

(12) **United States Patent**
King et al.

(10) **Patent No.:** **US 7,656,393 B2**
(45) **Date of Patent:** **Feb. 2, 2010**

(54) **ELECTRONIC DEVICE HAVING DISPLAY AND SURROUNDING TOUCH SENSITIVE BEZEL FOR USER INTERFACE AND CONTROL**

(75) Inventors: **Nick King**, San Jose, CA (US); **Duncan Kerr**, San Francisco, CA (US); **Paul Herbst**, Morgan Hill, CA (US); **Steven P Hotelling**, San Jose, CA (US)

(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 588 days.

(21) Appl. No.: **11/426,078**

(22) Filed: **Jun. 23, 2006**

(65) **Prior Publication Data**

US 2006/0238517 A1 Oct. 26, 2006

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/367,749, filed on Mar. 3, 2006.

(60) Provisional application No. 60/663,345, filed on Mar. 16, 2005, provisional application No. 60/658,777, filed on Mar. 4, 2005.

(51) **Int. Cl.**

G06F 3/041 (2006.01)

G09G 5/00 (2006.01)

G06F 3/02 (2006.01)

G06F 3/045 (2006.01)

H04B 1/40 (2006.01)

A61M 37/00 (2006.01)

(52) **U.S. Cl.** **345/173**; 345/156; 345/169; 345/174; 455/77; 604/6.13

(58) **Field of Classification Search** 345/156-178
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,333,160 A 7/1967 Gorski

(Continued)

FOREIGN PATENT DOCUMENTS

CA 1243096 10/1988

(Continued)

OTHER PUBLICATIONS

Quantum Research Group, "QT510/QWheel(TM) Touch Slider IC," copyright 2004-2005, 14-pgs.

(Continued)

Primary Examiner—Sumati Lefkowitz

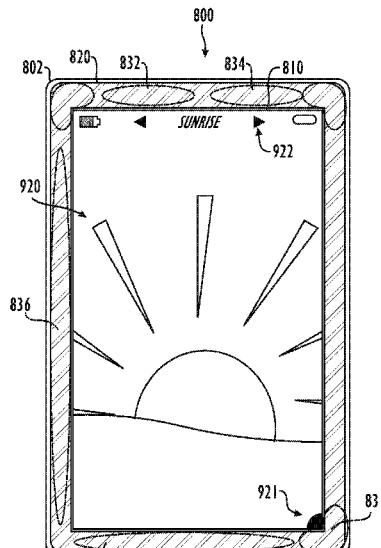
Assistant Examiner—Charles Hicks

(74) *Attorney, Agent, or Firm*—Morrison & Foerster LLP

(57) **ABSTRACT**

An electronic device has a display and has a touch sensitive bezel surrounding the display. Areas on the bezel are designated for controls used to operate the electronic device. Visual guides corresponding to the controls are displayed on the display adjacent the areas of the bezel designated for the controls. Touch data is generated by the bezel when a user touches an area of the bezel. The device determines which of the controls has been selected based on which designated area is associated with the touch data from the bezel. The device then initiates the determined control. The device can have a sensor for determining the orientation of the device. Based on the orientation, the device can alter the areas designated on the bezel for the controls and can alter the location of the visual guides for the display so that they match the altered areas on the bezel.

45 Claims, 13 Drawing Sheets



U.S. PATENT DOCUMENTS					
			5,729,250	A	3/1998 Bishop et al.
			5,730,165	A	3/1998 Philipp
			5,736,976	A	4/1998 Cheung
			5,741,990	A	4/1998 Davies
			5,745,116	A	4/1998 Pisutha-Arnond
			5,745,716	A	4/1998 Tchao et al.
			5,748,269	A	5/1998 Harris et al.
			5,764,818	A	6/1998 Capps et al.
			5,767,457	A	6/1998 Gerpheide et al.
			5,767,842	A	6/1998 Korth
			5,790,104	A	8/1998 Shieh
			5,790,107	A	8/1998 Kasser et al.
			5,802,516	A	9/1998 Shwarts et al.
			5,808,567	A	9/1998 McCloud
			5,809,267	A	9/1998 Moran et al.
			5,821,690	A	10/1998 Martens et al.
			5,821,930	A	10/1998 Hansen
			5,823,782	A	10/1998 Marcus et al.
			5,825,351	A	10/1998 Tam
			5,825,352	A	10/1998 Bisset et al.
			5,854,625	A	12/1998 Frisch et al.
			5,880,411	A	3/1999 Gillespie et al.
			5,898,434	A	4/1999 Small et al.
			5,920,309	A	7/1999 Bisset et al.
			5,923,319	A	7/1999 Bishop et al.
			5,933,134	A	8/1999 Shieh
			5,943,044	A	8/1999 Martinelli et al.
			6,002,389	A	12/1999 Kasser
			6,002,808	A	12/1999 Freeman
			6,020,881	A	2/2000 Naughton et al.
			6,031,524	A	2/2000 Kunert
			6,037,882	A	3/2000 Levy
			6,050,825	A	4/2000 Nichol et al.
			6,052,339	A	4/2000 Frenkel et al.
			6,072,494	A	6/2000 Nguyen
			6,084,576	A	7/2000 Leu et al.
			6,107,997	A	8/2000 Ure
			6,128,003	A	10/2000 Smith et al.
			6,131,047	A	10/2000 Hayes, Jr. et al.
			6,131,299	A	10/2000 Raab et al.
			6,135,958	A	10/2000 Mikula-Curtis et al.
			6,144,380	A	11/2000 Shwarts et al.
			6,188,391	B1	2/2001 Seely et al.
			6,198,515	B1	3/2001 Cole
			6,208,329	B1	3/2001 Ballare
			6,222,465	B1	4/2001 Kumar et al.
			6,239,790	B1	5/2001 Martinelli et al.
			6,243,071	B1	6/2001 Shwarts et al.
			6,246,862	B1	6/2001 Grivas et al.
			6,249,606	B1	6/2001 Kiraly et al.
			6,288,707	B1	9/2001 Philipp
			6,289,326	B1	9/2001 LaFleur
			6,292,178	B1	9/2001 Bernstein et al.
			6,297,811	B1 *	10/2001 Kent et al. 345/173
			6,323,846	B1	11/2001 Westerman et al.
			6,347,290	B1	2/2002 Bartlett
			6,377,009	B1	4/2002 Philipp
			6,380,391	B2	4/2002 Gillespie et al.
			6,411,287	B1	6/2002 Scharff et al.
			6,413,233	B1 *	7/2002 Sites et al. 604/6.13
			6,414,671	B1	7/2002 Gillespie et al.
			6,421,234	B1	7/2002 Ricks et al.
			6,452,514	B1	9/2002 Philipp
			6,457,355	B1	10/2002 Philipp
			6,466,036	B1	10/2002 Philipp
			6,466,203	B2	10/2002 Van Ee
			6,515,669	B1	2/2003 Mohri
			6,525,749	B1	2/2003 Moran et al.
			6,535,200	B2	3/2003 Philipp
			6,543,684	B1	4/2003 White et al.
			6,543,947	B2	4/2003 Lee
3,541,541	A	11/1970 Englebart			
3,662,105	A	5/1972 Hurst et al.			
3,798,370	A	3/1974 Hurst			
4,246,452	A	1/1981 Chandler			
4,550,221	A	10/1985 Mabusth			
4,566,001	A	1/1986 Moore et al.			
4,672,364	A	6/1987 Lucas			
4,672,558	A	6/1987 Beckes et al.			
4,692,809	A	9/1987 Beining et al.			
4,695,827	A	9/1987 Beining et al.			
4,733,222	A	3/1988 Evans			
4,734,685	A	3/1988 Watanabe			
4,746,770	A	5/1988 McAvinney			
4,771,276	A	9/1988 Parks			
4,788,384	A	11/1988 Bruere-Dawson et al.			
4,806,846	A	2/1989 Kerber			
4,896,370	A *	1/1990 Kasparian et al. 455/77			
4,898,555	A	2/1990 Sampson			
4,933,660	A	6/1990 Wynne, Jr.			
4,968,877	A	11/1990 McAvinney et al.			
5,003,519	A	3/1991 Noijean			
5,017,030	A	5/1991 Crews			
5,178,477	A	1/1993 Gambaro			
5,189,403	A	2/1993 Franz et al.			
5,194,862	A	3/1993 Edwards			
5,224,861	A	7/1993 Glass et al.			
5,241,308	A	8/1993 Young			
5,252,951	A	10/1993 Tannenbaum et al.			
5,281,966	A	1/1994 Walsh			
5,305,017	A	4/1994 Gerpheide			
5,345,543	A	9/1994 Capps et al.			
5,376,948	A	12/1994 Roberts			
5,379,057	A	1/1995 Clough et al.			
5,398,310	A	3/1995 Tchao et al.			
5,442,742	A	8/1995 Greyson et al.			
5,463,388	A	10/1995 Boje et al.			
5,463,696	A	10/1995 Beernink et al.			
5,483,261	A	1/1996 Yasutake			
5,488,204	A	1/1996 Mead et al.			
5,495,077	A	2/1996 Miller et al.			
5,513,309	A	4/1996 Meier et al.			
5,523,775	A	6/1996 Capps			
5,530,455	A	6/1996 Gillick et al.			
5,543,590	A	8/1996 Gillespie et al.			
5,543,591	A	8/1996 Gillespie et al.			
5,563,632	A	10/1996 Roberts			
5,563,996	A	10/1996 Tchao			
5,565,658	A	10/1996 Gerpheide et al.			
5,579,036	A	11/1996 Yates, IV			
5,581,681	A	12/1996 Tchao et al.			
5,583,946	A	12/1996 Gourdol			
5,590,219	A	12/1996 Gourdol			
5,592,566	A	1/1997 Pagallo et al.			
5,594,471	A	1/1997 Deeran et al.			
5,594,810	A	1/1997 Gourdol			
5,596,694	A	1/1997 Capps			
5,612,719	A	3/1997 Beernink et al.			
5,631,805	A	5/1997 Bonsall			
5,633,955	A	5/1997 Bozinovic et al.			
5,634,102	A	5/1997 Capps			
5,636,101	A	6/1997 Bonsall et al.			
5,642,108	A	6/1997 Gopher et al.			
5,644,657	A	7/1997 Capps et al.			
5,666,113	A	9/1997 Logan			
5,666,502	A	9/1997 Capps			
5,666,552	A	9/1997 Greyson et al.			
5,675,361	A	10/1997 Santilli			
5,675,362	A	10/1997 Clough et al.			
5,677,710	A	10/1997 Thompson-Rohrlich			

6,597,384	B1	7/2003	Harrison	2006/0044259	A1	3/2006	Hotelling et al.
6,610,936	B2	8/2003	Gillespie et al.	2006/0053387	A1	3/2006	Ording
6,624,833	B1	9/2003	Kumar et al.	2006/0066582	A1	3/2006	Lyon et al.
6,639,577	B2	10/2003	Eberhand	2006/0079969	A1	4/2006	Seguin
6,650,319	B1	11/2003	Hurst et al.	2006/0085757	A1	4/2006	Andre et al.
6,658,994	B1	12/2003	McMillan	2006/0097991	A1	5/2006	Hotelling et al.
6,670,894	B2	12/2003	Mehring	2006/0197753	A1	9/2006	Hotelling
6,677,932	B1	1/2004	Westerman	2006/0232567	A1	10/2006	Westerman et al.
6,677,934	B1	1/2004	Blanchard	2006/0238518	A1	10/2006	Westerman et al.
6,724,366	B2	4/2004	Crawford	2006/0238519	A1	10/2006	Westerman et al.
6,757,002	B1	6/2004	Oross et al.	2006/0238520	A1	10/2006	Westerman et al.
D493,157	S	7/2004	Yang	2006/0238521	A1	10/2006	Westerman et al.
D493,158	S	7/2004	Yang	2006/0238522	A1	10/2006	Westerman et al.
D497,606	S	10/2004	Yang	2007/0229464	A1	10/2007	Hotelling et al.
6,803,906	B1	10/2004	Morrison et al.	2007/0236466	A1	10/2007	Hotelling
D500,298	S	12/2004	Yang	2007/0247429	A1	10/2007	Westerman
6,842,672	B1	1/2005	Straub et al.	2007/0257890	A1	11/2007	Hotelling et al.
6,888,532	B2*	5/2005	Wong et al. 345/156	2008/0088602	A1	4/2008	Hotelling
6,888,536	B2	5/2005	Westerman et al.	2008/0238879	A1	10/2008	Jaeger et al.
6,900,795	B1	5/2005	Knight, III et al.	2008/0297476	A1	12/2008	Hotelling et al.
6,909,424	B2*	6/2005	Liebenow et al. 345/169				
6,927,761	B2	8/2005	Badaye et al.				
D509,819	S	9/2005	Yang				
D509,833	S	9/2005	Yang				
D510,081	S	9/2005	Yang				
6,942,571	B1	9/2005	McAllister et al.				
D511,512	S	11/2005	Yang				
D511,528	S	11/2005	Yang				
6,965,375	B1	11/2005	Gettemy et al.				
D512,403	S	12/2005	Yang				
D512,435	S	12/2005	Yang				
6,972,401	B2	12/2005	Akitt et al.				
6,977,666	B1	12/2005	Hedrick				
6,985,801	B1	1/2006	Straub et al.				
6,992,659	B2	1/2006	Gettemy				
7,031,228	B2	4/2006	Born et al.				
D520,516	S	5/2006	Yang				
7,109,978	B2*	9/2006	Gillespie et al. 345/173				
7,129,416	B1	10/2006	Steinfeld et al.				
7,145,552	B2*	12/2006	Hollingsworth 345/168				
7,170,496	B2	1/2007	Middleton				
7,240,289	B2	7/2007	Naughton				
RE40,153	E	3/2008	Westerman et al.				
2001/0043189	A1	11/2001	Brisebois et al.				
2002/0093492	A1	7/2002	Baron				
2002/0118848	A1	8/2002	Karpenstein				
2003/0006974	A1	1/2003	Clough et al.				
2003/0074977	A1	4/2003	Doemens et al.				
2003/0076301	A1	4/2003	Tsuk et al.				
2003/0076303	A1	4/2003	Huppi				
2003/0076306	A1	4/2003	Zadesky et al.				
2003/0095095	A1	5/2003	Pihlaja				
2003/0095096	A1	5/2003	Robbin et al.				
2003/0098858	A1	5/2003	Perski et al.				
2003/0206202	A1	11/2003	Moriya				
2003/0234768	A1	12/2003	Rekimoto et al.				
2004/0012572	A1	1/2004	Sowden et al.				
2004/0263484	A1	12/2004	Mantysalo et al.				
2005/0012723	A1	1/2005	Pallakoff				
2005/0052425	A1	3/2005	Zadesky et al.				
2005/0104867	A1	5/2005	Westerman et al.				
2005/0110768	A1	5/2005	Marriott et al.				
2005/0146509	A1*	7/2005	Geaghan et al. 345/173				
2005/0154798	A1	7/2005	Nurmi				
2005/0212760	A1	9/2005	Marvit et al.				
2005/0219228	A1	10/2005	Alameh				
2006/0022955	A1	2/2006	Kennedy				
2006/0022956	A1	2/2006	Lengeling et al.				
2006/0026521	A1	2/2006	Hotelling et al.				
2006/0026535	A1	2/2006	Hotelling et al.				
2006/0026536	A1	2/2006	Hotelling et al.				

FOREIGN PATENT DOCUMENTS

DE	10251296	A1	5/2004
EP	0 288 692		11/1988
EP	0 464 908		1/1992
EP	0 664 504		7/1995
EP	1 014 295		1/2002
EP	1 505 484	A1	2/2005
GB	2 393 688	A	4/2004
JP	10-228350	A	8/1998
WO	WO9718547	A1	5/1997
WO	WO-97/023738		7/1997
WO	WO-98/14863		4/1998
WO	WO03088176	A1	10/2003
WO	WO-2004/111816	A2	12/2004
WO	WO-2004/111816	A3	12/2004
WO	WO-2006/023569		3/2006
WO	WO-2006/094308	A2	9/2006
WO	WO-2006/094308	A3	9/2006
WO	WO-2007/103631	A2	9/2007
WO	WO-2007/103631	A3	9/2007

OTHER PUBLICATIONS

Kionx, "KXP84 Series Summary Data Sheet," copyright 2005, dated Oct. 21, 2005, 4-pgs.

EBV Elektronik, "TSOP6238 IR Receiver Modules for Infrared Remote Control Systems," dated Jan. 2004, 1-pg.

Texas Instruments, "TSC2003 / I2C Touch Screen Controller," Data Sheet SBAS 162, dated Oct. 2001, 20-pgs.

European Examination Report mailed Apr. 21, 2008, for EP Application No. 06737515.4, filed Mar. 3, 2006, five pages.

International Search Report mailed Oct. 6, 2006, for PCT Application No. PCT/US2006/08349, filed Mar. 3, 2006, three pages.

International Search Report mailed Jan. 3, 2008, for PCT Application No. PCT/US2007/062474, filed Feb. 21, 2007, three pages.

Press Release, "iriver clix Delivers Complete Package for Portable Entertainment Fans," obtained from www.iriveramerica.com/images/pdf/iriv_clix.pdf, dated May 17, 2006, 3-pages.

iriver clix Product Guide, copyright 1999-2006, 38-pages.

iriver clix Quick Start Guide, undated, 2-pages.

Gear Live Review: iRiver clix Review, obtained from <http://www.gearlive.com/index.php/news/article/gear-live-review-iriver-clix-review-713400/>, dated Jul. 13, 2006, 8-pages.

Anonymous. "Touch Technologies Overview" 2001, 3M Touch Systems, Massachusetts.

Anonymous. "4-Wire Resistive Touchscreens" obtained from <http://www.touchscreens.com/intro-touchtypes-4resistive.html> generated Aug. 5, 2005.

Anonymous. "5-Wire Resistive Touchscreens" obtained from <http://>

- Anonymous. "A Brief Overview of Gesture Recognition" obtained from http://www.Dai.Ed.Ac.uk/Cvonline/LOCA_COPIES/COHEN/gesture_overview.html, generated Apr. 20, 2004.
- Anonymous. "Capacitive Position Sensing" obtained from <http://www.synaptics.com/technology/cps.cfm> generated Aug. 5, 2005.
- Anonymous. "Capacitive Touchscreens" obtained from <http://www.touchscreens.com/intro-touchtypes-capacitive.html> generated Aug. 5, 2005.
- Anonymous. "Comparing Touch Technologies" obtained from <http://www.touchscreens.com/intro-touchtypes.html> generated Oct. 10, 2004.
- Anonymous. "FingerWorks—Gesture Guide—Application Switching," obtained from http://www.fingerworks.com/gesture_guide_apps.html, generated on Aug. 27, 2004, 1-pg.
- Anonymous. "FingerWorks—Gesture Guide—Editing," obtained from http://www.fingerworks.com/gesture_guide_editing.html, generated on Aug. 27, 2004, 1-pg.
- Anonymous. "FingerWorks—Gesture Guide—File Operations," obtained from http://www.fingerworks.com/gesture_guide_files.html, generated on Aug. 27, 2004, 1-pg.
- Anonymous. "FingerWorks—Gesture Guide—Text Manipulation," obtained from http://www.fingerworks.com/gesture_guide_text_manip.html, generated on Aug. 27, 2004, 2-pg.
- Anonymous. "FingerWorks—Gesture Guide—Tips and Tricks," obtained from http://www.fingerworks.com/gesture_guide_tips.html, generated Aug. 27, 2004, 2-pgs.
- Anonymous. "FingerWorks—Gesture Guide—Web," obtained from http://www.fingerworks.com/gesture_guide_web.html, generated on Aug. 27, 2004, 1-pg.
- Anonymous. "FingerWorks—Guide to Hand Gestures for USB Touchpads," obtained from http://www.fingerworks.com/igesture_userguide.html, generated Aug. 27, 2004, 1-pg.
- Anonymous. "FingerWorks—iGesture—Technical Details," obtained from http://www.fingerworks.com/igesture_tech.html, generated Aug. 27, 2004, 1-pg.
- Anonymous. "FingerWorks—The Only Touchpads with Ergonomic Full-Hand Resting and Relaxation!" obtained from <http://www.fingerworks.com/resting.html>, Copyright 2001, 1-pg.
- Anonymous. "FingerWorks—Tips for Typing on the Mini," obtained from http://www.fingerworks.com/mini_typing.html, generated on Aug. 27, 2004, 2-pgs.
- Anonymous. "GlidePoint®" obtained from http://www.cirque.com/technology/technology_qp.html generated Aug. 5, 2005.
- Anonymous. "Gesture Recognition" http://www.fingerworks.com/gesture_recognition.html >, Jul. 2, 2006.
- Anonymous. "How do touchscreen monitors know where you're touching?" obtained from <http://www.electronics.howstuffworks.com/question716.html> generated Aug. 5, 2005.
- Anonymous. "How does a touchscreen work?" obtained from <http://www.touchscreens.com/intro-anatomy.html> generated Aug. 5, 2005.
- Anonymous. "iGesture Pad—the MultiFinger USB TouchPad with Whole-Hand Gestures," obtained from <http://www.fingerworks.com/igesture.html>, generated Aug. 27, 2004, 2-pgs.
- Anonymous. "iGesture Products for Everyone (learn in minutes) Product Overview" FingerWorks.com downloaded Aug. 30, 2005.
- Anonymous. "Infrared Touchscreens" obtained from <http://www.touchscreens.com/intro-touchtypes-infrared.html> generated Aug. 5, 2005.
- Anonymous. "Mouse Emulation" FingerWorks obtained from http://www.fingerworks.com/gesture_guide_mouse.html generated Aug. 30, 2005.
- Anonymous. "Mouse Gestures in Opera" obtained from <http://www.opera.com/products/desktop/mouse/index.dml> generated Aug. 30, 2005.
- Anonymous. "Mouse Gestures," Optim oz, May 21, 2004.
- Anonymous. "MultiTouch Overview" FingerWorks obtained from <http://finger.works.com/multoverview.html> generated Aug. 30, 2005.
- Anonymous. "Near Field Imaging Touchscreens" obtained from
- Anonymous. "PenTouch Capacitive Touchscreens" obtained from <http://www.touchscreens.com/intro-touchtypes-pentouch.html> generated Aug. 5, 2005.
- Anonymous. "Surface Acoustic Wave Touchscreens" obtained from <http://www.touchscreens.com/intro-touchtypes-saw.html> generated Aug. 5, 2005.
- Anonymous. "Symbol Commander" obtained from <http://www.sensiva.com/symbolcommander/>, generated Aug. 30, 2005.
- Anonymous. "Tips for Typing" FingerWorks http://www.fingerworks.com/mini_typing.html generated Aug. 30, 2005.
- Anonymous. "Wacom Components—Technology" obtained from <http://www.wacom-components.com/english/tech.asp> generated on Oct. 10, 2004.
- Anonymous. "Watershed Algorithm" <http://rsb.info.nih.gov/ij/plugins/watershed.html> generated Aug. 5, 2005.
- Bier et al., "Toolglass and Magic Lenses: The see-through interface" In James Kijiya, editor, *Computer Graphics (SIGGRAPH '93 Proceedings)*, vol. 27, pp. 73-80, Aug. 1993.
- Douglas et al., *The Ergonomics of Computer Pointing Devices* (1997).
- European Search Report received in EP 1 621 989 (@ Beyer Weaver & Thomas, LLP) dated Mar. 27, 2006.
- Fisher et al., "Repetitive Motion Disorders: The Design of Optimal Rate- Rest Profiles," *Human Factors*, 35(2):283-304 (Jun. 1993).
- Fukumoto and Yoshinobu Tonomura, "Body Coupled Fingering: Wireless Wearable Keyboard," *CHI97*, pp. 147-154 (Mar. 1997).
- Fukumoto et al., "ActiveClick: Tactile Feedback for Touch Panels," In CHI 2001 Summary, pp. 121-122, 2001.
- Hardy, "Fingerworks" Mar. 7, 2002; BBC World On Line.
- Hillier and Gerald J. Lieberman, *Introduction to Operations Research* (1986).
- International Search Report dated Mar. 3, 2006 (PCT/US 05/03325; 119-0052WO).
- Jacob et al., "Integrality and Separability of Input Devices," *ACM Transactions on Computer-Human Interaction*, 1:3-26 (Mar. 1994).
- Kinkley et al., "Touch-Sensing Input Devices," in CHI '99 Proceedings, pp. 223-230, 1999.
- Lee, "A Fast Multiple-Touch-Sensitive Input Device," Master's Thesis, University of Toronto (1984).
- Lee, S.K. et al., "A Multi-Touch Three Dimensional Touch-Sensitive Tablet," in CHI '85 Proceedings, pp. 121-128, 2000 [(Apr. 1985). Conference Proceedings: Human Factors in Computing Systems, pp. 21-251.]
- Matsushita et al., "HoloWall: Designing a Finger, Hand, Body and Object Sensitive Wall," In Proceedings of UIST '97, Oct. 1997.
- Non-Final Office Action mailed Feb. 26, 2009, for U.S. Appl. No. 11/367,749, filed Mar. 3, 2006, 10 pages.
- Quek, "Unencumbered Gestural Interaction," *IEEE Multimedia*, 3:36-47 (Winter 1996).
- Radwin, "Activation Force and Travel Effects on Overexertion in Repetitive Key Tapping," *Human Factors*, 39(1):130-140 (Mar. 1997).
- Rekimoto et al., "ToolStone: Effective Use of the Physical Manipulation Vocabularies of Input Devices," In Proc. Of UIST 2000.
- Rekimoto, J. (2002). "SmartSkin: An Infrastructure for Freehand Manipulation on Interactive Surfaces," *CHI 2002*, Apr. 20-25, 2002. [(Apr. 25, 2002). 4(1):113-120.]
- Rubine et al., "Programmable Finger-Tracking Instrument Controllers," *Computer Music Journal*, vol. 14, No. 1 (Spring 1990).
- Rutledge et al., "Force-To-Motion Functions for Pointing," *Human-Computer Interaction—INTERACT* (1990).
- Subatai Ahmad, "A Usable Real-Time 3D Hand Tracker," Proceedings of the 28th Asilomar Conference on Signals, Systems and Computers—Part 2 (of2), vol. 2 (Oct. 1994).
- U.S. Appl. No. 10/789,676, filed Feb. 27, 2004 entitled "Shape Detecting Input Device".
- U.S. Appl. No. 11/332,861, filed Jan. 13, 2006, which is a Reissue of 6,677,932.
- Wellner, "The Digital Desk Calculators: Tangible Manipulation on a

Williams, "Applications for a Switched-Capacitor Instrumentation Building Block" Linear Technology Application Note 3, Jul. 1985, pp. 1-16.

Yamada et al., "A Switched-Capacitor Interface for Capacitive Pressure Sensors" IEEE Transactions on Instrumentation and Measurement, vol. 41, No. 1, Feb. 1992, pp. 81-86.

Yeh et al., "Switched Capacitor Interface Circuit for Capacitive Transducers" 1985 IEEE.

Zhai et al., "Dual Stream Input for Pointing and Scrolling," *Proceedings of CHI '97 Extended Abstracts* (1997).

Zimmerman et al., "Applying Electric Field Sensing to Human-Computer Interfaces," In CHI '85 Proceedings, pp. 280-287, 1995. Final Office Action mailed Aug. 25, 2009, for U.S. Appl. No. 11/367,749, filed Mar. 3, 2006, 12 pages.

* cited by examiner

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.