Apple Inc. v. Samsung Electronics Co. Ltd. et al Doc. 561 Att. 17

EXHIBIT 3.18

Dockets.Justia.com

Notice of References Cited	Application/Control No. 10/840,862	Applicant(s)/Patent Under Reexamination HOTELLING ET AL.	
	Examiner KIMNHUNG NGUYEN	Art Unit 2629	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,856,259	02-2005	Sharp, Jeffrey L.	341/5
*	B	US-2005/0146511	07-2005	Hill et al.	345/173
*	C	US-6,888,536	05-2005	Westerman et al.	345/173
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/840,862	05/06/2004	Steve Hotelling	106842009000	8470

69753 7590 05/14/2008

APPLE C/O MORRISON AND FOERSTER ,LLP
LOS ANGELES
555 WEST FIFTH STREET SUITE 3500
LOS ANGELES, CA 90013-1024

EXAMINER	
NGUYEN, KIMNHUNG T	
ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
05/14/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/840,862	HOTELLING ET AL.	
	Examiner	Art Unit	
	KIMNHUNG NGUYEN	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26 and 29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2, 13 and 29* is/are rejected.

7)☒ Claim(s) *3-12 and 14-26* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/25/05, 11/14/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This application has been examined. The claims 1-26 and 29 are pending. The examination results are as following.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-2 and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Hill et al. (US 2005/0146511).

As to claim 1, Hill et al. disclose in figs. 2 and 30, a touch panel (10) having a transparent capacitive (see touch substrate can be transparent or opaque (see 0060) sensing medium configured to detect multiple touches or near touches that occur at the same time and at distinct locations in the plane of the touch panel and to produce distinct signals representative of the location of the touches on the plane of the touch panel for each of the multiple touches (see 0063-0064).

As to claim 2, Hill et al. disclose further wherein the transparent sensing medium (12) includes a pixilated array of transparent capacitance sensing nodes (see touch substrate 12, which may be detected by passive and/or active sensing, and passive or active sensing should be array of transparent capacitance sensing nodes.

As to claim 13, Hill et al. disclose in figs. 2 and 30, a display arrangement comprising a display having a screen for displaying a graphic user interface; a transparent touch panel (see 0060) allowing the screen to be viewed therethrough and capable of recognizing multiple touch events that occur at different locations on the touch sensitive surface of the touch screen at the same time and to output this information to a host device (see 0063-0064).

4. Claim 29 is rejected under 35 U.S.C. 102(e) as being anticipated by Sharp (US 6,856,259).

Sharp discloses in fig. 6, a touch screen method comprising: driving a plurality of sensing points; reading the outputs from all the sensing lines connected to the sensing points; producing and analyzing an image of the touch screen plane at one moment in time in order to determine where objects are touching the touch screen; and comparing the current image to a past image in order to determine a change at the objects touching the touch screen (see col. 6, lines 57-67 and col. 7, lines 1-5

Allowable Subject Matter

5. Claims 3-12 and 14-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: None of the cited art teaches or suggests that wherein the transparent capacitive sensing medium comprises: a transparent electrode layer, the electrode layer including a plurality of electrically isolated electrodes and electrode traces formed from a transparent conductive material, each of the electrodes being placed at different locations in the plane of the touch panel, each of the

electrodes having an individual trace for operatively coupling to capacitive monitoring circuitry as claim 3; or a second layer spatially separated from the first layer and having a plurality of transparent conductive lines that are electrically isolated from one another, the second conductive lines being positioned transverse to the first conductive lines, the intersection of transverse lines being positioned at different locations in the plane of the touch panel, each of the conductive lines being operatively coupled to capacitive monitoring circuitry as claim 7; or wherein the capacitive sensing circuit comprises: a multiplexer that receives signals from each of the capacitive sensing nodes at the same time, stores all the signals and sequentially releases the signals one at a time through an output channel; an analog to digital converter operatively coupled to the MUX through the output channel, the analog to digital converter being configured to convert the incoming analog signals into outgoing digital signals; a digital signal processor operatively coupled to the analog to digital converter, the DSP filtering noise events from the raw data, calculating the touch boundaries for each touch that occurs on the touch screen at the same time as claim 23.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KIMNHUNG NGUYEN whose telephone number is (571)272-7698. The examiner can normally be reached on MON-FRI, FROM 8:30 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe can be reached on (571) 272-7691. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kimnhung Nguyen/
Examiner, Art Unit 2629
May 11, 2008

/Richard Hjerpe/
Supervisory Patent Examiner, Art Unit 2629

EFS-Web Receipt date: 11/14/2006

10840862 - GAU: 2629

NOV 14 2006 PATENT & TRADEMARK OFFICE

Appl. No.	:	10/840,862 Confirmation No. 8470
Applicant	:	Steven P. Hotelling; Joshua A. Strickon; Brian Q. Huppi / Apple Computer
Filed	:	May 6, 2004
TC/A.U.	:	2673
Examiner	:	Edouard Patrick Nestor
Docket No.	:	119-0093US (P3266US1)
Customer No.	:	61947
Title	:	MULTIPOINT TOUCHSCREEN

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria VA, 22313-1450.

Sir:

In compliance with the duty of disclosure under 37 C.F.R. § 1.56, it is respectfully requested that this Information Disclosure Statement be entered and the documents listed on attached Form PTO-1449 be considered by the Examiner and made of record. Copies of the listed documents required by 37 C.F.R. § 1.98(a)(2) are enclosed for the convenience of the Examiner.

In accordance with 37 C.F.R §§ 1.97(g),(h), this Information Disclosure Statement is not to be construed as a representation that a search has been made, and is not to be construed to be an admission that the information cited is, or is considered to be, material to patentability as defined in 37 C.F.R. § 1.56(b), or that such information constitutes prior art.

The present Information Disclosure Statement is being filed prior to the receipt of a first Official Action reflecting an examination on the merits, and hence is believed to be timely filed in accordance with 37 C.F.R § 1.97(b). No fees are believed to be due in connection with the filing of this Information Disclosure Statement. However, the Commissioner is authorized to deduct any necessary fees from Deposit Account No. 501922/119-0093US (P3266US1).

APLNDC00026572

Applicants respectfully request that the listed documents be considered and made of record in the present case, and that the Examiner initial the appropriate spaces on the Form 1449 to evidence the same.

Respectfully submitted,

Nov. 10, 2006
Date

Billy C. Allen III
Reg. No. 46,147
Attorney for Applicant

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832/446-2400
832/446-2424 (facsimile)

CERTIFICATE OF MAILING
37 § C.F.R. 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria VA, 22313-1450, on the date below.

11·10·06
Date

Rebecca R. Ginn

APLNDC00026573

NOV 14 2006 PATENT & TRADEMARK OFFICE

Form PTO-1449 (modified)

List of Patents and Publications for Applicant's

INFORMATION DISCLOSURE STATEMENT

(Use several sheets if necessary)

Atty. Docket No.	Serial No.
119-0093US	10/840,862

Applicant(s): **Steven P. Hotelling; Joshua A. Strickon; Brian Q. Huppi**

Title: **MULTIPOINT TOUCHSCREEN**

Filing Date:	Group:
May 6, 2004	2673

U.S. Patent Documents	Foreign Patent Documents	Other Art
Beginning on Page 1	*See Page 8*	*Beginning on Page 8*

U.S. Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
/K.N./	A1	2002/0118848	08/29/2002	Karpenstein	381	119	02/27/2001
/K.N./	A2	2003/0076301	04/24/2003	Tsuk et al.	345	159	09/26/2002
/K.N./	A3	2003/0076303	04/24/2003	Huppi	345	163	02/07/2002
/K.N./	A4	2003/0076306	04/24/2003	Zadesky et al.	345	173	07/01/2002
/K.N./	A5	2003/0095096	05/22/2003	Robbin et al.	345	156	09/26/2002
/K.N./	A6	2003/0098858	05/29/2003	Perski et al.	345	173	10/15/2002
/K.N./	A7	2005/0012723	01/20/2005	Pallakoff	345	173	07/14/2004
/K.N./	A8	2005/0052425	03/10/2005	Zadesky et al.	345	173	08/18/2003
/K.N./	A9	2005/0110768	05/26/2005	Marriott et al.	345	173	11/25/2003
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/K.N./	A12	2006/0026521	02/02/2006	Hotelling et al.	715	702	07/30/2004
/K.N./	A13	2006/0026535	02/02/2006	Hotelling et al.	715	863	01/18/2005
/K.N./	A14	2006/026536	02/02/2006	Hotelling et al.	715	863	01/31/2005
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/K.N./	A23	4,550,221	10/259/1985	Mabusth	178	18	10/07/1983
/K.N./	A24	4,672,364	06/09/1987	Lucas	340	365 P	06/18/1984
/K.N./	A25	4,672,558	06/09/1987	Beckes et al.	364	518	09/25/1984

EXAMINER:	/Kimnhung Nguyen/	DATE CONSIDERED:	05/11/2008

EXAMINER: INITIAL IF REFERENCE CONSIDERED, WHETHER OR NOT CITATION IS IN CONFORMANCE WITH MPEP609; DRAW LINE THROUGH CITATION IF NOT IN CONFORMANCE AND NOT CONSIDERED. INCLUDE COPY OF THIS FORM WITH NEXT COMMUNICATION TO APPLICANT.

Form PTO-1449 (modified)	Atty. Docket No. 119-0093US	Serial No. 10/840,862
List of Patents and Publications for Applicant's **INFORMATION DISCLOSURE STATEMENT** (Use several sheets if necessary)	Applicant(s): Steven P. Hotelling; Joshua A. Strickon; Brian Q. Huppi Title: MULTIPOINT TOUCHSCREEN	
	Filing Date: May 6, 2004	Group: 2673

U.S. Patent Documents	Foreign Patent Documents	Other Art
Beginning on Page 1	*See Page 8*	*Beginning on Page 8*

U.S. Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
/K.N./	A26	4,692,809	09/08/1987	Beining et al.	358	247	11/20/1984
/K.N./	A27	4,695,827	09/22/1987	Beining et al.	340	365 P	11/20/1984
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/K.N./	A49	5,442,742	08/15/1995	Greyson et al.	395	146	10/14/1993

EXAMINER: /Kimnhung Nguyen/	**DATE CONSIDERED:** 05/11/2008

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	Filing Date: May 6, 2004	Group: 2673

U.S. Patent Documents	Foreign Patent Documents	Other Art
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U.S. Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
/K.N./	A50	5,463,388	10/31/1995	Boie et al.	341	33	01/29/1993
/K.N./	A51	5,463,696	10/31/1995	Beernink et al	382	186	07/05/1994
/K.N./	A52	5,483,261	01/09/1996	Yasutake	345	173	10/26/1993
/K.N./	A53	5,488,204	01/30/1996	Mead et al.	178	18	10/17/1994
/K.N./	A54	5,495,077	02/27/1996	Miller et al.	178	18	06/02/1994
/K.N./	A55	5,513,309	04/30/1996	Meier et al.	395	155	05/08/1995
/K.N./	A56	5,523,775	06/04/1996	Capps	345	179	06/08/1994
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/K.N./	A58	5,543,590	08/06/1996	Gillespie et al.	178	18	09/02/1994
/K.N./	A59	5,543,591	08/06/1996	Gillespie et al.	178	18	10/07/1994
/K.N./	A60	5,563,632	10/08/1996	Roberts	345	173	04/30/1993
/K.N./	A61	5,563,996	10/08/1996	Tchao	395	144	09/24/1993
/K.N./	A62	5,565,658	10/15/1996	Gerpheide et al.	178	19	12/07/1994
/K.N./	A63	5,579,036	11/26/1996	Yates, IV	345	173	04/28/1994
/K.N./	A64	5,581,681	12/03/1996	Tchao et al.	395	804	06/07/1995
/K.N./	A65	5,583,946	12/10/1996	Gourdol	382	187	09/30/1993
/K.N./	A66	5,590,219	12/31/1996	Gourdol	382	202	03/16/1995
/K.N./	A67	5,592,566	01/07/1997	Pagallo et al.	382	187	06/01/1995
/K.N./	A68	5,594,810	01/14/1997	Gourdol	382	187	06/05/1995
/K.N./	A69	5,596,694	01/21/1997	Capps	395	152	04/08/1996
/K.N./	A70	5,612,719	03/18/1997	Beernink et al.	345	173	04/15/1994
/K.N./	A71	5,631,805	05/20/1997	Bonsall	361	681	09/27/1995
/K.N./	A72	5,633,955	05/27/1997	Bozinovic et al.	381	187	05/31/1995
/K.N./	A73	5,634,102	05/27/1997	Capps	395	334	08/07/1995
/K.N./	A74	5,636,101	06/03/1997	Bonsall et al.	361	681	09/27/1995

EXAMINER:	/Kimnhung Nguyen/	DATE CONSIDERED:	05/11/2008

EXAMINER: INITIAL IF REFERENCE CONSIDERED, WHETHER OR NOT CITATION IS IN CONFORMANCE WITH MPEP609; DRAW LINE THROUGH CITATION IF NOT IN CONFORMANCE AND NOT CONSIDERED. INCLUDE COPY OF THIS FORM WITH NEXT COMMUNICATION TO APPLICANT.

Form PTO-1449 (modified)	Atty. Docket No. 119-0093US	Serial No. 10/840,862
List of Patents and Publications for Applicant's **INFORMATION DISCLOSURE STATEMENT** (Use several sheets if necessary)	Applicant(s): Steven P. Hotelling; Joshua A. Strickon; Brian Q. Huppi Title: MULTIPOINT TOUCHSCREEN	
	Filing Date: May 6, 2004	Group: 2673

U.S. Patent Documents	Foreign Patent Documents	Other Art
Beginning on Page 1	*See Page 8*	*Beginning on Page 8*

U.S. Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
/K.N./	A75	5,642,108	06/24/1997	Gopher et al.	341	22	12/29/1994
/K.N./	A76	5,644,657	07/01/1997	Capps et al.	382	229	06/01/1995
/K.N./	A77	5,666,113	09/09/1997	Logan	341	34	09/05/1995
/K.N./	A78	5,666,502	09/09/1997	Capps	345	352	08/07/1995
/K.N./	A79	5,666,552	09/09/1997	Grayson et al.	395	802	06/01/1995
/K.N./	A80	5,675,361	10/07/1997	Santilli	345	168	08/23/1995
/K.N./	A81	5,677,710	10/14/1997	Thompson-Rohrlich	345	173	05/10/1993
/K.N./	A82	5,689,253	11/18/1997	Hargreaves et al	341	22	04/09/1993
/K.N./	A83	5,710,844	01/20/1998	Capps et al.	382	317	05/27/1992
/K.N./	A84	5,729,250	03/17/1998	Bishop et al.	345	175	05/08/1995
/K.N./	A85	5,730,165	03/24/1998	Philipp	137	1	12/26/1995
/K.N./	A86	5,736,976	04/07/1998	Cheung	345	168	02/13/1995
/K.N./	A87	5,741,990	04/21/1998	Davies	84	423 R	01/25/1997
/K.N./	A88	5,745,116	04/28/1998	Pisutha-Arnond	345	358	09/19/1996
/K.N./ /K.N./	A89	5,745,716	04/28/1998	Tchao et al.	395	350	08/07/1995
/K.N./	A90	5,748,269	05/05/1998	Harris et al.	349	58	11/21/1996
/K.N./	A91	5,764,222	06/09/1998	Shieh	345	173	05/28/1996
/K.N./	A92	5,746,818	05/05/1998	Yatake	106	31.86	08/29/1996
/K.N./	A93	5,767,457	06/16/1998	Gerpheide et al.	178	18	11/13/1995
/K.N./	A94	5,767,842	06/16/1998	Korth	345	168	04/21/1995
/K.N./	A95	5,790,104	08/04/1998	Shieh	345	173	06/25/1996
/K.N./	A96	5,790,107	08/04/1998	Kasser et al	345	174	06/07/1995
/K.N./	A97	5,802,516	09/01/1998	Shwarts et al.	707	6	05/30/1995
/K.N./	A98	5,808,567	09/15/1998	McCloud	341	20	05/17/1993

EXAMINER:	/Kimnhung Nguyen/	**DATE CONSIDERED:**	05/11/2008

EXAMINER: INITIAL IF REFERENCE CONSIDERED, WHETHER OR NOT CITATION IS IN CONFORMANCE WITH MPEP609; DRAW LINE THROUGH CITATION IF NOT IN CONFORMANCE AND NOT CONSIDERED. INCLUDE COPY OF THIS FORM WITH NEXT COMMUNICATION TO APPLICANT.

Form PTO-1449 (modified)	Atty. Docket No. 119-0093US	Serial No. 10/840,862
List of Patents and Publications for Applicant's **INFORMATION DISCLOSURE STATEMENT** (Use several sheets if necessary)	Applicant(s): Steven P. Hotelling; Joshua A. Strickon; Brian Q. Huppi Title: MULTIPOINT TOUCHSCREEN	
	Filing Date: May 6, 2004	Group: 2673

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Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
/K.N./	A99	5,809,267	09/15/1998	Moran et al.	395	358	03/18/1996
/K.N./	A100	5,821,690	10/13/1998	Martens et al.	313	506	04/22/1996
/K.N./	A101	5,821,930	10/13/1998	Hansen	345	340	05/30/1996
/K.N./	A102	5,823,782	10/20/1998	Marcus et al.	434	156	07/09/1997
/K.N./	A103	5,825,351	10/20/1998	Tam	345	173	11/15/1995
/K.N./	A104	5,825,352	10/20/1998	Bisset et al	345	173	02/18/1996
/K.N./	A105	5,854,625	12/29/1998	Frisch et al.	345	173	11/06/1996
/K.N./	A106	5,880,411	03/09/1999	Gillespie et al.	178	18.01	03/28/1996
/K.N./	A107	5,898,434	04/27/1999	Small et al.	345	348	08/22/1994
/K.N./	A108	5,920,309	07/06/1999	Bisset et al.	345	173	01/04/1996
/K.N./	A109	5,923,319	07/13/1999	Bishop et al.	345	175	11/07/997
/K.N./	A110	5,933,134	08/03/1999	Shieh	345	173	06/25/1996
/K.N./	A111	5,943,044	08/24/1999	Martinelli et al.	345	174	05/15/1997
/K.N./	A112	6,002,389	12/14/1999	Kasser	345	173	09/23/1997
/K.N./	A113	6,002,808	12/14/1999	Freeman	382	288	07/26/1996
/K.N./	A114	6,020,881	02/01/2000	Naughton et al.	345	327	02/18/1997
/K.N./	A115	6,031,524	02/29/2000	Kunert	345	173	06/18/1997
/K.N./	A116	6,037,882	03/14/2000	Levy	341	20	09/30/1997
/K.N./	A117	6,050,825	04/18/2000	Nichol et al.	434	227	05/08/1998
/K.N./	A118	6,052,339	04/18/2000	Frenkel et al.	368	230	06/01/1998
/K.N./	A119	6,072,494	06/06/2000	Nguyen	345	358	10/15/1997
/K.N./	A120	6,084,576	07/04/2000	Leu et al.	345	168	03/04/1998
/K.N./	A121	6,107,997	08/222/2000	Ure	345	173	06/27/1996
/K.N./	A122	6,128,003	10/03/2000	Smith et al.	345	157	12/22/1997
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/K.N./	A125	6,144,380	11/07/2000	Schwarts et al.	345	350	02/19/1997
/K.N./	A126	6,188,391	02/13/2001	Seely et al.	345	173	07/09/1998
/K.N./	A127	6,198,515	03/06/2001	Cole	348	836	03/16/1998
/K.N./	A128	6,208,329	03/27/2001	Ballare	345	173	08/13/1996
/K.N./	A129	6,222,465	04/24/2001	Kumar et al.	341	20	12/09/1998
/K.N./	A130	6,239,790	05/29/2001	Martinelli et al.	345	174	08/17/1999
/K.N./	A131	6,243,071	06/05/2001	Shwarts et al.	345	146	11/03/1993
/K.N./	A132	6,246,862	06/12/2001	Grivas et al.	455	90	02/03/1999
/K.N./	A133	6,249,606	06/19/2001	Kiraly et al.	382	195	02/19/1998
/K.N./	A134	6,288,707	09/11/2001	Philipp	345	168	01/25/1999
/K.N./	A135	6,289,326	09/11/2001	LaFleur	705	702	06/04/1997
/K.N./	A136	6,292,178	09/18/2001	Bernstein et al.	345	173	10/19/1998
/K.N./	A137	6,323,849	11/27/2001	Westerman et al	345	173	01/25/1999
/K.N./	A138	6,347,290	02/12/2002	Bartlett	702	150	06/24/1998
/K.N./	A139	6,377,009	04/23/2002	Philipp	318	468	09/07/2000
/K.N./	A140	6,380,931	04/30/2002	Gillespie et al.	345	173	05/18/2001
/K.N./	A141	6,411,287	06/25/2002	Scharff et al.	345	177	09/08/1999
/K.N./	A142	6,414,671	07/02/2002	Gillespie et al.	345	157	03/24/1998
/K.N./	A143	6,421,234	07/16/2002	Ricks et al.	361	683	01/10/2000
/K.N./	A144	6,452,514	09/17/2002	Philipp	341	33	01/26/2000
/K.N./	A145	6,457,355	10/01/2002	Philipp	73	304	08/24/2000
/K.N./	A146	6,466,036	10/15/2002	Philipp	324	678	09/07/1999
/K.N./	A147	6,515,669	02/04/2003	Mohri	345	474	10/06/1999

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Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
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/K.N./	A149	6,535,200	03/18/2003	Philipp	345	168	08/27/2001
/K.N./	A150	6,543,684	04/08/2003	White et al.	234	379	03/28/2000
/K.N./	A151	6,543,947	04/08/2003	Lee	400	489	03/14/2001
/K.N./	A152	6,570,557	05/27/2003	Westerman et al	345	173	02/10/2001
/K.N./	A153	6,593,916	07/15/2003	Aroyan	345	173	11/03/2000
/K.N./	A154	6,610,936	08/26/2003	Gillespie et al.	178	18.01	08/12/1997
/K.N./	A155	6,624,833	09/23/2003	Kumar et al.	345	863	04/17/2000
/K.N./	A156	6,639,577	10/28/2003	Eberhard	345	102	05/28/1998
/K.N./	A157	6,650,319	11/18/2003	Hurst et al.	345	173	03/05/1999
/K.N./	A158	6,658,994	12/09/2003	McMillan	99	468	03/31/2003
/K.N./	A159	6,670,894	12/30/2003	Mehring	341	22	02/01/2002
/K.N./	A160	6,677,932	01/13/2004	Westerman	345	173	01/28/2001
/K.N./	A161	6,677,934	01/13/2004	Blanchard	345	173	07/30/1999
/K.N./	A162	6,724,366	04/20/2004	Crawford	345	157	04/03/2001
/K.N./	A163	6,757,002	06/29/2004	Oross et al.	345	864	11/04/1999
/K.N./	A164	6,803,906	10/12/2004	Morrison et al.	345	173	07/05/2000
/K.N./	A165	6,842,672	01/11/2005	Straub et al.	701	3	02/24/2004
/K.N./	A166	6,856,259	02/15/2005	Sharp	341	5	02/06/2004
/K.N./	A167	6,888,536	05/03/2005	Westerman et al	345	173	07/31/2001
/K.N./	A168	6,900,795	05/31/2005	Knight, III et al.	345	173	02/27/2002
/K.N./	A169	6,927,761	08/09/2005	Badaye et al.	345	173	03/29/2002
/K.N./	A170	6,942,571	09/13/2005	McAllister et al.	463	20	10/16/2000
/K.N./	A171	6,965,375	11/15/2005	Gettemy et al.	345	173	04/27/2004
/K.N./	A172	6,972,401	12/06/2005	Akitt et al.	250	221	01/30/2003

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	Filing Date: May 6, 2004	Group: 2673

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/K.N./	A174	6,985,801	01/10/2006	Straub et al.	701	3	11/12/2004
/K.N./	A175	6,992,659	01/31/2006	Gettemy	345	173	05/22/2001
/K.N./	A176	7,031,228	04/18/2006	Born et al.	368	69	09/02/2003
/K.N./	A177	2005/0104867	05/19/2005	Westerman et al	345	173	12/17/2004
/K.N./	A178	2006/0033724	02/16/2006	Chaudhri et al	345	173	09/16/2005
/K.N./	A179	2006/0053387	03/09/2006	Ording	715	773	03/09/2006
/K.N./	A180	2006/0085757	04/20/2006	Andre et al.	715	771	09/16/2005
/K.N./	A181	2006/0197753	09/07/2006	Hotelling	345	173	03/03/2006
/K.N./	A182	2003/0234768	12/25/2003	Rekimoto et al	345	169	05/14/2003
/K.N./	A183	2003/0206202	11/06/2003	Moriya	345	846	11/06/2003
/K.N./	A184	2004/0263484	12/30/2004	Mantysalo et al.	345	173	06/25/2003
/K.N./	A185	2003/0095095	05/22/2003	Pihlaja	345	156	11/20/2001
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/K.N./	B2	102 51 296	05/19/2004	DE	G06F	3/023	No
/K.N./	B3	0 288 692	07/14/1993	EPO	G06K	11/06	Yes
/K.N./	B4	0 464 908	09/04/1996	EPO	G06K	11/16	Yes
/K.N./	B5	0 664 504	01/24/21995	EPO	G06F	3/033	Yes
/K.N./	B6	1 014 295	01/09/2002	EPO	G06K	11/06	Yes
/K.N./	B7	2003/088176	10/23/2003	WIPO	G08C	21/00	Yes
/K.N./	B8	2006/023569	03/02/2006	WIPO	G06F	3/044	Yes

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	Filing Date: May 6, 2004	Group: 2673

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Foreign Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Country	Class	Sub Class	Translation Yes/No
/K.N./	B9	1997/018547	05/22/1997	WIPO	G09G	5/00	Yes
/K.N./	B10	1997/023738	07/03/1997	WIPO	F16K	31/06	Yes
/K.N./	B11	1998/14863	04/09/1998	WIPO	G06F	3/14	Yes

Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

Exam. Init.	Ref. Des.	Citation
/K.N./	C1	US Patent Application No. 10/654,108 filed on September 2, 2003 entitled "Ambidextrous Mouse"
/K.N./	C2	US Patent Application No. 10/789,676 filed on February 27, 2004 entitled "Shape Detecting Input Device"
/K.N./	C3	"4-Wire Resistive Touchscreens" obtained from http://www.touchscreens.com/intro-touchtypes-4resistive.html generated August 5, 2005
/K.N./	C4	"5-Wire Resistive Touchscreens" obtained from http://www.touchscreens.com/intro-touchtypes-resistive.html generated August 5, 2005
/K.N./	C5	"A Brief Overview of Gesture Recognition" obtained from http://www.dai.ed.ac.uk/Cvonline/LOCA_COPIES/COHEN/gesture_overview.html, generated April 20, 2004
/K.N./	C6	"Capacitive Touchscreens" obtained from http://www.touchscreens.com/intro-touchtypes-capacitive.html generated August 5, 2005
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/K.N./	C8	"Comparing Touch Technologies" obtained from http://www.touchscreens.com/intro-touchtypes.html generated October 10, 2004
/K.N./	C9	"Gesture Recognition" http://www.fingerworks.com/gesture_recognition.html

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	Filing Date: **May 6, 2004**	Group: **2673**

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/K.N./	C11	"How do touchscreen monitors know where you're touching?" obtained from http://www.electronics.howstuffworks.com/question716.html generated August 5, 2005
/K.N./	C12	"How does a touchscreen work?" obtained from http://www.touchscreens.com/intro-anatomy.html generated August 5, 2005
/K.N./	C13	"iGesture Products for Everyone (learn in minutes) Product Overview" FingerWorks.com
/K.N./	C14	"Infrared Touchscreens" obtained from http://www.touchscreens.com/intro-touchtypes-infrared.html generated August 5, 2005
/K.N./	C15	"Mouse Emulation" FingerWorks obtained from http://www.fingerworks.com/gesture_guide_mouse.html generated August 30, 2005
/K.N./	C16	"Mouse Gestures in Opera" obtained from http://www.opera.com/products/desktop/mouse/index.dml generated August 30, 2005
/K.N./	C17	"Mouse Gestures," Optim oz, May 21, 2004
/K.N./	C18	"MultiTouch Overview" FingerWorks obtained from http://www.fingerworks.com/multoverview.html generated August 30, 2005
/K.N./	C19	"Near Field Imaging Touchscreens" obtained from http://www.touchscreens.com/intro-touchtypes-nfi.html generated August 5, 2005
/K.N./	C20	"PenTouch Capacitive Touchscreens" obtained from http://www.touchscreens.com/intro-touchtypes-pentouch.html generated August 5, 2005

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/K.N./	C22	"Symbol Commander" obtained from http://www.sensiva.com/symbolcomander/, generated August 30, 2005
/K.N./	C23	"Tips for Typing" FingerWorks http://www.fingerworks.com/mini_typing.html generated August 30, 2005
/K.N./	C24	"Touch Technologies Overview" 2001, 3M Touch Systems, Massachusetts
/K.N./	C25	"Wacom Components - Technology" obtained from http://www.wacom-components.com/english/tech.asp generated on October 10, 2004
/K.N./	C26	"Watershed Algorithm" http://rsb.info.nih.gov/ij/plugins/watershed.html generated August 5, 2005
/K.N./	C27	"FingerWorks – Gesture Guide – Application Switching," obtained from http://www.fingerworks.com/gesture_guide_apps.html, generated on 08/27/2004, 1-pg
/K.N./	C28	"FingerWorks – Gesture Guide – Editing," obtained from http://www.fingerworks.com/gesure_guide_editing.html, generated on 08/27/2004, 1-pg
/K.N./	C29	"FingerWorks – Gesture Guide – File Operations," obtained from http://www.fingerworks.com/gesture_guide_files.html, generated on 08/27/2004, 1-pg
/K.N./	C30	"FingerWorks – Gesture Guide – Text Manipulation," obtained from http://www.fingerworks.com/gesture_guide_text_manip.html, generated on 08/27/2004, 2-pg

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/K.N./	C32	"FingerWorks – Gesture Guide – Web," obtained from http://www.fingerworks.com/gesture_guide_web.html, generated on 08/27/2004, 1-pg
/K.N./	C33	"FingerWorks – Guide to Hand Gestures for USB Touchpads," obtained from http://www.fingerworks.com/igesture_userguide.html, generated 08/27/2004, 1-pg
/K.N./	C34	"FingerWorks – iGesture – Technical Details," obtained from http://www.fingerworks.com/igesture_tech.html, generated 08/27/2004, 1-pg
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EXAMINER: /Kimnhung Nguyen/	DATE CONSIDERED: 05/11/2008

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Form PTO-1449 (modified)	Atty. Docket No. 119-0093US	Serial No. 10/840,862
List of Patents and Publications for Applicant's **INFORMATION DISCLOSURE STATEMENT** (Use several sheets if necessary)	Applicant(s): Steven P. Hotelling; Joshua A. Strickon; Brian Q. Huppi Title: MULTIPOINT TOUCHSCREEN	
	Filing Date: May 6, 2004	Group: 2673

U.S. Patent Documents	Foreign Patent Documents	Other Art
Beginning on Page 1	*See Page 8*	*Beginning on Page 8*

Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

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Beginning on Page 1	*See Page 8*	*Beginning on Page 8*

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/K.N./	C69	Application Serial No. 10/774,053 Filed on February 5, 2004
/K.N./	C70	US Patent Application No. 11/140,529 filed on 5/27/2005 which is a Reissue of 6,570,557 listed above (*see A152*).
/K.N./	C71	US Patent Application No. 11/381,313 filed on 5/2/2006 entitled "Multipoint Touch Surface Controller".
/K.N./	C72	US Patent Application No. 11/332,861 filed on 1/13/2006 which is a Reissue of 6,677,932 listed above (*see A160*).
/K.N./	C73	US Patent Application No. 11/380,109 filed on 4/25/2006 entitled "Keystroke Tactility Arrangement On Smooth Touch Surface."
/K.N./	C74	US Patent Application No. 11/428,501 filed on 7/3/2006 entitled "Capacitive Sensing Arrangement," which is a Continuation of US 2005/0104867 listed above (*see A177*).
/K.N./	C75	US Patent Application No. 11/428,503 filed on 07/03/2006 entitled "Touch Surface" which is a Continuation of US 2005/0104867 listed above (*see A177*).
/K.N./	C76	US Patent Application No. 11/428,506 filed on 07/03/2006 entitled "User Interface Gestures" which is a Continuation of US 2005/0104867 listed above (*see A177*).
/K.N./	C77	US Patent Application No. 11/428,515 filed on 07/03/2006 entitled "User Interface Gestures" which is a Continuation of US 2005/0104867 listed above (*see A177*).
/K.N./	C78	US Patent Application No. 11/428,522 filed on 07/03/2006 entitled "Identifying Contacts on a Touch Surface" which is a Continuation of US 2005/0104867 listed above (*see A177*).

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	Filing Date: May 6, 2004	Group: 2673

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Exam. Init.	Ref. Des.	Citation
/K.N./	C79	US Patent Application No. 11/428,521 filed on 07/03/2006 entitled "Identifying Contacts on a Touch Surface" which is a Continuation of US 2005/0104867 listed above (*see A177*).
/K.N./	C80	US Patent Application No. 11/426,078 filed on 06/23/2006 entitled "Electronic Device Having Display and Surrounding Touch Sensitive Bezel For User Interface and Control" which is a Continuation-In-Part of 2006/0197753 listed above (*see A181*).
/K.N./	C81	US Patent Application No. 11/278,080 filed on 03/30/2006 entitled "Force Imaging Input Device and System"
/K.N./	C82	US Patent Application No. 11/382,402 filed on 05/09/2006 entitled "Force and Location Sensitive Display" which is a Continuation of 11/278,080 listed above (*see C81*).
/K.N./	C83	International Search Report received in corresponding PCT application number PCT/US2006/008349 dated October 20, 2006
	C84	
	C85	
	C86	
	C87	
	C88	

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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	12	(("20020015024") or ("3662105") or ("3798370") or ("5825351") or ("6188391") or ("6323846") or ("6570557") or ("6593916") or ("6650319") or ("6677932") or ("6856259") or ("6888536")).PN.	US-PGPUB; USPAT	OR	OFF	2008/05/09 17:09
S2	281	(touch panel) and (transparent capacitive) and (multiple touches) and traces and 345/173-179.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/05/09 17:38
S3	141	S2 and (@ad<="20040506")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/05/09 17:39
S4	2	(("5854625") or ("5872561")).PN.	USPAT	OR	OFF	2008/05/09 17:47

5/11/08 11:59:12 PM
C:\Documents and Settings\KNguyen10\My Documents\EAST\Workspaces\10840862.wsp

APLNDC00026590

Docket No.: 106842009000
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Steve P. HOTELLING et al.

Application No.: 10/840,862 Confirmation No.: 8470

Filed: May 6, 2004 Art Unit: 2629

For: MULTIPOINT TOUCHSCREEN Examiner: Kimnhung T. Nguyen

AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INTRODUCTORY COMMENTS

This is in response to the non-final Office Action dated May 14, 2008, for which a response is due on August 14, 2008. Reconsideration and allowance of the pending claims, as amended, in light of the remarks presented herein are respectfully requested.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 12 of this paper.

APLNDC00026591

AMENDMENTS TO THE CLAIMS

Claim 1 (currently amended): A touch panel having a transparent capacitive sensing medium configured to detect multiple touches or near touches that occur at ~~the~~a same time and at distinct locations in ~~the~~a plane of the touch panel and to produce distinct signals representative of ~~the~~a location of the touches on the plane of the touch panel for each of the multiple touches;

wherein the transparent capacitive sensing medium comprises a transparent electrode layer, the electrode layer including a plurality of electrically isolated electrodes and electrode traces formed from a transparent conductive material, each of the electrodes being placed at different locations in the plane of the touch panel, each of the electrodes having an individual trace for operatively coupling to capacitive monitoring circuitry.

Claim 2 (original): The touch panel as recited in claim 1 wherein the transparent sensing medium includes a pixilated array of transparent capacitance sensing nodes.

Claim 3 (canceled)

Claim 4 (original): The touch panel as recited in claim 3 further including one or more integrated circuits for monitoring the capacitance at each of the electrodes, the integrated circuits being operatively coupled to the electrodes via the traces.

Claim 5 (original): The touch panel as recited in claim 3 wherein the electrodes are placed in rows and columns.

Claim 6 (original): The touch panel as recited in claim 3 wherein the electrodes and traces are formed from indium tin oxide (ITO).

APLNDC00026592

Claim 7 (currently amended): ~~The touch panel as recited in claim 1~~A touch panel comprising a transparent capacitive sensing medium configured to detect multiple touches or near touches that occur at a same time and at distinct locations in a plane of the touch panel and to produce distinct signals representative of a location of the touches on the plane of the touch panel for each of the multiple touches, wherein the transparent capacitive sensing medium comprises:

a first layer having a plurality of transparent conductive lines that are electrically isolated from one another; and

a second layer spatially separated from the first layer and having a plurality of transparent conductive lines that are electrically isolated from one another, the second conductive lines being positioned transverse to the first conductive lines, the intersection of transverse lines being positioned at different locations in the plane of the touch panel, each of the conductive lines being operatively coupled to capacitive monitoring circuitry.

Claim 8 (original): The touch panel as recited in claim 7 wherein the conductive lines on each of the layers are substantially parallel to one another.

Claim 9 (original): The touch panel as recited in claim 8 wherein the conductive lines on different layers are substantially perpendicular to one another.

Claim 10 (original): The touch panel as recited in claim 7 wherein the transparent conductive lines of the first layer are disposed on a first glass member, and wherein the transparent conductive lines of the second layer are disposed on a second glass member, the first glass member being disposed over the second glass member.

Claim 11 (original): The touch panel as recited in claim 10 further including a third glass member disposed over the first glass member, the first and second glass members being attached to one another via an adhesive layer, the third glass member being attached to the first glass member via another adhesive layer.

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Claim 12 (original): The touch panel as recited in claim 7 wherein the conductive lines are formed from indium tin oxide (ITO).

Claim 13 (currently amended): A display arrangement comprising:

a display having a screen for displaying a graphical user interface; and

a transparent touch panel allowing the screen to be viewed therethrough and capable of recognizing multiple touch events that occur at different locations on the touch ~~sensitive surface of the touch screen~~panel at ~~the~~a same time and to output this information to a host device;

wherein the touch panel includes a multipoint sensing arrangement configured to simultaneously detect and monitor the touch events and a magnitude of those touch events at distinct points across the touch panel.

Claim 14 (canceled)

Claim 15 (currently amended): The display arrangement as recited in claim [[14]]13 wherein the multipoint sensing arrangement provides a plurality of transparent capacitive sensing nodes that work independent of one another and that represent different points on the touch screen.

Claim 16 (original): The display arrangement as recited in claim 15 wherein the capacitive sensing nodes are formed with a transparent conductive medium.

Claim 17 (original): The display arrangement as recited in claim 16 wherein the transparent conductive medium corresponds to indium tin oxide (ITO).

Claim 18 (original): The display arrangement as recited in claim 16 wherein the capacitive sensing nodes are based on self capacitance.

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Claim 19 (original): The display arrangement as recited in claim 18 wherein the transparent conductive medium is patterned into electrically isolated electrodes and traces, each electrode representing a different coordinate in the plane of the touch screen, and the traces connecting the electrodes to a capacitive sensing circuit.

Claim 20 (original): The display arrangement as recited in claim 16 wherein the capacitive sensing nodes are based on mutual capacitance.

Claim 21 (original): The display arrangement as recited in claim 18 wherein the transparent conductive medium is patterned into a group of spatially separated lines formed on two different layers, driving lines are formed on a first layer and sensing lines are formed on a second layer, the sensing lines being configured to traverse across the driving lines in order to form a capacitive sensing node, the driving lines being connected to a voltage source and the sensing lines being connected to a capacitive sensing circuit, the voltage source driving a current through one driving line at a time and because of capacitive coupling, the current is carried through to the sensing lines at each of the capacitive sensing nodes.

Claim 22 (original): The display arrangement as recited in claim 16 wherein the capacitive sensing nodes are coupled to a capacitive sensing circuit, and wherein the capacitive sensing circuit monitors changes in capacitance that occurs at each of the capacitive sensing nodes, the position where changes occur and the magnitude of those changes being used to help recognize the multiple touch events.

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Claim 23 (original): The display arrangement as recited in claim 22 wherein the capacitive sensing circuit comprises:

a multiplexer that receives signals from each of the capacitive sensing nodes at the same time, stores all the signals and sequentially releases the signals one at a time through an output channel;

an analog to digital converter operatively coupled to the MUX through the output channel, the analog to digital converter being configured to convert the incoming analog signals into outgoing digital signals;

a digital signal processor operatively coupled to the analog to digital converter, the DSP filtering noise events from the raw data, calculating the touch boundaries for each touch that occurs on the touch screen at the same time and thereafter determining the coordinates for each touch.

Claim 24 (original): The display arrangement as recited in claim 13 wherein the touch panel comprises:

a glass member disposed over the screen of the display;

a transparent conductive layer disposed over the glass member, the conductive layer including a pixilated array of electrically isolated electrodes;

a transparent cover sheet disposed over the electrode layer; and

one or more sensor integrated circuits operatively coupled to the electrodes.

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Claim 25 (original): The display arrangement as recited in claim 13 wherein the touch panel comprises:

a first glass member disposed over the screen of the display;

a first transparent conductive layer disposed over the first glass member, the first transparent conductive layer comprising a plurality of spaced apart parallel lines having the same pitch and linewidths;

a second glass member disposed over the first transparent conductive layer;

a second transparent conductive layer disposed over the second glass member, the second transparent conductive layer comprising a plurality of spaced apart parallel lines having the same pitch and linewidths, the parallel lines of the second transparent conductive layer being substantially perpendicular to the parallel lines of the first transparent conductive layer;

a third glass member disposed over the second transparent conductive layer; and

one or more sensor integrated circuits operatively coupled to the lines.

Claim 26 (original): The display arrangement as recited in claim 25 further including dummy features disposed in the space between the parallel lines, the dummy features optically improving the visual appearance of the touch screen by more closely matching the optical index of the lines.

Claim 27 (withdrawn): A computer readable medium including at least computer code executable by a computer, the computer code comprising:

receiving multiple touches on the surface of a transparent touch screen at the same time;

separately recognizing each of the multiple touches; and

reporting touch data based on the recognized multiple touches.

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Claim 28 (withdrawn): A computer system comprising:

a processor configured to execute instructions and to carry out operations associated with the computer system;

a display device that is operatively coupled to the processor;

a touch screen that is operatively coupled to the processor, the touch screen being a substantially transparent panel that is positioned in front of the display, the touch screen being configured to track multiple objects, which rest on, tap on or move across the touch screen at the same time, the touch screen including a capacitive sensing device that is divided into several independent and spatially distinct sensing points that are positioned throughout the plane of the touch screen, each sensing point being capable of generating a signal at the same time, the touch screen also including a sensing circuit that acquires data from the sensing device and that supplies the acquired data to the processor.

Claim 29 (canceled)

Claim 30 (withdrawn): A digital signal processing method, comprising:

receiving raw data, the raw data including values for each transparent capacitive sensing node of a touch screen;

filtering the raw data;

generating gradient data;

calculating the boundaries for touch regions base on the gradient data; and

calculating the coordinates for each touch region.

Claim 31 (withdrawn): The method as recited in claim 30 wherein the boundaries are calculated using a watershed algorithm.

Claim 32 (new): The touch panel as recited in claim 1, further comprising a virtual ground charge amplifier coupled to the touch panel for detecting the touches on the touch panel.

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Claim 33 (new): The touch panel as recited in claim 1, the transparent capacitive sensing medium formed on a single side of a substrate.

Claim 34 (new): The touch panel as recited in claim 1, the transparent capacitive sensing medium formed on a transparent substrate.

Claim 35 (new): The touch panel as recited in claim 34, wherein the transparent substrate is formed from glass.

Claim 36 (new): The touch panel as recited in claim 7, wherein the capacitive sensing medium is a mutual capacitance sensing medium.

Claim 37 (new): The touch panel as recited in claim 7, the transparent capacitive sensing medium formed on both sides of a single substrate.

Claim 38 (new): The touch panel as recited in claim 36, further comprising a virtual ground charge amplifier coupled to the touch panel for detecting the touches on the touch panel.

APLNDC00026599

Claim 39 (new): A touch panel having a transparent capacitive sensing medium configured to detect multiple touches or near touches that occur at a same time and at distinct locations in a plane of the touch panel and to produce distinct signals representative of a location of the touches on the plane of the touch panel for each of the multiple touches;

wherein the transparent capacitive sensing medium comprises a transparent electrode layer, the electrode layer including a plurality of electrically isolated electrodes and electrode traces formed from a transparent conductive material, each of the electrodes being placed at different locations in the plane of the touch panel, each of the electrodes operatively couplable to capacitive monitoring circuitry.

Claim 40 (new): The touch panel as recited in claim 39, further comprising a virtual ground charge amplifier coupled to the touch panel for detecting the touches on the touch panel.

Claim 41 (new): The touch panel as recited in claim 39, the transparent capacitive sensing medium formed on a single side of a substrate.

Claim 42 (new): The touch panel as recited in claim 39, the transparent capacitive sensing medium formed on a transparent substrate.

Claim 43 (new): The touch panel as recited in claim 42, wherein the transparent substrate is formed from glass.

Claim 44 (new): The touch panel as recited in claim 39, wherein the capacitive sensing medium is a mutual capacitance sensing medium.

Claim 45 (new): The touch panel as recited in claim 39, the transparent capacitive sensing medium formed on both sides of a single substrate.

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Claim 46 (new): The display arrangement as recited in claim 13, further comprising a virtual ground charge amplifier coupled to the touch panel for detecting the touch events on the touch panel.

Claim 47 (new): The display arrangement as recited in claim 13, the multipoint sensing arrangement formed on a single side of a substrate.

Claim 48 (new): The display arrangement as recited in claim 13, the multipoint sensing arrangement formed on a transparent substrate.

Claim 49 (new): The display arrangement as recited in claim 48, wherein the transparent substrate is formed from glass.

Claim 50 (new): The display arrangement as recited in claim 13, the multipoint sensing arrangement formed on both sides of a single substrate.

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REMARKS

Claims 1-26 and 29 were pending in the application, claims 27, 28, 30 and 31 having been previously withdrawn. Claims 1, 2 and 13 were rejected under 35 U.S.C. §102(e) as being anticipated by Hill et al. Claim 29 was rejected under 35 U.S.C. §102(e) as being anticipated by Sharp. Claims 3-12 and 14-26 were objected to as being dependent on a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 1, 7, 13 and 15 have been amended, claims 3, 14 and 29 have been canceled, and claims 32-50 have been added, resulting in claims 1, 2, 4-13, 15-26 and 32-50 presently under consideration. Reconsideration and reexamination of the application in view of the amendments and following remarks is respectfully requested.

The previously pending claims have been amended to include the allowable subject matter as indicated by the Examiner, thus rendering those claims allowable.

Claims 1, 2 and 13 were rejected under 35 U.S.C. §102(e) as being anticipated by Hill. Claims 1 and 13 have been amended. With the amendments to claims 1 and 13, it is respectfully submitted that the rejection of claims 1, 2 and 13 have been overcome.

Claim 1 has been amended to include the limitations of claim 3, which is equivalent to writing claim 3 in independent form, indicated by the Examiner to be allowable. Similarly, claim 13 has been amended to include limitations of claim 14, which is similar to writing claim 14 in independent form, also indicated by the Examiner to be allowable. Therefore, amended claims 1 and 13 are now allowable, and it is respectfully submitted that the rejection of those claims has been overcome. In addition, because claim 2 depends from allowable claim 1, the rejection of claim 2 has been overcome for the same reasons provided above with respect to claim 1.

Claim 29 was rejected under 35 U.S.C. §102(e) as being anticipated by Sharp. Claim 29 has been canceled, making the rejection of claim 29 moot.

APLNDC00026602

Claims 3-12 and 14-26 were objected to as being dependent on a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 3 and 14 have been canceled, making the rejection of claims 3 and 14 moot. Claims 4-6 depend from now allowable claim 1 (as discussed above), and claims 15-26 depend from now allowable claim 13 (as discussed above). Therefore, claims 4-6 and 15-26 are now allowable. Claim 7 has been amended to include all of the limitations of the base claim (there are no intervening claims), and thus claim 7 is now allowable. Claims 8-12 depend from now allowable claim 7, and thus claims 8-12 are now allowable.

Claims 32-50 have been added. Claims 32-35 depend from now allowable claim 1 (as discussed above), and are therefore allowable. Claims 36-38 depend from now allowable claim 7 (as discussed above), and are therefore allowable. Claims 46-50 depend from now allowable claim 13 (as discussed above), and are therefore allowable.

Claim 39 is a new independent claim, and claims 40-45 depend from claim 39. Claim 39 is similar to amended and now allowable claim 1, but removes the limitation that each of the electrodes have "an individual trace." Claim 39 is believed to be allowable for the same reason that amended claim 1 is now allowable.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

APLNDC00026603

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no.*. 106842009000 However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Dated: August 14, 2008

Respectfully submitted,

By _____

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Electronic Acknowledgement Receipt

EFS ID:	3785200
Application Number:	10840862
International Application Number:	
Confirmation Number:	8470
Title of Invention:	Multipoint touchscreen
First Named Inventor/Applicant Name:	Steve Hotelling
Customer Number:	69753
Filer:	Glen Masashi Kubota/Elizabeth B. Lavallee
Filer Authorized By:	Glen Masashi Kubota
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1	Miscellaneous Incoming Letter	Transmittal.pdf	37255 5044788bdc100a848d8ef6426ffa15dc76743441	no	1

Warnings:	
Information:	

2		Amendment.pdf	489626 80980696c80a73cc02d04ce9b34a7a4521cbbc37	yes	14

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment - After Non-Final Rejection	1	1
Claims	2	11
Applicant Arguments/Remarks Made in an Amendment	12	14

Warnings:	
Information:	
Total Files Size (in bytes):	526881

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/21 (08-08)
Approved for use through 08/31/2008. OMB 0651-0031
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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	

Application Number	10/840,862
Filing Date	May 6, 2004
First Named Inventor	Steve P. HOTELLING
Art Unit	2629
Examiner Name	Kimnhung T. Nguyen
Attorney Docket Number	106842009000

ENCLOSURES (*Check all that apply*)

- [ ] Fee Transmittal Form
- [ ] Fee Attached
- [X] Amendment/Reply
- [ ] After Final
- [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
- [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) (please Identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	MORRISON & FOERSTER LLP		
Signature			
Printed name	Gregory Weaver		
Date	August 14, 2008	Reg. No.	53,751

P3266US1

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/840,862	05/06/2004	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	08/14/2008	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 47	Minus	** 31	= 16	X $ =		OR	X $50=	800
	Independent (37 CFR 1.16(h))	* 7	Minus	***6	= 1	X $ =		OR	X $210=	210
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	1010

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/TINA M. BELL/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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United States Patent and Trademark Office
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Via EFS Web
Patent
Docket No. 106842009000
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Steve P. HOTELLING et al.

Serial No.: 10/840,862

Filing Date: May 6, 2004

For: MULTI-POINT TOUCHSCREEN

Examiner: Kimnhung T. NGUYEN

Group Art Unit: 2629

Confirmation No.: 8470

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97 & 1.98

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

Pursuant to 37 C.F.R. § 1.97 and § 1.98, Applicants submit for consideration in the above-identified application the documents listed on the attached Form PTO/SB/08a/b. Copies of the foreign and non-patent literature documents are also submitted herewith. The Examiner is requested to make these documents of record.

This Information Disclosure Statement is submitted:

☒ After receipt of a first Office Action on the merits but before mailing of a final Office Action or Notice of Allowance.

☐ A fee is required. A check in the amount of __ is enclosed.

☒ A fee is required. Accordingly, a Fee Transmittal form is attached to this submission.

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Applicants would appreciate the Examiner initialing and returning the Form PTO/SB/08a/b, indicating that the information has been considered and made of record herein.

The information contained in this Information Disclosure Statement under 37 C.F.R. § 1.97 and § 1.98 is not to be construed as a representation that: (i) a complete search has been made; (ii) additional information material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the above information constitutes prior art to the subject invention.

In the unlikely event that the transmittal form is separated from this document and the Patent and Trademark Office determines that an extension and/or other relief (such as payment of a fee under 37 C.F.R. § 1.17 (p)) is required, Applicants petition for any required relief including extensions of time and authorize the Director to charge the cost of such petition and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing 106842009000.

Dated: December 19, 2008

Respectfully submitted,

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ALTERNATIVE TO PTO/SB/08A/B
(Based on PTO 08-08 version)

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	10/840,862
Filing Date	May 6, 2004
First Named Inventor	Steve P. HOTELLING
Art Unit	2629
Examiner Name	Not Yet Assigned
Attorney Docket Number	106842009000

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1.	US-4,914,624	04-03-1990	Dunthorn et al.	
	2.	US-5,589,856	12-31-1996	Stein et al.	
	3.	US-2005/0146511	07-07-2005	Hill et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	4.	JP-59-214941	12-04-1984	Toshiba Corp	with English abstract	
	5.	JP-60-211529	10-23-1985	AMP Inc.	with English abstract	
	6.	JP-08-016307	01-19-1996	Pentel KK	with English abstract	
	7.	JP-2000-112642	04-21-2000	Digital Electronics Corp	with Englilsh abstract	
	8.	JP-2002-342033	11-29-2002	Sony Corp	with English abstract	
	9.	JP-2003-029899	01-31-2003	Sony Corp	with English abstract	
	10.	EP-0 156 593	10-02-1985	AMP Incorporated		√
	11.	EP-0 250 931	01-07-1988	International Business Machines Corp		√

Examiner Signature		Date Considered	

*EXAMINER: Initial if information considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	12.	International search report for International Application No. PCT/US2005/014364 mailed January 12, 2005	√

Examiner Signature		Date Considered	

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[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached.

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(54) Method and apparatus for mode changes and/or touch mouse control.

(57) A method and device for instituting mode changes (78) or precise relative cursor (13) positioning is taught. Briefly stated, an operator who is interfacing with a CRT (10) or display area (12) which has a touch input device (51) on it, such as a switch matrix or infrared light beam matrix, may institute a number of changes simply by inserting two or more noncontiguous styli (18,18), such as two fingers, into the touch input area. This would, therefore, change the mode of information which is presented by the display to the operator (16) or the information presented to a computer or interface via the display area by the operator. In the preferred embodiment, the insertion of two noncontiguous fingers would allow the cursor (13) to be moved in a speed and direction which is directly related to the speed and direction of a finger with the result that the cursor need not be disposed directly under the finger which might otherwise block an operator's view and thereby allow more precise positioning of the cursor.

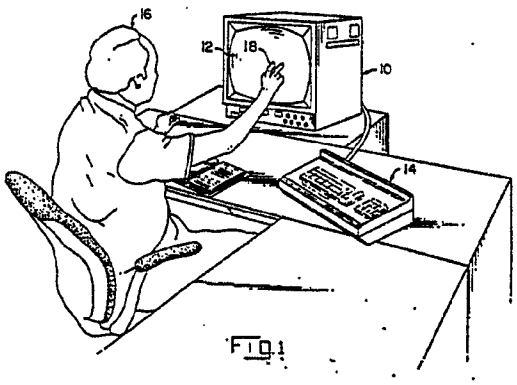

FIG.1

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METHOD AND APPARATUS FOR MODE CHANGES AND/OR TOUCH MOUSE CONTROL

This invention relates, generally, to a mouse and more particularly to a method and device for use of a touch input device so as to change program modes as well as move a cursor in a direction and/or speed relative to the direction and/or speed of a stylus.

Coincident with the use of video displays has always been the problem of the man/machine interface. Traditionally, control of information displayed or cursors has been via a keyboard. This is generally an inexpensive approach since keyboards are generally always necessary but have an inherent deficiency. This deficiency is the interruption of the train of thought of the operator in diverting the operator's attention between screen and keyboard and is particularly problematic with less skillful operators. Recently, a number of devices have been utilized to allow an operator to interact directly with the video display. These types of devices have included light pens, desk type mouse controllers or touch input devices, such as a switch matrix or opto-electronic matrices. Heretofore however, even this has required that an operator must go back and forth between display and a keyboard, whether it is to change modes or screens or whatever. Therefore, there is an ever-increasing effort to allow an operator to perform all or almost all functions directly from the video display without reverting to a keyboard. Accordingly, it is desirable to have a device which allows for as many commands or responses as possible to be fed through the display. These commands or responses may take the form of mode changes as well as gross or precise cursor movement. Further, it is desirable to have a device which does not require the use of mouse-type control units or keyboard operation. Such a scheme is taught in the present invention.

Accordingly, it is desirable to have and as an object of the present invention a device which provides a method and apparatus instituting program and/or mode changes as well as

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for controlling movement of a cursor or the like on a video display which may be in a manner similar to a mouse mode comprising, a touch input entry device for determining the presence and/or position of one or more styli which are introduced to the touch input entry device, a controller device connected to the video display and to the touch input entry device, being adapted for a mouse mode such that upon the introduction of at least one stylus at any point on the touch input entry device, wherein the point need not be adjacent the cursor or the like, the cursor or the like is moved at a speed and/or direction and/or distance which is relative to any movement of the styli, and a touch input entry control device interconnected with the touch input entry device whereby upon the introduction of two or more noncontiguous styli to the touch input entry device, the controller is placed into a mouse mode and which is accomplished through the steps of introducing at least two noncontiguous styli to the touch input entry device, detection of at least two noncontiguous styli by the touch input entry device, changing the mode of cursor movement on the video display to a mouse mode in response to the detection of the styli, introduction of a stylus to the touch input entry device at any point on the touch input entry device wherein the point need not be adjacent the cursor and moving the cursor or the like at a speed and/or direction and/or distance which is relative to any movement of the stylus.

Reference is now made to the accompanying drawings in which:

FIGURE 1 is a representative view of an operator utilizing a video display;

FIGURE 2 is a functional block diagram for use in conjunction with the touch input entry device in the preferred embodiment of the present invention; and

FIGURES 3 through 7 are flow chart diagrams for use with the preferred embodiment of the present invention.

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Referring now to Figure 1 there is shown an illustrative embodiment of the present invention. Shown is a CRT 10 having a display area 12 and which interacts with a keypad 14. An operator 16 interacts with the display area 12 through the use of styli 18, which in the preferred embodiment of the present invention are the fingers of the operator thereby presenting a truly touch-type interactive system. It is to be understood, however, that other types of styli can and may be used without departing from the spirit and scope of the present invention such as, for example, pencils, pointers, or other similar types of apparatus. While the keypad 14 is shown, it is one of the primary objects of the present invention to utilize the keypad 14 as little as possible if at all with the operator 16 utilizing the stylus 18 for direct interaction with the CRT 10. A touch input area is generally defined by what the operator 16 sees in the display area 12 and would have a cursor 13 (not shown) viewable by the operator 16. In the preferred embodiment of the present invention, this touch area utilizes emitters which are disposed on the top and one side of the display with detectors located on the bottom and opposite side thereby forming an infrared light beam matrix (not shown). However, it is to be understood that many other types of touch input mechanisms may be utilized such as, for example, a switch or membrane matrix disposed on the display area 12, capacitive sensors or switches, or acoustic sound wave methods, all of which are known to one skilled in the art.

In order to more readily understand the present invention a brief description or overview will now be given by way of example which will thereafter be followed by a much more detailed description. Accordingly, if an operator 16 is perhaps using a Computer Aided Design or Computer Aided Manufacturing program (CAD/CAM) he will be using his fingers 18 as a stylus to move lines, changes views or the like. However when the operator 16 needs to more precisely move a stylus or perhaps does not want the stylus to appear immediately under his finger

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18, as is generally the case in present stylus systems, he would simply insert two noncontiguous styli 18, which in the preferred embodiment of the present invention fingers 18 onto the display area 12. The touch input device (numbered 51 for clarity purposes) itself is actually composed of various individual components and generally would include a mechanism to detect stylus presence and decoding circuitry, which may include software, for interaction with a CRT or another computer or the like. This would then be registered by a touch input device, which in the preferred embodiment of the present invention is a infrared light beam matrix, but as mentioned may be any type of touch input entry device. This would then change the cursor into a Mouse Mode whereby the operator 16 simply by inserting a stylus 18 anywhere onto the display area 12 would cause the cursor to move in the same direction and at the same speed as the stylus without having to position his finger 18 over the cursor. Thereafter, if the operator 16 desires to go back to the previous mode he simply reinserts two noncontiguous styli onto the touch entry device which is then recognized and executed. Further, utilizing this method it is possible for the operator 16, simply by insertion of two noncontiguous styli, to change modes of the program with which he is interacting. Therefore he may simply step through a series of modes or as in the above example, toggle between two modes. It should also be understood, however, that the Mouse Mode may be used independent of the manner of mode change discussed.

Referring now to Figure 2, there is shown a functional block diagram of the apparatus for carrying out the preferred embodiment of the present invention. However, depending upon different touch input mechanisms or circumstances, other types of apparatus can and may be utilized without departing from the spirit and scope of the present invention. A detailed description of the apparatus utilized may be found in pending U.S. Patent Application Serial No. 568,044 entitled "Cursor Control Apparatus and Method" by Carroll et al, and filed on January 4, 1984, and

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which is expressly incorporated by reference herein. Accordingly, only a brief description of the apparatus of Figure 2, which may be called, generally, a touch input entry control device, will be had below with the exception that the differences between the referenced apparatus and the present apparatus will be more fully described. A counter 24 receives clock pulses from a source of clock pulses 26. For each pulse of the clock generator 26, the counter 24 is incremented, and continuously counts through its entire radix. The multibit output of the counter is connected to the inputs of a selector circuit 28, the outputs of which are connected so as to drive light emitting diodes 20, although other light sources may be utilized thereby creating light beams at times within each cycle which is determined by the selector circuit 26. Three light sources 20 are selected at a time as members of a single group, although in the preferred embodiment of the present invention the three light sources which are selected are not directly adjacent each other. Various photodetectors 22 are all connected in groups to a plurality of gates 30 which are enabled by a select circuit 32 in accordance with the output of the counter 24. Preferably, the light emitters 20 are driven in groups, so that a plurality of lamps are energized at the same time, and the photodetectors 22 are enabled in groups, with only one member of the selected light emitter group corresponding to one member of the selected photodetector group at any given time. This allows for the inspection of individual light beams at individual time slots within a scanning cycle, i.e., a complete cycle of the counter 24. However, individual emitters and/or detectors may be driven at any given instant or other groups such as two may be utilized. If the selected group of photodetectors 22 produces an output pulse, the beam associated with that time slot is recognized as not being interrupted. If no pulse is produced by the selected group of photodetectors during a time slot, the beam associated with that time slot is recognized as being interrupted. The signal from the selected group of photodetectors 22 is passed

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through a NOR gate 34 to an input of an AND gate 36, which has its other input connected to a synchronizing pulse drive from the clock source 26 and is delayed by a delay unit 38 thereby allowing the pulse to arrive at the gate 36 at the proper time for sampling a selected group of photodetectors 22. The gate 36 is enabled during the time slot corresponding to an interrupted beam and enables a gate circuit 40 to pass the multibit output of the counter 24 to the input of a Read Only Memory (ROM) 42. The ROM decodes the interrupted beam identifier signal from the gate 40 and produces a group of control signals which are presented to a CPU shown at 44 and loaded thereinto by means of a strobe pulse from the AND gate 36 over a line 46. In this manner, the CPU 44 is given an address which corresponds to a hit by a stylus. It is to be understood that the block diagram of Figure 2 is only illustrative of the various individual functions carried out by the apparatus and does not include other parts which interface with the CPU 44 such as memory devices and a controller for a video display terminal but which are readily known and understood by one skilled in the art. Further, conventional logic circuits may be combined in various ways to provide signals to a computer system which indicates that a given beam has been interrupted or a switch matrix may have been used. While the embodiment of Figure 1 does show only twelve beams of which only one axis at a time may be interrogated, it is readily obvious to one skilled in the art that this number of beams may be expanded to accommodate more or less beams and more or less than one axis may be interrogated at a time. The CPU 44 in the preferred embodiment of the present invention interacts with the ROM 42 and other addressable memory (not shown) to determine the number and location of styli which may then be presented as an output signal 49 (not shown) to the system shown generally at 50 which in the preferred embodiment of the present invention is a CRT or cursor controller and which could have a number of other devices connected such as another computer or an

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interface device. In this manner cursor movement may be controlled or a number of commands may be given.

Referring now to Figures 3 through 7 a flow chart of a program which is used is illustrated and which is stored in memory such as PROMS (not shown) with the PROMS being addressable by the CPU 44. However it is to be understood that hardware or other firmware or arrangements may be utilized to accomplish the same purpose without departing from the spirit and scope of the present invention. The program begins at the Start Unit 52 which is in an Absolute Mode. This is where the cursor tracks the movement of the stylus, that is the cursor will move to the exact position of the stylus. The program is placed into the Start Mode by any number of arrangements such as an input from a keypad or in the preferred embodiment of the present invention by the touching of the display area 12 at an appropriately designated location. Upon the initiation of the Start Mode at unit 52, a number of conditions are thereafter set up. These conditions include setting the mode to the Absolute Mode at unit 54, setting the First Report Flag equal to 0 at unit 56, setting the Present Cursor Position equal to the Home Position at unit 58, setting the touch panel operation mode to Stream at unit 60 (thereby enabling the cursor to attempt to remain positioned under the stylus), disabling all Exit Reports at unit 62 (that is ignoring the location of a stylus when it exits or leaves the touch input area), and finally to unit 64 where a Waiting Mode is set up for receiving a touch input. Thereafter, unit 66 Exit Target Touched interrogates the display to see if the operator wishes to exit the entire program. This, in the preferred embodiment of the present invention, is accomplished by the operator touching a specific marked portion of the screen or display which may state "Exit" or "End" and thereby place the CRT into another programming mode entirely. In this manner if the Exit Target Area has been touched then a TRUE or YES condition exists and an exiting of the program will be accomplished at unit 72. In the event that this exit area has

not been touched, a NO condition will exist at 70B, and will then be presented to unit 73 for Touch Error analysis. Unit 73 in analyzing Touch Error will analyze the number of hits or broken beams to determine the position and number of styli present. In the event that there is only one stylus present then a non-error or NO condition exists which is presented to 74C which is then in turn presented to unit 80 Mode Equals Absolute. In the preferred embodiment of the present invention, the use of two noncontiguous styli is utilized for switching into a Mouse Mode (numbered 53 for clarity purposes and would actually include the software steps following) although it is to be understood that three or more noncontiguous styli may be utilized or a stylus of a particular shape or size, without departing from the spirit and scope of the present invention. Accordingly, when unit 73 Touch Error analyzes the styli presented to the touch input area, should two noncontiguous styli be present then a YES condition exists such that a Switch Cursor Positioning Mode Change 78 occurs and which could therefore be generally considered as a mode changing device or event. However, should a nonacceptable condition or error be present, the input is ignored. Should two noncontiguous styli be presented then, as mentioned earlier, a YES condition exists which is then presented to unit 80 which looks at the mode in which the system is presently operating. Accordingly, should the operator decide to change modes, the operator would present two noncontiguous styli to the display or touch input area and would then remove one of the styli with only one stylus now being necessary to operate in the new mode. As mentioned, at unit 80 the present mode is analyzed and if the system is in the Absolute Mode, that is the cursor is attempting to remain under the stylus and move along with it, a YES condition would exist. However if the unit was previously in the Mouse Mode a NO condition would exist. Therefore, in the case where an Absolute Mode already existed, a YES condition would exist which would

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then be presented to unit 84 and therefore set the unit into a Mouse Mode while an Absolute Mode would be set at unit 82 if the previous mode had been a Mouse Mode or any other mode. In this manner, unit 80 acts as a toggle between one mode or the other. It is to be understood, however, that without departing from the spirit and scope of the present invention, unit 80 might simply look for a touch error condition which would be initiated by, for example, two noncontiguous styli and simply sequentially toggle from one mode to the next vis-a-vis the input of two noncontiguous styli into perhaps a dozen different modes before finally returning to a home mode. If the mode has been set as Absolute at unit 80, it is then presented to unit 86 disabling the Exit Reports which is thereby in turn presented to a unit 68 and thereafter to a unit 64 to wait for a touch input which, as mentioned previously, is a Waiting Mode. After the mode has been set to the Mouse Mode in unit 84, it is then presented to unit 88 which sets the first Report Flag equal to zero and thereby indicates that no reference point is established. This is then presented to unit 90 enabling the Exit Reports which is then presented to 68A and again in turn to unit 64 which is a Waiting Mode. In this manner a loop is established such that the mode will stay the same until two noncontiguous styli are again presented to the touch input area whereafter a change of modes from absolute to mouse or mouse to absolute will be initiated.

Thereafter, the system will shift through units 64, 66 to Touch Error unit 73 regardless of the mode it is in. If no touch error is realized, this condition is presented to unit 76 Mode Equals Absolute Mode. If in fact the mode is the Absolute Mode, a YES condition will exist which is then presented to unit 92 Touch Input Equals Exit Report. Thereafter if the stylus is exited from the touch input entry area, a YES condition will exist which is then presented to 68A. However, if the stylus is not exited from the touch input area, a NO condition will exist which is then presented to unit 94 Set Cursor Position to Touch

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(X, Y) and thereafter to 68A. In this manner the cursor will move relative to the stylus position. However, should the mode be a non-absolute mode in unit 76, a NO condition, as mentioned, will exist which is then presented to unit 96 which then checks to see if the First Report Flag equals zero. This in effect defines a relative mode with unit 96 interrogating whether a reference point has or has not been set. Accordingly, should the First Report Flag equal zero, a YES condition would exist which would represent that a reference point has not been set which would then be presented to unit 102 so as to set the first Report Flag equal to 1 and thereby setting a reference point which is the position of the stylus. This is then presented to unit 106 Old Touch Position Equals New Touch Position whereby the reference point is updated which is then presented through 68A to unit 64. Should the First Report Flag in unit 96 not equal zero, it is then presented to unit 98 which in effect inquires whether the touch input is equal to the exit report. If this is a TRUE or YES condition, then the stylus has not moved and is then presented to unit 104 which sets the First Report Flag equal to zero and is then presented via 68A to unit 64. In this manner if a finger is removed, an exit report is presented through unit 104 to unit 64. However, if a finger has not been removed from the touch input area, then an exit report is not generated and a NO condition is indicated which is then presented through 99D to unit 108 which in effect inquires whether the Old Touch X is Equal to the New Touch X. This in effect interrogates the position of the stylus in the X direction. If the X coordinates have not changed, then a YES condition exists which is then presented to unit 110 which defines the New Cursor X Coordinate as the Current Cursor X Coordinate which in effect does not change the X coordinate of the cursor and which is then presented through 100E for a Y Coordinate Analysis as will be discussed more fully below. If, however, the old touch X position does not equal the new touch X position in unit 108, a NO condition would exist which represents that the

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stylus has moved in the X coordinate plane. This is then presented to unit 112 which determines the magnitude of this change. If in fact this magnitude is defined as less than two units, a NO condition exists which is then presented to unit 116 Set New Cursor X Equals Current Cursor X which is then presented through 100E for Y Coordinate Analysis. It is to be understood that this designation of two units is an arbitrary number which may be changed, but is used as a means of steadying the cursor if the stylus has moved what is thought to be an imperceptible amount, due to perhaps an unsteady finger. If, however, the units of movement in the X direction are greater than or equal to two units, a YES condition exists which is then presented to unit 114 which in effect checks to see if the units moved are between the areas of three to six units or above six units. If the number of units in the X direction is greater than six, then a NO condition would exist which is then presented to unit 120 which sets the New Cursor X Position Equal to the Change in X Plus the Current Cursor Position of X, which is then presented to 100E for Y Axis Analysis. If, however, the number of units in the X direction is between two and six, the new cursor X position is set equal to the Change in X Minus 1 Plus the Current Cursor X Position which is then presented to unit 122. It should be mentioned that in unit 122, where it is determined whether the new cursor X position is less than or equal to zero, a wrap-around function is begun. Therefore if the cursor is, for example, at the far left side of the screen and the stylus indicates that continued movement to the left is desired, the cursor will wrap around and reappear at the far edge of the right side of the screen. Accordingly, should the new cursor X be less than or equal to zero, a YES condition will exist which defines the New Cursor X as the New Cursor X plus 80, thereby causing the mentioned wrap-around. It is to be understood that in the preferred embodiment of the present invention 80 is utilized as the number of columns present on the CRT. However, more or less columns may be utilized

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depending upon individual CRT design without departing from the spirit and scope of the present invention. Should the new cursor X position not be less than or equal to zero in unit 122, a NO condition exists which is then presented to unit 126 to check if the new cursor position X is greater than 80. If in fact it is greater than 80, a YES condition exists which is then presented to unit 128 which subtracts 80 from the X position by defining new cursor X equal to new cursor X minus 80. In this manner the cursor would wrap around from the right side of the screen to the left side of the screen as defined by the example discussed previously. The outputs of units 124 and 128 are then presented to 100E. If, however, the new cursor X position is not greater than 80 in unit 126, a NO condition exists which is simply presented through 100E.

This is then presented to unit 130 Old Touch Y Equals New Touch Y which similarly to the X Axis Analyses of Figure 6 performs the same function such as cursor wrap-around and checking for the magnitude of stylus movement. However, instead of the outputs being presented to 100E, they are presented to unit 152 which sets the cursor position equal to a new cursor X and a new cursor Y which thereafter in unit 154 defines the Old Touch X, Y Position Equal to the New Touch X, P position so as to update the position of the stylus which is then presented via unit 68A back to unit 64.

In this manner when the operator wishes to move the cursor a certain distance without having his finger or stylus in the way, he merely inserts two fingers into the touch input area which thereby changes the mode from an absolute or stream mode to a Mouse Mode and thereby, through the use of one finger, moves the cursor. Once in the Mouse Mode it makes no difference where the operator inserts his finger such that movement in any direction and at any speed is followed by exact paralleling of the cursor in the same direction and at the same speed. When the operator thereafter decides to go into a different mode or back to the absolute mode, he simply reinserts

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two fingers into the touch input area and then operates as he did prior to the Mouse Mode.

It is to be remembered that many variations of the present invention may be utilized without departing from the spirit and scope of the present invention. Such variations may include the use of displays other than a CRT such as a flat panel display or more conventional television screens. Additionally, the touch input area may be physically offset from the display. Further, the number of styli utilized may indicate the type of mode change. For example, the use of two noncontiguous styli may indicate a mode change from a first mode to a second mode, while three noncontiguous styli may indicate a mode change from a first mode to a third mode. Additionally, the movement of the cursor in relation to the movement of the stylus may be scaled or non linear such that large movement of the stylus results in small movement of the cursor or the cursor may be moved slower or faster than the stylus. Further, the cursor may be a letter or number so as to indicate the mode it is in (M for Mouse and A for Absolute, etc.) or the program being utilized.

Therefore, in addition to the above-enumerated advantages, the disclosed invention produces a method for instituting mode changes or precise relative cursor positioning without the use of additional expensive hardware or without the use of separate input devices such as a tabletop mouse or a keypad. Further, the present invention may readily be retrofitted to a large variety of existing touch input systems such as, for example, switch matrix, capacitance or motion wave sensors, without the need for costly or significant design or engineering changes.

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CLAIMS:

1. A method for initiating a program and/or mode change in a CPU/controller (44) or the like, comprising the steps of:

a. introducing two or more noncontiguous styli (18, 18) to a touch input entry device (51);

b. detection of at least two noncontiguous styli by said touch input entry device; and

c. changing the program and/or mode of said CPU/controller or the like from the program and/or mode it was in just prior to step (a) above to another program and/or mode, in response to said detection of two or more noncontiguous styli of step (b) above.

2. A method for controlling a cursor (13) or the like on a video display (12), comprising the steps of:

a. introduction of a stylus (18) to a touch input entry device (51) at any point on said touch input entry device, wherein said point need not be adjacent said cursor or the like; and

b. moving said cursor or the like at a speed and/or direction and/or distance which is relative to any movement of said stylus of step (a).

3. A method according to claim 2 which includes the following steps which are performed prior to step (a) above, comprising the steps of:

a. introducing at least two noncontiguous styli (18, 18) to a touch input entry device;

b. detection of at least two noncontiguous styli by said touch input entry device; and

c. changing the mode of cursor movement on said video display to a mouse mode (53) in response to the detection of said styli in step (b).

4. Apparatus for instituting a program and/or mode change in conjunction with a touch input entry device (51), characterized by:

a touch input entry device for producing an output signal (49) in response to one or more styli (18) being introduced thereto; and

a mode change device (78) adapted to interact with said touch input entry device for changing the program and/or mode of a computer/controller or the like in response to the introduction of a predetermined number of styli to said touch input entry device.

5. Apparatus for controlling movement of a cursor (13) or the like on a video display (12), characterized by:

a touch input entry device (51) for determining the presence and/or position of one or more styli (18) which are introduced to said touch input entry device; and

a cursor controller device (10) connected to said video display and said touch input entry device and being adapted such that upon the introduction of one or more styli at any point on said touch input entry device, wherein said point need not be adjacent said cursor or the like, said cursor or the like is moved at a speed and/or direction and/or distance which is relative to any movement of said styli.

6. Apparatus for controlling movement of a cursor (13) or the like on a video display (12) in a manner similar to a mouse mode (53), characterized by:

a touch input entry device (51) for determining the presence and/or position of one or more styli (18) which are introduced to said touch input entry device;

a cursor controller device (10) connected to said video display and to said touch input entry device being adapted for a mouse mode such that upon the introduction of at least one stylus at any point on said touch input entry device, wherein said point need not be adjacent said cursor or the like, said cursor or the like is moved at a speed and/or direction and/or distance which is relative to any movement of said styli; and

touch input entry control device interconnected with said a touch input entry device whereby upon the introduction of two

or more noncontiguous styli to said touch input entry device said controller is placed into said mouse mode.

7. A device according to claim 5 or 6, wherein said touch input entry device is disposed adjacent said video display.

8. A device according to claim 4, 5 or 6, wherein said touch input entry device is comprised of an infrared opto-matrix frame.

9. A device according to claim 4,5 or 6, wherein said touch input entry device is comprised of a membrane switch matrix.

10. A device according to claim 5 or claim 6, wherein said styli are comprised of the fingers of an operator.

11. A device according to claim 4, 5 or claim 6, wherein said touch input entry device utilises acoustic sound waves to detect said styli.

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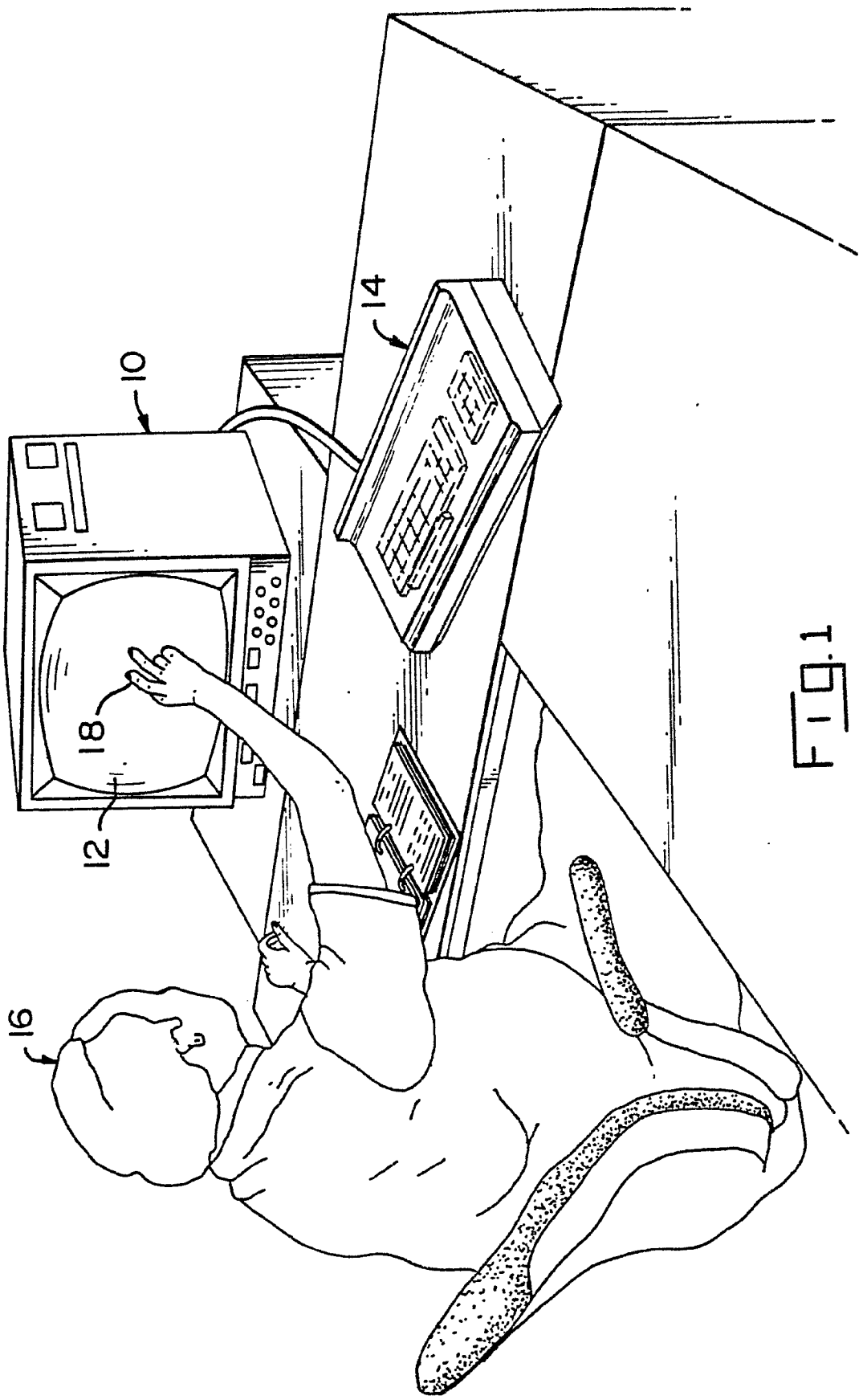

FIG.1

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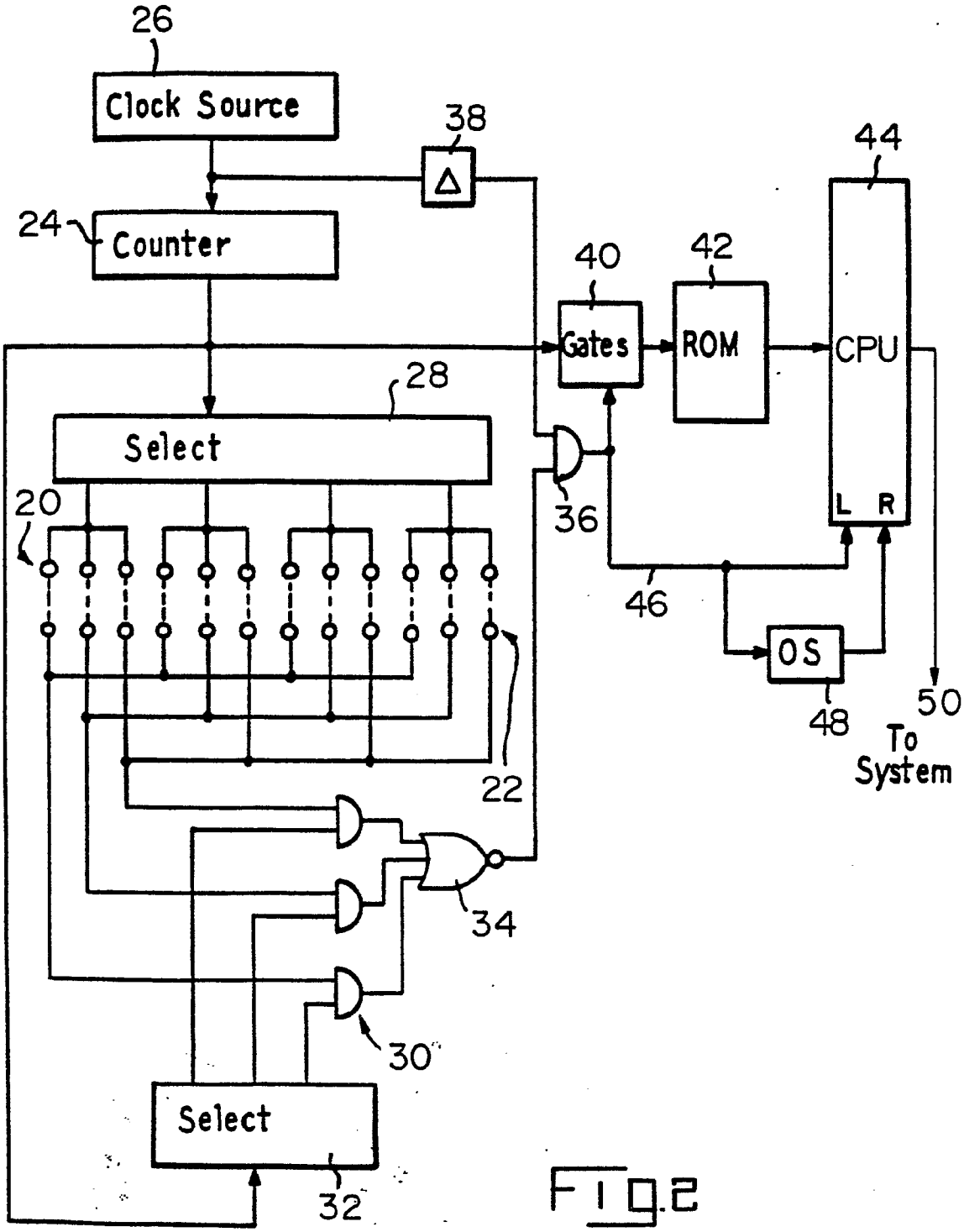

FIG.2

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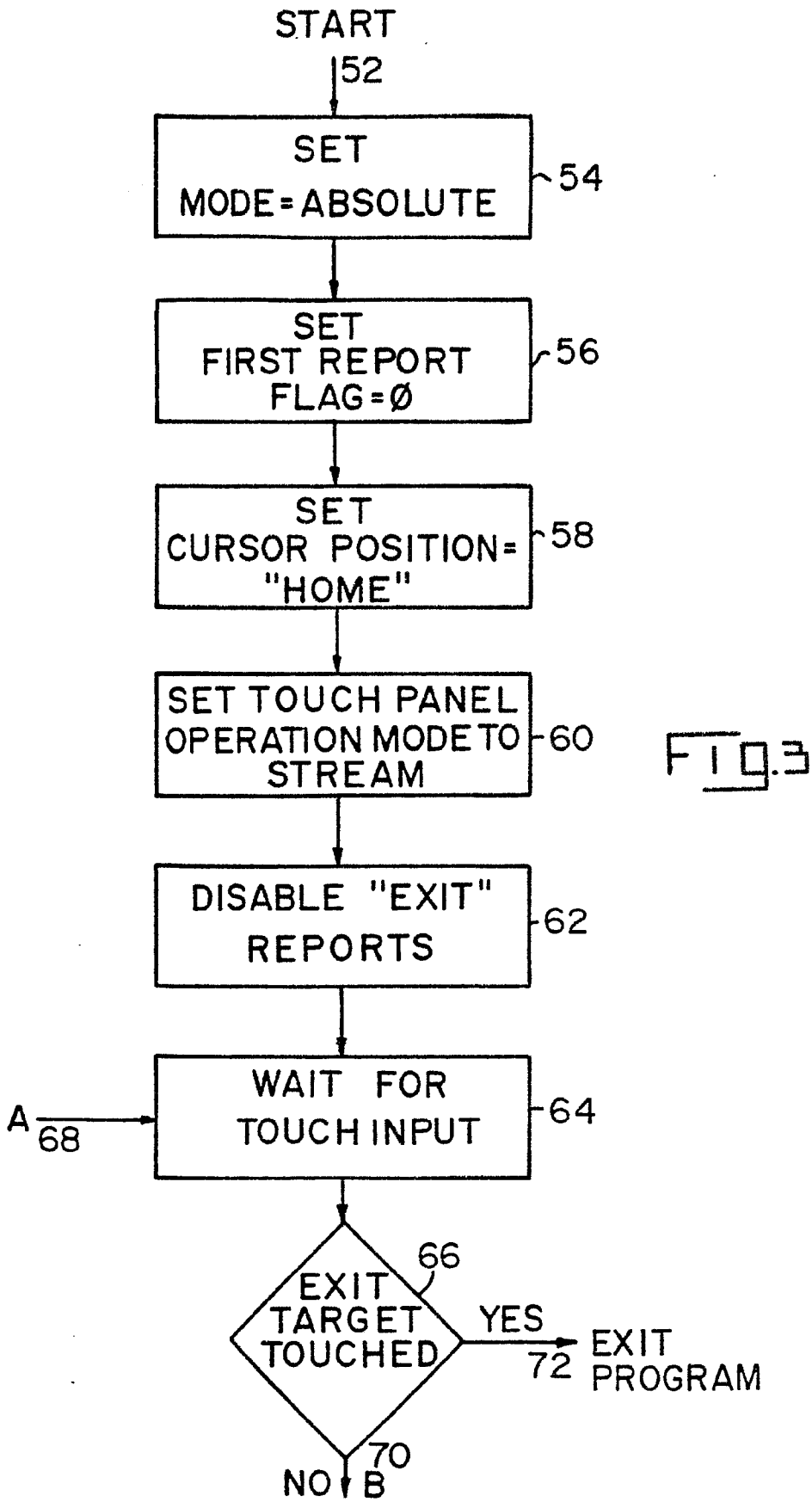

FIG.3

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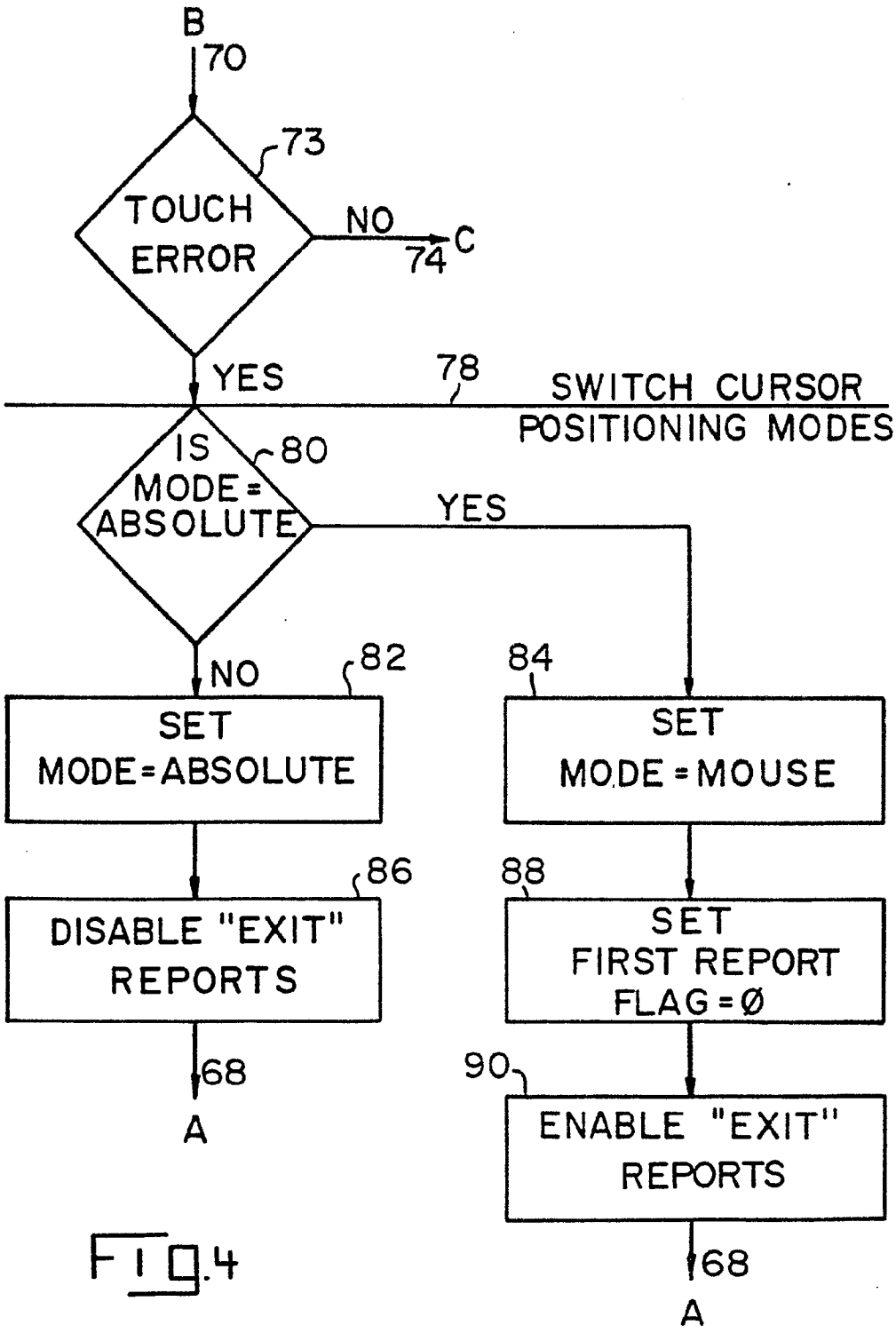

FIG.4

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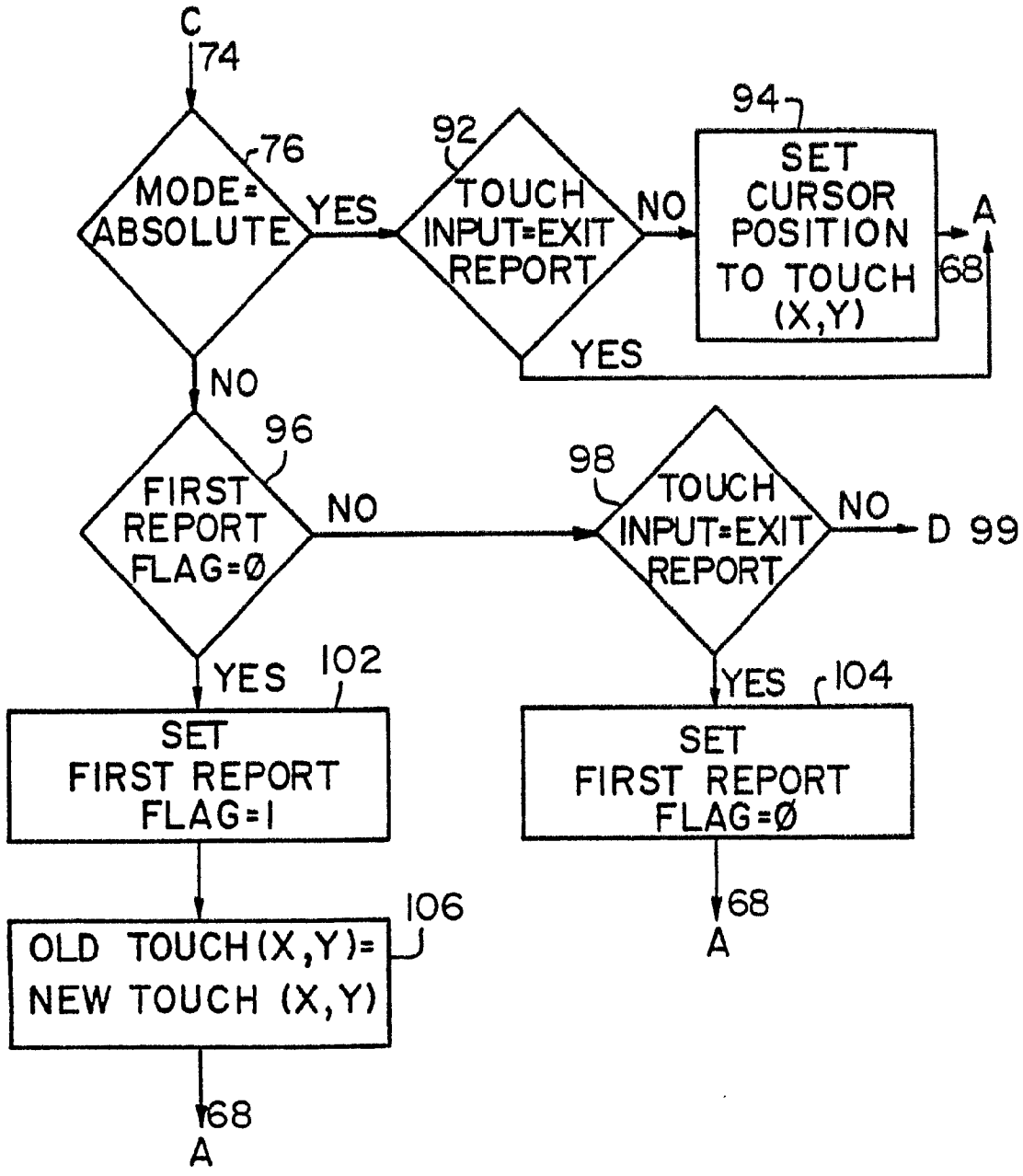

FIG.5

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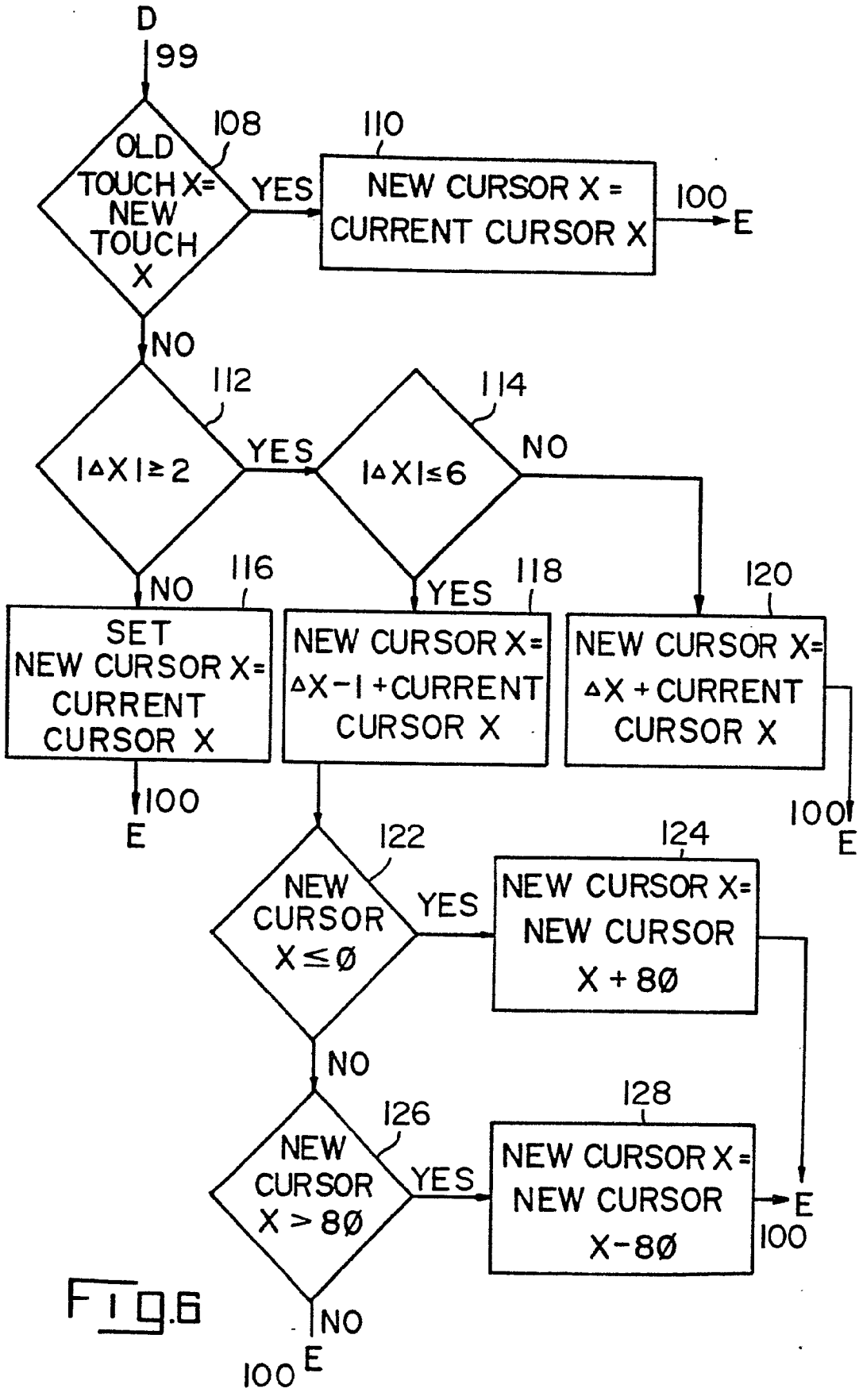

FIG.6

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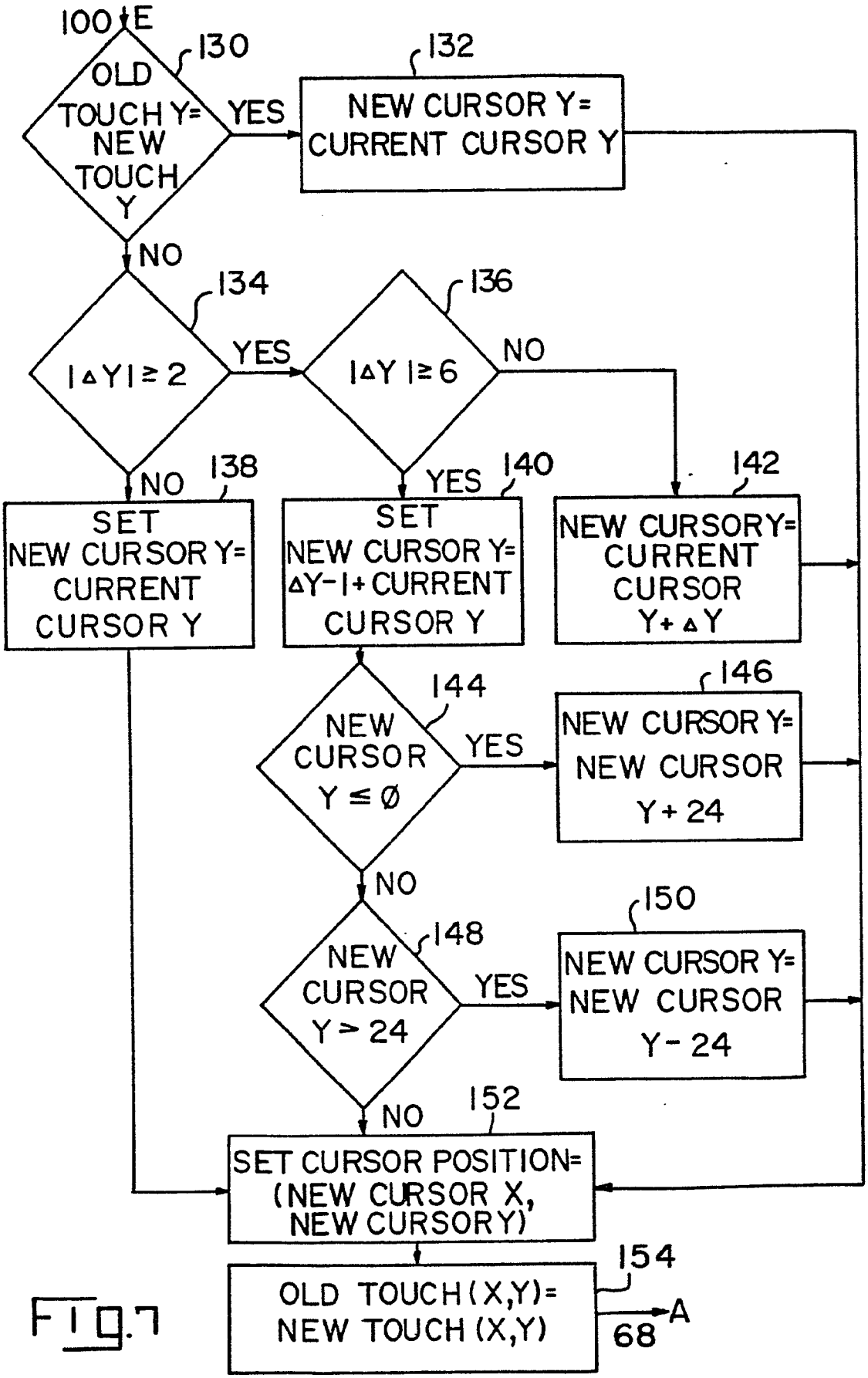

FIG.7

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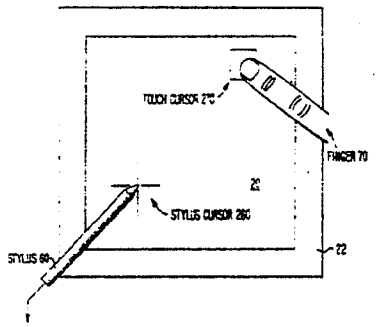
(54) Combined finger touch and stylus detection system for a display device.

(57) A combined finger touch and stylus detection system is disclosed for use on the viewing surface of the visual display device. Transparent conductors (X1, X2,...X112) arranged in horizontal and vertical grid are supported on a flexible, transparent overlay membrane (20) which is adaptable to a variety of displays. A unique interconnection pattern is provided between the transparent conductors in the array and buses (80,90) which interconnect the conductors with the supporting electronics, whereby a minimum number of bus wires can be employed to service the array conductors and yet both unique finger touch location sensing and unique stylus location sensing can be accomplished. The system includes a control processor (100) which operates on stored program instructions which, in a first embodiment provides for the alternate detection of either finger touch location or stylus location and, in a second embodiment, provides for the simultaneous detection of both finger touch location and stylus location. The resulting system provides the unique function of combined finger touch and stylus detection, is adaptable to a variety of display surfaces, is provided with a structure which is easily manufacturable, and which has an inherent long-term reliability.

FIG. 12.
DISPLAY AS SEEN THROUGH OVERLAY SHOWING SIMULTANEOUS FINGER TOUCH AND STYLUS DETECTION



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A COMBINED FINGER TOUCH AND STYLUS DETECTION SYSTEM FOR USE ON THE VIEWING SURFACE OF A VISUAL DISPLAY DEVICE

Background of the Invention

The invention disclosed broadly relates to data processing technology and more particularly relates to input devices for use in conjunction with visual displays.

In data processing systems, a central processor executes a sequence of stored program instructions to process data provided by an input device and to present the results of the data processing operations to an output device. Data processing results can be presented in either alphanumeric text or in graphical form and a universal mechanism for manifesting those results is by means of a visual display device such as a cathode ray tube monitor, a gas panel display, an array of light emitting diodes, or other types of visual display devices. Frequently, the results presented to the user on a visual display device, will require the user to provide additional data to the data processing system. Various types of data input devices have been employed in data processing systems, for example keyboard input, graphical tablet input, and various forms of display surface inputs. Human factors studies have shown that by providing a means for inputting data on the visual display screen itself, the user can achieve the most closely coupled interactive operations with the data processing system. When the user responds to visual signals output at the face of the visual display device, by inputting signals at that same visual display surface, an accuracy and immediacy in the interaction between man and machine can be achieved. This form of input device is easy to learn to use and seems the most natural and user-friendly to the operator.

Various types of interactive input devices for use at the display surface have been provided in the prior art. One of the first forms of interactive devices was the light pen, which is an optical detector provided in a hand-held pen, which is placed against the display surface of a cathode ray tube screen. When the dot of light represented by the scanning raster is detected by the light pen, the coordinates of the raster dot are attributed as the location of the hand-held pen. Another type of interactive input device for use on a display surface is the mechanical deformation membrane, which is a transparent laminate placed over the display surface. The laminate consists of two conductor planes respectively deposited on a flexible medium so that when the user mechanically displaces one of the conductor planes by a finger touch, the conductors are brought into electrical contact with the conductors in the second plane. The electrical resistance of the conductor plane is changed as a function of the position of the finger touch on the membrane and appropriate electronics are provided to translate that resistance value into the position attributed to the finger touch.

Opaque graphics tablets, upon which a sheet of drawing paper can be supported for tracing with an electronic stylus, have been provided in the prior art. In opaque graphics tablets, a horizontal wire grid and a vertical wire grid are embedded in the surface of the tablet. The wires in the tablet are driven with a signal which is electromagnetically radiated from the surface of the tablet and which is received by a pickup stylus connected to a signal detector. In one type of opaque graphics tablet, a field gradient is imposed from one side to the other side of the tablet and the strength of the field as picked up by the stylus, is correlated with the position attributed to the stylus. Another approach has been described by H. Dym, et al. in USPs 3,992,579; 3,999,012; and 4,009,338, those patents being assigned to the IBM Corporation. Dym, et al. describe driving the conductors embedded in the opaque graphics tablets so that they are selectively energized with 40 kilohertz signals in a multiple stage operation to first determine the stylus proximity to the surface of the tablet and then to track the position of the stylus along the surface of the tablet in the horizontal and vertical directions. During the proximity stage of operation, the conductors in all regions of the tablet surface emit signals which are detected by the stylus as it approaches the surface. When the amplitude of the received signals is great enough, the operation then changes into the locate and tracking mode which is programmed to produce periodic indications of the stylus position with respect to the horizontal and vertical conductors embedded in the tablet.

The popularity of the Personal Computer can be attributed, in part, to the enhanced productivity which can be achieved by applying data processing techniques to the execution of tasks which were previously done manually. Typical applications employing an interactive input at the display surface of the monitor in a Personal Computer, require the operator to make control selections at the keyboard, perhaps selecting the mode of operation or particular image to be displayed, prior to using the interactive input device for inputting data to the system. For example, in hotel management applications, the operator would enter control information at the keyboard to select either a first dis-

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played image for a room assignment application or a second displayed image for entering billing information. Only after having made the control input at the keyboard, will the operator be able to make data entries by means of the interactive input at the display surface.

Objects of the Invention

It is therefore an object of the invention to provide an improved interactive input device for a display surface.

It is another object of the invention to provide an interactive input device which permits either finger touch input or stylus detection input modes.

It is yet a further object of the invention to provide an improved interactive input for a display surface which can be adapted to a variety of surface contours.

It is yet a further object of the invention to provide an improved interactive input for a display surface which is reliable and is inexpensive to manufacture.

It is yet a further object of the invention to provide an interactive input device for use at a display surface, which permits the simultaneous detection of both a finger touch and a stylus position.

The invention as claimed solves these stated and further objectives in advantageous manner.

Disclosure of the Invention

A combined finger touch and stylus detection system is disclosed for use on the viewing surface of a visual display device. The system includes an array of horizontal and vertical conductors arranged on the viewing surface of the visual display device, having an I/O terminal coupled thereto, for conducting electrical signals between the terminal and the vicinity of the viewing surface. A radiative pickup stylus is also included, having an output terminal, for receiving electromagnetic signals radiated from the array.

The system includes a selection means having a switchable path connected to the I/O terminal of the array and having a control input, for connecting selected patterns of a plurality of the horizontal and vertical conductors to the switchable path in response to control signals applied to the control input. A capacitance measuring means is also included, having an input coupled to the switchable path of the selection means, for measuring the capacitance of selected ones of the conductors in the array, in response to the control signals applied to the control input.

The system further includes a radiative signal source having an output coupled to the switchable path of the selection means, for driving selected ones of the conductors in the array, in response to the control signals applied to the control input. A radiative signal measuring means is also included, coupled to the radiative pickup stylus, for measuring the electromagnetic signals received by the stylus.

In addition, the system includes a control processor connected to the control input of the selection means, for executing a sequence of stored program instructions to sequentially output the control signals to the selection means. The control processor is connected to the capacitance measuring means, for receiving measured capacitance values of the conductors when the selection means, in response to the control signals, has connected a first pattern of a plurality of the conductors in the array to the capacitance measuring means, to detect the location of a finger touch with respect to the viewing surface of the display device. The control processor is also connected to the radiative signal measuring means, for receiving measured radiative signal values when the selection means, in response to the control signals, has connected a second pattern of a plurality of the conductors in the array to the radiative signal source, to detect the location of the stylus with respect to the viewing surface of the display device.

In this manner, both finger touch location and stylus location with respect to the viewing surface of the display, can be detected.

The system can be used for both sequential and simultaneous detection of finger touch and stylus position. The system makes use of a unique interconnection arrangement for the horizontal and vertical conductors to respective buses which are of a reduced size, thereby saving space and driver electronics. A unique overlay membrane structure supports the horizontal and vertical conductors of the array and has sufficient mechanical flexibility to enable it to conform to the surface contour of a variety of display surfaces.

Brief Description of the Drawings

The foregoing and other advantages of the invention will be more fully understood with reference to the description of the best mode embodiments as shown in the drawing in which:

Fig. 1 is a front view of the overlay 20 and the mounting frame 22;

Fig. 2 is a side cross-sectional, breakaway view of the overlay and mounting frame of Fig. 1, along with section line 2-2';

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