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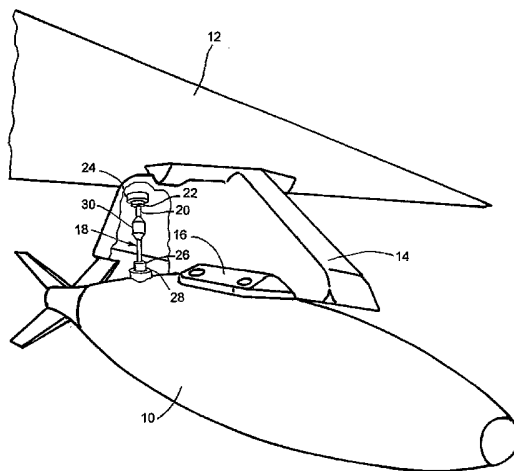
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(54) Title: SELF-CONTAINED AIRBORNE SMART WEAPON UMBILICAL CONTROL CABLE



(57) Abstract: An umbilical cable (18) for delivering electrical signals between an aircraft and a smart weapon (10) carried by the aircraft. The umbilical cable (18) includes cabling (20) comprising a plurality of conductive wires, a first connector (22) provided on one end of the cabling (20) and configured to connect to the aircraft, and a second connector (26) provided on the other end of the cabling and configured to connect to the smart weapon (10). The umbilical cable (18) further includes an interface circuit (30) electrically coupled between the first connector (22) and the second connector (26) via the plurality of conductive wires. The interface circuit (30) is configured to receive via the first connector a non-standard combination of signals comprising at least one of data signals, control signals and power signals not receivable directly by the smart weapon (10) to carry out operations. Moreover, the interface circuit (30) is configured to convert the non-standard combination of signals to a set of signals receivable by the smart weapon to carry out operations, and to provide the set of receivable signals to the smart weapon (10) via the second connector (26).

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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> F41G7/00				
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<b>B. FIELDS SEARCHED</b>				
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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) EPO-Internal, WPI Data, PAJ				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 2003/033059 A1 (EBERT WILLIAM J ET AL) 13 February 2003 (2003-02-13) abstract	1,17		
A	column 5, line 19 - column 11, line 67; figures 1-7	2-16, 18-21		
P,X	----- US 2004/015273 A1 (LEONARD JAMES V ET AL) 22 January 2004 (2004-01-22)	1,17		
P,A	column 3, line 66 - column 11, line 60; figures 1-5	2-16, 18-21		
E	& WO 2004/009441 A (THE BOEING COMPANY) 29 January 2004 (2004-01-29)	1,17		
X	----- EP 1 001 242 A (THE BOEING COMPANY) 17 May 2000 (2000-05-17) abstract	1,17		
A	page 4, column 5, line 54 - page 8, column 13, line 48; figures 1-5 ----- -/--	2-16, 18-21		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <span style="margin-left: 200px;"><input checked="" type="checkbox"/> Patent family members are listed in annex.</span>				
° Special categories of cited documents :				
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## INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 548 510 A (EBERT ET AL) 20 August 1996 (1996-08-20) abstract	1,17
A	column 5, line 8 - column 10, line 7; figures 1-3	2-16, 18-21
A	EP 1 306 641 A (RAYTHEON COMPANY) 2 May 2003 (2003-05-02) abstract page 3, column 3, line 51 - page 5, column 8, line 14; figures 1-7	1-21
A	EP 0 747 656 A (HUGHES MISSILE SYSTEMS COMPANY) 11 December 1996 (1996-12-11) abstract page 3, column 4, line 25 - page 7, column 12, line 7; figures 1-3	1-21
A	EP 0 685 700 A (HUGHES AIRCRAFT COMPANY; RAYTHEON COMPANY) 6 December 1995 (1995-12-06) abstract page 3, column 3, line 56 - page 5, column 8, line 25; figures 1-7	1-21
A	GB 2 202 061 A (THE * BOEING COMPANY) 14 September 1988 (1988-09-14) abstract page 3, line 12 - page 7, line 7; figures 1-4	1-21
A	US 5 414 347 A (MONK ET AL) 9 May 1995 (1995-05-09) abstract column 3, line 36 - column 9, line 68; figures 1-9	1-21

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC /US2004/040659

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2003033059	A1	13-02-2003	NONE	
US 2004015273	A1	22-01-2004	AU 2003251560 A1 WO 2004009441 A1	09-02-2004 29-01-2004
WO 2004009441	A	29-01-2004	AU 2003251560 A1 US 2004015273 A1	09-02-2004 22-01-2004
EP 1001242	A	17-05-2000	AU 759939 B2 AU 5940199 A US 6122569 A	01-05-2003 18-05-2000 19-09-2000
US 5548510	A	20-08-1996	NONE	
EP 1306641	A	02-05-2003	NONE	
EP 0747656	A	11-12-1996	AU 673794 B1 CA 2177211 A1 IL 118498 A JP 2875508 B2 JP 9033198 A US 5721680 A	21-11-1996 08-12-1996 20-06-1999 31-03-1999 07-02-1997 24-02-1998
EP 0685700	A	06-12-1995	CA 2150042 A1 DE 69529941 D1 DE 69529941 T2 IL 113887 A JP 3488318 B2 JP 8054197 A NO 952108 A US 5591031 A	01-12-1995 24-04-2003 27-11-2003 22-12-1999 19-01-2004 27-02-1996 01-12-1995 07-01-1997
GB 2202061	A	14-09-1988	AU 597944 B2 AU 6991287 A DE 3708262 A1 FR 2612646 A1 NL 8701202 A	14-06-1990 15-09-1988 22-09-1988 23-09-1988 16-12-1988
US 5414347	A	09-05-1995	AU 4191993 A CA 2100156 A1 DE 69326583 D1 DE 69326583 T2 EP 0579143 A1 ES 2136104 T3 IL 106355 A JP 2569264 B2 JP 6183397 A KR 134872 B1 NO 932532 A TR 28587 A	20-01-1994 14-01-1994 04-11-1999 25-05-2000 19-01-1994 16-11-1999 10-03-1998 08-01-1997 05-07-1994 23-04-1998 14-01-1994 23-10-1996