVES ALAN M [US])
[A] 1-11
* figure 5 *
* column 2, lines 27-41 *
* column 2, line 61 - column 3, line 14 *
* column 5, lines 34-50 *
* column 6, line 15 - column 7,



line 68 *

* column 10, line 47 - column 12,

line 10 *

* claims 1,2,11 *;

[US2002197686](#) A1 20021226

[A] (LIGHTNER GENE E [US])

[A] 1-11

* the whole document *;

[EP1130085](#) A1 20010905 [A] (CT
INVESTIG ENERGETICAS CIEMAT [ES])

[A] 1-11

* the whole document *

- CCI - [C12P19/02](#) ; [C13K1/02](#) ; [C13K1/06](#) ;
[C12P7/10](#)
- CCA - [Y02E50/16](#)
- PA - BIOTECH PROGRESS A S [CZ];
KRATOCHVIL ZDENEK [CZ]; BOUSKA
FRANTISEK [CZ]; MACHEK FRANTISEK [CZ]
- TI - METHOD AND DEVICES FOR THE
CONTINUOUS PROCESSING OF
RENEWABLE RAW MATERIALS
- AB - By means of the continuous
pressure **hydrolysis** of **lignocellulose**
material and subsequent
enzymatic **hydrolysis** of solid
unhydrolysed residues is obtained
glucose, to which starch raw materials
are added and all of which undergoes
amylolytic cleavage and
spirituous **fermentation** . Ethanol,
furfural, acetic and ligin are obtained.
The device, which comprises the filling
unit, **hydrolysers**, expanders, distilling
and rectifying columns is represented
in that the continuous worm pressure
filling unit (13) consists of segments
formed by the body (94) with single-
threated conveyer worms (86) place on
the shaft (85). Between the worms there
is at least one **steam** ring (88), which
conically widens on the input side of
the raw material. In the outlet filler
(93) with the reducing part leading into
the first **hydrolyser** (22) a pressure
identical to that of the first **hydrolyser**
(22) is achieved. The last **hydrolyser**
(24) is connected to the first rectifying
column (43) for furfural and to the
section of the cellulolytic **enzyme**
hydrolysis, amylolytic cleavage, and
ethanol **fermentation** .

13/13 © EPODOC / EPO

PN - [CZ20030954](#) A3 20041215

PNFP - CZ294398 B6 20041215

PR - CZ20030000954 20030404

AP - CZ20030000954 20030404

DT - I

CCA - [Y02E50/17](#)

PA - (A3 B6)
BIOTECH PROGRESS A S [CZ]

TI - (A3)
Process and apparatus for comprehensive treatment of renewable raw materials
- (B6)
Process and apparatus for complex treatment of recoverable raw materials

AB - (B6)
First, glucose is obtained by continuous pressure **hydrolysis** of **lignocellulose** material and subsequent enzymatic **hydrolysis** of solid non-**hydrolyzed** residues. After addition of starch-containing raw materials to the glucose, the mixture is subjected to amylolytic cleavage and alcoholic **fermentation** to obtain ethanol, furfural, acetic acid and lignin. Disclosed is also apparatus for making the above-described process, said apparatus comprising a filling unit, **hydrolyser**, expanders, distillation and rectification columns is characterized in that a continuous pressure screw filling unit (13) consists of segments formed by a body (94) with one-way screws (86) being mounted on a shaft (85). At least one **steam** lock (88) conically widening on the raw material feeding side is disposed between the screws. Pressure equaling to that in the first **hydrolyser** (22) is achieved within an outlet insert with a transient portion (93) leading into said first **hydrolyser**. The last **hydrolyser** (24) is connected with a first furfural-producing rectification column (43) and at the same time with sections of cellulolytic **enzyme hydrolysis**, amylolytic cleavage and ethanol **fermentation**.