



(51) International Patent Classification:

D06B 3/14 (2006.01) **B29C 59/04** (2006.01)
B29B 15/12 (2006.01) **B32B 5/28** (2006.01)
B32B 37/14 (2006.01) **B32B 27/00** (2006.01)

(21) International Application Number:

PCT/US2008/068466

(22) International Filing Date:

27 June 2008 (27.06.2008)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

60/947,785 3 July 2007 (03.07.2007) US
60/947,798 3 July 2007 (03.07.2007) US

(71) Applicant (for all designated States except US): **3M INNOVATIVE PROPERTIES COMPANY** [US/US]; 3M Center, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **THUNHORST, Kristin, L.** [US/US]; 3M Center, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US).
PEKUROVSKY, Mikhail, L. [US/US]; 3M Center, Post

Office Box 33427, Saint Paul, Minnesota 55133-3427 (US).

(74) Agents: **PRALLE, Jay, R.** et al.; 3M Center, Office of Intellectual Property Counsel, Post Office Box 33427, Saint Paul, MN 55133-3427 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, 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, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(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, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI

[Continued on next page]

(54) Title: APPARATUS AND METHOD OF IMPREGNATING FIBROUS WEBS

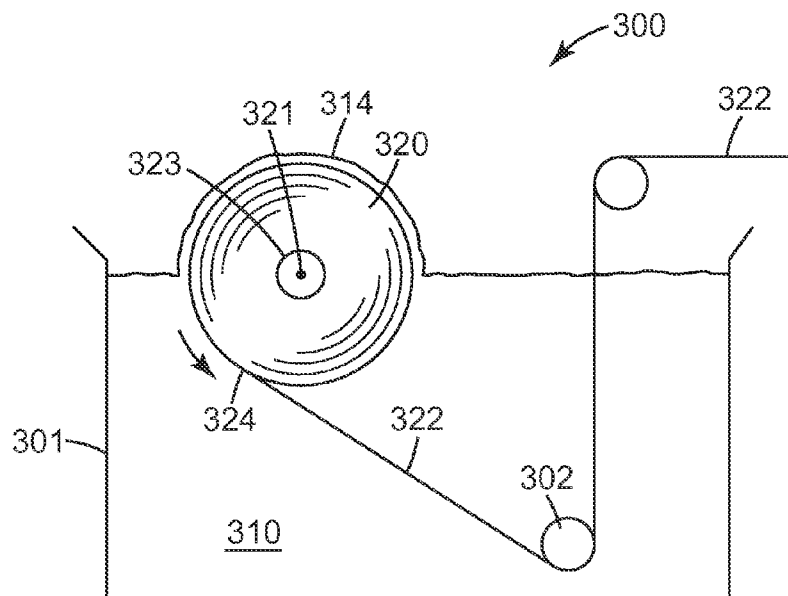


Fig. 3

(57) Abstract: The present disclosure relates to an apparatus and method of impregnating fibrous webs. An apparatus generally includes a volume of liquid curable resin having a liquid surface, and a liquid curable resin (310) saturated roll of fibrous web (320) at least partially submerged in the volume of resin. The apparatus is configured to unwind the liquid curable resin saturated roll of fibrous web such that the fibrous web separates from the roll of fibrous web below the liquid surface and forms a resin impregnated fibrous web.



(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG). **Published:**

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

- *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:

14 January 2010

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/068466

A. CLASSIFICATION OF SUBJECT MATTER

INV. D06B3/14 B29B15/12 B32B37/14 B29C59/04 B32B5/28
B32B27/00

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)

B29B D06B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 05 059194 A (DAINIPPON INK & CHEMICALS) 9 March 1993 (1993-03-09)	1-10, 13-16
Y	abstract; figures	11-12
X	JP 03 140338 A (TAKUMA KK) 14 June 1991 (1991-06-14)	1-10, 13-16
X	US 5 436 045 A (FRUITMAN CLINTON [US]) 25 July 1995 (1995-07-25)	1-10, 13-16
	column 2, lines 28-47; figure 1	
X	US 1 157 694 A (HUNGERFORD) 26 October 1915 (1915-10-26)	1-9
	claim; figures	
	----- -/--	



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 document 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.

Z document member of the same patent family

Date of the actual completion of the international search

3 November 2009

Date of mailing of the international search report

12/11/2009

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

Cordenier, Jozef

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/068466

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/219335 A1 (FUSCO LUCIANO A [BR]) 4 November 2004 (2004-11-04) paragraphs [0011], [0054] - [0056]; figure 1	11
Y	EP 0 041 849 A1 (AECI LTD [ZA]) 16 December 1981 (1981-12-16) claims 1,10; figures	11
Y	DE 85 10 769 U1 (SIEMPELKAMP) 4 June 1987 (1987-06-04) claim 1; figures	12
Y	JP 56 121735 A (NITTO ELECTRIC IND CO) 24 September 1981 (1981-09-24) abstract; figures	12
A	GB 2 301 842 A (CHARWOOD ELASTICS LIMITED [GB]) 18 December 1996 (1996-12-18) figure 2	4
A	WO 89/10248 A (INST FRANCAIS DU PETROLE [FR]) 2 November 1989 (1989-11-02) figure 1	6
A	US 2 946 698 A (BRUNNICK WAYNE A ET AL) 26 July 1960 (1960-07-26) figure 2	6
A	JP 07 102467 A (NISSHIN SPINNING) 18 April 1995 (1995-04-18) figures	6
A	US 3 384 505 A (PALMER WALTER B ET AL) 21 May 1968 (1968-05-21) figure 2	1
A	JP 01 317749 A (HITACHI CHEMICAL CO LTD) 22 December 1989 (1989-12-22) abstract; figures	12
A	JP 05 162256 A (TOPPAN PRINTING CO LTD) 29 June 1993 (1993-06-29) abstract; figures	12
A	JP 2000 102978 A (TORAY INDUSTRIES) 11 April 2000 (2000-04-11) abstract; figures	12
A	JP 02 289334 A (HITACHI CHEMICAL CO LTD) 29 November 1990 (1990-11-29) abstract; figures	12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/068466

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 allsearchable 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 reportcovers 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-10, 13-16

An apparatus, comprising:
a volume of liquid curable resin having a liquid surface;
and
a liquid curable resin saturated roll of fibrous web at least partially submerged in the volume of resin, the apparatus configured to unwind the roll of fibrous web such that the fibrous web separates from the roll of fibrous web below the liquid surface and forms a resin impregnated fibrous web

2. claims: 10-11

further comprising laminating the resin impregnated fibrous web to an at least partially visible light transmitting polymer film and curing the resin impregnated fibrous web to form a cured impregnated fibrous composite

3. claims: 10, 12

- further comprising curing the resin impregnated fibrous web while the resin impregnated fibrous web is in contact with a structured surface to form a cured impregnated fibrous composite.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/068466

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 5059194	A	09-03-1993	NONE	
JP 3140338	A	14-06-1991	NONE	
US 5436045	A	25-07-1995	NONE	
US 1157694	A		NONE	
US 2004219335	A1	04-11-2004	NONE	
EP 0041849	A1	16-12-1981	DE 3163854 D1 JP 57029672 A US 4397909 A ZW 12581 A1	05-07-1984 17-02-1982 09-08-1983 08-02-1982
DE 8510769	U1	04-06-1987	NONE	
JP 56121735	A	24-09-1981	NONE	
GB 2301842	A	18-12-1996	NONE	
WO 8910248	A	02-11-1989	CA 1333239 C EP 0366761 A1 FR 2630464 A1 JP 2598329 B2 JP 3500032 T US 5133995 A	29-11-1994 09-05-1990 27-10-1989 09-04-1997 10-01-1991 28-07-1992
US 2946698	A	26-07-1960	NONE	
JP 7102467	A	18-04-1995	NONE	
US 3384505	A	21-05-1968	GB 1069954 A	24-05-1967
JP 1317749	A	22-12-1989	NONE	
JP 5162256	A	29-06-1993	JP 3087405 B2	11-09-2000
JP 2000102978	A	11-04-2000	NONE	
JP 2289334	A	29-11-1990	NONE	