

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



PCT



(43) International Publication Date
22 May 2008 (22.05.2008)

(10) International Publication Number
WO 2008/060650 A3

(51) **International Patent Classification:**
B32B 5/26 (2006.01) **B32B** 27/04 (2006.01)
B32B 5/28 (2006.01) **F41H** 5/04 (2006.01)

(21) **International Application Number:**
PCT/US2007/065447

(22) **International Filing Date:** 29 March 2007 (29.03.2007)

(25) **Filing Language:** English

(26) **Publication Language:** English

(30) **Priority Data:**
11/396,153 31 March 2006 (31.03.2006) US

(71) **Applicant** (for all designated States except US): **HONEYWELL INTERNATIONAL INC.** [US/US]; Law Department AB/2B, 101 Columbia Road, Morristown, NJ 07962 (US).

(72) **Inventors; and**

(75) **Inventors/Applicants** (for US only): **HURST, David A.** [US/US]; 11121 Morgan Run Road, Richmond, Virginia 23233 (US). **ARVIDSON, Brian D.** [US/US]; 4101 Old Cheshire Drive, Chester, Virginia 23831 (US). **BHATNAGAR, Ashok** [US/US]; 7843 Lakeforest Street, Richmond, Virginia 23235 (US). **ARDIFF, Henry G.** [US/US]; 8060 Hampton Station Court, Chesterfield, Virginia 23832 (US).

(74) **Agent:** **CHESS, Deborah;** Honeywell International Inc., Law Department AB/2B, 101 Columbia Road, Morristown, New Jersey 07962 (US).

(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, 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, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) **Date of publication of the international search report:**
14 August 2008

(54) **Title:** IMPROVED LIQUID SUBMERSION BALLISTIC PERFORMANCE THROUGH HYBRIDIZATION

(57) **Abstract:** Ballistic resistant articles having excellent resistance to deterioration due to liquid exposure. More particularly, a ballistic resistant structures and articles formed from a hybrid of woven and non-woven fibrous components that retain their superior ballistic resistance performance after exposure to liquids such as sea water and organic solvents, such as gasoline and other petroleum-based products. The hybrid structures are particularly useful for the formation of or for use in conjunction with soft, flexible body armor.



WO 2008/060650 A3

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/065447

A. CLASSIFICATION OF SUBJECT MATTER

INV. B32B5/26 B32B5/28 B32B27/04 F41H5/04

According to International Patent Classification (IPG) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B32B F41H

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 , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 119 575 A (DRA6ONE GAETOR J [US] ET AL) 19 September 2000 (2000-09-19) cited in the application column 2, line 40 - column 3, line 30; claims 1,2,6-8,,10-18	19-29, 33-36., 40-42
A	column 5, line 3 - line 53 column 6, line 53 - column 1, line 11; examples 1-5	30-32
X	US 5 926 842 A (PRICE ALLEN L [US] ET AL) 27 July 1999 (1999-07-27) cited in the application column 1, line 58 - column 2, line 10; claims 1-3,5-7,10-12; figures 1,2	19-23, 28-30, 32-36, 40-42
A	column 4, line 54 - column 5, line 9; examples ----- -/--	31



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.

"&" document member of the same patent family

Date of the actual completion of the international search

18 June 2008

Date of mailing of the international search report

25/06/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL- 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kanetakis, Ioannis

INTERNATIONAL SEARCH REPORT

International application No

.PCT/US2007/065447

(^Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WO 2005/001373 A (UNIV AUBURN [US]; THOMAS-HOWARD L JR [US]) 6 January 2005 (2005-01-06)</p> <p>paragraphs [0063], [0032] - [0037], [0043] - [0045], [0059]; claims 1,7,8,13,15,19,21; figures 1-6</p> <p style="text-align: center;">-----</p>	<p>19, 21-23, 28-31, 35,40,41</p>
A	<p>WO 02/103275 A (SARGENT WAYNE B [US]) 27 December 2002 (2002-12-27) claims 6,14</p> <p style="text-align: center;">-----</p>	<p>1,16</p>
A	<p>US 5 724 670 A (PRICE ALLEN L [US]) 10 March 1998 (1998-03-10) column 3, line 64 - column 4, line 44; claims 1,2,8,-10,12,13; figures 1,2 column 1, line 56 - line 62</p> <p style="text-align: center;">-----</p>	<p>1,19,37, 40</p>
L	<p>WO 2007/097780 A (HONEYWELL INTERNATIONAL INC [US]; BHATNAGAR ASHOK [US]; HURST DAVID A [U] 30 August 2007 (2007-08-30) page 12, line 12 - line 16; claims 42,41,40,1-34 page 2, line 5 - line 10 page 10, line 26 - page 11, line 12</p> <p style="text-align: center;">-----</p>	<p>1,19,37, 40</p>

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/065447

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6119575	A	19-09-2000	NONE
US 5926842	A	27-07-1999	NONE
WO 2005001373	A	06-01-2005	EP 1644684 A1 12-04-2006
WO 02103275	A	27-12-2002	NONE
US 5724670	A	10-03-1998	NONE
wo 2007097780	A	30-08-2007	AR 057779 A1 19-12-2007
		AU 2006338598	A1 30-08-2007
		CA 2620324	A1 30-08-2007
		EP 1917140	A2 07-05-2008