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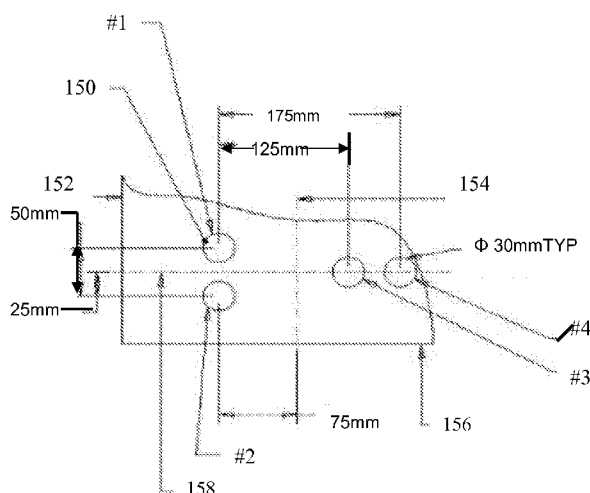
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[Continued on next page]

(54) Title: TRANSPARENT ARMOR WITH IMPROVED MULTI-HIT PERFORMANCE BY USE OF A THIN COVER GLASS

Figure 3



(57) Abstract: The disclosure is directed to a transparent armor laminate having a glass, glass ceramic or ceramic strike face layer, one or a plurality of glass, glass ceramic ("GC"), ceramic ("C") or polymeric ("P") backing layer behind the strike face layer, one or a plurality of spall catcher ("SC") layers behind the backing layer(s), and a thin cover glass layer laminated to the strike face, the thin layer being the first layer to be impacted by any incoming projectile or debris. The cover glass has a thickness ≤3mm. In another embodiment the cover glass thickness is ≤1mm. Additionally, a defrosting/defogging element is laminated between the cover glass and the strike face.



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A. CLASSIFICATION OF SUBJECT MATTER
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ADD.
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B. FIELDS SEARCHED
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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)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/042877 A2 (SCHOTT CORP [US]; WEINHOLD CARSTEN [US]) 2 April 2009 (2009-04-02) page 1, line 1 - page 23, last line; claims 1-24; figures 1-12	1,3,4,6, 8-12
X	DE 29 03 115 B1 (BFG GLASSGROUP) 13 March 1980 (1980-03-13) column 2, line 30 - column 4, last line; claims 1-12; figure 1	1-12
X	US 4 663 228 A (BOLTON NELSON P [US] ET AL) 5 May 1987 (1987-05-05) column 1, line 1 - column 8, line 54; claims 1-40; figure 9	1-7
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Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search 14 March 2012	Date of mailing of the international search report 26/03/2012
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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 Ansorge, Markus
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/042269

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 137 613 A1 (POST OFFICE [GB]) 17 April 1985 (1985-04-17) page 1, line 1 - page 14, last line; claims 1-11; figure 1 -----	1-7
X	US 2010/154622 A1 (ZACHAU THILO [DE] ET AL) 24 June 2010 (2010-06-24) paragraphs [0001] - [0083]; claims 1-19; figure 1 -----	1,3,4,6
X	DE 29 01 951 A1 (VER GLASWERKE GMBH) 24 July 1980 (1980-07-24) page 3, line 1 - page 7, last line; claims 1-3 -----	1,3,4,6
X	WO 2009/150380 A2 (SAINT GOBAIN [FR]; PLUEN VINCENT [FR]; LERAY STEPHANE [FR]; MENNECHEZ) 17 December 2009 (2009-12-17) page 1, line 1 - page 5, last line; claims 1-9 -----	1,3,4,6
X	WO 03/068501 A1 (AGP EUROP GMBH [DE]; IDEA INC [US]; MANNEHEIM ARTURO [CO] AGP EUROP GM) 21 August 2003 (2003-08-21) page 1, line 1 - page 18, last line; claims 1-20; figures 1-3c -----	1-7
X	EP 0 003 432 A1 (ROMAG HOLDINGS LTD [GB]) 8 August 1979 (1979-08-08) page 1, line 1 - page 38, last line; claims 1-10; figures 1-6 -----	1-7
X	US 2009/324935 A1 (BENNISON STEPHEN J [US] ET AL) 31 December 2009 (2009-12-31) paragraphs [0001] - [0174]; claims 1-28; figures 1,2 -----	1-7
A	DE 92 18 849 U1 (HELMUT FRICKE) 16 November 1995 (1995-11-16) claims 1-9; figure 1 -----	8-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/042269

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
WO 2009042877	A2	02-04-2009	CN 101815688 A	25-08-2010
			EP 2244988 A2	03-11-2010
			TW 200930674 A	16-07-2009
			WO 2009042877 A2	02-04-2009
DE 2903115	B1	13-03-1980	NONE	
US 4663228	A	05-05-1987	NONE	
EP 0137613	A1	17-04-1985	AU 562000 B2	21-05-1987
			AU 3170584 A	14-02-1985
			CA 1230039 A1	08-12-1987
			DE 3470397 D1	19-05-1988
			DK 383384 A	11-02-1985
			EP 0137613 A1	17-04-1985
			ES 8607191 A1	01-11-1986
			IN 161684 A1	16-01-1988
			JP 1757588 C	20-05-1993
			JP 4043862 B	17-07-1992
			JP 60060956 A	08-04-1985
			US 4595624 A	17-06-1986
US 2010154622	A1	24-06-2010	DE 102008043718 A1	20-05-2010
			EP 2191962 A1	02-06-2010
			US 2010154622 A1	24-06-2010
DE 2901951	A1	24-07-1980	AT 370391 B	25-03-1983
			BE 881244 A1	18-07-1980
			CH 646671 A5	14-12-1984
			DE 2901951 A1	24-07-1980
			ES 254321 U	01-04-1981
			FR 2446902 A1	14-08-1980
			NL 8000065 A	22-07-1980
WO 2009150380	A2	17-12-2009	CN 102056741 A	11-05-2011
			CO 6331318 A2	20-10-2011
			EA 201170001 A1	30-06-2011
			EP 2296877 A2	23-03-2011
			FR 2932411 A1	18-12-2009
			FR 2932412 A3	18-12-2009
			US 2011168005 A1	14-07-2011
			WO 2009150380 A2	17-12-2009
WO 03068501	A1	21-08-2003	AU 2003213028 A1	04-09-2003
			WO 03068501 A1	21-08-2003
EP 0003432	A1	08-08-1979	AU 525727 B2	25-11-1982
			AU 4379079 A	09-08-1979
			BR 7900638 A	28-08-1979
			CA 1120844 A1	30-03-1982
			DE 2962408 D1	19-05-1982
			EP 0003432 A1	08-08-1979
			IT 1202872 B	15-02-1989
			JP 1392479 C	23-07-1987
			JP 54113677 A	05-09-1979
			JP 61053225 B	17-11-1986
			US 4243719 A	06-01-1981

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2011/042269

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2009324935	A1	31-12-2009	EP 2310197 A1	20-04-2011
			US 2009324935 A1	31-12-2009
			US 2010062236 A1	11-03-2010
			WO 2010002531 A1	07-01-2010

DE 9218849	U1	16-11-1995	NONE	
