US009409998B2

(12) **United States Patent**
**Laukkanen et al.**

(10) **Patent No.: US 9,409,998 B2**
(45) **Date of Patent: Aug. 9, 2016**

(54) **METHOD AND APPARATUS FOR PROCESSING FIBRIL CELLULOSE AND FIBRIL CELLULOSE PRODUCT**

(71) Applicant: **UPM-KYMMENE CORPORATION**, Helsinki (FI)

(72) Inventors: **Antti Laukkanen**, Helsinki (FI); **Markus Nuopponen**, Helsinki (FI)

(73) Assignee: **UPM-KYMMENE CORPORATION**, Helsinki (FI)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 2 days.

(21) Appl. No.: **14/378,474**

(22) PCT Filed: **Jan. 29, 2013**

(86) PCT No.: **PCT/FI2013/050095**
§ 371 (c)(1),
(2) Date: **Aug. 13, 2014**

(87) PCT Pub. No.: **WO2013/121086**
PCT Pub. Date: **Aug. 22, 2013**

(65) **Prior Publication Data**

US 2015/0045549 A1 Feb. 12, 2015

(30) **Foreign Application Priority Data**

Feb. 13, 2012 (FI) ..... 20125158

(51) **Int. Cl.**

| | |
|---|---|
| ***C08L 1/02*** | (2006.01) |
| ***C08B 15/04*** | (2006.01) |
| ***D21H 11/20*** | (2006.01) |
| ***D21C 9/00*** | (2006.01) |
| ***D21H 11/18*** | (2006.01) |

(52) **U.S. Cl.**
CPC . ***C08B 15/04*** (2013.01); ***C08L 1/02*** (2013.01); ***D21H 11/18*** (2013.01); ***D21H 11/20*** (2013.01)

(58) **Field of Classification Search**
CPC ..... C08L 1/02; C08B 15/04; D21H 11/20; D21C 9/002
USPC ..... 536/63, 85, 124, 7; 162/163
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 3,882,029 | A | 5/1975 | Fischer et al. | |
| 5,487,419 | A * | 1/1996 | Weibel | C08B 15/02 162/100 |
| 5,964,983 | A | 10/1999 | Dinand et al. | |

FOREIGN PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| EP | 0 859 011 | B1 | 5/2001 |
| EP | 2 386 682 | A1 | 11/2011 |
| JP | A-2004-161 | | 1/2004 |
| JP | A-2010-209510 | | 9/2010 |
| JP | A-2012-1626 | | 1/2012 |
| WO | WO 00/47628 | A2 | 8/2000 |
| WO | WO 01/66600 | A1 | 9/2001 |
| WO | WO 2009/084566 | A1 | 7/2009 |

OTHER PUBLICATIONS

"Pressure Filters", *Custom Equipment Solutions Co.* (*CESCO*), date accessed Nov. 20, 2012, Internet Address: http://www.gocesco.com/pressurefilters.html.
Search Report issued in Finnish Patent Application No. 20125158 dated Nov. 22, 2012.
Office Action issued in Finnish Patent Application No. 20125158 dated Nov. 22, 2012.
International Search Report issued in International Patent Application No. PCT/FI2013/050095 mailed on Jun. 4, 2013.
Written Opinion of the International Searching Authority issued in International Patent Application No. PCT/FI2013/050095 mailed on Jun. 4, 2013.
Written Opinion of the International Preliminary Examining Authority issued in International Patent Application No. PCT/FI2013/050095 mailed on Apr. 2, 2014.
International Preliminary Report on Patentability issued in International Patent Application No. PCT/FI2013/050095 dated Jun. 27, 2014.
Sep. 8, 2015 Extended Search Report issued in European Patent Application No. 13749276.5.

* cited by examiner

*Primary Examiner* — Patrick Lewis
*Assistant Examiner* — Everett White
(74) *Attorney, Agent, or Firm* — Oliff PLC

(57) **ABSTRACT**

A method for processing fibril cellulose which is in the form of aqueous fibril cellulose gel includes lowering the pH of the aqueous fibril cellulose gel to provide aqueous fibril cellulose gel of reduced water retention capacity, and dewatering the aqueous fibril cellulose gel of reduced water retention capacity to provide dewatered fibril cellulose. The dewatering is performed by pressure filtration.

**34 Claims, 4 Drawing Sheets**