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(54) **EVENT RECORDER FOR PORTABLE MEDIA DEVICE**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,090,216	A	5/1978	Constable
4,386,345	A	5/1983	Narveson et al.
4,451,849	A	5/1984	Fuhrer
4,589,022	A	5/1986	Prince et al.
4,908,523	A	3/1990	Snowden et al.
4,928,307	A	5/1990	Lynn
4,951,171	A	8/1990	Tran et al.
5,185,906	A	2/1993	Brooks
5,293,494	A	3/1994	Saito et al.
5,406,305	A	4/1995	Shimomura et al.
5,559,945	A	9/1996	Beaudet et al.
5,566,337	A	10/1996	Szymanski et al.
5,583,993	A	12/1996	Foster et al.
5,608,698	A	3/1997	Yamanoi et al.
5,616,876	A	4/1997	Cluts
5,617,386	A	4/1997	Choi
5,670,985	A	9/1997	Cappels, Sr. et al.
5,684,513	A	11/1997	Decker
5,710,922	A	1/1998	Alley et al.
5,712,949	A	1/1998	Kato et al.
5,721,949	A	2/1998	Smith et al.
5,726,672	A	3/1998	Hernandez et al.
5,739,451	A	4/1998	Winksy et al.
5,740,143	A	4/1998	Suetomi
5,760,588	A	6/1998	Bailey
5,778,374	A	7/1998	Dang et al.

(Continued)

FOREIGN PATENT DOCUMENTS

DE	43 34 773	A1	4/1994

(Continued)

OTHER PUBLICATIONS

"Apple Announces iTunes 2," Press Release, Apple Computer, Inc., Oct. 23, 2001.

(Continued)

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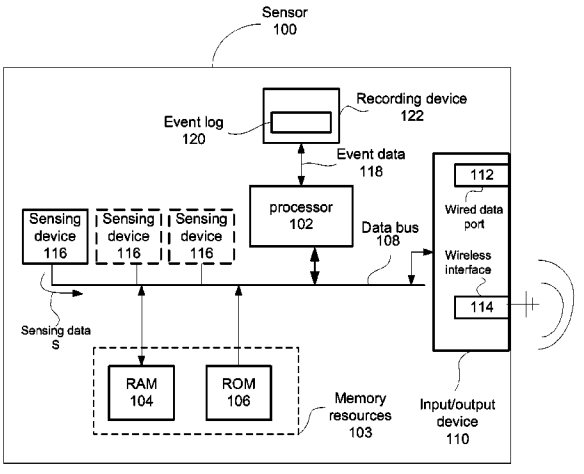
(57) **ABSTRACT**

Operational parametric sensing and event recording capabilities are provided for portable electronic devices such as media players, cell phones, laptop computers, and the like that takes the can take the form of a standalone sensing unit or as an integrated component of the portable electronic device.

43 Claims, 8 Drawing Sheets



U.S. PATENT DOCUMENTS

5,803,786	A	9/1998	McCormick	
5,815,225	A	9/1998	Nelson	
5,822,288	A	10/1998	Shinada	
5,835,721	A	11/1998	Donahue et al.	
5,835,732	A	11/1998	Kikinis et al.	
5,838,969	A	11/1998	Jacklin et al.	
5,864,868	A	1/1999	Contois	
5,867,163	A	2/1999	Kurtenbach	
5,870,710	A	2/1999	Ozawa et al.	
5,918,303	A	6/1999	Yamaura et al.	
5,920,728	A	7/1999	Hallowell et al.	
5,923,757	A	7/1999	Hocker et al.	
5,952,992	A	9/1999	Helms	
6,006,274	A	12/1999	Hawkins et al.	
6,009,237	A	12/1999	Hirabayashi et al.	
6,011,585	A	1/2000	Anderson	
6,018,705	A	1/2000	Gaudet et al.	
6,041,023	A	3/2000	Lakhansingh	
6,052,654	A	4/2000	Gaudet et al.	
6,108,426	A	8/2000	Stortz	
6,122,340	A	9/2000	Darley et al.	
6,158,019	A	12/2000	Squibb	
6,161,944	A	12/2000	Leman	
6,172,948	B1	1/2001	Keller et al.	
6,179,432	B1	1/2001	Zhang et al.	
6,185,163	B1	2/2001	Bickford et al.	
6,191,939	B1	2/2001	Burnett	
6,208,044	B1	3/2001	Viswanadham et al.	
6,216,131	B1	4/2001	Liu et al.	
6,217,183	B1	4/2001	Shipman	
6,248,946	B1	6/2001	Dwek	
6,295,541	B1	9/2001	Bodnar et al.	
6,298,314	B1	10/2001	Blackadar et al.	
6,332,175	B1	12/2001	Birrell et al.	
6,336,365	B1	1/2002	Blackadar et al.	
6,336,727	B1	1/2002	Kim	
6,341,316	B1	1/2002	Kloba et al.	
6,357,147	B1	3/2002	Darley et al.	
6,377,530	B1	4/2002	Burrows	
6,452,610	B1	9/2002	Reinhardt et al.	
6,467,924	B2	10/2002	Shipman	
6,493,652	B1	12/2002	Ohlenbusch et al.	
6,536,139	B2	3/2003	Darley et al.	
6,549,497	B2	4/2003	Miyamoto et al.	
6,560,903	B1	5/2003	Darley	
6,587,403	B1	7/2003	Keller et al.	
6,587,404	B1	7/2003	Keller et al.	
6,605,038	B1	8/2003	Teller et al.	
6,606,281	B2	8/2003	Cowgill et al.	
6,611,789	B1	8/2003	Darley	
6,617,963	B1 *	9/2003	Watters et al.	340/10.41
6,621,768	B1	9/2003	Keller et al.	
6,623,427	B2	9/2003	Mandigo	
6,631,101	B1	10/2003	Chan et al.	
6,693,612	B1	2/2004	Matsumoto et al.	
6,731,312	B2	5/2004	Robbin	
6,760,536	B1	7/2004	Amir et al.	
6,762,741	B2	7/2004	Weindorf	
6,794,566	B2	9/2004	Pachet	
6,799,226	B1	9/2004	Robbin et al.	
6,801,964	B1	10/2004	Mahdavi	
6,870,529	B1	3/2005	Davis	
6,871,063	B1	3/2005	Schiffer	
6,876,947	B1	4/2005	Darley et al.	
6,882,955	B1	4/2005	Ohlenbusch et al.	
6,898,550	B1	5/2005	Blackadar et al.	
6,911,971	B2	6/2005	Suzuki et al.	
6,918,677	B2	7/2005	Shipman	
6,934,812	B1	8/2005	Robbin et al.	
6,950,087	B2	9/2005	Knox et al.	
7,028,096	B1	4/2006	Lee	
7,046,230	B2	5/2006	Zadesky	
7,062,225	B2	6/2006	White	
7,084,856	B2	8/2006	Huppi	
7,084,921	B1	8/2006	Ogawa	
7,092,946	B2	8/2006	Bodnar	
7,124,125	B2	10/2006	Cook et al.	
7,143,241	B2	11/2006	Hull	
7,146,437	B2	12/2006	Robbin et al.	
7,171,331	B2 *	1/2007	Vock et al.	702/160
7,191,244	B2	3/2007	Jennings et al.	
7,213,228	B2	5/2007	Putterman et al.	
7,234,026	B2	6/2007	Robbin et al.	
7,277,928	B2	10/2007	Lennon	
7,301,857	B2	11/2007	Shah et al.	
7,356,679	B1	4/2008	Le et al.	
7,508,535	B2	3/2009	Hart et al.	
2001/0013983	A1	8/2001	Izawa et al.	
2001/0037367	A1	11/2001	Iyer	
2001/0041021	A1	11/2001	Boyle et al.	
2001/0042107	A1	11/2001	Palm	
2002/0002413	A1	1/2002	Tokue	
2002/0013784	A1	1/2002	Swanson	
2002/0045961	A1	4/2002	Gibbs et al.	
2002/0046315	A1	4/2002	Miller et al.	
2002/0055934	A1	5/2002	Lipscomb et al.	
2002/0090912	A1	7/2002	Cannon et al.	
2002/0116082	A1	8/2002	Gudorf	
2002/0152045	A1	10/2002	Dowling et al.	
2002/0156833	A1	10/2002	Maurya et al.	
2002/0161865	A1	10/2002	Nguyen	
2002/0173273	A1	11/2002	Spurgat et al.	
2002/0189426	A1	12/2002	Hirade et al.	
2002/0189429	A1	12/2002	Qian et al.	
2002/0199043	A1	12/2002	Yin	
2003/0037254	A1	2/2003	Fischer et al.	
2003/0046434	A1	3/2003	Flanagin et al.	
2003/0050092	A1	3/2003	Yun	
2003/0074457	A1	4/2003	Kluth	
2003/0076301	A1	4/2003	Tsuk et al.	
2003/0076306	A1	4/2003	Zadesky	
2003/0079038	A1	4/2003	Robbin et al.	
2003/0095096	A1	5/2003	Robbin et al.	
2003/0097379	A1	5/2003	Ireton	
2003/0104835	A1	6/2003	Douhet	
2003/0128192	A1	7/2003	van Os	
2003/0133694	A1	7/2003	Yeo	
2003/0153213	A1	8/2003	Siddiqui et al.	
2003/0156503	A1	8/2003	Schilling et al.	
2003/0167318	A1	9/2003	Robbin et al.	
2003/0176935	A1	9/2003	Lian et al.	
2003/0229490	A1	12/2003	Etter	
2004/0001395	A1	1/2004	Keller et al.	
2004/0001396	A1	1/2004	Keller et al.	
2004/0012556	A1	1/2004	Yong et al.	
2004/0055446	A1	3/2004	Robbin et al.	
2004/0069122	A1	4/2004	Wilson	
2004/0076086	A1	4/2004	Keller et al.	
2004/0086120	A1	5/2004	Akins, III et al.	
2004/0094018	A1	5/2004	Ueshima et al.	
2004/0125522	A1	7/2004	Chiu et al.	
2004/0165302	A1	8/2004	Lu	
2004/0177063	A1	9/2004	Weber et al.	
2004/0198436	A1	10/2004	Alden	
2004/0224638	A1	11/2004	Fadell et al.	
2004/0267825	A1	12/2004	Novak et al.	
2005/0015254	A1	1/2005	Beaman	
2005/0053365	A1	3/2005	Adams et al.	
2005/0108754	A1	5/2005	Carhart et al.	
2005/0111820	A1	5/2005	Matsumi et al.	
2005/0122315	A1	6/2005	Chalk et al.	
2005/0123886	A1	6/2005	Hua et al.	
2005/0152294	A1	7/2005	Yu et al.	
2005/0160270	A1	7/2005	Goldberg et al.	

2005/0166153	A1	7/2005	Eytchison et al.	
2005/0245839	A1	11/2005	Stivoric et al.	
2005/0248555	A1	11/2005	Feng et al.	
2005/0259524	A1	11/2005	Yeh	
2006/0013414	A1	1/2006	Shih	
2006/0068760	A1	3/2006	Hameed et al.	
2006/0088228	A1	4/2006	Marriott et al.	
2006/0098320	A1	5/2006	Koga et al.	
2006/0135883	A1*	6/2006	Jonsson et al.	600/546
2006/0152382	A1	7/2006	Hiltunen	
2006/0155914	A1	7/2006	Jobs et al.	
2006/0170535	A1*	8/2006	Watters et al.	340/10.41
2006/0190577	A1	8/2006	Yamada	
2006/0221788	A1	10/2006	Lindahl et al.	
2006/0265503	A1	11/2006	Jones et al.	
2006/0272483	A1	12/2006	Honeywell	
2007/0028009	A1	2/2007	Robbin et al.	
2007/0124679	A1	5/2007	Jeong et al.	
2007/0135225	A1*	6/2007	Nieminen et al.	473/212
2007/0255163	A1*	11/2007	Prineppi	600/549

FOREIGN PATENT DOCUMENTS

DE	44 45 023	A1	6/1996
EP	0 127 139		5/1984
EP	0578604		1/1994
EP	0 757 437		2/1997
EP	0 813 138		12/1997
EP	0 863 469		9/1998
EP	0 917 077		5/1999
EP	0 982 732		3/2000
EP	1 028 425		8/2000
EP	1028426	A2	8/2000
EP	1 076 302		2/2001
EP	1 213 643		6/2002
EP	1 289 197		3/2003
EP	1 503 363		2/2005
EP	1536612		6/2005
EP	1 566 743		8/2005
EP	1566948		8/2005
EP	1 372 133		12/2005
EP	1 686 496		8/2006
GB	2 370 208		6/2002
GB	2384399		7/2003
JP	59-023610		2/1984
JP	03-228490		10/1991
JP	04-243386		8/1992
JP	6-96520		4/1994
JP	8-235774		9/1996
JP	9-50676		2/1997
JP	9-259532		10/1997
JP	2000-90651		3/2000
JP	2000-224099		8/2000
JP	2000-285643		10/2000
JP	2000-299834		10/2000
JP	2000-311352		11/2000
JP	2000-339864		12/2000
JP	2001-236286		8/2001
JP	2001-312338		11/2001
JP	2002-076977		3/2002
JP	2002-175467		6/2002
JP	2003-188792		7/2003
JP	2003-259333		9/2003
JP	2003-319365		11/2003
JP	2004-021720		1/2004
JP	2004-219731		8/2004
JP	2004-220420		8/2004
KR	20010076508		8/2001
WO	WO 95/16950		6/1995
WO	98/17032		4/1998
WO	WO 99/28813		6/1999
WO	WO 00/22820		4/2000
WO	WO 01/33569		5/2001
WO	WO 01/65413		9/2001
WO	WO 01/67753		9/2001
WO	WO 02/25610		3/2002
WO	WO 03/023786		3/2003
WO	WO 03/036457		5/2003
WO	WO 03/067202		8/2003
WO	2004/061850	A1	7/2004
WO	WO 2004/055637		7/2004
WO	WO2004/084413	A2	9/2004
WO	WO 2004/104815		12/2004
WO	WO 2005/031737		4/2005
WO	2005/048644		5/2005
WO	WO 2005/008505		7/2005
WO	2005/109781		11/2005
WO	WO 2006/040737		4/2006
WO	2006/071364		6/2006

OTHER PUBLICATIONS

"Apple Introduces iTunes / World's Best and Easiest To Use Jukebox Software," Macworld Expo, San Francisco, Jan. 9, 2001.

"Apple's iPod Available in Stores Tomorrow," Press Release, Apple Computer, Inc., Nov. 9, 2001.

"Nomad Jukebox," User Guide, Creative Technology Ltd., Version 1, Aug. 2000.

"SoundJam MP Plus Manual, version 2.0" / MP3 Player and Encoder for Macintosh by Jeffrey Robbin, Bill Kincaid and Dave Heller, manual by Tom Negrino, published by Casady & Greene, Inc., 2000.

"12.1" 925 Candela Mobile PC", downloaded from LCDHardware.com on Dec. 19, 2002, http://www.lcdharware.com/pane1/12_1_panel/default.asp.

"BL82 Series Backlit Keyboards", www.tg3electronics.com/products/backlit/backlit.htm, downloaded Dec. 19, 2002.

"Bluetooth PC Headsets—Enjoy Wireless VoIP Conversations: 'Connecting' Your Bluetooth Headset With Your Computer", Bluetooth PC Headsets; downloaded on Apr. 29,2006 from http://www.bluetoothpcheadsets.com/connect.htm.

"Creative MuVo TX 256 MB," T3 Magazine, Aug. 17, 2004, http://www.t3.co.uk/reviews/entertainment/mp3_player/creative_muvo_tx_256mb [downloaded Jun. 6, 2006].

"Digital Still Cameras—Downloading Images to a Computer," Mimi Chakarova et al., Multi/Media Reporting and Convergence, 2 pgs., May 9, 2005.

"Eluminx Illuminated Keyboard", downloaded Dec. 19, 2002, http://www.elumix.com/.

"How to Pair a Bluetooth Headset & Cell Phone", About.com; downloaded on Apr. 29, 2006 from http://mobileoffice.about.com/od/usingyourphone/ht/blueheadset_p.htm.

"Peripherals for Industrial Keyboards & Pointing Devices", Stealth Computer Corporation, downloaded on Dec. 19, 2002, http://www.stealthcomputer.com/peropherals_oem.htm.

"Poly/Optical Fiber Optic Membrane Switch Backlighting", downloaded Dec. 19, 2002, http://www.poly/optical.com/membrane_switches.html.

"Public Safety Technologies Tracer 2000 Computer", downloaded Dec. 19, 2002, http://www.pst911.com/traver.html.

"QuickTime Movie Playback Programming Guide", Apple Computer, Inc., Aug. 11, 2005.

"QuickTime Overview", Apple Computer, Inc., Aug. 11, 2005.

"Rocky Matrix Backlit Keyboard", downloaded Dec. 19, 2002, http://www.amrel.com/asi_matrixkeyboard.html.

"Sony Ericsson to introduce Auto pairing to improve Bluetooth connectivity between headsets and phones", Sep. 28, 2005 Press Release, Sony Ericsson Corporate; downloaded on Apr. 26, 2006 from http://www.sonyericsson.com/spg.jsp?cc=global&1c=en&ver=4001&template=pc3_1_1&z . . . .

"TAOS, Inc., Announces Industry's First Ambient Light Sensor to Convert Light Intensity to Digital Signals", www.taosinc.com/pressrelease_090902.htm, downloaded Jan. 23, 2003.

"Toughbook 28: Powerful, Rugged and Wireless", Panasonic: Toughbook Models, downloaded Dec. 19, 2002, http:www.panasonic.com/computer/notebook/htm1/01a_s8.htm.

"When it Comes to Selecting a Projection TV, Toshiba Makes Everything Perfectly Clear, Previews of New Releases", www.bestbuy.com/HomeAudioVideo/Specials/ToshibaTVFeatures.asp, downloaded Jan. 23, 2003.
"WhyBuy: Think Pad", IBM ThinkPad Web Page Ease of Use, downloaded on Dec. 19, 2002, http://www.pc.ibm.com/us/thinkpad/easeofuse.html.
512MB Waterproof MP3 Player with FM Radio & Built/in Pedometer, Oregon Scientific, downloaded on Jul. 31, 2006 from http://www2.oregonscientific.com/shop/product.asp?cid=4&scid=11&pid=581.
Adam C. Engst, "SoundJam Keeps on Jammin'," Jun. 19, 2000, http://db.tidbits.com/getbits.acgi?tbart=05988.
Alex Veiga, "AT&T Wireless Launching Music Service," Yahoo! Finance, Oct. 5, 2004, pp. 1/2.
Andrew Birrell, "Personal Jukebox (PJB)," Oct. 13, 2000, http://birrell.org/andrew/talks/pjb/overview.ppt.
Apple iPod Technical Specifications, iPod 20GB and 60GB Mac + PC, downloaded from http://www.apple.com/ipod/color/specs.html on Aug. 8, 2005.
Bociurkiw, Michael, "Product Guide: Vanessa Matz,", www.forbes.com/asap/2000/1127/vmartz_print.html, Nov. 27, 2000.
Compaq, "Personal Jukebox," Jan. 24, 2001, http://research.compaq.com/SRC/pjb/.
Creative: "Creative NOMAD MuVo TX," www.creative.com, Nov. 1, 2004, http://web.archive.org/web/20041024175952/www.creative.com/products/pfriendly.asp?product=9672 [downloaded Jun. 6, 2006].
Creative: "Creative NOMAD MuVo," www.creative.com, Nov. 1, 2004, http://web.archive.org/web/20041024075901/www.creative.com/products/product.asp?category=213&subcategory=215&product=110 [downloaded Jun. 7, 2006].
Creative: "MP3 Player," www.creative.com, Nov. 1, 2004, http://web.archive.org/web/20041024074823/www.creative.com/products/product.asp?category=213&subcategory=216&product=4983 [downloaded Jun. 7, 2006].
De Herrera, Chris, "Microsoft ActiveSync 3.1," Version 1.02, Oct. 13, 2000.
iAP Sports Lingo 0x09 Protocol V1.00, May 1, 2006.
IEEE 1394—Wikipedia, 1995, http://www.wikipedia.org/wiki/Firewire.
Written Opinion of the International Searching Authority dated Nov. 24, 2006 in PCT Application No. PCT/U52005/046797.
International Search Report dated Feb. 4, 2003 in corresponding application No. PCT/US2002/033330.
International Search Report dated Jul. 10, 2007 in corresponding application No. PCT/US2006/048738.
International Search Report dated Apr. 5, 2006 from corresponding International Application No. PCT/U52005/038819.
International Search Report dated Jul. 2, 2007 in related case PCT/US2006/048669.
International Search Report dated Jun. 19, 2007 in related Application PCT/US2006/048753.
International Search Report dated May 21, 2007 from corresponding PCT Application No. PCT/US2006/048670.
International Search Report in corresponding European Application No. 06256215.2 dated Feb. 20, 2007.
Invitation to Pay Additional Fees and Partial Search Report for conesponding PCT Application No. PCT/US2005/046797 dated Jul. 3, 2006.
iTunes 2, Playlist Related Help Screens, iTunes v2.0, Apple Computer, Inc., Oct. 23, 2001.
iTunes, Playlist Related Help Screens, iTunes v1.0, Apple Computer, Inc., Jan. 2001.
Jabra Bluetooth Headset User Manual; GN Netcom A/s, 2005.
Jabra Bluetooth Introduction; GN Netcom A/S, Oct. 2004.
Jabra FreeSpeak BT200 User Manual; Jabra Corporation, 2002.
Kennedy, "Digital Data Storage Using Video Disc," IBM Technical Disclosure Bulletin, vol. 24, No. 2, Jul. 1981.
Miniman, "Applian Software's Replay Radio and Player v1.02," Product review, pocketnow.com, http://www.pocketnow.com/reviews/replay/replay.htm, Jul. 31, 2001.
Musicmatch, "Musicmatch and Xing Technology Introduce Musicmatch Jukebox," May 18, 1998, http://www.musicmatch.com/info/company/press/releases/?year=1998&release=2.
Nonhoff/Arps, et al., "Straβenmusik Portable MP3/Spieler mit USB/Anschluss," CT Magazin Fuer Computer Technik, Verlag Heinz Heise GMBH, Hannover DE, No. 25, Dec. 4, 2000.
International Search Report dated Nov. 24, 2006 in PCT Application No. PCT/US2005/046797.
Personal Jukebox (PJB), "Systems Research Center and PAAD," Compaq Computer Corp., Oct. 13, 2000, http://research.compaq.com/SRC/pjb/.
Peter Lewis, "Two New Ways to Buy Your Bits," CNN Money, Dec. 31, 2003, pp. 1/4.
Sastry, Ravindra Wadali. "A Need for Speed: A New Speedometer for Runners", submitted to the Department of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology, May 28, 1999.
Sinitsyn, Alexander. "A Synchronization Framework for Personal Mobile Servers," Pervasice Computing and Communications Workshops, 2004. Proceedings of the Second IEEE Annual Conference on, Piscataway, NJ, USA, IEEE, Mar. 14, 2004, pp. 208/212.
SoundJam MP Plus, Representative Screens, published by Casady & Greene, Inc., Salinas, CA, 2000.
Specification Sheet, iTunes 2, Apple Computer, Inc., Oct. 31, 2001.
Spiller, Karen. "Low/decibel earbuds keep noise at a reasonable level", The Telegraph Online, dated Aug. 13, 2006, http://www.nashuatelegraph.com/apps/pbcs.dll/article?Date=20060813&Cate.. Downloaded Aug. 16, 2006.
Steinberg, "Sonicblue Rio Car," Product Review, Dec. 12, 2000, http://electronics.cnet.com/electronics/0/6342420/1304/4098389.html.
Travis Butler, "Archos Jukebox 6000 Challenges Nomad Jukebox," Aug. 13, 2001, http://db.tidbits.com/getbits.acgi?tbart=06521.
Travis Butler, "Portable MP3: The Nomad Jukebox," Jan. 8, 2001, http://db.tidbits.com/getbits.acgi?tbart=06261.
U.S. Appl. No. 11/621,541, "Personalized Podcasting Podmapping" filed Jan. 9, 2007.
Waterproof Music Player with FM Radio and Pedometer User Manual, Oregon Scientific, 2005.
Apple iTunes Smart Playlists, downloaded Apr. 5, 2005 from http://web.archive.org/web/20031002011316/www.apple.com/itunes/smartplaylists.... pp. 1-2.
International Search Report dated Dec. 5, 2007 in PCT Application No. PCT/US2007/004810.
International Search Report in Patent Application No. PCT/US2006/048738 dated Jan. 29, 2008.
International Search Report in Patent Application No. PCT/US2007/077020 dated Jan. 28, 2008.
International Search Report in Patent Application No. PCT/US2007/076889 dated Jan. 28, 2008.
iTunes, Wikipedia: The Free Encyclopedia; downloaded on Oct. 5, 2005, pp. 1-6.
Nutzel et al., "Sharing Systems for Future HiFi Systems", The Computer Society, Jun. 2004.
Partial Search Report dated Sep. 6, 2007 in PCT Application No. PCT/US2007/004810.
Written Opinion dated Dec. 5, 2007 in PCT Application No. PCT/US2007/004810.
Written Opinion in Patent Application No. PCT/US2006/048738 dated Jan. 29, 2008.
Written Opinion in Patent Application No. PCT/US2007/076889 dated Jan. 28, 2008.
Written Opinion in Patent Application No. PCT/US2007/077020 dated Jan. 28, 2008.
Office Action dated Feb. 1, 2008 in U.S. Appl. No. 11/327,544.
Hart-Daves, Guy. "How To Do Everything With Your iPod and iPod Mini", 2004, McGraw-Hill Professional, p. 33.
Office Action dated Feb. 4, 2008 in U.S. Appl. No. 11/566,072.
"Creative liefert erstes Portable Media Center aus" [Online] Sep. 2, 2004, Retrieved from the internet on Sep. 20, 2007 from http://www.golem.de/0409/33347.html>.
International Search Report dated Feb. 18, 2008 in Patent Application No. PCT/US2007/079766.

International Search Report Dated Sep. 27, 2007 in Application No. 05824296.7.
Office Action dated Apr. 4, 2008 in U.S. Appl. No. 11/212,555.
Office Action dated Feb. 20, 2008 in Japanese Application No. 2007-538196.
Office Action dated Feb. 25, 2008 in U.S. Appl. No. 11/749,599.
Office Action dated Mar. 4, 2008 from U.S. Appl. No. 10/973,657.
Partial International Search Report dated Feb. 1, 2008 in Patent Application No. PCT/US2007/010630.
Written Opinion dated Feb. 18, 2008 in Patent Application No. PCT/US2007/079766.
Search Report dated Mar. 20, 2008 in Patent Application No. PCT/US2007/077789.
Written Opinion dated Mar. 20, 2008 in Patent Application No. PCT/US2007/077789.
Invitation to Pay Additional Fees and Partial Search Report for PCT Application No. PCT/US2007/077160 dated Apr. 1, 2008.
"Combination Belt Clip Leaf Spring and Housing Latch", Wandt et al.; Motorola Technical Developments, Motorla Inc. Schaumburg, IL. vol. 18, Mar. 1, 1993.
Notification of Reason for Rejection from PCT Application No. 2003-539048 dated Nov. 27, 2007.
"Creative Zen Vision: M 30GB", Dec. 21, 2005; downloaded on Jan. 11, 2008 from http://web.archive.org/web/20051221050140/http://www.everthingusb.com/creative_zen_vision:m_30gb.html>.
International Search Report dated Jul. 7, 2008 in PCT Application No. PCT/US2007/076793.
International Search Report dated Jun. 10, 2008 in PCT Application No. PCT/US2007/010630.
Kadir et al., "Adaptive Fast Playback-Based Video Skimming Using a Compressed-Domain Visual Complexity Measure", 2004 IEEE International Conference on Multimedia and Expo, pp. 2055-2058.
Office Action dated Jun. 17, 2008 in U.S. Appl. No. 11/212,313.
Office Action dated May 30, 2008 in Chinese Patent Application No. 02825938.6.
Office Action dated Oct. 16, 2008 in U.S. Appl. No. 11/327,544.
Office Action in Japanese Patent Application No. 2008-045351 dated Aug. 5, 2008.
Office Action in U.S. Patent Appl. No. 11/212,555 dated Aug. 14, 2008.
Search Report dated May 15, 2008 in PCT Application No. PCT/US2007/019578.
Written Opinion dated Jul. 7, 2008 in PCT Application No. PCT/US2007/076793.
Written Opinion dated Jun. 10, 2008 in PCT Application No. PCT/US2007/010630.
Written Opinion dated May 15, 2008 in PCT Application No. PCT/US2007/019578.
Yee et al., "Faceted Metadata for Image Search and Browsing." Association For Computing Machinery, Conference Proceedings, Apr. 5, 2003.
Notice of Allowance dated Apr. 21, 2009 in U.S. Appl. No. 11/327,544.
Office Action in European Patent Application No. 05 855 368.6 dated Nov. 20, 2008.
Office Action dated Dec. 15, 2008 in U.S. Appl. No. 11/212,313.
Notice of Allowance dated Dec. 18, 2008 in U.S. Appl. No. 11/212,555.
International Search Report dated Oct. 10, 2008 in PCT Application No. PCT/US2007/077160.
Written Opinion dated Oct. 10, 2008 in PCT Application No. PCT/US2007/077160.
Office Action dated Jan. 26, 2009 in U.S. Appl. No. 11/373,468.
Office Action dated Sep. 1, 2008 in EP Application No. 06 256 215.2.
Written Opinion dated Jan. 6, 2009 in Singapore Application No. 0701865-8.
Office Action dated Mar. 30, 2009 in U.S. Appl. No. 11/515,270.
Office Action dated Apr. 9, 2009 in U.S. Appl. No. 11/583,199.

* cited by examiner

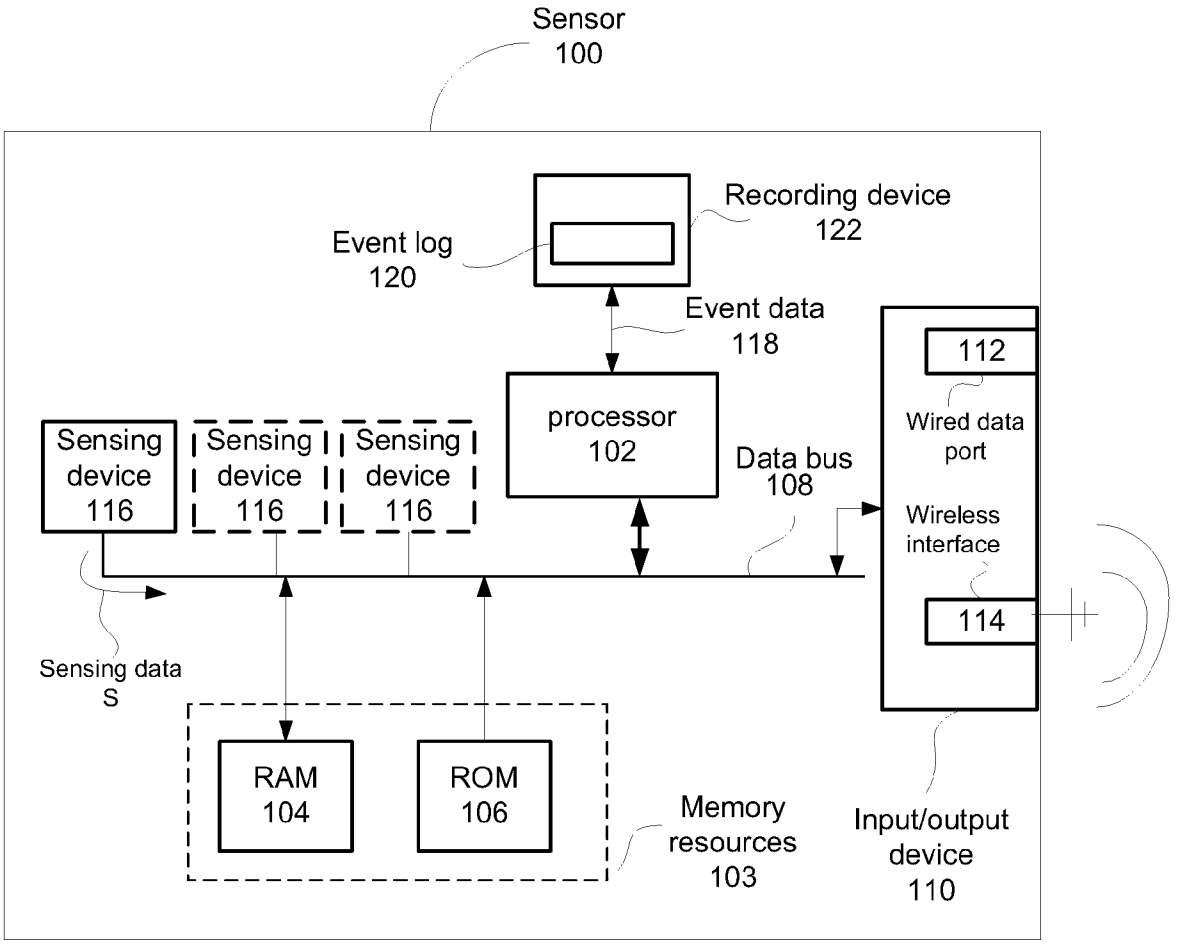

Sensor
100
Recording device
122
Event log
120
Event data
118
112
processor
102
Wired data
port
Sensing
device
116
Sensing
device
116
Sensing
device
116
Data bus
108
Wireless
interface
114
Sensing data
S
RAM
104
ROM
106
Memory
resources
103
Input/output
device
110

Fig. 1

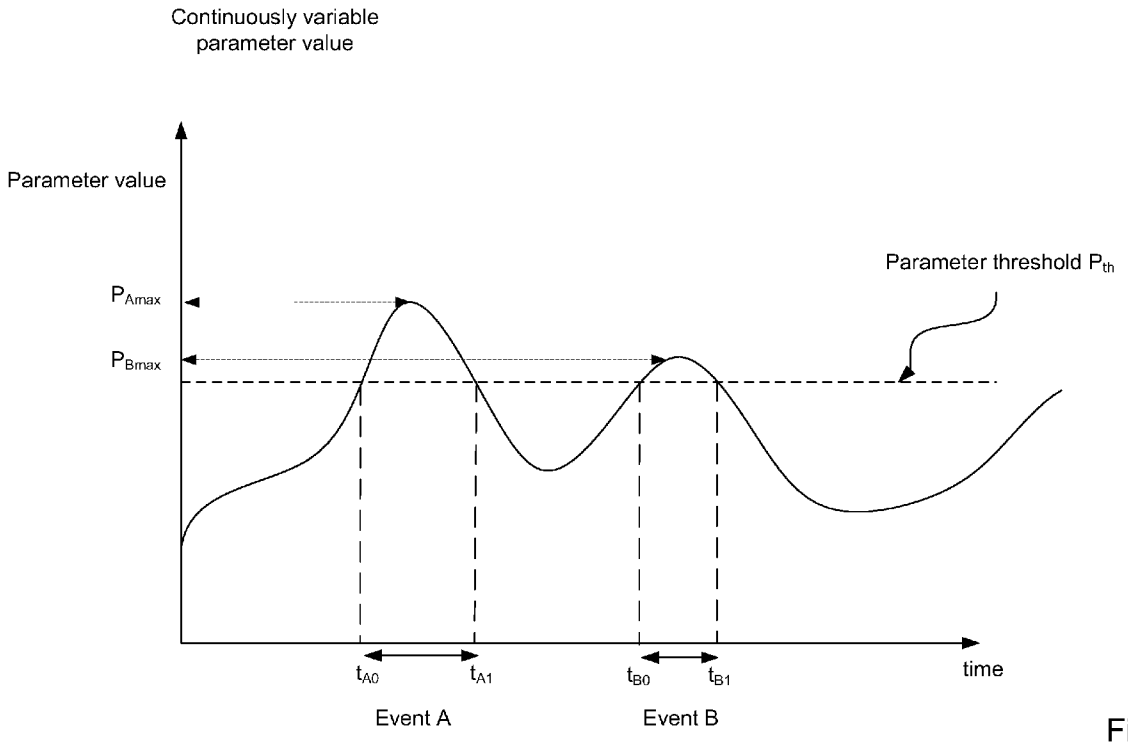

Continuously variable parameter value
Parameter value
Parameter threshold P_{th}
P_{Amax}
P_{Bmax}
t_{A0}
t_{A1}
t_{B0}
t_{B1}
time
Event A
Event B

Fig. 2

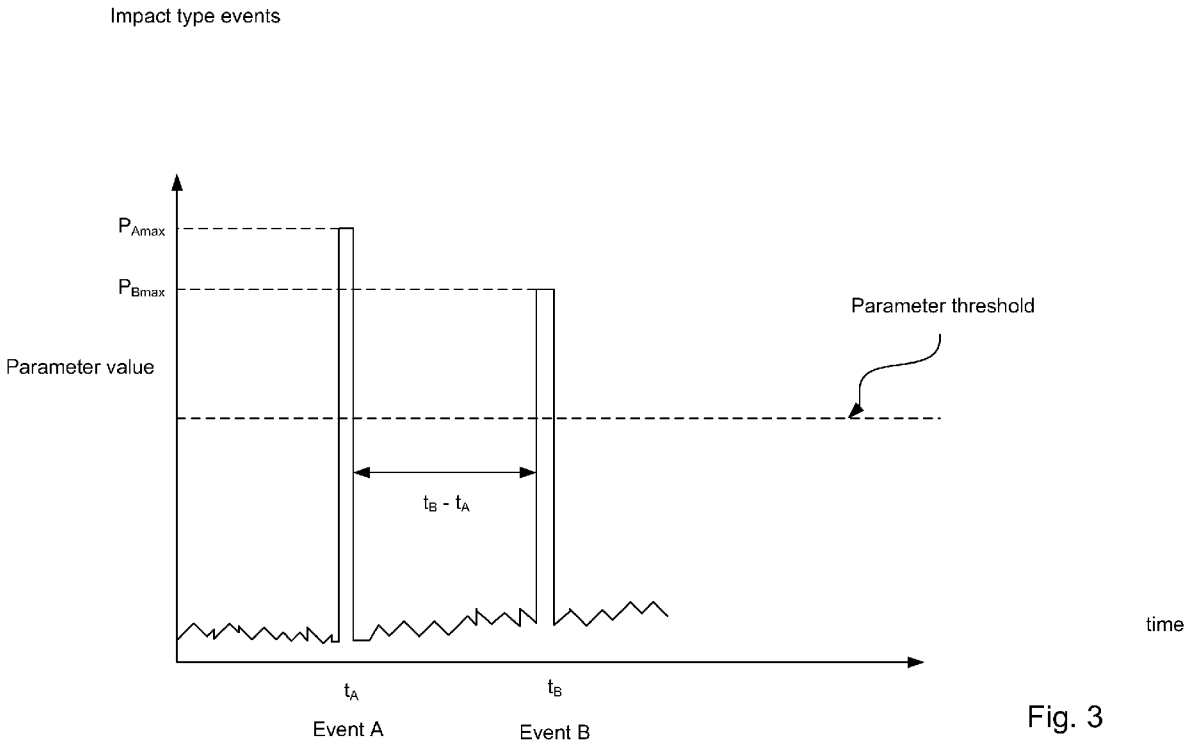

Impact type events
P_{Amax}
P_{Bmax}
Parameter value
Parameter threshold
$t_B - t_A$
time
t_A
Event A
t_B
Event B

Fig. 3

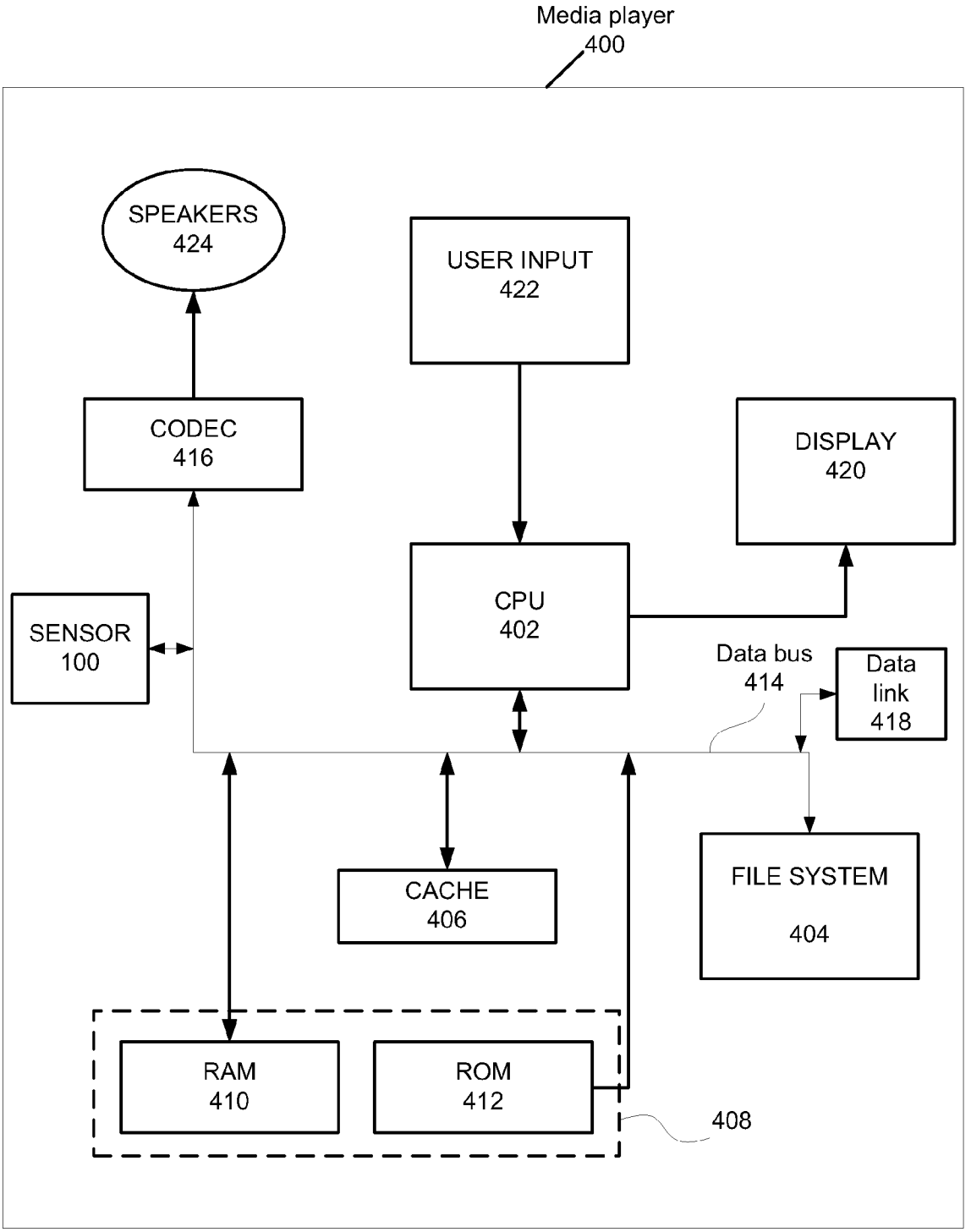

Media player
400
SPEAKERS
424
USER INPUT
422
CODEC
416
DISPLAY
420
CPU
402
SENSOR
100
Data bus
414
Data
link
418
CACHE
406
FILE SYSTEM
404
RAM
410
ROM
412
408

Fig. 4

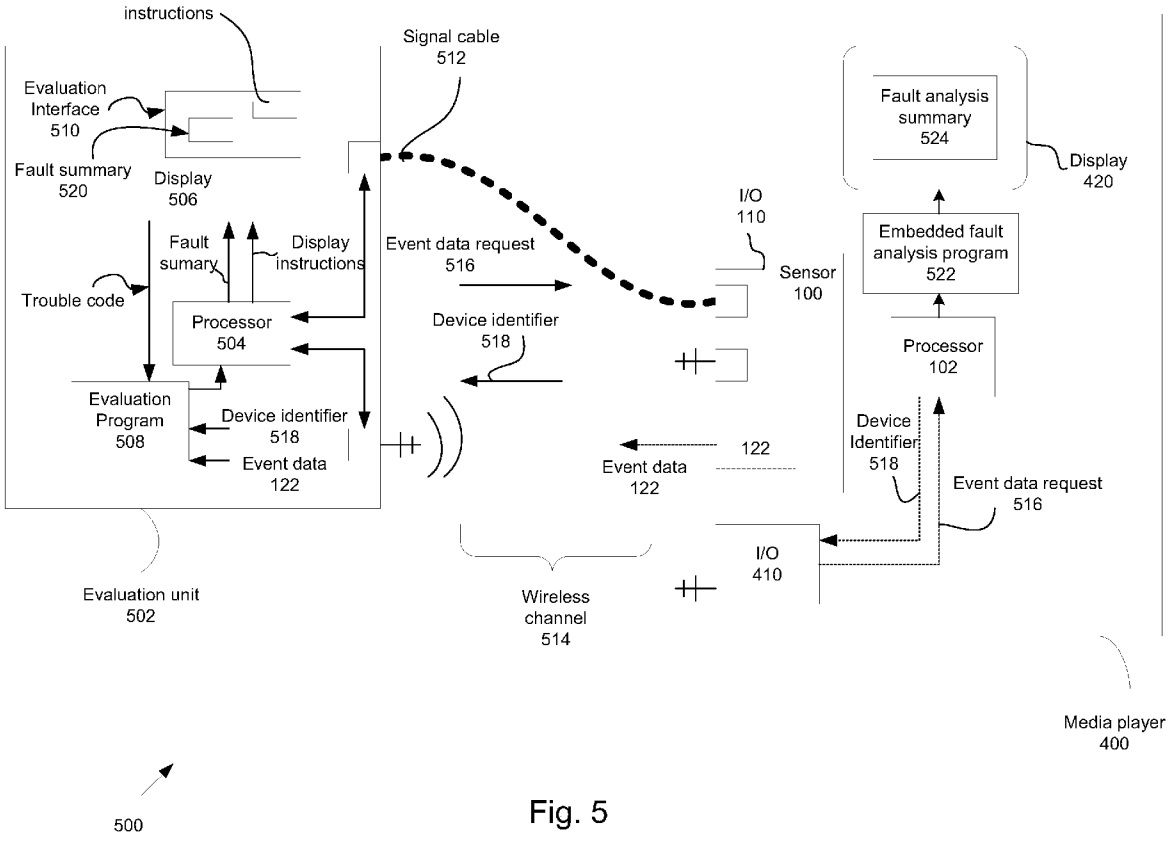

instructions
Signal cable
512
Evaluation
Interface
510
Fault summary
520
Display
506
Fault analysis
summary
524
Display
420
I/O
110
Fault
sumary
Display
instructions
Event data request
516
Sensor
100
Embedded fault
analysis program
522
Trouble code
Processor
504
Device identifier
518
Processor
102
Evaluation
Program
508
Device identifier
518
Event data
122
122
Event data
122
Device
Identifier
518
Event data request
516
I/O
410
Evaluation unit
502
Wireless
channel
514
Media player
400
500

Fig. 5

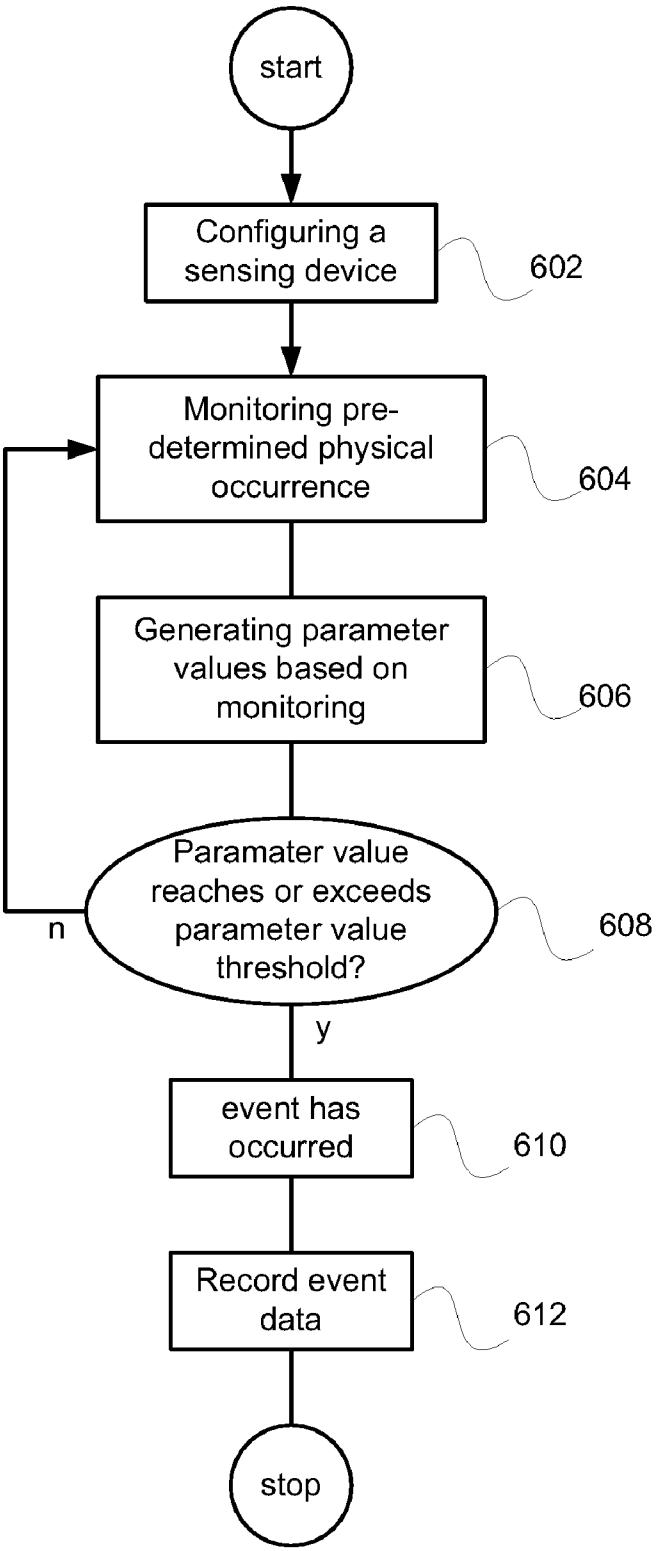

start
Configuring a sensing device
602
Monitoring pre-determined physical occurrence
604
Generating parameter values based on monitoring
606
Paramater value reaches or exceeds parameter value threshold?
608
n
y
event has occurred
610
Record event data
612
stop

Fig. 6

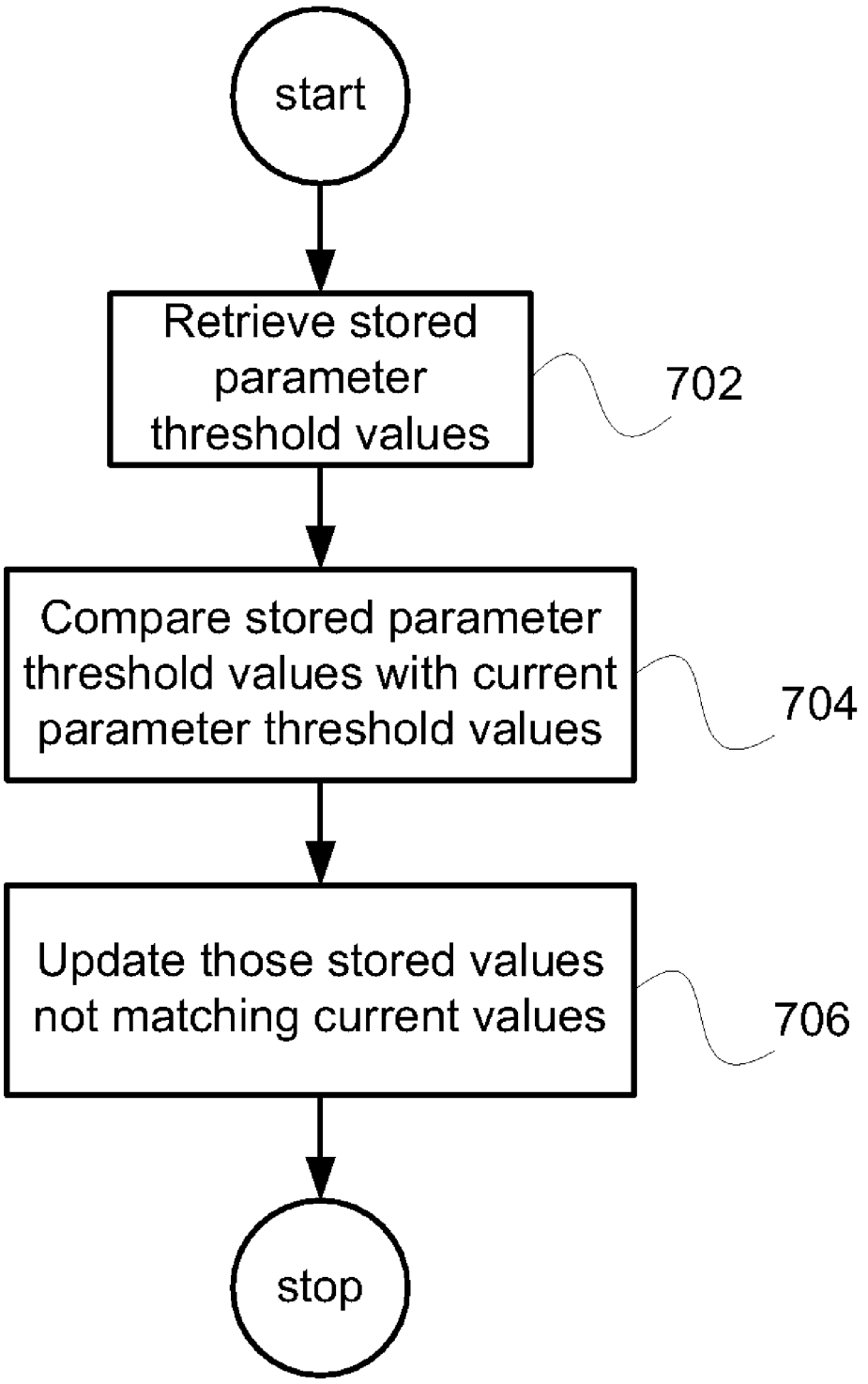

start
Retrieve stored parameter threshold values
702
Compare stored parameter threshold values with current parameter threshold values
704
Update those stored values not matching current values
706
stop

Fig. 7

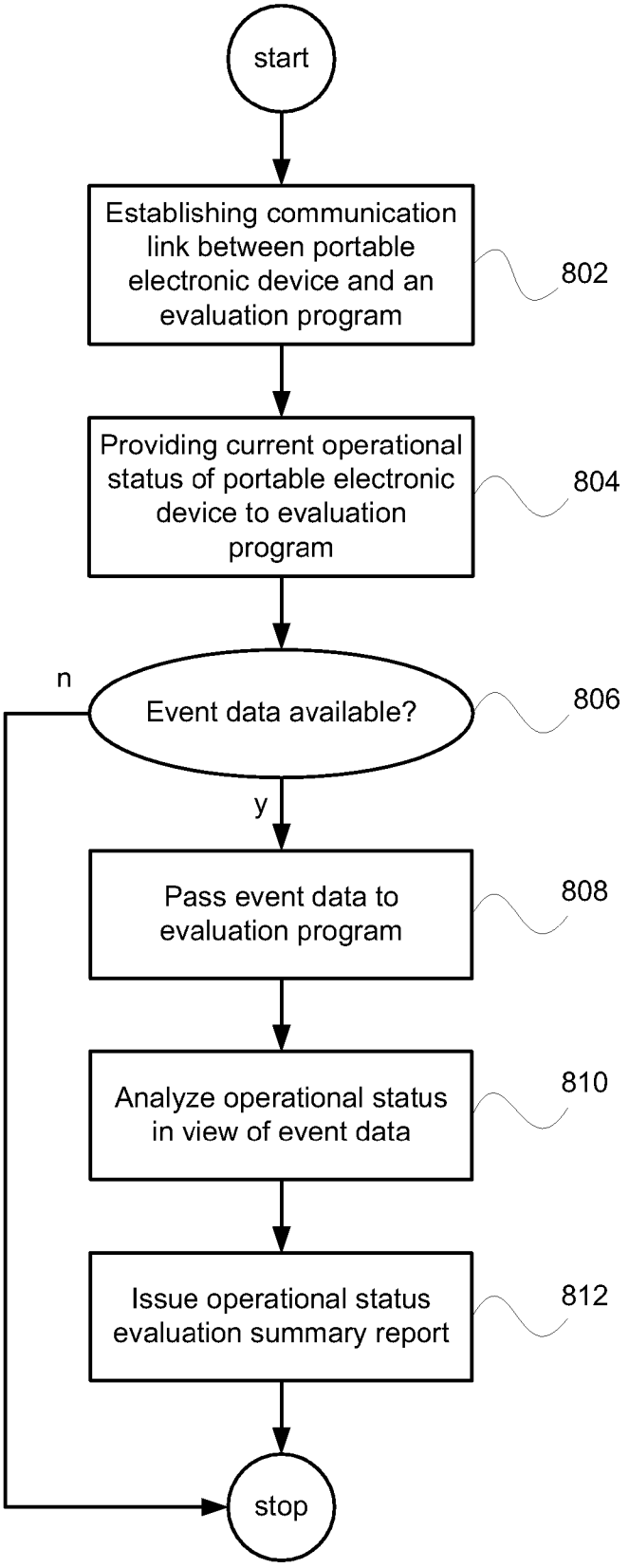

start
Establishing communication link between portable electronic device and an evaluation program
802
Providing current operational status of portable electronic device to evaluation program
804
n
Event data available?
806
y
Pass event data to evaluation program
808
Analyze operational status in view of event data
810
Issue operational status evaluation summary report
812
stop

Fig. 8

EVENT RECORDER FOR PORTABLE MEDIA DEVICE

FIELD OF INVENTION

The present invention relates generally to portable electronic devices. More particularly, the present invention relates to sensing devices used to record events that affect the operability of portable electronic devices.

DESCRIPTION OF RELEVANT ART

The small size and lightweight of many popular portable electronic consumer products (media players, cell phones, laptops) make such products particularly susceptible to events (e.g., dropping, immersion in water, exposure to temperature extremes, humidity, etc.) that can render them either completely or partially inoperable. For example, a severe shock or vibration can render display elements of a display on a portable electronic device inoperative. Sometimes, as a result, a user may request that the manufacturer repair the damaged device. Moreover, the user may also request that such repairs be made free of charge if the user believes the damage is a result of a product design defect or covered by a manufacturer's warranty.

It is therefore important for the manufacturer to be able to determine if the damage to the device was caused by product defect or by warranty voiding user actions. Such user actions include, for example, abusive behavior (e.g., immersion in water, dropping, throwing, etc.), unauthorized opening of the device housing, improper battery charging, etc. By being able to determine the likely cause of the damage, the manufacturer can distinguish defects from improper use. By recording relevant information, the manufacturer can also save the time and expense of dealing with device owners who may or may not understand the source of the problem.

Therefore it is desirable to be able to record an event in a portable electronic device that can be used to, at least, evaluate an operational status of a portable electronic device such as a hand-held, wearable, and other miniature device.

SUMMARY

The invention pertains to methods, systems, and apparatus for recording an event and associated event data in a portable electronic device. The recorded event data can be used at least to evaluate an operational status of a portable electronic device such as media players, cell phones, laptop computers, and the like. In one embodiment, the portable electronic device includes appropriate event monitoring and recording capabilities that can take the form of a standalone sensing unit. By providing monitoring and recording capabilities, more efficient and accurate fault analysis can be provided that, in turn, can facilitate product design and may reduce cost of repair by more clearly delineating if any recorded event (usually user initiated) has voided a current product warranty.

Several embodiments of the invention are discussed below.

As a method for recording an event in a portable electronic device the method is carried out by performing at least the following operations: monitoring the portable electronic device for at least one physical occurrence expressed as a parameter having a parameter value; designating the physical occurrence as an event when the associated parameter value reaches or exceeds a parameter threshold value; and recording event data corresponding to the event. In one aspect of the invention, the recorded event data can be used to evaluate the operational status of the portable electronic device.

As a portable electronic consumer product, one embodiment of the invention includes, at least: a sensing unit arranged to monitor the consumer electronic product for at least one physical occurrence expressed as a parameter having a parameter value; a processor coupled to the sensing unit arranged to, at least, receive the parameter value from the sensing unit and designate the physical occurrence as an event when the parameter value reaches or exceeds a parameter threshold value; and a recording device coupled to the processor arranged to, at least, record event data corresponding to the event.

As computer program product executable by a processor for recording an event in a portable electronic device, one embodiment of the invention includes at least: computer code for monitoring the portable electronic device for at least one physical occurrence expressed as a parameter having a parameter value; computer code for designating the physical occurrence as the event when the associated parameter value reaches or exceeds a parameter threshold value; computer code for recording event data corresponding to the event; and computer readable medium for storing the computer code.

As a system, one embodiment of the invention includes at least: a portable electronic consumer product, having a sensing unit arranged to monitor the consumer electronic product for at least one physical occurrence expressed as a parameter having a parameter value; a processor coupled to the sensing unit arranged to, at least, receive the parameter value from the sensing unit and designate the physical occurrence as an event when the parameter value reaches or exceeds a parameter threshold value; a recording device coupled to the processor arrange to, at least, record event data corresponding to the event, and an external circuit in communication with at least the portable electronic consumer product arranged to evaluate the current operational status of the portable electronic consume product using the recorded event data.

Other aspects and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an example of a data-gathering device (sensor) in the form of sensing unit in accordance with an embodiment of the invention.

FIG. **2** shows a representative response of sensor to the monitoring of a continuously variable parameter (such as temperature) in accordance with an embodiment of the invention.

FIG. **3** shows a representative response of a sensor to the monitoring of a short duration event (such as an impact) in accordance with an embodiment of the invention.

FIG. **4** shows portable media player in accordance with an embodiment of the invention.

FIG. **5** shows a system having an evaluator unit for evaluating recorded event data in accordance with an embodiment of the invention.

FIG. **6** shows a flowchart detailing a process for real time monitoring in accordance with an embodiment of the invention.

FIG. **7** illustrates a flowchart detailing a process used for updating threshold values in accordance with an embodiment of the invention.

FIG. **8** shows a flowchart detailing a process for evaluating an operational status of a portable electronic device in accordance with an embodiment of the invention.

DETAILED DESCRIPTION

Reference will now be made in detail to selected embodiments of the invention, an example of which is illustrated in the accompanying drawings. While the invention will be described in conjunction with selected embodiments, it will be understood that it is not intended to limit the invention to one particular embodiment. To the contrary, it is intended to cover alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

A portable electronic device can suffer loss of function due to manufacturing or product defects or user events. Such user events can include exposing the device to extreme temperatures (either high or low) or exposing the device to physical shock or stress (e.g., dropping the device or attempting to open the device housing). Other potentially damaging events include improper use of the device over an extended period of time (e.g., improper battery charging, repeatedly dropping the device). Since the occurrence of a single event may not, in itself, cause damage it may be necessary to record multiple events to distinguish between user and manufacturer related damage. For example, dropping the device once or even twice may not result in damage to the device, but numerous shocks over an extended time can have a cumulative effect that can result in the device being damaged. In addition to isolated events, a user may be operating the device in a manner that can damage the device or otherwise reduce its useful operating life. For example, if the user does not properly charge the battery, then the battery lifetime can be severely reduced.

It is also desirable for both the user and manufacturer that when such events are recorded, that a warning notice be issued that informs the user that a potentially damaging event has just occurred (i.e., the device has been dropped), or has occurred a number of times (i.e., the device has been repeatedly dropped), or that the user is operating the device in an improper manner (i.e., improperly charging the battery). In this way, not only does the manufacturer have the data to help determine the likely cause of damage, the user is put on notice that the device is being operated by the user in a manner that can result in damage to the device.

Generally, the invention relates to monitoring at least one parameter in a portable electronic device (e.g., a cell phone, laptop, or media player). An event occurs when a monitored parameter value reaches or exceeds a pre-determined threshold value. Event data can be recorded and subsequently analyzed (by a manufacturer, for example) to evaluate an operating status of the portable electronic device. For example, if the portable electronic device is not operating properly (or at all) or has been damaged in some way, the event data can be used to determine a likely cause of the device malfunction and/or device damage. Furthermore, in those situations where an event has been improperly or only partially recorded (due, for example, to the device failing during the recording or a defective recording device or a recording device that becomes defective due to the event being recorded and so on), the partially or improperly recorded data can be used to evaluate the current operational status of the device. For example, if an event occurs (such as a device being dropped) while another event (temperature over or under limit, for example) is being recorded, any event data in the process of being or already having been recorded can be corrupted leaving only a portion of the recorded data available for subsequent evaluation. In these situations, the uncorrupted data can be retrieved and used to evaluate the current operational status of the device.

Furthermore, a warning notice can be timely issued notifying a user that an event (or events) has occurred that may result in damage to the device if corrective actions are not taken. Sensors that can be used in embodiments of this invention include temperature sensors, pressure sensors, stress/strain sensors, accelerometers, shock sensors, vibration sensors, position sensors, sensors that detect thermal exposure, optical exposure, x-ray exposure, microwave exposure, pollutants, and the like many of which are commercially available.

FIG. **1** illustrates an example of a data-gathering device in the form of sensor **100** in accordance with an embodiment of the invention. Sensor **100** can include processor **102** for controlling the overall operation of sensor **100**. Sensor **100** can also include memory resources **103** that can include RAM **104** that can provide volatile data storage and Read-Only Memory (ROM) **106** that can store programs, utilities or processes each of which can be coupled to processor **102** by way of data bus **108**. Sensor **100** can also include input/output device **110** that can allow an external circuit (such as an external processor or an evaluator unit) to interact with sensor **100**. For example, input/output (I/O) device **110** can include wired data port **112** that can communicate with an external signal cable by way of a connector (not shown). I/O device **110** can also include wireless interface **114** that can provide a wireless communication channel that can be used for transmission and receiving data between sensor **100** and external circuitry. Such communication channels can be formed using, for example, RF carrier waves, infrared (IR) signals, etc.

Sensor **100** can also include sensing device(s) **116** that can detect a change in a parameter (expressed as a parameter value) associated with the one or more physical occurrences. Therefore, sensing device **116** can have a dynamic range that covers the expected parameter value of the physical occurrence to be monitored and can withstand the operating conditions to which it may be exposed. For example, FIG. **2** shows a representative response of sensing unit **116** to the monitoring of a physical occurrence (exposure to heat/cold) expressed as continuously variable parameter (i.e., temperature) in accordance with an embodiment of the invention. In the context of this discussion, an event occurs whenever a physical occurrence has a parameter value that reaches or exceeds a parameter threshold P_{th}. For example, event A can be said to occur when processor **102** determines that parameter value P (received from sensing unit **116** in the form of sensing signal S) exceeds parameter threshold P_{th} (at time t_{A0}, for example) for at least a duration of time (t_{A1}-t_{A0}). Similarly, event B can be said to occur when processor **102** determines that parameter value P exceeds parameter threshold P_{th} (at time t_{B0}, for example) for at least a duration of time (t_{14}-t_{B0}). Some sensors (or corresponding constituent sensing units), however, are more suited for monitoring events of a discontinuous nature (such as an impact having a short or indeterminate duration) an example of which can be seen in FIG. **3**. In these cases, an event can be said to occur when processor **102** determines that parameter value P has reached or exceeded the parameter threshold value P_{th} at a time t_a and/or t_b.

Once processor **102** has determined that an event has occurred, processor **102** can process sensing data S received from sensing unit **116** into associated event data **118** that can then be forwarded and stored event log **120** in recording device **122**. Event data **118** can include time of occurrence, date of occurrence, duration of occurrence, maximum (or minimum) parameter value, and so on. For example, in FIG. **2**, event data **118** can include information related to a difference between parameter threshold value P_{th} and maximum parameter value P_{max} (for example, with respect to event A, event data **118** can include information related to the differ-

ence between P_{Amax}-P_{th}) or more simply as a maximum value of parameter value P during a particular event (P_{Amax} or P_{Bmax}, for example).

If recording device **122** is electronic in nature (such as volatile memory devices), then event data **118** can be recorded as a change in bit values of the memory device whereas if recording device **122** is electro-mechanical or mechanical in nature, then event data **118** can be recorded as a non-reversible state change (such as the melting of a fuse, etc.). Examples of recording devices include electrical circuits, electromechanical circuits, mechanical latching mechanisms, programmable integrated circuits such as EPROMs, fusible links, magnetic circuits, acoustic circuits, optical/IR circuits, and the like. It should be noted that event data **118** could be stored in any appropriate memory device located either within sensor **100** or external to sensor **100**.

In some cases, in order to preserve power resources (which is especially important in battery powered electronic devices), recording device **122** can be configured to record an event in a non-reversible manner (such a melting of a thermocouple to indicate extreme temperature, or discoloration of a moisture sensitive tab to indicate high moisture). In this case "recording" usually means that some mechanical aspect of recording device **122** has changed in a non-reversible manner. In this way, even if sensor **100** becomes inoperable for whatever reason, an event can still be recorded even if sensor **100** is not powered or otherwise inoperable. For example, recording device **122** can be implemented as an electrical circuit having a particular resonance frequency in communication with sensing device **116** that can be a fuse in one leg of the circuit.

Furthermore, sensor **100** can be placed in an inactive, or sleep mode. However, in order to record event data when a parameter value (temperature, for example) passes a threshold value, sensor **100** can be activated (e.g., woken up). For example, if all that is required is that a temperature excursion (either hot or cold) be recorded, it is not necessary for sensor **100** to continually monitor the temperature of the device. All that is necessary is that at least one sensing unit **116** in sensor **100** provide appropriate notification to processor **102** that the monitored temperature has reached or exceeded the temperature threshold at which point processor **102** can wake up sensor **100** and complete the recordation of the event. Once the recordation of the event is complete, processor **102** can put sensor **100** back into sleep mode. By providing for a low power operational mode, valuable power resources can be preserved while still maintaining the ability to monitor parameters of interest.

It should be noted that if sensor **100** includes more than one sensing device, each sensing device could be configured to monitor different parameters, or the same parameter having different parameter threshold values in a cascade arrangement, or even different event types (e.g.; continuously variable type or impact type). In any case, each of the sensing devices can be placed in either active or sleep mode depending upon the particular event type, parameter to be monitored, and so on for which it is configured to monitor. For example, one sensing device can be configured to continuously monitor temperature and therefore be set to active mode whereas another sensing unit can be configured to concurrently monitor impacts and therefore can be set to low power mode. In this way, sensor **100** can be used to monitor separate parameters and provide corresponding event data that can be used in subsequent analysis either separately or together. For example, a piezoelectric strain sensor for measuring material strain (indicative of rough handling) can be used to determine if a device has undergone an impact type event. A temperature sensor can also be used to record any temperature events experienced by the device. The data provided by both sensing devices can be used separately or together (using cross correlation type analysis, for example) to determine if, for example, stress damage to a device housing was likely due to externally applied forces (i.e., if an impact event has been recorded but no temperature event) or related to thermal expansion/contraction (i.e., if temperature event has been recorded but no impact event). Subsequent analysis of any or all available data can be used to evaluate a likely cause of any damage or non-functionality of a device.

The invention will now be described in the context of a portable electronic consumer product that for the remainder of the discussion takes the form of a portable media player **400** that at least incorporates sensor **100**.

FIG. **4** shows portable media player **400** in accordance with an embodiment of the invention that can include central processing unit (CPU) **402** for controlling the overall operation of media player **400**. Media player **400** can store media data pertaining to media assets in file system **404** and/or cache **406**. File system **404** can take the form of a storage disk or a plurality of disks that can provide high capacity storage capability for the media player **400**. However, since the access time to file system **404** can be relatively slow, media player **400** can also include cache **406**. Even though the relative access time to cache **406** can be substantially shorter than for file system **404**, cache **406** typically does not have the large storage capacity of file system **404**. Media player **400** can also include memory resources **408**. In the described embodiment, memory resources can be configured to include RAM **410** (that can store programs, utilities or processes to be executed in a non-volatile manner) and Read-Only Memory (ROM) **412** that can store programs, utilities or processes to be executed in a non-volatile manner. Data bus **414** can facilitate data transfer between at least file system **404**, cache **406**, CPU **402**, and CODEC **416**. Media player **400** can also include data link **418** allowing media player **400** to couple to a host computer, for example. Media player **400** includes display **420** for displaying graphical, video, or images, user input **422** for receiving user supplied input commands, and speakers **424**.

Sensor **100** can be configured as a stand-alone type unit along the lines described with respect to FIG. **1** and, as such, can be connected to CPU **402** by way of data bus **414**. Sensor **100** can also have its own power supply (not shown) independent of that provided for media player **400**. In this way, sensor **100** can monitor selected parameters and communicate with external circuitry when media player **400** is powered off or has been rendered inoperable. Sensor **100** can also be integrated with CPU **402** providing a less robust, but more cost effective embodiment since all memory and processing requirements of sensor **100** can then be performed by memory resources **408** and CPU **402**, respectively. It should be noted, by utilizing on board memory resources (either memory resources **103** or memory resources **408**), various threshold values used to determine whether an event has or has not occurred can be updated in a timely manner.

FIG. **5** shows a system **500** used to evaluate recorded event data in accordance with an embodiment of the invention. Evaluation of recorded event data by system **500** can be put to any number of uses such as providing a repair technician information related to a likely cause of a device malfunction or defect. This information can be used to repair the device and/or inform the device owner that any repairs would or would not be covered by a warranty. For example, if the evaluation reveals that the damage to the device or device malfunction was most likely caused by improper use by the

device user, then any repairs would most likely not be covered by a manufacturer warranty or at least would be at the option of the manufacturer.

Accordingly, when media player **400** is brought into a repair center, for example, for evaluation and possible repair, a repair technician can power on evaluator unit **502** that includes processor **504** for controlling operations of evaluator unit **502** and display **506** for displaying user interfaces and other relevant information/data. Once evaluator unit **502** is powered on, evaluation program **508** (typically stored in evaluator unit memory not shown for sake of clarity) can instruct processor **504** to orchestrate the evaluation process that can include, at least, displaying an evaluation interface **510** on display **506**. At this point, as part of the evaluation process, a repair technician can be requested to follow a set of specific instructions as part of the evaluation interface **510**. Such instructions can include, at least, visually inspecting the device and/or device housing for any external damage (a cracked housing, for example), entering a trouble code (or its equivalent) indicating the nature of the device problem if known, powering up the device (if possible), and so on. If media player **400** can not be powered up (due to a faulty power supply, for example), it may be necessary to connect evaluator unit **502** directly to sensor **100** by way of signal cable **512** or by way of wireless channel **514** if sensor **100** has wireless capabilities using RF, acoustic, or any appropriate wireless signal. Clearly, if media player **400** cannot provide power to sensor **100**, then sensor **100** must be self powered or at least be able to receive power from an external power supply. In some cases, however, sensor **100** can be configured in such a way that recording device **122** can be detachable or otherwise accessible to external circuitry in such a way that any recorded event data can be retrieved without either sensor **100** or media player **400** providing any power whatsoever.

In any case, once evaluator unit **502** is in communication with sensor **100** by way of I/O **110** (or indirectly by way of I/O **410** if media player **400** is active), evaluation program **508** instruct processor **504** to send event data request **516** to sensor **100** for processing by processor **102**. Processor **102** can, in turn, respond to event data request **516**, in part, by transmitting device identifier **518**. Device identifier **518** can provide any information that evaluation program **508** might require in order to carry out the evaluation process. For example, device identifier **518** can include information used to distinguish media player **400** from other, similar media players. In some embodiments, evaluation program **508** can use device identifier **518** to determine if media player **400** has had any previous repair sessions and if so retrieve data from those previous repair sessions stored in a server computer, for example, connected to evaluator unit **502** as part of a network of computers. In addition to device identifier **518**, processor **102** can be programmed to provide event data **118** from recording device **122** without waiting for a specific data request from evaluation program **508**. In any case, once evaluation program **508** has received event data **118**, evaluation program **508** can use event data **118** to evaluate the current operational status of media player **400** that could include determining a likely cause of a device defect or device malfunction. For example, one type of analysis that can be carried out by evaluation program **508** can be based upon pattern analysis where a pattern of occurrence of a particular event (such as repeated improper battery charging, repeated impacts, etc.) can be correlated to observed defects or operational problems with media player **400**. Another type of analysis that can be carried out by evaluation program **508** can be based upon performing a correlation analysis between certain aspects of event data **118** to known problems and their causes. For example, if it is observed that a battery in media player **400** cannot hold a proper charge and event data indicates that a user of media player **400** is not following proper charging procedures, then in all likelihood, that is the cause of the battery not holding a charge. Another example could be that event data **118** indicates that a number of warning notices have been issued by media player **400** over a period of time indicating that the media player **400** has, for example, been exposed to temperature extremes, repeated shocks, improper battery charging, etc. If media player **400** is exhibiting a problem that has been previously linked to any of the events associated with the issued warning(s), then a conclusion could be that the observed problem with media player **400** is due to that event(s) and not a design or product defect. In this case, a manufacturer could realistically decline to repair media player **400** under a manufacturer warranty. In any case, when evaluation program **508** has completed its analysis, a fault summary **520** can be displayed on display **506** indicating at least a list of faults, causes and any corrective actions.

In some cases, a user can also invoke an embedded fault analysis program **522** that can provide simplified fault analysis generated by, for example, CPU **402**. In this way, real time fault analysis summary **524** along the lines of an automated trouble shooting guide can be provided to, for example, a user, repair technician, etc. on display **420**. Real time fault analysis summary **524** can provide specific fault codes indicating faults detected, recommended corrective actions, and so on. In this way, a user, for example, can consult use real time fault analysis **524** to diagnose and potentially correct the problem without the need to deal with customer service thereby greatly reducing any device downtime lost in transporting the damaged device to a repair center.

FIG. **6** shows a flowchart detailing a process **600** for real time monitoring of a portable electronic device in accordance with an embodiment of the invention. Process **600** begins at **602** by configuring a sensing device to monitor a selected physical occurrence that can be expressed as a parameter value. Configuring the sensing device can include setting, or resetting, a parameter threshold value, setting an operational mode (for example, low power mode, or sleep mode), connecting the sensing device to other sensing devices to form a cascade arrangement, and so on. Once the sensing device has been configured, the sensing device monitors for a pre-determined physical occurrence at **604** and generates sensing data (i.e., temperature, pressure, impact, stress, etc.) at **606** that can be expressed as a corresponding parameter value (° F., nt/cm^2, etc). If, at **608**, the parameter value reaches or exceeds a corresponding parameter threshold value, then an event flag is issued at **610** indicating that an event has occurred. At **612**, corresponding event data is recorded. Event data can include time of occurrence, date of occurrence, duration of occurrence, maximum (or minimum) parameter value, and so on.

FIG. **7** illustrates process **700** for updating parameter threshold values in accordance with an embodiment of the invention. Process **700** begins at **702** by retrieving stored parameter threshold values. At **704**, current parameter threshold values are compared to stored parameter threshold values. At **706**, based upon the comparison, any stored parameter threshold value not matching current parameter threshold values can be updated.

FIG. **8** illustrates a flowchart detailing a process **800** for evaluating an operational status of a portable electronic device in accordance with an embodiment of the invention. Process **800** begins at **802** establishing a communication link between the portable electronic device and an evaluation program. In the described embodiment, the evaluation program can be executed by a processor included in an external

circuit that can be separate and distinct from the portable electronic device. The evaluation program can also be executed by a processing unit that is part of the portable electronic device under evaluation along the lines of a virtual troubleshooting guide. In any case, once the communication link has been established, a current operational status (that can include operational problems, defects, and so on) of the portable electronic device can be provided to the evaluation program at **804**. The evaluation program can request a manual entry of the current operational status by, for example, a repair technician, a user, and so on. The evaluation program can also request the portable electronic device automatically provide information over the communication link indicative of the operational status of the portable electronic device. Such operational problems can include the inability of the portable electronic device to power up properly or power up at all, some or all of the components (speakers, display, and so on) are not functioning properly, the battery (if the portable electronic device is battery powered) is not holding a proper charge or not holding a charge for as long as expected, etc.

At **806**, a determination can be made if any recorded event data is available. If no recorded event data is available, then processing ends, otherwise, any recorded event data can be passed to the evaluation program at **808**. At **810**, the evaluation program analyzes the operational status in view of the event data. Analysis of the event data can include pattern analysis, correlation analysis, and evaluation of any warning notices that have been issued and if there is any correlation to any operational problems. At **812**, once the evaluation program has completed the analysis, a summary report is issued. The summary report can include information about the operational status of the portable electronic device pointing out likely causes of any problems. In some cases, the summary report can include a probability analysis indicating a probability distribution of likely causes of any operational problems. For example, if the portable electronic device is experiencing short battery life and the event data indicates a history of improper battery charging, then there would be a high probability that the improper battery charging practices is the root cause of the reduced battery life and not a defective battery. In this case, since the likely cause of the reduced battery life stems from the user, a manufacturer can refuse to repair or replace the defective battery under a manufacturer's warranty.

While this invention has been described in terms of a preferred embodiment, there are alterations, permutations, and equivalents that fall within the scope of this invention. It should also be noted that there are many alternative ways of implementing both the process and apparatus of the present invention. It is therefore intended that the invention be interpreted as including all such alterations, permutations, and equivalents as fall within the true spirit and scope of the present invention.

What is claimed is:

1. In a portable electronic device, a method of recording an event, comprising:

monitoring the portable electronic device for at least one physical occurrence expressed as a parameter having a parameter value;

designating the physical occurrence as the event when the associated parameter value reaches or exceeds a parameter threshold value; and

recording event data corresponding to the event,

if at least some of the recorded event data is improperly recorded, then

evaluating a current operational status of the portable electronic device using a portion of the properly recorded event data.

2. A method as recited in claim **1**, further comprising:

issuing in real time a notification that the event has been recorded; and

recording the issuance of the notification as part of the recorded event data.

3. A method as recited in claim **2**, further comprising:

updating an event counter indicating a number of times that a like event has occurred.

4. A method as recited in claim **3**, wherein the event data comprises:

an event type code;

a date of the event;

a time of the event;

a duration of the event; and

the event counter.

5. A method as recited in claim **3**, wherein the issuing the notification comprises:

communicating at least some of the recorded event data.

6. A method as recited as recited in claim **5**, wherein the communicating comprises:

providing a visual cue and/or an audio cue.

7. A method as recited in claim **1**, wherein the evaluating the operational status of the portable electronic device further comprises:

passing at least some of the recorded event data to an external circuit for further processing that includes at least some of the evaluating; and

issuing an operational status evaluation report that includes a current operational status of the portable electronic device.

8. A method as recited in claim **7**, further comprising:

if the current operational status requires a repair operation, then

determining if the repair operation is covered by a manufacturer's warranty or not based upon the evaluation.

9. A method as recited in claim **1**, wherein the external circuit is a computing device.

10. A method as recited in claim **9**, wherein the computing device is part of a network of computing devices.

11. A method as recited in claim **1**, wherein the physical occurrence is selected from a group comprising: exposure to heat and/or cold, impact, stress, user-initiated action, and exposure to moisture.

12. A method as recited in claim **1**, further comprising:

updating the parameter threshold value to an updated parameter threshold value.

13. A portable consumer electronic product, comprising:

a sensing unit arranged to monitor the consumer electronic product for at least one physical occurrence expressed as a parameter having a parameter value;

a central processing unit (CPU) coupled to the sensing unit arranged to, at least, receive the parameter value from the sensing unit and designate the physical occurrence as an event when the parameter value reaches or exceeds a parameter threshold value; and

a recording device coupled to the processor arranged to, at least, record event data corresponding to the event, Wherein if at least some of the recorded event data is improperly recorded, then a current operational status of the portable consumer electronic product is evaluated using a portion of the properly recorded event data.

14. A portable electronic consumer product as recited in claim **13**, wherein the CPU issues and records in the recording

device as part of the event data, a notification that the event has occurred and has been recorded.

15. A portable electronic consumer product as recited in claim **14**, wherein the event data comprises:

an event type code;

a date of the event;

a time of the event;

a duration of the event; and

an event counter indicating a number of times that a like event has occurred.

16. A portable electronic consumer product as recited in claim **15**, wherein the notification includes at least some of the recorded event data.

17. A portable electronic consumer product as recited as recited in claim **16**, wherein the notification takes the form of a visual cue and/or an audio cue.

18. A portable electronic consumer product as recited in claim **13**, wherein the portable electronic consumer product further comprises:

an input/output device coupled to the CPU arranged to pass at least some of the recorded event data to an external circuit for further processing.

19. A portable electronic consumer product as recited in claim **18**, wherein as part of the further processing the external circuit issues an operational status evaluation report.

20. A portable electronic consumer product as recited in claim **19**, wherein if the current operational status indicates that a repair operation is required, then the external circuit determines if the repair operation is covered by a manufacturer's warranty or not.

21. A portable electronic consumer product as recited in claim **20**, wherein the external circuit is a computing device.

22. A portable electronic consumer product as recited in claim **21**, wherein the computing device is part of a network of computing devices.

23. A portable electronic consumer product as recited in claim **22**, wherein the physical occurrence is selected from a group comprising: exposure to heat and/or cold, impact, stress, user initiated action, and exposure to moisture.

24. A portable electronic consumer product as recited in claim **13**, wherein the parameter threshold value is periodically updated.

25. An evaluation unit having a processor for evaluating an operational status of a portable electronic device, comprising:

computer code for monitoring the portable electronic device for at least one physical occurrence expressed as a parameter having a parameter value;

computer code for designating the physical occurrence as an event when the associated parameter value reaches or exceeds a parameter threshold value;

computer code for recording event data corresponding to the event;

computer code for determining a current operational status of the portable electronic device based upon the recorded event data;

computer code for determining if the current operational status requires a repair operation;

computer code for determining if the repair operation is covered by a manufacturer's warranty or not; and

computer readable medium for storing the computer code.

26. An evaluation unit as recited in claim **25**, further comprising:

computer code for issuing in real time a notification that the event has been recorded; and

computer code for recording the issuance of the notification as part of the recorded event data.

27. An evaluation unit as recited in claim **26**, further comprising:

computer code for updating an event counter indicating a number of times that a like event has occurred.

28. An evaluation unit as recited in claim **27**, wherein the event data comprises:

an event type code;

a date of the event;

a time of the event;

a duration of the event; and

the event counter.

29. An evaluation unit as recited in claim **27**, wherein the issuing the notification comprises:

computer code for communicating at least some of the recorded event data.

30. An evaluation unit as recited as recited in claim **29**, wherein the communicating comprises:

computer code for providing a visual cue and/or an audio cue.

31. An evaluation unit as recited in claim **25**, further comprising:

computer code for evaluating the operational status of the portable electronic device based upon the recorded event data

computer code for determining if at least some of the recorded event data is improperly recorded; and

computer code for evaluating a current operational status of the portable electronic device using a portion of the properly recorded event data.

32. An evaluation unit as recited in claim **31**, further comprising:

computer code for passing at least some of the recorded event data to an external computing device having a processor arranged to execute computer code for further processing that includes at least some of the evaluating; and

computer code for issuing a portable electronic device operational status evaluation report based upon the evaluating.

33. An evaluation unit as recited in claim **31**, wherein the external circuit is a computing device that is part of a network of computing devices.

34. An evaluation unit as recited in claim **25**, wherein the physical occurrence is selected from a group comprising: exposure to heat and/or cold, impact, stress, user initiated action, and exposure to moisture.

35. An evaluation unit as recited in claim **25**, further comprising:

computer code for updating the parameter threshold value to an updated parameter threshold value.

36. A system, comprising:

a portable electronic consumer product, having at least a sensing unit arranged to monitor the consumer electronic product for at least one physical occurrence expressed as a parameter having a parameter value, a central processing unit (CPU) coupled to the sensing unit arranged to, at least, receive the parameter value from the sensing unit and designate the physical occurrence as an event when the parameter value reaches or exceeds a parameter threshold value, and a recording device coupled to the processor arranged to, at least, record event data corresponding to the event; and

an external circuit in communication with at least the portable electronic consumer product arranged to evaluate the current operational status based, in part, upon recorded event data received from the recording device, wherein if at least some of the recorded event data is

improperly recorded, then a current operational status of the portable electronic consumer product is evaluated using a portion of the properly recorded event data.

37. The system as recited in claim **36**, wherein the CPU issues in real time a notification that the event has been recorded, and records the issuance of the notification as part of the recorded event data.

38. The system as recited in claim **37**, wherein the CPU updates an event counter indicating a number of times that a like event has occurred.

39. The system as recited in claim **37**, the notification includes at least some of the recorded event data.

40. The system as recited in claim **36**, wherein the event data comprises:

an event type code;

a date of the event;

a time of the event;

a duration of the event; and

the event counter.

41. A system, comprising:

a portable electronic consumer product having at least a sensing unit arranged to monitor the consumer electronic product for at least one physical occurrence expressed as a parameter having a parameter value, a central processing unit (CPU) coupled to the sensing unit arranged to, at least receive the parameter value from the sensing unit and designate the physical occurrence as an event when the parameter value reaches or exceeds a parameter threshold value, and a recording device coupled to the processor arranged to, at least, record event data corresponding to the event; and

an external circuit in communication with at least the portable electronic consumer product arranged to

evaluate the current operational status based, in part, upon recorded event data received from the recording device,

determine if the current operational status requires a repair operation, and

determine if the repair operation is covered by a manufacturer's warranty or not.

42. The system as recited in claim **41**, wherein the CPU issues in real time a notification if the current operational status requires the repair operation.

43. The system as recited in claim **42**, wherein the notification includes the indication if the repair operation is covered by the manufacturer's warranty or not.

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