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(71) Applicant (for all designated States except US): **MIL-LIKEN & COMPANY** [US/US]; 920 Milliken Road, M-495, Spartanburg, SC 29303 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **NAIR, Sujith** [IN/US]; 1403 Perdita Way, Greer, SC 29650 (US). **PUT-HILLATH, Padmakumar** [IN/US]; 328 Hansa Lane, Greer, SC 29650 (US). **PRESTRIDGE, Charles, W.** [US/US]; 705 Piney Woods Drive, LaGrange, GA 30240 (US). **PESCHEK, Johann** [DE/BE]; Kleine Vismarkt 7/201, B-9000 Gent (BE). **ROYER, Joseph R.** [US/US]; 505 Royal Dutch Ln, Simpsonville, SC 29681 (US). **EL-MAJID, Ines** [TN/BE]; Buldenspoorstraat 19, B-9000 Gent (BE).

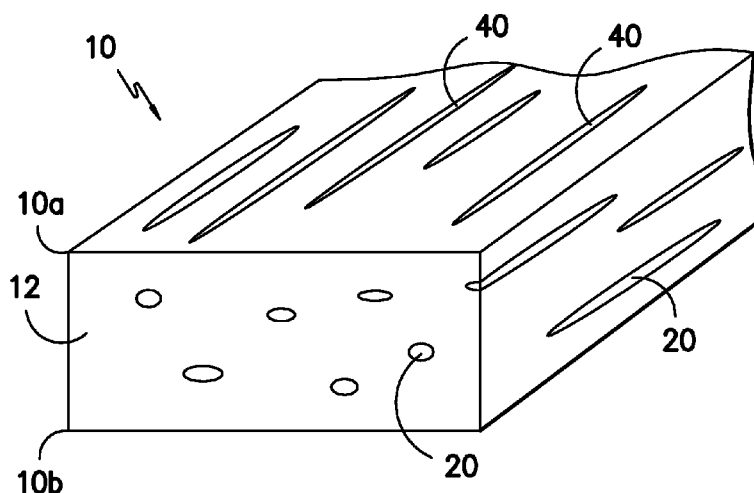
(74) Agent: **BRICKEY, Cheryl, J.**; 920 Milliken Road, M-495, Spartanburg, SC 29303 (US).

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[Continued on next page]

(54) Title: REINFORCED RUBBER ARTICLE WITH TAPE ELEMENTS

**FIG. -9-**

(57) Abstract: A reinforced rubber article containing a rubber article and a fibrous layer embedded into the rubber article. The fibrous layer contains monoaxially drawn tape elements having a rectangular cross-section and at least a first layer having a draw ratio of at least about 5, a modulus of at least about 2 GPa, a density of at least 0.85 g/cm³. The first layer contains a polymer selected from the group consisting of polyamide, polyester, and co-polymers thereof. Methods of forming the reinforced rubber article are also disclosed.



— with international search report (Art. 21(3))

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/046070

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60C1/00

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)

B32B B60C

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	wo 03/031713 Al (3M INNOVATIVE PROPERTIES CO [US]) 17 April 2003 (2003-04-17) abstract; claims 1, 2, 10, 12, 13, 16, 17, 19, 29, 30, 32, 35, 40, 41 ; figures page 1, lines 9-19 page 8, line 25 - page 9, line 17 page 12, lines 16-31 page 13, lines 17-32 page 15, lines 4-11 page 18, lines 13-29 page 21, line 29 - page 22, line 21 page 27, line 29 - page 29, line 31 -----	1-4
A	wo 00/68301 Al (3M INNOVATIVE PROPERTIES CO [US]) 16 November 2000 (2000-11-16) abstract; claims 1-4, 6, 8, 9; figures 1-5 page 2, line 18 - page 3, line 3 page 6, lines 4-13 -----	1-4



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

24 September 2012

Date of mailing of the international search report

18/04/2013

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

Balázs, Matthiás

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/046070

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. :

1-4

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

Information on patent family members

International application No

PCT/US2012/046070

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
wo 03031713	AI	17-04-2003	EP 1434905 AI 07-07-2004 JP 2005504901 A 17-02-2005 US 2003068481 AI 10-04-2003 Wo 03031713 AI 17-04-2003
wo 0068301	AI	16-11-2000	AU 5905699 A 21-11-2000 BR 9917290 A 19-02-2002 CA 2371180 AI 16-11-2000 CN 1352663 A 05-06-2002 DE 69922265 D1 30-12-2004 DE 69922265 T2 01-12-2005 EP 1177244 AI 06-02-2002 JP 2002544310 A 24-12-2002 US 6331343 B1 18-12-2001 Wo 0068301 AI 16-11-2000

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-4

A reinforced rubber article comprising a fibrous layer embedded into rubber, wherein the fibrous layer comprises monoaxially drawn tape elements having a rectangular cross-section.

2. claims: 5-7

A process of forming a reinforced rubber article comprising: slit extruding tape elements or extruding and slitting a film into a plurality of tape elements, orienting the tape elements monoaxially

3. claims: 8-13

A reinforced rubber article having embedded into the rubber a fibrous layer comprising monoaxially drawn fibers having at least a first layer, an upper surface and a lower surface, wherein the first layer comprises a polymer and a plurality of voids, wherein the voids are in an amount of between about 3 and 18 percent by volume of the first layer.

4. claims: 14-19

A process of forming a reinforced rubber article comprising slit extruding tape elements or extruding and slitting a film into a plurality of tape elements, orienting the fibers monoaxially forming monoaxially drawn fibers forming a plurality of voids in the first layer in an amount of between about 3 and 18 percent by volume of the first layer; forming the monoaxially drawn fibers into a fibrous layer; and, embedding the fibrous layer into rubber.
