

EXHIBIT 3.23

such applications, a simple graphic underlay such as a plastic button template could be slid into a slot underneath the transparent sensor.

Advertising logos or other graphics not related to the device user interface could also be placed under the sensor.

- 5 f) Display-enhanced capacitive sensor for a personal computer. To enhance the user interface for personal computers, the transparent two-dimensional sensor can be used in conjunction with an underlying LCD display device for a display-enhanced sensor input device. The underlying LCD screen can provide information such as a record of the current stroke
10 or gesture for handwriting recognition, signature/text capture or graphics software. Soft buttons, icons, scroll bars, or other zones of enhanced sensor functionality could also brought to attention on the LCD screen. In more general terms, a display-enhanced sensor could contain specific applications that interface with the host computer. Examples include, but
15 are not limited to, mimicking a numeric keypad, launching applications, or providing menus or soft buttons that are specific to a software application that is running concurrently on the host computer. Finally, advertising logos, or bitmapped images and photographs can be drawn in the LCD screen to enhance functionality or as additional display space.
- 20 g) Display-enhanced capacitive sensor for personal computer that detaches to function as a stand alone handheld device. A further extension of the display-enhanced sensor is a detachable transparent sensor and LCD display assembly. While the sensor and LCD is attached to the host computer, it functions as a display-enhanced sensor as
25 described in the previous section. However, the sensor and LCD assembly also contains hardware and software to function as a stand alone, handheld device, for example, a personal digital assistant (PDA) device such as a 3Com PalmPilot™ or a Rolodex Rex™. The detachable sensor has distinct benefits. First, it serves as a simple security
30 mechanism for the host computer since most modern computer operating

systems are almost impossible to use without a pointing device. Second, the detachable capacitive sensor provides an obvious location to store the PDA without need for a separate cradle or docking station. Because the input is a capacitive position sensor, the finger pointing performance of such a device is the same as the current state-of-the-art computer touchpads and vastly superior to the resistive pads that are currently in use on most PDA devices.

h) Transparent capacitive sensor as an aesthetic improvement to personal computer design. In some modern computers, transparency is used for purely aesthetic or artistic purposes. A transparent sensor array allows industrial designers to incorporate a pointing device onto a computer but allow the surface underneath to be viewable. This might allow the underlying electronics of the computer, or other artwork such as, but no limited to, logos, advertising, or labels, to be viewable.

Described herein is a preferred embodiment, however, one skilled in the art that pertains to the present invention will understand that there are equivalent alternative embodiments.

What is claimed is:

1. A capacitive sensor system comprising a substantially transparent sensor trace and a processor configured to detect a
5 capacitance change in the sensor trace caused by the proximity of a
conductive object adjacent to the sensor trace to determine proximity of
the conductive object.

2. The capacitive sensor system of claim 1, further comprising
10 at least one additional transparent sensor trace resulting in a first plurality
of sensor traces oriented in a first dimension, wherein the processor is
further configured to detect capacitance changes in the first plurality of
sensor traces corresponding to a conductive object adjacent the sensor
traces to determine proximity of the conductive object and positioning of
15 the conductive object along the first dimension.

3. The capacitive sensor system of claim 2, further comprising
a second plurality of sensor traces oriented in a second dimension,
wherein the processor is further configured to detect capacitance
20 changes in the first plurality of sensor traces and the second plurality of
sensor traces corresponding to a conductive object adjacent the sensor
traces to determine proximity of the conductive object and positioning of
the conductive object along the first dimension and the second
dimension.
25

4. The capacitive sensor system of claim 3, wherein the first
dimension is substantially perpendicular to the second dimension.

5. The capacitive sensor system of claim 3, further comprising a substantially transparent insulating material separating the first plurality of sensor traces from the second plurality of sensor traces.

5 6. The capacitive sensor system of claim 3, wherein the first plurality of sensor traces and the second plurality of sensor traces are configured to minimize overlap.

7. The capacitive sensor system of claim 6, wherein each
10 sensor trace of the first plurality of sensor traces and the second plurality of sensor traces is configured to comprise a series of diamond shapes aligned and connected along a common axis.

8. The capacitive sensor system of claim 7, wherein the first
15 plurality of sensor traces and the second plurality of sensor traces are aligned to maximize transparency.

9. The capacitive sensor system of claim 3, further comprising
a flexible substrate.

20

10. The capacitive sensor system of claim 5, wherein the sensor traces and the insulating material have similar indices of refraction.

11. The capacitive sensor system of claim 1, wherein the
25 sensor trace is mounted over an active display.

12. The capacitive sensor system of claim 2, wherein the sensor trace is mounted over an active display.

13. The capacitive sensor system of claim 3, wherein the sensor trace is mounted over an active display.

5 14. The capacitive sensor system of claim 1, wherein the processor is further configured to recognize gestures.

15. The capacitive sensor system of claim 2, wherein the processor is further configured to recognize gestures.

10 16. The capacitive sensor system of claim 3, wherein the processor is further configured to recognize gestures.

15 17. The capacitive sensor system of claim 3, wherein the sensor traces are mounted over a system to read fingerprints.

18. The capacitive sensor system of claim 1, further comprising a substantially transparent ground plane to electrically shield the sensor system.

20 19. The capacitive sensor system of claim 2, further comprising a substantially transparent ground plane to electrically shield the sensor system.

25 20. The capacitive sensor system of claim 3, further comprising a substantially transparent ground plane to electrically shield the sensor system.

21. The capacitive sensor system of claim 3, wherein the sensor system is mounted over a display device and comprises an object

positioning system in which the display device provides additional user interface information.

22. The capacitive sensor system of claim 8, wherein the first
5 plurality of sensor traces and the second plurality of sensor traces
comprises a sensor array that has substantially uniform transparency.

23. The capacitive sensor system of claim 3, wherein the is
further configured to detect capacitance changes in the first plurality of
10 sensor traces and the second plurality of sensor traces to determine
contact area of a conductive object.

24. The capacitive sensor system of claim 2, wherein the
sensor traces are mounted over a system to read fingerprints.
15

25. The capacitive sensor system of claim 1, wherein the
sensor traces are mounted over a system to read fingerprints.

26. The capacitive sensor system of claim 1, wherein the
20 conductive object is a human finger.

27. The capacitive sensor system of claim 2, wherein the
conductive object is a human finger.

25 28. The capacitive sensor system of claim 3, wherein the
conductive object is a human finger.

29. The capacitive sensor system of claim 2, further comprising
a flexible substrate.
30

30. The capacitive sensor system of claim 1, further comprising a flexible substrate.

31. The capacitive sensor system of claim 1, wherein the
5 conductive object is a stylus.

32. The capacitive sensor system of claim 2, wherein the conductive object is a stylus.

10 33. The capacitive sensor system of claim 3, wherein the conductive object is a stylus.

1/2

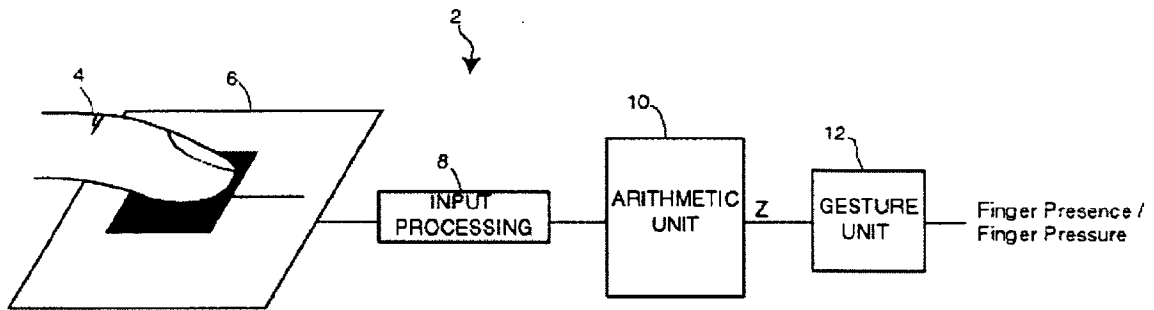


Figure 1

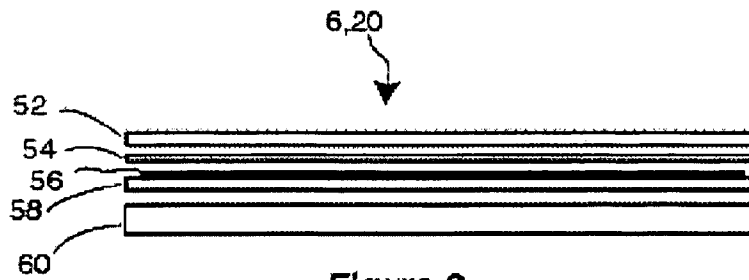


Figure 2

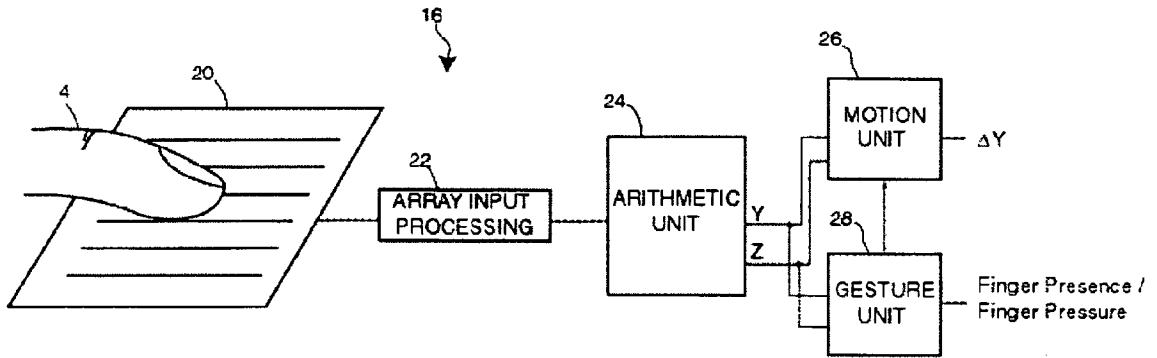


Figure 3

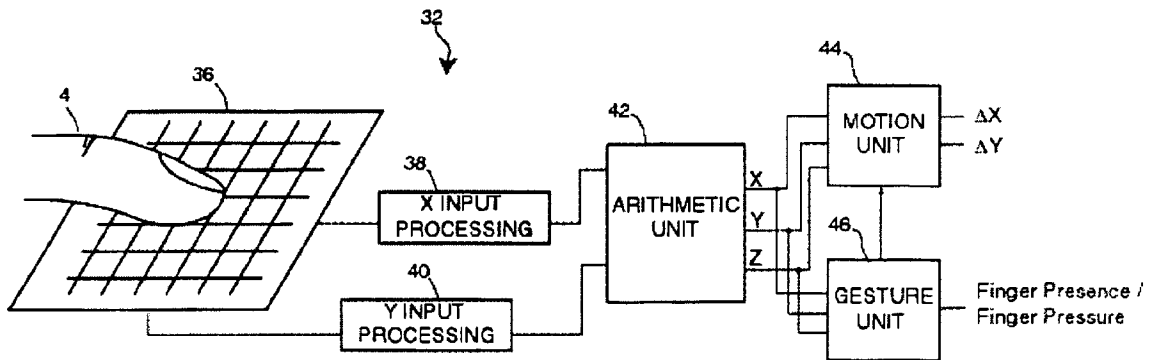


Figure 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 00/27720

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06K11/16 G06F3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06K G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 543 588 A (ALLEN TIMOTHY P ET AL) 6 August 1996 (1996-08-06) cited in the application	1-8, 11-13, 21-23, 26-28
Y	column 9, line 13 -column 10, line 26 figures 1A-1D	9, 14-20, 24, 25, 29-33
A	---	10
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

16 February 2001

Date of mailing of the international search report

23/02/2001

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/27720

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 952 998 A (CLANCY KEVIN F ET AL) 14 September 1999 (1999-09-14) column 2, line 42 -column 3, line 6 column 4, line 21 -column 5, line 32 figures 4-8	1-9, 11-13, 21,22, 26-28
A	---	10,23
X	US 5 381 160 A (LANDMEIER WALDO L) 10 January 1995 (1995-01-10) cited in the application column 4, line 42 -column 7, line 63 figures 5-11	1-5, 11-13, 21,26-33
Y	---	18-20
Y	US 5 880 411 A (GILLESPIE DAVID W ET AL) 9 March 1999 (1999-03-09) cited in the application column 9, line 3 -column 13, line 7 column 26, line 45 -column 40, line 30 column 51, line 35 -column 52, line 29 figures 1-2D	9,14-16, 29-33
A	---	1-8, 26-28,31
Y	US 5 559 504 A (BEPPU TATSURO ET AL) 24 September 1996 (1996-09-24) column 5, line 43-56 column 9, line 33-60 figures 13A-14	17,24,25

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/27720

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5543588 A	06-08-1996	US 5374787 A	20-12-1994
		DE 69425551 D	21-09-2000
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		EP 0665508 A	02-08-1995
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		DE 69324067 T	15-07-1999
		EP 0574213 A	15-12-1993
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		US 5841078 A	24-11-1998

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 00/27720

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5559504 A	24-09-1996	JP 7168930 A	04-07-1995
		US 5745046 A	28-04-1998

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known			
				Application Number		10/840,862	
				Filing Date		May 6, 2004	
				First Named Inventor		Steven Porter HOTELLING	
				Art Unit		2629	
				Examiner Name		Kimnhung T. Nguyen	
Sheet	1	of	1	Attorney Docket Number		106842009000 Client Ref. No. P3266US1	

U.S. PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)				
	1.	US-6,337,678-B1		01-08-2002	Fish	
	2.	US-6,723,929-B2		04-20-2004	Kent	

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No. ¹	Foreign Patent Document		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
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)					
	3.	WO-01/27868-A1		04-19-2001	Synaptics Incorporated		

Examiner Signature		Date Considered	
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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

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.

VIA EFS WEB
Patent
Docket No. 106842009000
Client Reference No. P3266US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Steven Porter HOTELLING et al.

Application 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. A copy of the foreign document is submitted herewith. The Examiner is requested to make these documents of record.

Pursuant to 37 C.F.R. § 1.704(d), I hereby certify that each item of information contained in this Supplemental Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart application and that this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of this Supplemental Information Disclosure Statement.

1a-1039843

APLNDC00026954

The documents listed on the attached Form PTO/SB/08a/b were cited in a Canadian Office Action mailed on July 17, 2009, directed to a counterpart international or foreign application and have not been previously cited. A certification under 37 C.F.R. § 1.97(e)(1) follows:

I hereby certify that each item of information was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Supplemental Information Disclosure Statement.

This Supplemental Information Disclosure Statement is submitted:

- With the application; accordingly, no fee or separate requirements are required.
- Before the mailing of a first Office Action after the filing of a Request for Continued Examination under 37 C.F.R. § 1.114. However, if applicable, a certification under 37 C.F.R. § 1.97 (e)(1) has been provided.
- Within three months of the application filing date or before mailing of a first Office Action on the merits; accordingly, no fee or separate requirements are required. However, if applicable, a certification under 37 C.F.R. § 1.97 (e)(1) has been provided.
- 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. Accordingly, a Fee Transmittal Form (PTO/SB/17) is attached to this submission.
 - A Certification under 37 C.F.R. § 1.97(e) is provided above; accordingly; no fee is believed to be due.
- After mailing of a final Office Action or Notice of Allowance, but before payment of the Issue Fee.
 - A Certification under 37 C.F.R. § 1.97(e) is provided above and a Fee Transmittal Form (PTO/SB/17) is attached to this submission.

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 Supplemental 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 Commissioner 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:

8/5/09

Respectfully submitted,

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Registration No.: 44,197
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Via EFS Web
Patent
Docket No. 106842009000
Client Ref.: P3266US1

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.

1a-1009923

APLND00026957


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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.

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Dated: December 19, 2008

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Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	10/840,862
		Filing Date	May 6, 2004		
		First Named Inventor	Steve HOTELLING		
		Art Unit	2629		
		Examiner Name	Kimnhung T. NGUYEN		
Sheet	1	of	1	Attorney Docket Number	106842009000 Client Ref. P3266US1

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No. ¹	Foreign Patent Document		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
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)					
	1.	JP-59-214941		12-04-1984	Toshiba Corp	Full English Translation	<input checked="" type="checkbox"/>
	2.	JP-2002-342033		11-29-2002	Sony Corp	Full English Translation	<input checked="" type="checkbox"/>

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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
			<input checked="" type="checkbox"/>

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(19) JAPANESE PATENT OFFICE (JP)

(12) Publication of Unexamined Patent Application (KOKAI) (A)

(11) Japanese Patent Application Kokai Number: S59-214941

(43) Kokai Publication Date: December 4, 1984

(51) Int. Cl.³
G 06 F 3/033

Identification Symbol

JPO File No.
7010-5B

Request for Examination: Requested

Number of Claims: 1

(pages total 5)

(54) Title of the Invention:

(21) Application Number: S58-87468

(22) Filing Date: May 20, 1983

(72) Inventor: SAITO, Mitsuo

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(71) Applicant: Toshiba Corporation

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(74) Agent: NORICHIKA, Kensuke, Patent Attorney

Specification

1. Title of Invention

Position input device

2. Claim

In a device that generates coordinate values of points indicated on a tablet, a position input device characterized by being equipped with a means that detects when two or more points are indicated simultaneously.

3. Detailed Description of Invention

Field of Invention

This invention pertains to position input devices, such as highly practical tablet devices.

Technological Background of Invention and its Problems

Numerous position input devices have been developed as devices to input text and graphic information. These position input devices take input by detecting position coordinates on a tablet as indicated by a pen or the like, and they use a variety of systems. Many conventional systems, for example, have used electromagnetic induction/magnetostrictive wire systems or the like, so they used special pens and required cords. While that meant some inconvenience, embedding switches and the like in the pen allowed some types of functions to be easily implemented.

Several systems that can input without using a special pen have also been devised. With these systems, anything can serve as the pen, or the hand can be used for input directly, greatly improving on the inconvenience of conventional systems. Since they don't use special pens, however, features cannot be added to pens, requiring separate switches to be provided for function input or specific areas of the tablet to be defined as functions.

Figure 1 shows one such example. Part (a) of Figure 1 shows functions defined on the face of the tablet; part (b) shows separate function switches. These make the device much more troublesome to use, since a separate switch must be pressed or different points pressed twice to input a function, and cost tends to rise when separate switches are added. It also forces the device to become larger or to reduce the actual space available for coordinate input.

Purpose of the Invention

The purpose of this invention is to provide a position input device of simple constitution that can easily provide functions and the like.

Summary of the Invention

This invention is characterized by being equipped with a circuit that detects when a plurality of points are indicated simultaneously in a tablet device for inputting coordinates. In other words, when two points are indicated simultaneously by a pen, finger or the like, they are input to a computer or the like as, for example, a function, using the signals from such detection.

Effect of the Invention

Using this invention allows the creation of an inexpensive tablet that does not use a special pen, does not require installation of switches or the like for indicating special functions, and that allows simple creation of text, graphics and the like because functions can be entered in a simple manner. Also, the signal that indicates detection that two points have been indicated simultaneously can also be used in various ways other than for functions.

Embodiment of the Invention

The invention will be described below with reference to an embodiment. Figure 2 shows one example of a tablet plate that uses this embodiment, which might have a constitution that disposes conducting wires on a pressure-sensitive conductive rubber sheet. A plurality of conductive wires 11 are arrayed in parallel at a specific pitch, each of the conductive wires 11 has electrode parts 12 and 13 connected to drive circuits 14a and 14b and detection circuits 15a and 15b, and adjacent conductive wires 11 are constituted to be in combinations such that they do not connect to the same drive circuit and same detection circuit. In other words, 37 conductive wires 11 are shown arrayed in parallel in Figure 2, with odd-numbered conductive wires 11 connected to drive circuit 14a and detection circuit 15a through electrode part 12 and even-numbered conductive wires 11 connected to drive circuit 14b and detection circuit 15b through electrode part 13. These drive circuits 14a and 14b are constituted by switch circuits 16a and 16b that supply power supply voltage +V to conductive wires 11. Conductive wires 11 connected to electrode part 12 are formed in a plurality of groups connected in common once for every prescribed number of wires. In the example shown in Figure 2, the conductive wires 11 at places $12x+1$, $12x+3$, $12x+5$... $12x+11$ ($x=0, 1, 2$) are respectively connected in six groups. Also, at electrode part 13, adjacent conductive wires 11 form a plurality of groups connected at every interval of a specific number of wires so that all the groups connected respectively to electrode part 12 and electrode part 13 are different from their adjacent conductive wires 11. In other words, in the example shown in Figure 2, conductive wires at places $4x+12y+2$ and $4x+12y+4$ ($x, y=0, 1, 2$) are respectively connected six groups. Switches 16a and 16b are connected separately to the drive circuits connected to these 12 groups and voltage V supplied by turning these switches on.

A tablet plate of this sort is arranged as shown in Figure 3. In other words, a pressure-sensitive conductive rubber sheet 23 is placed between two tablet plates 21 and 22 with the conductive wire of the respective plates running perpendicular to each other. When pressure is placed locally by a position-indication operation using a pen, finger or the like, resistance decreases in pressure-sensitive rubber sheet 23 and two conductive wires running perpendicularly in top and bottom tablet plates 21 and 22 short-circuit selectively and locally. Further, in this embodiment, the pitch of the conductive wires is set such that two adjacent wires in each of the top and bottom conductive wires short-circuit when a pen or finger applies pressure to any one spot on the tablet.

Figure 4 is a block diagram of this embodiment, which uses the aforementioned tablet. Drive circuits 32 and 33 and detection circuits 34 and 35 are connected respectively to the two electrode

parts of tablet 31. These two detection circuits 34 and 35 respectively detect when odd-numbered and even-numbered conductive wires are conducting. Figure 5 is a bit configuration diagram that shows the status of conductive points where an indicated position is detected in this detection circuit. Next, based on the signal of the detection line detected by detection circuit A 34 and the detection line detected by detection circuit B 35, tablet controller 36 sends the coordinate values of the indicated point or a function to the central processing unit (CPU) 37, CPU 37 creates output information using information from tablet controller 36, this output information is sent to display 38, and text, graphics or the like are displayed, following the flow chart shown in Figure 6. Also, only one tablet is shown in Figure 4, but two tablets, top and bottom, are connected to tablet controller 36.

Next we will explain the operation of this embodiment with reference to the flowchart shown in Figure 6. First, the bottom tablet plate 22 is set to the drive side by turning all its drive circuit switches to ON, then the top tablet plate 21 is set to the detect side by turning all its drive circuit switches to OFF. When a position indication operation is then performed, the conductive rubber sheet 23 becomes conductive at the indicated position and the voltage (current) supplied from aforementioned drive circuit electrode parts 22a and 22b is applied to conductive wires 11 of top tablet plate 21 via conductive rubber sheet 23. Tablet controller 36 searches with detection circuit 34 on the electrode part 21a side of the top tablet 21 for the conductive wire 11 at which the aforementioned voltage appears. If at this time two points are pressed simultaneously, two conductive points become ON, as shown in Figure 5, and can easily be detected. The fact that two points have been pressed simultaneously is sent to the CPU as a function. When only one location is ON, the same kind of operation is performed by detection circuit B 35 at electrode part 21b. Thus, when only one point is pressed, the specified position coordinate Y of one direction is found from the group of detection lines detected by detection circuit A 34 and 35. Thereafter, all the switches of the drive circuits of bottom tablet 22 are turned OFF to set it to the detection side, all switches of the drive circuits of top tablet 21 are turned ON to set it to the drive side, and coordinate X is found by executing the same flow as above. The coordinate values found are sent to the CPU. In this flow, a function is sent when two or more points are pressed simultaneously, but it can be allocated to several functions by the distance between, direction of, etc., the two pressed points. Also, any tablet that can detect when two points are pressed simultaneously can be used for this, not only the tablet described above, and it is also possible to implement more functions with three or more points rather than two points. Further, the control flow shown in Figure 6 might be executed by, for example, microprocessor control, but the detection control algorithm can naturally be changed in various ways.

Next, we show an example of an operating procedure for this embodiment with reference to Figure 7. A command menu 12 is defined in one part of the display screen 41 shown in Figure 7a, and the user moves the cursor 43 as desired on the tablet with a finger, for example, to the CIRCLE command, and when a different finger then simultaneously specifies another appropriate point, the tablet sends the CPU a signal that two points have been specified. Figure 7b shows how this looks, with the thumb and pointer finger being used on the tablet 44. The CPU knows from the cursor

location and from the signal that two points are specified that the CIRCLE command was specified, and it waits for the center position and a position on the circumference to be input. Next, the user moves the cursor with a finger to the position desired for the center of the circle, and when two points are specified simultaneously using another finger as above, now the CPU interprets the cursor position as the center position of a circle. By similarly specifying a point on the circumference, the CPU draws a circle as specified as shown in Figure 7c.

By using this embodiment, simple cursor movements and making the cursor position the target of an operation can both be accomplished with extremely simple operations.

Further, using this invention provides the advantage of being able to enter functions without using special pens or function switches, but functions need not be used, allowing use as signals other than position specification input by indicating two or more points simultaneously.

4. Brief Description of the Drawings

Figure 1 is a surface diagram of a conventional tablet. Figure 2 is a structural diagram of a tablet plate used in one embodiment of this invention. Figure 3 is a schematic diagram of a tablet used in one embodiment of this invention. Figure 4 is a block diagram of one embodiment of this invention. Figure 5 is a bit configuration diagram that shows conduction point status. Figure 6 is a flowchart showing an example of a control flow. Figure 7 is a diagram showing operating procedure for this embodiment.

11: Conductive wires	12, 13: Electrode parts
14a, 14b: Drive circuits	15a, 15b: Detection circuits
16a, 16b: Switches	21, 22: Tablet plates
23: Pressure-sensitive conductive rubber sheet	31: Tablets
32, 33: Drive circuits	34, 35: Detection circuits
36: Tablet controller	37: CPU
38: Display	41: Display screen
42: Command menu	43: Cursor
44: Tablet plate	

Figure 1

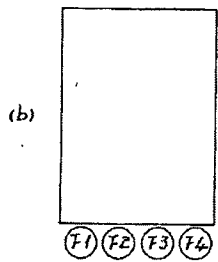
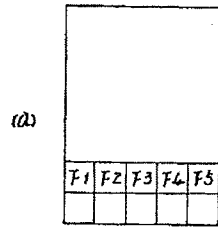
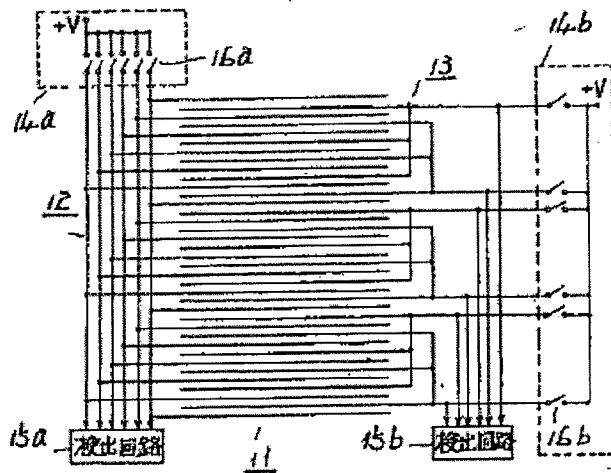


Figure 2



[Key]

15a, 15b: Detection circuit

Figure 3

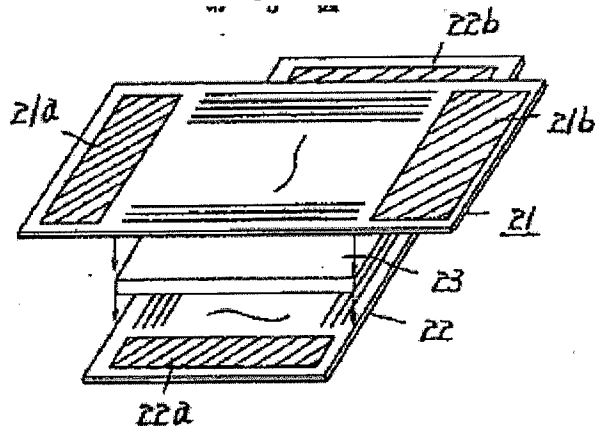
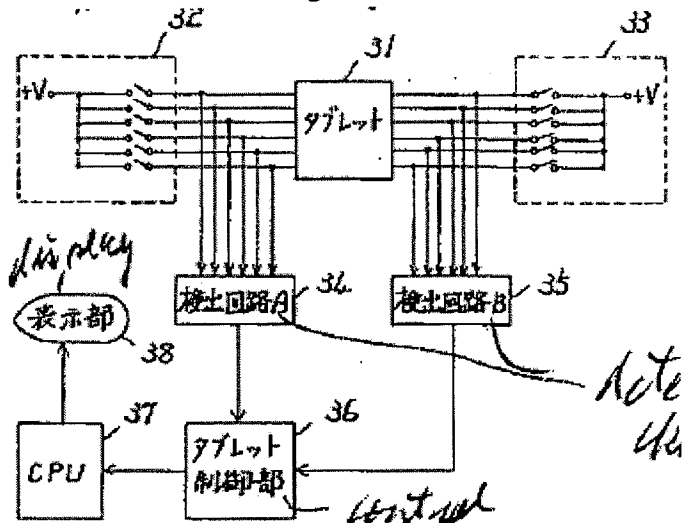


Figure 4



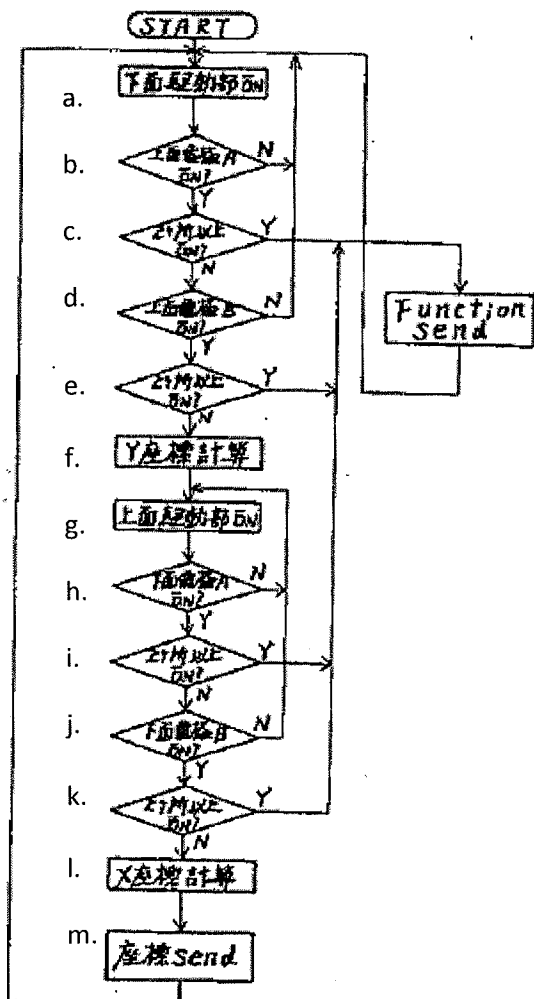
[Key]

- 31: Tablet
- 34: Detection circuit A
- 35: Detection circuit B
- 36: Tablet controller
- 38: Display

Figure 5



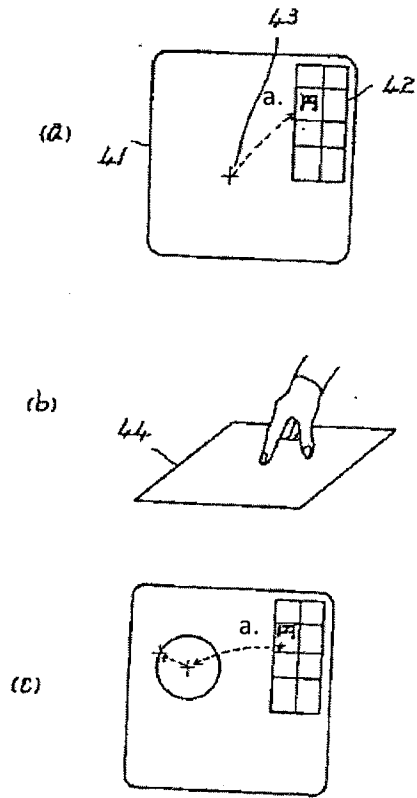
Figure 6



[Key]

- a. Bottom drive part on
- b. Top electrode A on?
- c. Two or more locations on?
- d. Top electrode B on?
- e. Two or more locations on?
- f. Calculate Y coordinate
- g. Top drive part on
- h. Bottom electrode A on?
- i. Two or more locations on?
- j. Bottom electrode B on?
- k. Two or more locations on?
- l. Calculate X coordinate
- m. Send coordinates

Figure 7



[Key] a. CIRCLE

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⑮ 位置入力装置

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明 細 書

1. 発明の名称

位置入力装置

2. 特許請求の範囲

タブレット板上で指示された点の座標値を発生する装置において、2点以上の点が同時に指示されたことを検出する手段を設けたことを特徴とする位置入力装置。

3. 発明の詳細な説明

〔発明の技術分野〕

本発明は実用性の高いタブレット装置等の位置入力装置に関する。

〔発明の技術的背景とその問題点〕

従来、文字・図形情報の入力装置としての位置入力装置が種々実現されている。この種の位置入力装置は、ペン等により指示されたタブレット上の位置座標を検出して入力するものであり種々の方式がある。例えば、従来は電磁誘導・磁歪線方式等の方式が多く使われてきたため、ペンには特殊なペンを使いコードを必要とした。そのための

不便さはあつたが、ペンにスイッチ等を組み込むことにより、ある種のフアンクションを容易に実現することができた。

一方、特殊なペンを使わずに入力できる方式もいくつか考えられている。この方式の場合は、ペンは何でも良く、手で直接指示することも出来るために、従来の不便は大きく改善されている。しかし、特殊なペンを使わないので、ペンに仕掛けをすることが出来ないため、フアンクションを入力するには別にスイッチを付けるか、タブレットの特定のエリアをフアンクションとして定義する必要があつた。

第1図はその例を示した図であり、第1図(a)はタブレットの盤面にフアンクションを定義した図、第1図(b)は別にフアンクションのスイッチを置いた図である。この様にするとフアンクションを入力する際に別のスイッチを押す、又は2度別の点を指示しなければならない等、使い勝手が非常に悪くなり、スイッチを別に付けた場合、コストの上昇をも招くことになつていた。またそのため装

置が大型化するか、あるいは実質的に座標入力のための領域が小さくならざるを得なかつた。

〔発明の目的〕

本発明の目的は、簡単な構成で容易にファンクション等を与えることのできる位置入力装置を提供するものである。

〔発明の概要〕

本発明は、座標入力用のタブレット装置において、同時に複数の点が指示されたことを検出する回路を設けたことを特徴とする。つまり、ペン・指等で同時に2点が指示された場合には、これを検出した信号をもつて、例えばファンクションとして計算機等に入力するものである。

〔発明の効果〕

本発明に依れば、特殊なペンを用いることなく、また特別にファンクション指定用のスイッチ等も設ける必要がなく、簡単にファンクションを入れられるために、文字・図形等が容易に作成出来、コスト的にも安価なタブレットを作製出来る。また2点が同時に指示されたことを検出したことを

検される導線(1)は所定本数おきに共通に接続して複数の組を形成している。この第2図に示される例では、 $12x+1$ 、 $12x+8$ 、 $12x+5\sim 12x+11$ ($x=0, 1, 2$)番目の導線(1)をそれぞれ共通に接続して6本の組を形成している。また電極部(2)は隣接した導線(1)が、それぞれ接続された電極部(2)及び電極部(2)の組合せが隣接する導線(1)間毎に全て異なるように所定本ずつ共通に接続して複数の組を形成している。即ち第2図に示す例では、 $4x+12y+2$ 、 $4x+12y+4$ ($x, y=0, 1, 2$)番目の導線をそれぞれ共通に接続して、6本の組を形成している。そしてこれら12本の組に接続された駆動回路にはスイッチ(16a)(16b)が各別に接続され、これらのスイッチのON動作によつて電圧Vが与えられるようになっていく。

このようなタブレット板は第8図に示すように配置される。すなわち2板のタブレット板(1)を感圧性導電ゴムシート(4)を間にして、且つ夫々の導線方向が直交するようになし重ね合わせる。そしてペン・指等の位置指示操作により局部的に圧力

を示す信号はファンクション以外にも各種利用することができる。

〔発明の実施例〕

以下、本発明の一実施例について図面を参照して説明する。第2図は本実施例に使われるタブレット板の一例で、例えば感圧性導電ゴムシート上に配設された導線の構造を示している。複数本の導線(1)は所定ピッチで平行に配置されており、それぞれの導線(1)には駆動回路(14a)(14b)及び検出回路(15a)(15b)が接続された電極部(2)(3)を有し、且つ隣接する導線(1)が同一の駆動回路及び検出回路に接続されないような組合せとなる様に構成している。つまり第2図においては平行に配置された8本の導線(1)が示されるが、奇数番目の導線(1)は電極部(2)を介して駆動回路(14a)と検出回路(15a)に、また偶数番目の導線(1)は電極部(3)を介して駆動回路(14b)と検出回路(15b)に接続されるようになっていく。この駆動回路(14a)(14b)は電源電圧+Vを導線(1)に供給するスイッチ回路(16a)(16b)により構成されている。電極部(2)に接

が加わると、感圧性導電ゴムシート(4)の抵抗値が減少し、上下タブレット板(1)(2)の直交する2本の導線が選択的に、且つ局部的に短絡される。なお本実施例ではペン又は指でタブレットの任意の1点に圧力を加えた場合、上下の導線の夫々隣接する2本が同時に短絡されるように導線のピッチが定められているものとする。

第4図は前記タブレットを用いた本実施例のブロック図である。タブレット(1)の二電極部にはそれぞれ駆動回路(14)と検出回路(15)が接続されている。この2つの検出回路(15)は、それぞれ奇数番目、偶数番目の導線の導通状態を検出する。第5図はこの検出回路において指示位置が検出される導通点の状態を示すビット構成図である。次にタブレット制御部(17)は検出回路A(15)で検出される検出ラインと検出回路B(15)で検出される検出ラインとの信号に基づき、第6図に示すフローに従つて、指示された点の座標値又はファンクションを、CPU(中央処理装置)(18)へ送る、このCPU(18)はタブレット制御部(17)からの情報を用いて出力情報

を作成し、その出力情報を表示部(図)へ送り、文字・図形等を表示する。なお、第4図では一方のタブレットのみ図示したがタブレット制御部(図)には上下2枚のタブレットが接続される。

次に第6図に示すフローを参照し、本実施例の動作を説明する。まず、下面側タブレット板(図)については、その駆動回路のスイッチを全てONすることにより、駆動部側に設定し、上面側タブレット板(図)については、その駆動回路のスイッチを全てOFFすることにより、検出部側に設定する。そして位置指示操作がなされたとき、該指示位置の導電ゴムシート(図)が導通状態になり、前記駆動回路側電極(22a)(22b)より供給される電圧(電流)が導電ゴムシート(図)を介して上面側タブレット板(図)の導線(図)に与えられるようにする。タブレット制御部(図)は上面側タブレット(図)の電極部(21a)側の検出回路A(図)にて上記電圧が現われる導線(図)を探す。この時2点が同時に押されている場合は、第5図に示す様に導通点が2カ所ON状態となるので容易に検出できる。そして同時に2点が押さ

る。更に、第6図に示す制御フローの実行は、例えばマイクロプロセッサ制御等により行われるが、その検出制御のアルゴリズムが種々変形可能であることは勿論である。

次に第7図を用いて本実施例の操作手順の例を示す。第7図(a)に示す表示画面(図)の一部にコマンドメニュー(図)が定義してあり、使用者が指でタブレット上をなぞることによりカーソル(図)を例えば円のコマンド上に移動させ、そのまま別の指で別の適当な点を同時に指定することにより本タブレットは2点が指定されたという信号をCPUに送る。第7図(b)はこの時の様子を表わした図であり、タブレット(図)上に親指と人指し指で操作している。こうしてCPUはカーソルの位置及び2点指定信号から“円”のコマンドが指されたことを知り、中心の位置と円周上の位置が入力されるのを待つ。次に使用者が円の中心位置にしたい場所にカーソルを指で移動し、前記と同様に別の指で同時に2点を指定すると、今度はそのカーソル位置を円の中心位置とCPUは解釈する。更に同様

れたことをファンクションとしてCPUに送る。また1カ所のみON状態の場合は、電極部(21b)側の検出回路B(図)で同様の操作を行う。こうして1点のみしか押されていない場合は、検出回路A(図)及びB(図)で検出される検出ラインの組合せから、一方の指定位置座標Yが求まる。しかるのち、下面側タブレット(図)の駆動回路のスイッチを全てOFFにして検出部側に設定し、上面側タブレット(図)の駆動回路のスイッチを全てONとすることにより駆動部側に設定し、前記と同様のフローを実行することにより座標Xが求まる。求められた座標値はCPU(図)に送られる。このフローにおいては、2点以上が同時に押されている場合にファンクションを送ることになっているが、押された2点の距離、方向等でいくつかのファンクションに振り分けることもできる。またこれに際しては前記説明したタブレットばかりでなく、2点が同時に押された時にそれが検出できるようなタブレットであれば利用可能であり、2点でなく3点以上として多くのファンクションを表現することも可能であ

に円周上の点を指定することにより、第7図(c)に示す様にCPUは指定通りの円を描く。

この実施例によれば極めて容易な操作で単なるカーソル移動とそのカーソル位置を操作の対象になる位置にさせることの両方の動作を行うことができる。

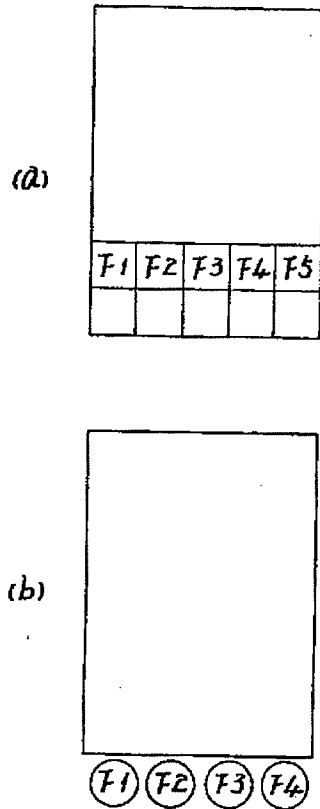
尚、本発明に依れば、特殊なペンやファンクション用のスイッチを用いなくて、ファンクションを入力できる利点があるが、必ずしもファンクションでなくとも良く、2点以上を同時に指示することにより、位置指定入力以外の信号として用いることが可能である。

4. 図面の簡単な説明

第1図は従来のタブレットの盤面図、第2図は本発明の一実施例に使われるタブレット板の一構成図、第3図は本発明の一実施例に使われるタブレットの概略構成図、第4図は本発明の一実施例のブロック図、第5図は導通点の状態を示すビット構成図、第6図は制御フローの1例を示す図、第7図は本実施例の操作手順の例を示す図である。

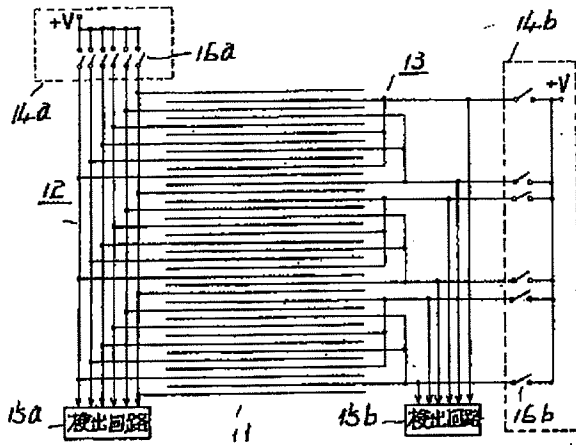
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 駆動回路、15a,15b...検出回路、16a,16b...
 スイッチ、21,22...タブレット板、23...感圧
 性導電ゴムシート、31...タブレット、32,33
 ...駆動回路、34,35...検出回路、36...タブレ
 ット制御部、37...CPU、38...表示部、41
 ...表示画面、42...コマンドメニュー、43...カ
 ーソル、44...タブレット板

第 1 図

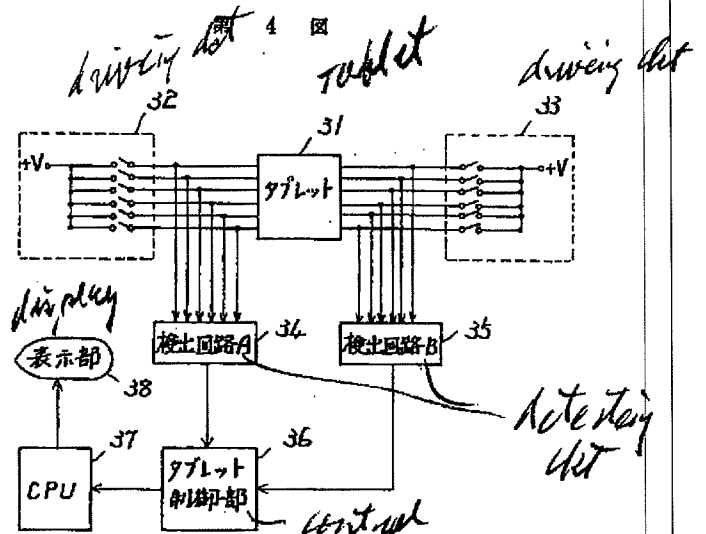
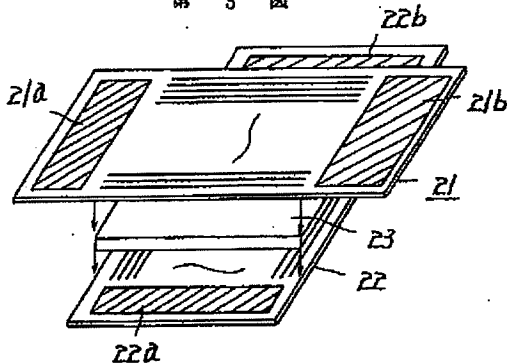


代理人 弁理士 則 近 憲 佑 (ほか1名)

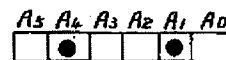
第 2 図



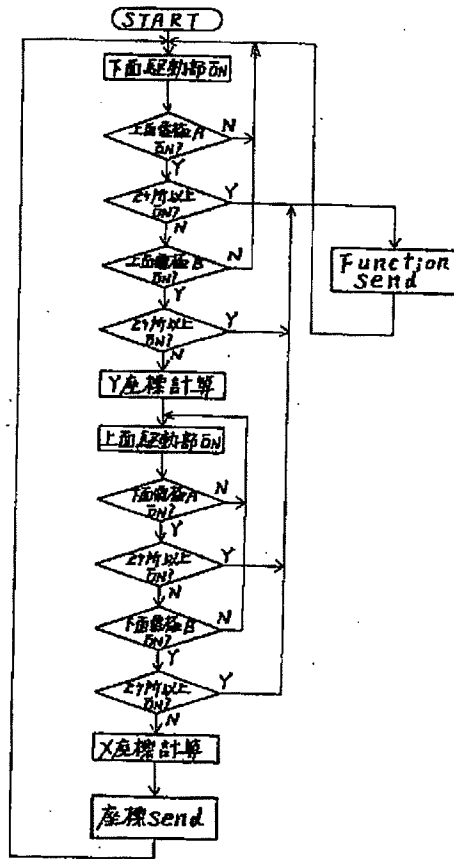
第 3 図



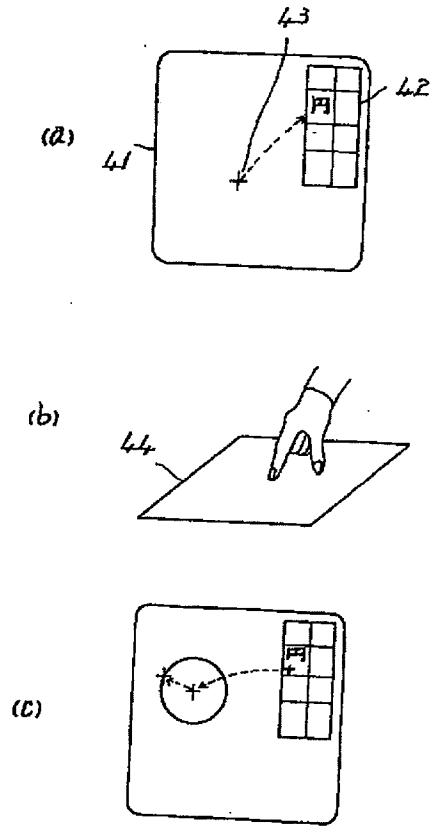
第 5 図



第 6 図



第 7 図



ALTERNATIVE TO PTO/SB08A/B
(Based on PTO 08-08 version)

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known		
				Application Number	10/840,862	
Sheet		1	of	1	Examiner Name	Not Yet Assigned
					Attorney Docket Number	106842009000

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
	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	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁵
		Country Code ² -Number-Kind Code ³ (if known)				
	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	01-19-1998	Pentel KK	with English abstract	
	7.	JP-2000-112642	04-21-2000	Digital Electronics Corp	with English 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	/Kimnhung Nguyen/	Date Considered	12/20/2008
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*EXAMINER: Initial if information considered, whether or not citation is in conformance with MPEP 608. 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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.N./

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	/Kimnhung Nguyen/	Date Considered	12/20/2008
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.N./

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(21) Application No.: 2001-151499 (p2001-151499)	(71) Applicant: 000002185 Sony Corporation 6-7-35 Kita-shinagawa, Shinagawa-ku, Tokyo-to
(22) Application Date May 21, 2001	(72) Inventor: REKIMOTO, Junichi Sony Corporation Computer Science Research Center, 3-14-13 Higashi-gotanda, Shinagawa-ku, Tokyo-to
	(74) Agent: 100101801 Patent Attorney, YAMADA, Eiji (and 2 other people)
	F Term (Ref.) 58087 AA00 CC02 CC11 CC16 CC26 CC32

(57) **[Abstract]**

[Problem to Be Solved] To recognize two or more points of information and the shape of a proximate object.

[Means for Solving the Problem] A noncontact type user input device comprises a plurality of linear transmission electrodes, a transmitter that supplies AC current for transmission to said transmission electrodes, a plurality of linear reception electrodes disposed so as not to touch said transmission electrodes, and a receiver that receives AC current flowing in the reception electrodes. A capacitor is formed at each of the points of intersection between the transmission electrodes and the reception electrodes; furthermore, a parallel capacitor is formed in repose to a user's fingertip having approached, and the capacitance of the capacitor changes in accordance with the degree of proximity of the fingertip. Recognition is performed utilizing the fact that there are changes in the AC current that passes through the capacitor [formed] between the electrodes.

[CLAIMS]

[Claim 1] A noncontact type user input device for performing input in a noncontact manner using a user's fingertip or the like, the noncontact type user input device being characterized by comprising a plurality of linear transmission electrodes, a transmitter that supplies AC current for transmission to said transmission electrodes, a plurality of linear reception electrodes disposed so as not to touch said transmission electrodes, and a receiver that receives AC current flowing in the reception electrodes, a circuit equivalent to a capacitor being formed at each of the intersection points between the transmission electrodes and the reception electrodes.

[Claim 2] The noncontact type user input device recited in Claim 1, characterized in that a first capacitor equivalent circuit, which is equivalent to a capacitor, is formed at each intersection point between a transmission electrode and a reception electrode, while a second capacitor equivalent circuit is formed, in parallel with the first capacitor equivalent circuit, in response to an electroconductive object such as a user's fingertip having approached [the] intersection point between [the] transmission electrode and [the] reception electrode, the capacitance of said second capacitor equivalent circuit changing in accordance with the degree of proximity of said electroconductive object, as of consequence of which, the AC current passing through said first capacitor equivalent circuit changes.

[Claim 3] The noncontact type user input device recited in Claim 1, characterized in that said transmitter scans the transmission electrodes with the AC current, and a signal processing unit is further provided, which detects the input position of the user's finger or the like by way of the positional relationship between the transmission electrode that transmitted the AC current and the reception electrode that received the AC current.

[Claim 4] The noncontact type user input device recited in Claim 3, characterized in that said signal processing unit utilizes the difference between the capacitance of the first virtual capacitor that is formed at the intersection point between the transmission electrode and the reception electrode and the capacitance of the second virtual capacitor that is formed in response to an electroconductive object such as a user's fingertip having approached [the] intersection point between [the] transmission electrode and [the] reception electrode, so as to detect the electroconductive object having approached.

[Claim 5] The noncontact type user input device recited in Claim 3, characterized in that said signal processing unit detects the position of said electroconductive object by integrating the capacitances of the capacitors that are virtually formed between the electroconductive object, such as the user's finger, and the electrodes.

[Claim 6] The noncontact type user input device recited in Claim 1, characterized in that a user input area constituted by at least the intersection of said plurality of transmission electrodes and said plurality of reception electrodes is overlaid on a display screen of a display device.

[Claim 7] The noncontact type user input device recited in Claim 1, characterized by being constituted so as to be united with a display device constituted by stacking an anode electrode layer and a cathode electrode layer, with an insulating layer therebetween.

[Claim 8] The noncontact type user input device recited in Claim 7, characterized in that the user input area is constituted by the intersection of said plurality of transmission electrodes and said plurality of reception electrodes, by way of applying an AC current for detection to one electrode layer, to which a DC voltage is applied, and detecting the AC current received by way of the other electrode layer.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] The present invention relates to a user input device for inputting object operations, commands and the like to a computer; and in particular relates to a user input device with which object operations, commands and the like are directly input to a computer using a user's fingertip.

[0002] More specifically, this relates to a user input device that inputs object operations, commands and the like to a computer in a noncontact manner; and in particular relates to a noncontact user input device that can recognize two or more points of information, the shape of a proximate object, and information on the distance to an object.

[0003]

[Prior Art] In the wake of recent technological innovations, general-purpose type computer systems have been developed and marketed, which are referred to as workstations (WS) or personal computers (PC), and have better added value and improved functionality with relatively small sizes, at low cost; these have become highly prevalent in universities and other research organizations, in businesses and other offices, as well as in the day-to-day life of ordinary households.

[0004] A computer system generally provides an "interactive," which is to say dialogical, processing environment, by way of operating in response to user input commands and displaying the processing results on a display screen. Recent trends include the movement from old character-based user input environments, which is to say, "CUIs (Character User Interfaces)" which use a conventional keyboard, the DOS (Disk Operating System) shell screen

being representative of these, to "GUIs (Graphical User Interfaces)" whereby graphics-based user input has been implemented. In GUI environments, the computer system provides a simulated desktop and a large number of icons on a display screen.

[0005] All of the resource objects that are handled in the computer system, such as files, are represented as icons on the desktop that is provided by the GUI. The user can perform computer operations intuitively by performing operations (for example, clicking or dragging and dropping) directly on objects that are displayed on the screen, by using a mouse or the like on icons that symbolize programs, data, folders, devices and the like, on the display screen. Furthermore, buttons [*sic*] are provided on the desktop for instantly calling up various different functions, which is to say, computer processes, such as menu bars and toolboxes, and thus command input methods are becoming increasingly intuitive and easy to understand.

[0006] With the introduction of the GUI environment, a computer can be properly operated without the user having to undergo special training in specific command names, command operation methods or the like, and without performing complex key input.

[0007] In such GUI environments, coordinate specification devices such as, for example, mice, TrackPoints, joysticks, tablets and touchpads are representative of user input devices that can be used. From among these, the mouse is deeply established in the computer industry, and almost all users have become comfortable with operations based on dragging and dropping. It is not unreasonable to say that there is absolutely no need for special training in mouse operation when computers are newly introduced to various aspects of everyday life, such as in offices and households. GUIs based on mouse operations are already established [as the norm] for most users, and provide multiple general usage functions.

[0008] In the GUI environment, the user can perform input operations in a manner that is easy to understand, by way of interaction with the computer, while being guided by the content of the display on the computer screen. User input devices using touch panels can be cited as one example of a further advancement in such interactive input. In this case, a touch panel that reads coordinate values specified by a pen or the user's fingertip is overlaid with a screen and therefore, as differs from the case of mouse operations, there is no need for the user remove their line of sight from the screen, and it is possible to directly indicate a desired display object with one's own fingertip, whereby operability is further improved.

[0009] However, for user input based on conventional touch panels, it is necessary to actually touch the surface of the touch panel with the fingertip.

[0010] Furthermore, if there are two or more contact points on the panel, it is not possible to measure each position independently. For example, if we consider a usage situation

in which a meeting is conducted, in which several people are positioned so as to surround a touch panel, it is possible that the fingertips of several participants touch the touch panel at the same time, but the system cannot recognize such phenomena. This would result in the first touch being given precedence, or in the multiple touches interfering/being mixed up.

[0011] Furthermore, user input with the conventional touch panel system is based on point data input, and it is not possible to recognize the shape of proximate objects or information on distance to a proximate fingertip.

[0012]

[Problems to Be Solved by the Invention] An object of the present invention is to provide an excellent user input device, with which object operations, commands and the like can be input directly to a computer using a user's fingertip.

[0013] A further object of the present invention is to provide an excellent user input device, with which input to a computer such as object operations and commands can be performed in a noncontact manner.

[0014] A further object of the present invention is to provide an excellent noncontact type user input device, with which it is possible to recognize two or more points of information, the shape of proximate objects, information on the distance to an object and the like.

[0015]

[Means for Solving the Problems and Operation] The present invention, which was made in light of the problems described above, is a noncontact type user input device for performing input in a noncontact manner using a user's fingertip or the like, the noncontact type user input device being characterized by comprising a plurality of linear transmission electrodes, a transmitter that supplies AC current for transmission to the transmission electrodes, a plurality of linear reception electrodes disposed so as not to touch the transmission electrodes, and a receiver that receives AC current flowing in the reception electrodes, a circuit equivalent to a capacitor being formed at each of the points of intersection between the transmission electrodes and the reception electrodes.

[0016] With a noncontact type user input device of this sort, a first capacitor equivalent circuit, which is equivalent to a capacitor, is virtually formed at each point of intersection between a transmission electrode and a reception electrode.

[0017] Furthermore, a second capacitor equivalent circuit is virtually formed, in parallel with the first capacitor equivalent circuit, in response to an electroconductive object such as a user's fingertip having approached.

[0018] The capacitance of the second capacitor equivalent circuit changes in accordance with the degree of proximity of the electroconductive object such as a fingertip. Accordingly, the AC current passing through the first capacitor equivalent circuit, which is connected in parallel with the second capacitor equivalent circuit, likewise changes in accordance with the degree of proximity of the electroconductive object such as a fingertip. Utilizing such a phenomenon, the noncontact type user input device can measure, not only the fact that the fingertip has approached, but also the distance to the fingertip when this has approached.

[0019] Furthermore, the transmitter may scan the transmission electrodes with the AC current, and a signal processing unit may be further provided, which detects the input position by way of the positional relationship between the transmission electrode that transmitted the AC current and the reception electrode that received the AC current.

[0020] In such a case, the noncontact user input device can measure the contour of the proximate object by tracking the points of intersection between the transmission electrodes and the reception electrodes at which input positions have been detected. In other words, the noncontact user input device can recognize not just simply the fact that an object such as a user's fingertip has approached, but also the shape of the object. Furthermore, even if two or more users try to access the noncontact user input device at the same time, it is possible to recognize the fingertips of each person separately.

[0021] The transmitter may apply AC current to the transmission electrodes while scanning. Then, the noncontact user input device may be further provided with a signal processing unit, which detects the input position by way of the positional relationship between the transmission electrode that transmitted the AC current and the reception electrode that received the AC current.

[0022] The signal processing unit utilizes the difference between the capacitance of the first virtual capacitor that is formed at the point of intersection between the transmission electrode and the reception electrode and the capacitance of the second virtual capacitor that is formed in response to an electroconductive object such as a user's fingertip having approached [the] point of intersection between [the] transmission electrode and [the] reception electrode, so as to detect the electroconductive object having approached.

[0023] Furthermore, the signal processing unit detects the position of an electroconductive object by integrating the capacitances of the capacitors that are virtually formed between the electroconductive object such as the user's finger and the electrodes.

[0024] A display-integrated user input device can be constituted by overlaying a user input area comprising at least the intersection of the plurality of transmission electrodes and the plurality of reception electrodes of the noncontact type user input device of the present invention on a display screen of a display device. For example, the noncontact type user input device of the present invention may be constituted so as to be united with a liquid crystal display or an organic LED.

[0025] For example, the noncontact type user input device of the present invention may be constituted so as to be united with a display device constituted by stacking an anode electrode layer and a cathode electrode layer, with an insulating layer therebetween.

[0026] In such a case, the user input area can be constituted by the intersection of the plurality of transmission electrodes and the plurality of reception electrodes, by way of combining one electrode layer and another electrode layer. That is to say, an AC current for detection may be applied to one electrode layer, to which a DC voltage is applied, and the AC current received by way of the other electrode layer may be detected.

[0027] Further objects, features and advantages of the present invention will be apparent from the following embodiments of the present invention and the detailed description based on the accompanying drawings.

[0028]

[Modes of Embodiment of the Invention] Hereafter, embodiments of the present invention are described in detail with reference to the drawings.

[0029] FIG. 1 schematically illustrates the basic configuration of a noncontact type user input device 1 according to one mode of embodiment of the present invention.

[0030] As shown in the drawing, a noncontact type user input device 1 comprises: a plurality of linear transmission electrodes 11-1, 11-2, ..., 11-m; a transmitter 12 that supplies an AC current for transmission at a predetermined frequency (for example, 100 kHz) to the transmission electrodes 11-1...; a plurality of linear reception electrodes 15-1, 15-2, ..., 15-n, which receive the AC current from the transmission electrodes 11-1..., by way of an electrostatic effect; and a receiver 16 that receives the AC current flowing in the reception electrodes 15-1... . The receiver 16 comprises: an AM modulator comprising a band pass filter (BPF) 16A, which allows only AC current at a predetermined frequency range to pass, an amplifier 16B and a detector 16C; and an A/D converter 16 D, that converts the detector output to a digital format signal.

[0031] It will be understood from FIG. 1 that the reception electrodes 15-1, 15-2, ..., 15-n have points of intersection with the reception electrodes 11-1, 11-2, ..., 11-m, but these

electrodes do not contact each other at these points of intersection. In other words, a circuit equivalent to a capacitor that stores electrical charge is substantially formed at each intersection between the electrodes. Accordingly, when the AC current passes through a transmission electrode, an AC current flows in the reception electrodes facing this as a result of electrostatic induction via this point of intersection. The area in which these transmission electrodes 11-1, 11-2, ..., 11-m and the reception electrodes 15-1, 15-2, ..., 15-n cross each other constitutes a user input area for the noncontact type user input device 1. As shown in the drawing, this user input area extends in two dimensions.

[0032] The transmitter 12 applies the AC current to the transmission electrodes 11-1, ... while scanning. Accordingly, for a certain brief period of time, an AC current flows in the reception electrodes 15-1... from the capacitor equivalent circuit at the point of intersection with the corresponding transmission electrode, and the input position can be detected from the positional relationship between the transmission electrode that has transmitted the AC current and the reception electrode that has received the AC current. For example, by performing predetermined computational processing of the A/D converted output signals from the reception electrodes 15-1... with a processor 20, two-dimensional user input can be detected via the user input area.

[0033] In the illustrated example, the transmission electrodes 11-1, 11-2, ..., 11-m are arrayed substantially parallel, while the reception electrodes 15-1, 15-2, ..., 15-n are arrayed in a direction orthogonal to the transmission electrodes 11-1..., and the user input area is a substantially planar area in which the electrodes are combined with each other, in a uniform manner, at the nodes of a lattice. However, the gist of the present invention is not particularly limited to such a mode, and so long as the transmission electrodes and the reception electrodes cross each other without contact, this may be a non-planar shape, such as a sphere or another curved surface shape.

[0034] A certain intersection between a transmission electrode 11 and a reception electrodes 15 is shown enlarged in FIG. 2. Furthermore, an equivalent circuit at the point of intersection between this transmission electrode 11 and this reception electrode 15 is shown in FIG. 3.

[0035] At the point of intersection where the transmission electrode 11 and the reception electrode 15 cross over, a circuit equivalent to a capacitor is formed, as shown in FIG. 3.

[0036] Here, if AC voltage is applied to the transmission electrode 11 side, capacitive coupling occurs, by way of a capacitance C_a between the transmission electrode 11 and the

reception electrode 15, and an AC current is generated in the reception electrode 15. The strength of the current that passes through this capacitor C_a is picked up as digital data by way of performing signal processing with parts [that include] the band pass filter 16A, which is tuned to the transmission frequency of the AC voltage at the transmitter 12, the amplifier 16B, the detector 16C and the A/D converter 16D. The strength of the AC current received by the reception electrode 11 is dependent only on the capacitance C_a of the capacitor.

[0037] The capacitance C_a is maintained at a static fixed value so long as the transmission electrode 11 and the reception electrode 15 are not deformed or the like. Accordingly, so long as the same AC voltage is applied on the transmission electrode 11 side, the strength of the AC current that is received on the reception electrode 15 side will be constant.

[0038] Next, the mechanism whereby an object such as a user's fingertip is detected in a noncontact manner by the combination of such a transmission electrode 11 and reception electrode 15 is described.

[0039] FIG. 4 shows the situation in which a user's fingertip is proximate to a certain point of intersection between a transmission electrode 11 and a reception electrode 15. Furthermore, FIG. 5 shows the equivalent circuit at the point of intersection between the transmission electrode 11 and the reception electrode 15, when the user's fingertip is proximate to a certain point of intersection between the transmission electrode 11 and the reception electrode 15.

[0040] As described above, a circuit is formed which is equivalent to a capacitor C_a at the point of intersection at which the transmission electrode 11 and the reception electrode 15 cross over.

[0041] Furthermore, a human body [part], such as a fingertip, can be considered a virtual ground point (earth). Accordingly, the equivalent circuit is configured so that the capacitor C_a , which is formed between the transmission electrode 11 and the reception electrode 15, and virtual capacitors C_{b1} and C_{b2} , which are formed in series between the human body [part] and the transmission electrode 11 and the human body [part] and the reception electrode 15, are connected in parallel.

[0042] Accordingly, if an AC voltage is applied to the transmission electrode 11 side, the strength of the AC current that is generated by capacitive coupling by way of the capacitance C_a between the transmission electrode 11 and the reception electrode 15, which is to say, the current that is detected on the reception electrode 15 side, is weakened by an amount corresponding to the current that flows to ground via the capacitor C_{b1} .

[0043] The capacitance C_a is maintained at a static fixed value so long as the transmission electrode 11 and the reception electrode 15 are not deformed or the like. Conversely, the capacitances C_{b1} and C_{b2} of the virtual capacitors that are formed between the human body [part] and the transmission electrode 11 and between the human body [part] and the reception electrode 15, which are formed in series, increase in accordance with the approach of the human body [part] to the transmission electrode 11 and the reception electrode 15.

[0044] Consequently, if the same AC voltage is applied to the transmission electrode 11, the strength of the AC current that is detected in the reception electrode 15 decreases in accordance with the approach of the human body [part] to the transmission electrode 11 and the reception electrode 15.

[0045] Utilizing such a phenomenon, the processor 20 can use the reception signal that has been AM modulated by the AM modulator 16 and then converted to digital format by the A/D converter 16D to determine whether or not a human body [part] is close to the point of intersection between the electrodes, or to measure the degree of proximity (distance) of the human body [part].

[0046] As shown in FIG. 1, in the noncontact user input device according to this mode of embodiment, the points of intersection between such transmission electrodes 11-1... and reception electrodes 15-1... are arrayed in an $m \times n$ matrix. For example, the intersections between these electrodes can be disposed on an input panel having a predetermined flat surface (or curved surface).

[0047] The AC voltage is applied to each of the transmission electrodes 11-1, 11-2, ..., 11-m in time division. Then, the AC currents generated in each of the reception electrodes 15-1, 15-2, ..., 15-n, which correspond to each of these, are sequentially measured, whereby it is possible to determine which point of intersection in the user input area the human body [part] is close to.

[0048] In the noncontact user input device 11 according to this mode of embodiment, an electrostatic effect is utilized, and therefore it is not necessary for the human body [part] to make direct contact with the electrode in order for the human body [part] such as the user's fingertip to be detected. Furthermore, by integrating the detection values obtained at proximate points of intersection, it is possible to measure the distance from the input surface to the fingertip by way of performing common geometrical calculations or the like.

[0049] Furthermore, by virtue of the constitution shown in FIG. 1, it is possible to independently drive each point of intersection between the electrodes. In other words, because

it is possible to pick up detection values independently from each point of intersection, if a plurality of objects (for example, the right-hand and left-hand of the same user, or the hands of a plurality of users) approach the user input area at the same time, if the distance is greater than the pitch distance between the points of intersection, these can be recognized as independent objects. In other words, it is possible to measure the locations of a plurality of objects at the same time.

[0050] Furthermore, by tracking the points of intersection at which object proximity has been simultaneously detected, it is possible to capture the shape or contour of the proximate object.

[0051] FIG. 6 depicts a variant of the noncontact user input device 1.

[0052] When the user's fingertip has approached an area surrounded by the grid points A, B, C, D, virtual capacitors C_i , C_j , C_p , C_q are formed between the transmission electrodes 11-i, 11-j as well as the reception electrodes 15-p, 15-q and the user's fingertip.

[0053] The capacitances of these virtual capacitors C_i , C_j , C_p , C_q vary with the distance between the electrodes and the user's fingertip.

[0054] Accordingly, by integrating the values from a plurality of points of intersection of the human body [part] and the electrodes, it is possible to measure the position of a hand, which is intermediate between the points of intersection. That is to say, the position measurement system [sic] of the noncontact user input device 1 according to this mode of embodiment can be made finer than the gap between the points of intersection of the electrodes.

[0055] FIG. 7 depicts another variant of the noncontact user input device 1.

[0056] As has already been described with reference to FIG. 1, the noncontact user input device 1 according to this mode of embodiment is such that the points of intersection between the transmission electrodes 11-1... and the reception electrodes 15-1... are arrayed in an $m \times n$ matrix in the user input area. Furthermore, by virtue of a constitution such as shown in FIG. 1, it is possible to independently pick up detection values from points of intersection by independently driving the points of intersection between the electrodes.

[0057] Accordingly, as shown in FIG. 7, if a plurality of user fingertips are present in the user input area, these can be independently recognized at the points of intersection where the user fingertips are proximate. Consequently, it is possible to receive simultaneous input from a plurality of users using one single user input device.

[0058] Furthermore, FIG. 8 depicts another variant of the noncontact user input device 1.

[0059] As has already been described with reference to FIG. 1, the noncontact user input device 1 according to this mode of embodiment is such that the points of intersection between the transmission electrodes 11-1... and the reception electrodes 15-1... are arrayed in an $m \times n$ matrix in the user input area. However, in the example shown in FIG. 8, the gaps between the transmission electrodes 11-1, 11-2,..., 11-m and the reception electrodes 15-1, 15-2,..., 15-n are provided so as to be sufficiently narrow, and the scan speed with which the transmitter 12 applies the AC voltage to the transmission electrodes 11-1 is made sufficiently fast.

[0060] In such a case, as shown in FIG. 8, if the user brings their palm close to the user input area, by tracking the points of intersection at which the approach has been detected, the shape of the object, which is to say, the palm, can be recognized.

[0061] In other words, by making the pitch distance between the electrodes sufficiently small and making the scan speed for the transmission electrodes sufficiently fast, the noncontact user input device 1 according to this mode of embodiment can recognize the shape of objects.

[0062] Applications in which the noncontact user input device 1 according to this mode of embodiment is combined with other devices can be conceived. For example, by overlaying the noncontact user input device 1 on a flat display such as a liquid crystal display (LCD) or an organic EL [*sic*], it is possible to constitute a user input device having an integrated display. With such a user input device, the user can easily and intuitively perform command input to the computer while being guided by the content of GUI screens that are output on the display. The user can perform input operations without removing their line of sight from the display screen, and therefore the risk of erroneous input is reduced.

[0063] FIG. 9 schematically depicts the cross-sectional structure of a noncontact user input device 1 that is constituted so as to be united with a display device comprising an electroconductive polymer-based light emitting element, which is to say, an organic LED.

[0064] As shown in this figure, an anode electrode layer and a cathode electrode layer comprising an electroconductive polymer are stacked, with an insulating layer comprising an organic material therebetween. Furthermore, the anode electrodes and the cathode electrodes are disposed running straight with respect to each other¹. This is similar to the structure shown in FIG. 1 in which the transmission electrodes 11-1... and the reception electrodes 15-1... are disposed intersecting so as not to touch each other.

¹ It is likely that there was a typographical error in the original Japanese at this point, as a homophone would read "orthogonal to each other." -- *trans*.

[0065] In the organic display, in order to cause the pixels to emit light, DC voltage is successively applied to the electrodes in one of the electrode layers, in the screen scan direction.

[0066] In this mode of embodiment, an AC voltage for detecting a human body [part] is applied superimposed on the DC voltage that flows in one of the electrode layers. Consequently, an AC current is received in the other electrode layer. At the point of intersection that is approached by a human body [part] such as a user's fingertip, the strength of the received AC current decreases, and it is therefore possible to specify the position occupied by the user's finger and to recognize the shape of the proximate object.

[0067] With a constitution such as shown in FIG. 9, without changing the constitution of the screen in the organic display, the display device can be used as-is, as a noncontact type user input device.

[0068] Furthermore, an organic display is generally flexible and can be bent at will. Accordingly, with application examples such as shown in FIG. 9, it is possible to constitute a spherical or cylindrical user input integrated display device.

[0069] [Supplement] Hereabove, the present invention has been discussed with reference to specific embodiments. However, it is self-evident that those skilled in the art can modify and make substitutions in the embodiments, within a scope that does not depart from the gist of the present invention. In other words, the present invention has been disclosed in the modes that have been illustrated by way of example, but these are not intended to be limiting interpretations. The scope of the present invention should be judged by referring to the claims recited at the outset.

[0070]

[Effects of the Invention] As described in detail above, by virtue of the present invention, it is possible to provide an excellent user input device, with which object operations and commands and the like can be directly input to a computer using a user's fingertip.

[0071] Furthermore, by virtue of the present invention, an excellent user input device can be provided with which input to a computer, such as object operations and commands, can be performed in a noncontact manner.

[0072] Furthermore, by virtue of the present invention, an excellent noncontact type user input device can be provided, with which it is possible to recognize two or more points of information, the shape of a proximate object, information on distance to the object and the like.

[0073] In the noncontact type user input device according to the present invention, a first capacitor equivalent circuit, which is equivalent to a capacitor, is virtually formed at each of

the points of intersection between the transmission electrodes and the reception electrodes. Furthermore, in response to the approach of an electroconductive object, such as a user's fingertip, a second capacitor equivalent circuit is virtually formed in parallel with the first capacitor equivalent circuit. The capacitance of this second capacitor equivalent circuit changes in response to the degree of proximity of the electroconductive object, such as a fingertip, and consequently the AC current passing through the first capacitor equivalent circuit changes. Accordingly, utilizing such a phenomenon, it is possible to not only [detect] contact with the fingertip but also measure the distance to the fingertip when this has approached.

[0074] Furthermore, by way of scanning the input of an AC current to the transmission electrodes, it is possible to detect the input position on the basis of the positional relationship between the transmission electrode that transmitted the AC current and the reception electrode that received the AC current. By tracking the points of intersection between the transmission electrodes and the reception electrodes at which input positions have been detected, it is possible to measure the contour of a proximate object. In other words, the noncontact user input device can not just simply detect when an object such as a user's fingertip has approached, but also recognize the shape of the object. Furthermore, even if two or more users try to access the noncontact user input device at the same time, it is possible to recognize the fingertips of each person separately.

[Brief Description of the Drawings]

[FIG. 1] is a view schematically showing the basic constitution of a noncontact type user input device 1 according to one mode of embodiment of the present invention.

[FIG. 2] is a view showing, in an enlarged manner, a certain point of intersection between a transmission electrode 11 and a reception electrode 15.

[FIG. 3] is a view showing an equivalent circuit at a certain point of intersection between a transmission electrode 11 and a reception electrode 15.

[FIG. 4] is a view showing the situation when a user's fingertip is proximate to a certain point of intersection between a transmission electrode 11 and a reception electrode 15.

[FIG. 5] is a view showing an equivalent circuit at a point of intersection between a transmission electrode 11 and a reception electrode 15 when a user's fingertip has approached a certain point of intersection between the transmission electrode 11 and the reception electrode 15.

[FIG. 6] is a view intended to describe a variant of the noncontact user input device 1.

1. [FIG. 7] is a view intended to describe a variant of the noncontact user input device

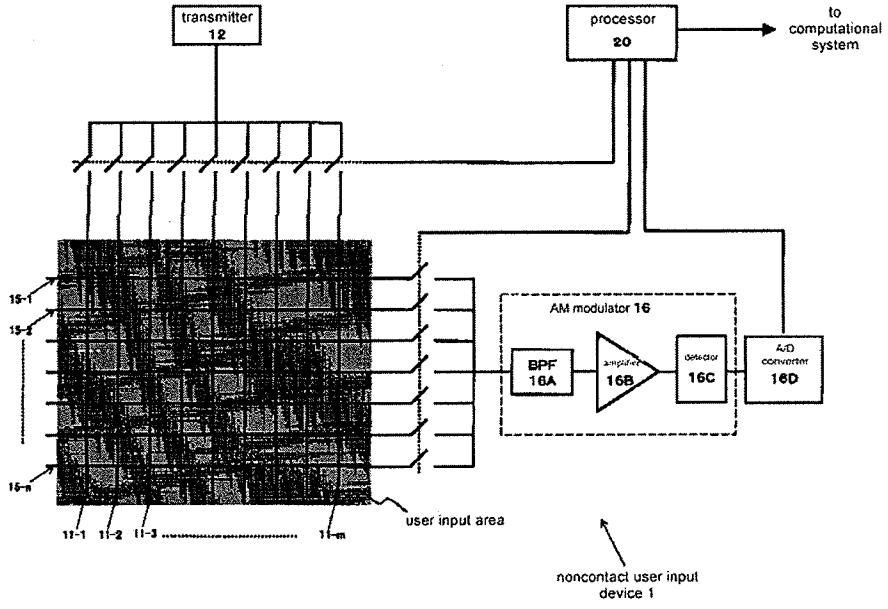
1. [FIG. 8] is a view intended to describe a variant of the noncontact user input device

[FIG. 9] is a view showing the cross-sectional structure of a noncontact user input device 1 constituted so as to be united with a display device comprising an electroconductive polymer-based light emitting element, which is to say, an organic LED.

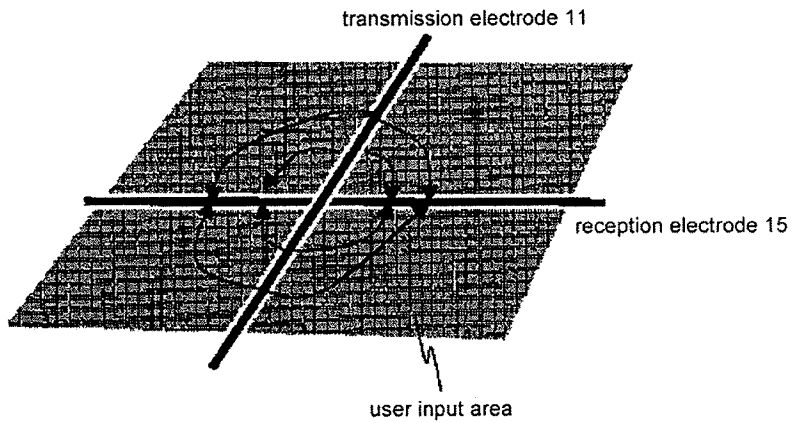
[Explanation of the Reference Numerals]

- 1... noncontact user input device
- 11... transmission electrode
- 12... transmitter
- 15... reception electrode
- 16... AM modulator
- 16A... band pass filter
- 16B... amplifier
- 16C... detector
- 16D... A/D converter
- 20... processor

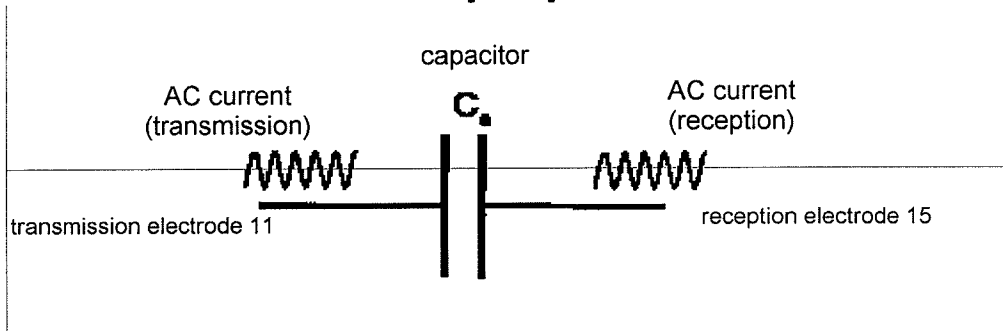
[FIG. 1]



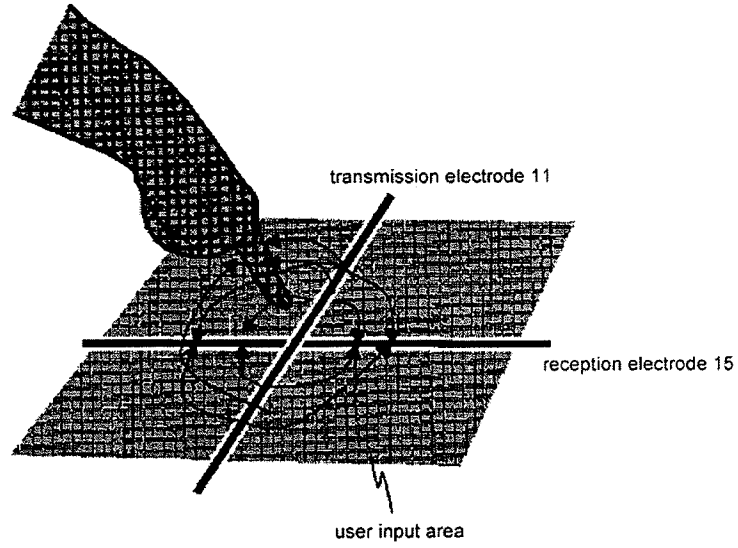
[FIG. 2]



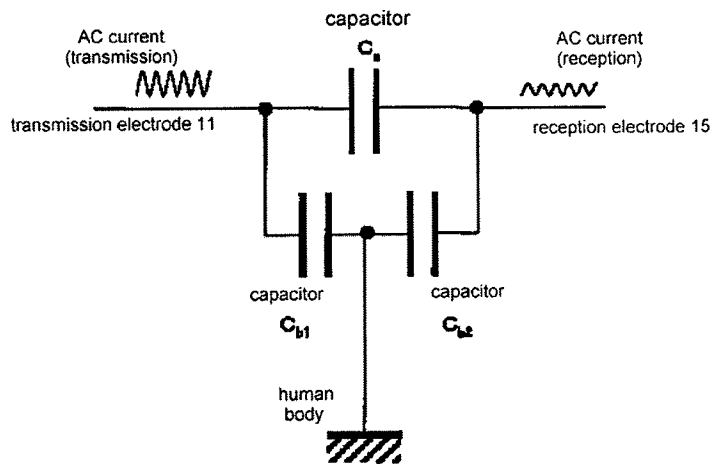
[FIG. 3]



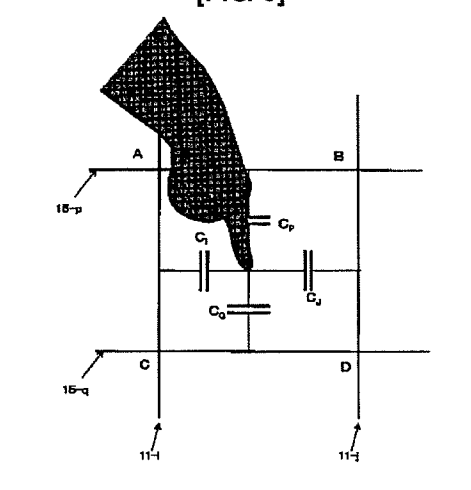
[FIG. 4]



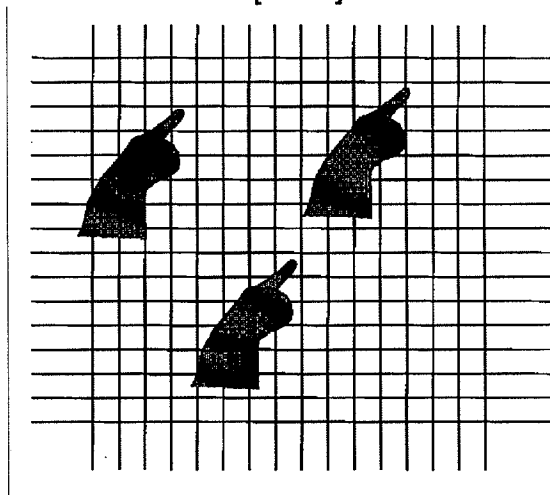
[FIG. 5]



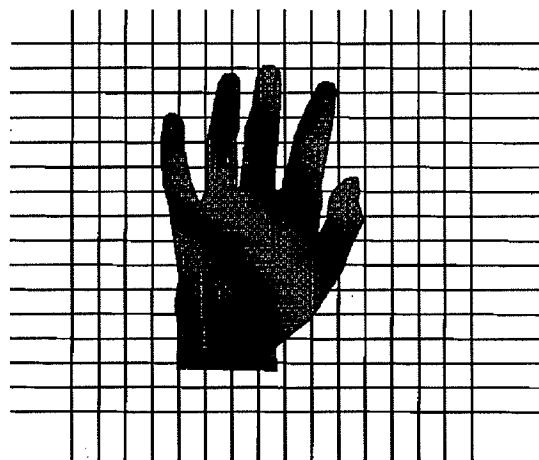
[FIG. 6]



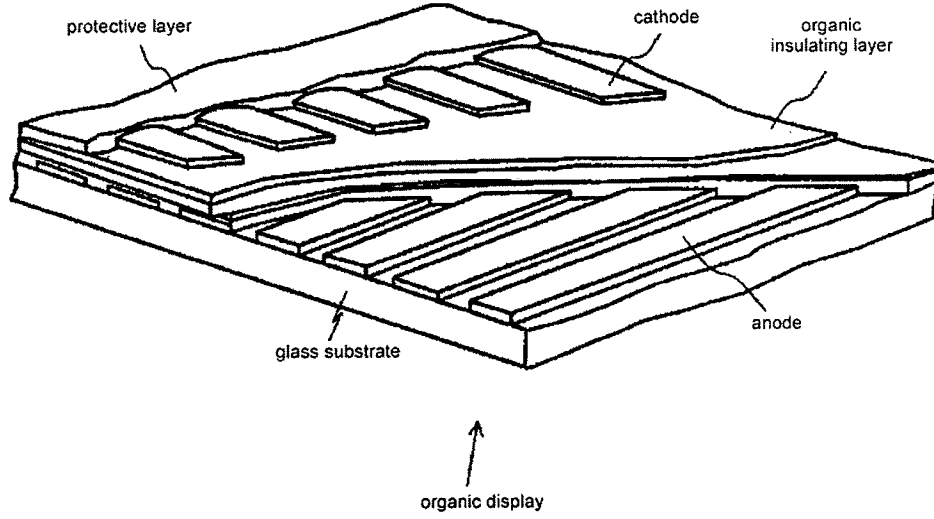
[FIG. 7]



[FIG. 8]



[FIG. 9]



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[Amendment to Proceedings 1]

[Title of Document to Be Amended] Specification

[Item to Be Amended] Title of the Invention

[Amendment Method] Modification

[Content of the Amendment]

[Title of the Invention] User Input Device

[Amendment to Proceedings 2]

[Title of Document to Be Amended] Specification

[Item to Be Amended] Claims

[Amendment Method] Modification

[Content of the Amendment]

[CLAIMS]

[Claim 1]

A user input device that receives data or command input from a user for an information processing device,

the user input device being characterized by comprising:

user input means with which a user performs input operations using an electroconductive object such as a human body [part]; and

detection means for detecting, with respect to said input operation on said user input means, the contact or proximate position of the electroconductive object and other

conditions of the contact or proximate state of said electroconductive object,

said other conditions including the shape or contour of one or more electroconductive objects that perform an input operation on said user input device.

[Claim 2]

The user input device recited in Claim 1, characterized in that said user input means have a capacitance that changes due to the proximity of, or contact by, an electroconductive object; and

said detection means detect said input operation on the basis of said change in capacitance.

[Claim 3]

The user input device recited in Claim 2, characterized in that said user input means comprise:

a plurality of transmission electrodes;

a transmitter that supplies AC current to said transmission electrodes;
a plurality of reception electrodes that are disposed so as not to touch said transmission electrodes; and
a receiver that receives an AC current that flows through said reception electrodes, said capacitance being formed at the points of intersection between said transmission electrodes and said reception electrodes.

[Claim 4]

The user input device recited in Claim 3, characterized in that detection values obtained on the basis of changes in the capacitance at plurality of said points of intersection are integrated in said user input means.

[Claim 5]

The user input device recited in Claim 3, characterized in that said AC current is supplied from said transmitter to said plurality of transmission electrodes in time division.

[Claim 6]

The user input device recited in Claim 3, characterized in that changes in said capacitance are detected in said user input means, on the basis of changes in the strength of said AC current that is received by said receiver.

[Claim 7]

The user input device recited in Claim 1, characterized in that input operations on said user input means relate to data input or command input to an application program that runs on said information processing device.

[Claim 8]

A user input device that receives inputs such as data or commands from a user for an information processing device,
the user input device being characterized by comprising:
user input means with which a user performs input operations using an electroconductive object such as a human body [part]; and
detection means that detect, with respect to said input operation on said user input means, the contact or proximate position of an electroconductive object and the extent to which said electroconductive object is proximate to or in contact with said user input device [sic].

[Claim 9]

A user input device that receives data or command input from a user for an information processing device,
the user input device being characterized by comprising:
user input means with which a user performs input operations using an electroconductive object such as a human body [part]; and
detection means for detecting, with respect to said input operation on said user input means, the contact or proximate position of the electroconductive object and other conditions of the contact or proximate state of said electroconductive object,
said detection means independently detecting the contact or proximate position and the other conditions for each of a plurality of electroconductive objects.

[Claim 10]

The user input device recited in Claim 13 [sic], characterized in that said detection means distinguish a plurality of electroconductive objects by way of integrated processing of contact or proximate positions.

[Amendment to Proceedings 3]

[Title of Document to Be Amended] Specification

[Item to Be Amended] 0054

[Amendment Method] Modification

[Content of the Amendment]

[0054]

Accordingly, by integrating the values from a plurality of points of intersection of the human body [part] and the electrodes, it is possible to measure the position of a hand, which is intermediate between the intersection points. That is to say, the position measurement precision of the noncontact user input device 1 according to this mode of embodiment can be made finer than the gap between the points of intersection of the electrodes.

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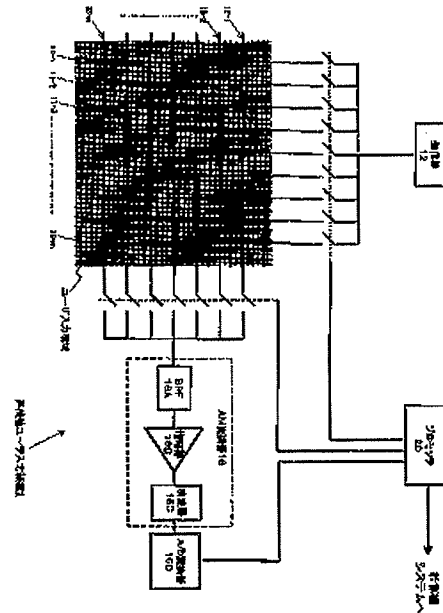
(21) 出願番号	特願2001-151499(P2001-151499)	(71) 出願人	000002185 ソニー株式会社 東京都品川区北品川6丁目7番35号
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(54) 【発明の名称】 非接触型ユーザ入力装置

(57) 【要約】

【課題】 2点以上の情報や接近する物体の形状を認識する。

【解決手段】 非接触型ユーザ入力装置は、複数の線状の送信電極と、前記の各送信電極に送信用の交流電流を供給する発信器と、前記の各送信電極とは接触しないように配置された複数の線状の受信電極と、受信電極を流れる交流電流を受信する受信器を備えている。送信電極と受信電極の各交差点ではコンデンサが形成され、また、ユーザの指先が接近したことに応じて並列的なコンデンサが形成されて、指先が接近する程度に応じてコンデンサの静電容量が変化する。電極間のコンデンサを通過する交流電流が変化することを利用して認識する。



(2)

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【特許請求の範囲】

【請求項1】ユーザの指先などを用いて非接触形式で入力する非接触型ユーザ入力装置であって、
複数の線状の送信電極と、

前記の各送信電極に送信用の交流電流を供給する発信器と、

前記の各送信電極とは接触しないように配置された複数の線状の受信電極と、

受信電極を流れる交流電流を受信する受信器とを備え、送信電極と受信電極の各交差点においてコンデンサと等価な回路が形成されている。ことを特徴とする非接触型ユーザ入力装置。

【請求項2】送信電極と受信電極の各交差点ではコンデンサと等価な第1のコンデンサ等価回路が形成されているとともに、

ユーザの指先などの導電性の物体が送信電極と受信電極の交差点に接近したことに応じて、第1のコンデンサ等価回路とは並列的となる第2のコンデンサ等価回路が形成されて、

該導電性の物体との接近の程度に応じて前記第2のコンデンサ等価回路の静電容量が変化して、この結果、前記第1のコンデンサ等価回路を通過する交流電流が変化する。ことを特徴とする請求項1に記載の非接触型ユーザ入力装置。

【請求項3】前記発信器は、各送信電極に対して交流電流をスキャンして、

交流電流を送信した送信電極と交流電流を受信した受信電極との位置関係によりユーザの指先などの入力位置を検出する信号処理部をさらに備える。ことを特徴とする請求項1に記載の非接触型ユーザ入力装置。

【請求項4】前記信号処理部は、送信電極と受信電極の交差点で形成される第1の仮想コンデンサの静電容量と、ユーザの指先などの導電性の物体が送信電極と受信電極の交差点に接近したことに応じて形成される第2の仮想コンデンサの静電容量との相違を利用して、該導電性の物体が接近したことを検出する。ことを特徴とする請求項3に記載の非接触型ユーザ入力装置。

【請求項5】前記信号処理部は、ユーザの指先などの導電性の物体と各電極との間で仮想的に形成されるそれぞれのコンデンサの静電容量を統合することで、該導電性の物体の位置を検出する。ことを特徴とする請求項3に記載の非接触型ユーザ入力装置。

【請求項6】少なくとも前記複数の送信電極と前記複数の受信電極とが交差して構成されるユーザ入力領域が表示装置の表示画面上に重畳されている。ことを特徴とする請求項1に記載の非接触型ユーザ入力装置。

【請求項7】アノード電極層とカソード電極層が絶縁層を介して積層して構成される表示装置と一体的に構成されている。ことを特徴とする請求項1に記載の非接触型ユーザ入力装置。

【請求項8】直流電圧が印加される一方の電極層に検出用の交流電圧を印加させるとともに、他方の電極層から受信される交流電流を検出することによって、前記複数の送信電極と前記複数の受信電極とが交差してなるユーザ入力領域を構成する。ことを特徴とする請求項7に記載の非接触型ユーザ入力装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、コンピュータに対してオブジェクトの操作やコマンドなどの入力を行うためのユーザ入力装置に係り、特に、コンピュータに対してオブジェクトの操作やコマンドなどをユーザの指先を用いて直接入力するユーザ入力装置に関する。

【0002】更に詳しくは、コンピュータに対してオブジェクトの操作やコマンドなどの入力を非接触形式で行うユーザ入力装置に係り、特に、2点以上の情報や接近する物体の形状や物体までの距離情報などを認識することができる非接触型ユーザ入力装置に関する。

【0003】

【従来の技術】昨今の技術革新に伴い、ワークステーション(WS)やパーソナル・コンピュータ(PC)と呼ばれる、比較的小型且つ低価格で、高付加価値化・高機能化された汎用タイプのコンピュータ・システムが開発・市販され、大学その他の研究機関や企業その他のオフィス、さらには一般家庭内の日常生活にも深く浸透している。

【0004】コンピュータ・システムは、一般に、ユーザ入力コマンドにตอบสนองして駆動し、処理結果をディスプレイ・スクリーン上に表示することによって、「インタラクティブ」、すなわち対話的な処理環境を提供している。最近の傾向として、DOS(Disk Operating System)シェル画面を代表とする旧来のキーボードを介したキャラクタ・ベースのユーザ入力環境すなわち「CUI(Character User Interface)」から、グラフィック・ベースのユーザ入力を実現した「GUI(Graphical User Interface)」への移行が挙げられる。GUI環境下では、コンピュータ・システムがシミュレートされたデスクトップと無数のアイコンがディスプレイ・スクリーンに用意される。

【0005】GUIが提供されたデスクトップ上では、ファイル等のコンピュータ・システム上で取り扱われる全ての資源オブジェクトはアイコンとして表現される。ユーザは、ディスプレイ・スクリーン上のプログラム、データ、フォルダ、デバイスなどを象徴するアイコンに対してマウスなどを用いて画面上の表示オブジェクトに対して直接操作を印加する(例えば、クリックやドラッグ・アンド・ドロップ)ことで、直感的にコンピュータ操作を行うことができる。また、デスクトップ上には、メニュー・バーやツール・ボックスなど、各種の機能すなわちコンピュータ処理を瞬時に呼び出すためのボタンが

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用意されており、コマンド入力の様式はますます直感的で分かり易いものとなってきている。

【0006】GUI環境の導入により、もはやユーザは、特定のコマンドの名称やコマンド操作方法等を特に習得したり、煩雑なキー入力を行わなくとも、コンピュータを充分に操作することができる。

【0007】かかるGUI環境下において利用可能なユーザ入力装置として、例えば、マウスや、トラックポイント、ジョイスティック、タブレット又はタッチパッドなどの座標指示装置が代表的である。このうち、マウスは、コンピュータ業界に深く定着しており、ほとんどのユーザは、ドラッグ・アンド・ドロップを基調とするマウス操作に慣れ親しんでいる。オフィスや家庭などの日常生活の各場面においてコンピュータを新規導入するに際して、マウス操作を特にトレーニングする必要は全くないと言っても過言ではない。マウス操作を基調とするGUIは、既に多くのユーザ間で定着しており、複数の汎用的な機能を提供している。

【0008】GUI環境下では、ユーザは、コンピュータ・スクリーン上の表示内容に案内されながら、コンピュータに対して対話的に分かりやすく入力作業を行うことができる。このような対話入力がさらに進んだ一例として、タッチパネルを利用したユーザ入力装置を挙げることができる。この場合、ペンやユーザの指先から指示される座標値を読み取るタッチパネルがスクリーンに重畳されているので、ユーザは、マウス操作する場合は相違して、スクリーンから視線を外す必要がなくなるし、所望の表示オブジェクトを自分の指先で直接指示することができるので、操作性はさらに向上する。

【0009】しかしながら、従来のタッチパネルによるユーザ入力では、指先がタッチパネル表面上に実際に接触させる必要がある。

【0010】また、パネル上に2点以上の接触点があると、それぞれの位置を独立して計測することができない。例えば、複数人がタッチパネルを囲むように配置して会議を行うような利用形態を考察した場合、複数の参加者の指先がタッチパネル上に同時に触れることはあるが、システム側ではこのような現象を認識することはできない。最初のタッチを優先させるか、あるいは複数のタッチを混信・混同してしまいかねない。

【0011】また、従来のタッチパネル式のユーザ入力は、点情報の入力を基本としており、接近している物体の形状や、接近した指先までの距離情報などを認識することはできない。

【0012】

【発明が解決しようとする課題】本発明の目的は、コンピュータに対してオブジェクトの操作やコマンドなどをユーザの指先を用いて直接入力することができる、優れたユーザ入力装置を提供することにある。

【0013】本発明の更なる目的は、コンピュータに対

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してオブジェクトの操作やコマンドなどの入力を非接触形式で行うことができる、優れたユーザ入力装置を提供することにある。

【0014】本発明の更なる目的は、2点以上の情報や接近する物体の形状や物体までの距離情報などを認識することができる、優れた非接触型ユーザ入力装置を提供することにある。

【0015】

【課題を解決するための手段及び作用】本発明は、上記課題を参酌してなされたものであり、ユーザの指先などを用いて非接触形式で入力する非接触型ユーザ入力装置であって、複数の線状の送信電極と、前記の各送信電極に送信用の交流電流を供給する発信器と、前記の各送信電極とは接触しないように配置された複数の線状の受信電極と、受信電極を流れる交流電流を受信する受信器とを備え、送信電極と受信電極の各交差点においてコンデンサと等価な回路が形成されている、ことを特徴とする非接触型ユーザ入力装置である。

【0016】このような構成の非接触型ユーザ入力装置によれば、送信電極と受信電極の各交差点では、コンデンサと等価な第1のコンデンサ等価回路が仮想的に形成されている。

【0017】また、ユーザの指先などの導電性の物体が接近したことに応じて、第1のコンデンサ等価回路とは並列的となる第2のコンデンサ等価回路が形成される。

【0018】前記第2のコンデンサ等価回路の静電容量は、指先などの該導電性の物体との接近の程度に応じて変化していく。したがって、第2のコンデンサ等価回路とは並列的に接続された前記第1のコンデンサ等価回路を通過する交流電流は、指先などの該導電性の物体との接近の程度に応じて同様に变化する。このような現象を利用して、非接触型のユーザ入力装置は、指先が接触したことだけでなく、接近したときの指先までの距離を計測することができる。

【0019】また、前記発信器は、各送信電極に対して交流電流をスキャンして、交流電流を送信した送信電極と交流電流を受信した受信電極との位置関係により入力位置を検出する信号処理部をさらに備えていてもよい。

【0020】このような場合、非接触のユーザ入力装置は、入力位置を検出した送信電極と受信電極の交差点を追跡していくことにより、接近している物体の輪郭を計測することができる。すなわち、非接触のユーザ入力装置は、単にユーザの指先などの物体が近づいたということを検知するだけでなく、物体の形状を認識することができる。また、2以上のユーザが同時に非接触ユーザ入力装置にアクセスしようとしても、各人の指先を分離して認識することも可能である。

【0021】前記発信器は、各送信電極に対して交流電流をスキャンさせながら印加するようによい。そ

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して、非接触型ユーザ入力装置は、交流電流を送信した送信電極と交流電流を受信した受信電極との位置関係により入力位置を検出する信号処理部をさらに備えていてもよい。

【0022】前記信号処理部は、送信電極と受信電極の交差点で形成される第1の仮想コンデンサの静電容量と、ユーザの指先などの導電性の物体が送信電極と受信電極の交差点に接近したことに応じて形成される第2の仮想コンデンサの静電容量との相違を利用して、該導電性の物体が接近したことを検出することができる。

【0023】また、前記信号処理部は、ユーザの指先などの導電性の物体と各電極との間で仮想的に形成されるコンデンサの静電容量を統合することで、該導電性の物体の位置を検出することができる。

【0024】また、本発明に係る非接触型ユーザ入力装置のうち少なくとも前記複数の送信電極と前記複数の受信電極とが交差してなるユーザ入力領域を、表示装置の表示画面上に重畳させることによって、表示一体型のユーザ入力装置を構成することができる。例えば、液晶表示ディスプレイや有機LEDなどと一体的に、本発明に係る非接触型ユーザ入力装置を構成することができる。

【0025】例えば、アノード電極層とカソード電極層が絶縁層を介して積層して構成される表示装置と一体的に、本発明に係る非接触型ユーザ入力装置を構成するようによい。

【0026】このような場合、一方の電極層と他方の電極層との組み合わせによって、前記複数の送信電極と前記複数の受信電極とが交差してなるユーザ入力領域を構成することができる。すなわち、直流電圧が印加される一方の電極層に検出用の交流電圧を印加させるとともに、他方の電極層から受信される交流電流を検出するようにすればよい。

【0027】本発明のさらに他の目的、特徴や利点は、後述する本発明の実施例や添付する図面に基づくより詳細な説明によって明らかになるであろう。

【0028】

【発明の実施の形態】以下、図面を参照しながら本発明の実施例を詳解する。

【0029】図1には、本発明の一実施形態に係る非接触型ユーザ入力装置1の基本構成を模式的に示している。

【0030】同図に示すように、非接触型ユーザ入力装置1は、複数の線状の送信電極11-1、11-2、…、11-mと、各送信電極11-1…に送信用の所定周波数（例えば100KHz）の交流電流を供給する発信器12と、静電作用によって各送信電極11-1…からの交流電流を受信する複数の線状の受信電極15-1、15-2、…、15-nと、各受信電極15-1…を流れる交流電流を受信する受信器16とで構成される。受信器16は、所定周波数帯域の交流電流のみを通

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過させるバンド・パス・フィルタ（BPF）16Aと、増幅器16Bと、検波器16CとからなるAM変調器と、検波出力をデジタル形式の信号に変換するA/D変換器16Dとで構成される。

【0031】各受信電極15-1、15-2、…、15-nは、図1では各送信電極11-1、11-2、…、11-mと交差点を持つことが分かるが、交差点ではこれら電極どうしが接触していない。言い換えれば、電極どうしの各交差点では、電荷を蓄積するコンデンサと等価な回路が実質上形成されている。したがって、送信電極に交流電流が通過すると、これに対向する受信電極には、静電誘導によって、その交差点を介して交流電流が流れる。これら各送信電極11-1、11-2、…、11-mと各受信電極15-1、15-2、…、15-nが交差する領域は、非接触型ユーザ入力装置1におけるユーザ入力領域を構成する。このユーザ入力領域は、図示の通り、2次元的な広がりを持つ。

【0032】発信器12は、各送信電極11-1…に対して交流電流をスキャンしながら印加する。したがって、ある瞬間では、各受信電極15-1…には該当する送信電極との交差点におけるコンデンサ等価回路からの交流電流が流れることになり、交流電流を送信した送信電極と交流電流を受信した受信電極との位置関係により入力位置を検出することができる。例えば、A/D変換された各受信電極15-1…における出力信号をプロセッサ20上で所定の演算処理を行うことによって、ユーザ入力領域を介して2次元的なユーザ入力を検出することができる。

【0033】図示の例では、各送信電極11-1、11-2、…、11-mは略平行に配列されているとともに、各受信電極15-1、15-2、…、15-nは各送信電極11-1…とは直交する方向に配列されており、ユーザ入力領域は、電極どうしが均一に網の目上に組み合わせられた略平面状の領域である。但し、本発明の要旨はこのような形態に特に限定されるものではなく、各送信電極と受信電極が接触せずに交差していれば、平面以外の形状、例えば球状やその他の曲面状であってもよい。

【0034】図2には、送信電極11と受信電極15間のある1つの交差点を拡大して示している。また、図3には、この送信電極11と受信電極15との交差点の等価回路を示している。

【0035】送信電極11と受信電極15とが交差する交差点では、図3に示すように、コンデンサと等価な回路が形成される。

【0036】ここで、送信電極11側に交流電圧を印加すると、送信電極11と受信電極15の間の静電容量C₀によって容量結合が起こり、受信電極15に交流電流が発生する。このコンデンサC₀を通過する電流の強度は、発信器12における交流電圧の発信周波数に同調し

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たバンド・パス・フィルタ16A、増幅器16B、検波器16C、並びにA/D変換器16Dの各部により信号処理を施すことによって、デジタル・データとして取り出される。受信電極11において受信される交流電流の強度は、コンデンサの静電容量 C_1 にのみ依存する。

【0037】静電容量 C_1 は、送信電極11や受信電極15の変形などがない限り、静的で、固定値を保つ。したがって、送信電極11側に同じ交流電圧が印加される限り、受信電極15側において受信される交流電流の強度は一定となる。

【0038】次いで、このような送信電極11及び受信電極15の組み合わせによって、ユーザの指先などの物体を非接触で検出する仕組みについて説明する。

【0039】図4には、送信電極11と受信電極15間のある1つの交差点にユーザの指先が接近している様子を示している。また、図5には、送信電極11と受信電極15間のある1つの交差点にユーザの指先が接近したときの送信電極11と受信電極15との交差点の等価回路を示している。

【0040】送信電極11と受信電極15とが交差する交差点では、上述したように、コンデンサ C_1 と等価な回路が形成される。

【0041】また、指先などの入体は仮想的な接地点（アース）とみなすことができる。したがって、その等価回路は、送信電極11と受信電極15の間で形成されるコンデンサ C_1 と、人体と送信電極11並びに人体と受信電極15それぞれの間で直列的に形成される仮想的なコンデンサ C_2 、及び C_3 とが、並列的に接続された構成となる。

【0042】したがって、送信電極11側に交流電圧を印加した場合、コンデンサ C_1 を介してグラウンドに流れ込む電流の分だけ、送信電極11と受信電極15の間の静電容量 C_1 による容量結合によって発生する交流電流。すなわち受信電極15側で検出される電流の強度は弱まる。

【0043】静電容量 C_1 は、送信電極11や受信電極15の変形などがない限り、静的で、固定値を保つ。これに対し、人体と送信電極11並びに人体と受信電極15それぞれの間で直列的に形成される仮想的なコンデンサのそれぞれの静電容量 C_2 、及び C_3 は、人体が送信電極11並びに受信電極15に接近するに従って大きくなる。

【0044】このため、同じ交流電圧を送信電極11に印加した場合、受信電極15で検出される交流電流の強度は、人体が送信電極11並びに受信電極15に接近するに従って、小さくなっていく。

【0045】このような現象を利用して、プロセッサ20では、AM変調器16でAM変調され、さらにA/D変換器16Dでデジタル形式に変換された受信信号を用いて、電極間の交差点に人体が接近しているかどうかを

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判定したり、あるいは、人体がどの程度接近しているか（距離）を計測することができる。

【0046】図1に示したように、本実施形態に係る非接触ユーザ入力装置1は、このような送信電極11-1…と受信電極15-1…との交差点が、 $m \times n$ のマトリクス状に配列されている。例えば、所定の平面（又は曲面）からなる入力パネル上に、これら各電極の交点を配設することができる。

【0047】交流電圧を各送信電極11-1、11-2、…、11-mに時分割で印加する。そして、それぞれに対応して、各受信電極15-1、15-2、…、15-nに発生する交流電流を順次計測することで、ユーザ入力領域上のどの交差点に人体が接近しているかを判定することができる。

【0048】本実施形態に係る非接触ユーザ入力装置1では、静電作用を利用しているので、ユーザの指先などの人体を検出するために、人体が電極に直接接触している必要はない。また、近傍の交差点で得られた各検出値を統合して、一般的な幾何学的演算などを施すことによって、入力面から指先までの距離を計測することができる。

【0049】また、図1に示すような構成によれば、電極間の各交差点を独立して駆動させることができる。すなわち、それぞれの交差点から独立して検出値を取り出すことができるので、複数の物体（例えば、同じユーザの右手と左手、あるいは複数のユーザの手）が同時にユーザ入力領域に接近してきた場合には、その距離が交差点間のピッチ間隔よりも長ければ、これらを独立した物体として認識することができる。すなわち、複数の物体の位置を同時に計測することができる。

【0050】また、物体の接近が同時に検出された交差点を追跡していくことにより、接近している物体の形状又は輪郭を捉えることができる。

【0051】図6には、非接触ユーザ入力装置1の変形例を図解している。

【0052】ユーザの指先がある格子点A、B、C、Dで囲まれた領域に接近してきた場合、各送信電極11-1、11-j、並びに各受信電極15-p、15-qとユーザの指先との間では、仮想的なコンデンサ C_1 、 C_2 、 C_3 がそれぞれ形成されている。

【0053】これら各仮想コンデンサの静電容量 C_1 、 C_2 、 C_3 は、それぞれの電極とユーザの指先との距離に応じて変化する。

【0054】したがって、人体と電極との複数の交差点からの値を統合することで、各交差点の中間にある手の位置を計測することができる。すなわち、本実施形態に係る非接触ユーザ入力装置1の位置計測の精度は、各電極間の交差点の間隔よりも細かくすることができる。

【0055】また、図7には、非接触ユーザ入力装置1の他の変形例を図解している。

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【0056】図1を参照しながら既に説明したように、本実施形態に係る非接触ユーザ入力装置1は、そのユーザ入力領域において、送信電極11-1…と受信電極15-1…との交差点が $m \times n$ のマトリックス状に配列されている。また、図1に示すような構成によれば、電極間の各交差点を独立して駆動させて、それぞれの交差点から独立して検出値を取り出すことができる。

【0057】したがって、図7に示すように、ユーザ入力領域に複数のユーザの指先が存在するような場合、それぞれのユーザの指先の近傍における交差点において、これらを独立して認識することができる。この結果、単一のユーザ入力装置を用いて、複数のユーザからの同時入力を受容することができる。

【0058】また、図8には、非接触ユーザ入力装置1の他の変形例を図解している。

【0059】図1を参照しながら既に説明したように、本実施形態に係る非接触ユーザ入力装置1は、そのユーザ入力領域において、送信電極11-1…と受信電極15-1…との交差点が $m \times n$ のマトリックス状に配列されている。但し、図8に示す例では、各送信電極11-1、11-2、…、11-m、並びに、各受信電極15-1-1、15-2、…、15-nの間隔は十分に短く配設され、また、送信器12が各送信電極11-1に交流電圧を印加するスキャン速度は十分に速いものとする。

【0060】このような場合、図8に示すように、ユーザが掌をユーザ入力領域に接近させた場合、接近したことを検出した交差点を追跡していくことにより、物体すなわち掌の形状を認識することができる。

【0061】すなわち、各電極間のピッチ間隔を充分小さく、且つ、送信電極におけるスキャン速度を充分速くすることによって、本実施形態に係る非接触ユーザ入力装置1は、物体の形状を認識することができる。

【0062】本実施形態に係る非接触ユーザ入力装置1を他のデバイスと組み合わせて適用することも考えられる。例えば、液晶表示ディスプレイ(LCD: Liquid Crystal Display)や有機ELなどの平面ディスプレイ上に、非接触ユーザ入力装置1を重畳することにより、表示一体型のユーザ入力装置を構成することができる。このようなユーザ入力装置によれば、ユーザは、表示出力されるGUI画面の内容に案内されながら、直感的且つ容易にコンピュータへのコマンド入力を行うことができる。ユーザは、表示画面から視線をそらすことなく入力作業を行うことができ、ご操作する危険も少なくなる。

【0063】図9には、導電性ポリマーによる発光素子すなわち有機LEDからなる表示装置と一体的に構成された非接触ユーザ入力装置1の断面構成を模式的に図解している。

【0064】同図に示す例では、導電性ポリマーからなるアノード電極層とカソード電極層が、有機素材からな

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る絶縁層を介して積層されている。また、アノード電極とカソード電極は、互いに直行して配設されている。これは、図1における、各送信電極11-1…と各受信電極15-1…が互いに接触しないように交差して配設されている構成に類似する。

【0065】有機ディスプレイにおいては、各画素を発光させるために、一方の電極層では、画面スキャン方向に向かって各電極には直流電圧が順次印加される。

【0066】本実施形態では、一方の電極層に流れる直流電圧に、人体検出用の交流電圧を重ねさせて印加する。この結果、他方の電極層では、交流電流を受信する。ユーザの指先などの人体が接近している交差点においては、受信される交流電流の強度が減少するので、ユーザの指先が居る位置を特定したり、さらには、接近している物体の形状を認識したりすることができる。

【0067】図9に示したような構成によれば、有機ディスプレイにおける画面構成を変更することなく、表示装置をそのまま非接触型ユーザ入力装置としても利用することができる。

【0068】また、有機ディスプレイは、一般に、フレキシブルであり、自由に折り曲げることが可能である。したがって、図9に示したような適用例によれば、球面や筒状のユーザ入力一体型のディスプレイ装置を構成することができる。

【0069】〔追補〕以上、特定の実施例を参照しながら、本発明について詳述してきた。しかしながら、本発明の要旨を逸脱しない範囲で当業者が該実施例の修正や代用を成し得ることは自明である。すなわち、例示という形態で本発明を開示してきたのであり、限定的に解釈されるべきではない。本発明の要旨を判断するためには、冒頭に記載した特許請求の範囲の欄を参照すべきである。

【0070】

【発明の効果】以上詳記したように、本発明によれば、コンピュータに対してオブジェクトの操作やコマンドなどをユーザの指先を用いて直接入力することができる、優れたユーザ入力装置を提供することができる。

【0071】また、本発明によれば、コンピュータに対してオブジェクトの操作やコマンドなどの入力を非接触形式で行うことができる、優れたユーザ入力装置を提供することができる。

【0072】また、本発明によれば、2点以上の情報や接近する物体の形状や物体までの距離情報などを認識することができる、優れた非接触型ユーザ入力装置を提供することができる。

【0073】本発明に係る非接触型ユーザ入力装置においては、送信電極と受信電極の各交差点ではコンデンサと等価な第1のコンデンサ等価回路が仮想的に形成されている。また、ユーザの指先などの導電性の物体が接近したことに応じて、第1のコンデンサ等価回路とは並列

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的となる第2のコンデンサ等価回路が仮想的に形成される。指先などの誘導性の物体との接近の程度に応じて前記第2のコンデンサ等価回路の静電容量が変化して、この結果、前記第1のコンデンサ等価回路を通過する交流電流が変化する。したがって、このような現象を利用することによって、指先が接触したことだけでなく、接近したときの指先までの距離を計測することができる。【0074】また、各送信電極に対して交流電流をスキャン入力することにより、交流電流を送信した送信電極と交流電流を受信した受信電極との位置関係により入力位置を検出することができる。入力位置を検出した送信電極と受信電極の交差点を追跡していくことにより、接近している物体の輪郭を計測することができる。すなわち、非接触のユーザ入力装置は、単にユーザの指先などの物体が近づいたということを検知するだけでなく、物体の形状を認識することができる。また、2以上のユーザが同時に非接触ユーザ入力装置にアクセスしようとしても、各人の指先を分離して認識することも可能である。

【図面の簡単な説明】

【図1】本発明の一実施形態に係る非接触型ユーザ入力装置1の基本構成を模式的に示した図である。

【図2】送信電極11と受信電極15間のある1つの交差点を拡大して示した図である。

【図3】送信電極11と受信電極15間のある1つの交

* 差点の等価回路を示した図である。

【図4】送信電極11と受信電極15間のある1つの交差点にユーザの指先が接近している様子を示した図である。

【図5】送信電極11と受信電極15間のある1つの交差点にユーザの指先が接近したときの送信電極11と受信電極15との交差点の等価回路を示した図である。

【図6】非接触ユーザ入力装置1の変形例を説明するための図である。

10 【図7】非接触ユーザ入力装置1の変形例を説明するための図である。

【図8】非接触ユーザ入力装置1の変形例を説明するための図である。

【図9】導電性ポリマーによる発光素子すなわち有機LEDからなる表示装置と一体的に構成された非接触ユーザ入力装置1の断面構成を示した図である。

【符号の説明】

1…非接触ユーザ入力装置

11…送信電極

20 【図1】

12…送信器

15…受信電極

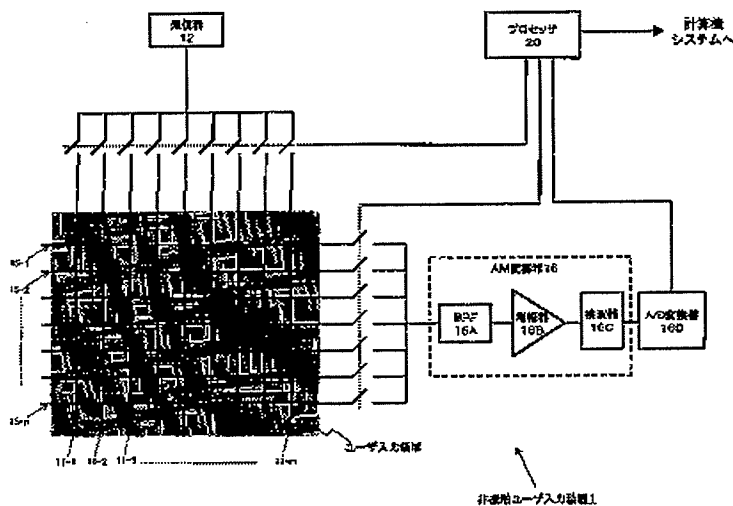
16…AM変調器

16A…バンド・パス・フィルタ、16B…増幅器

16C…検波器、16D…A/D変換器

20…プロセッサ

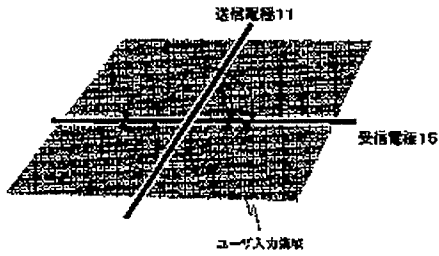
【図1】



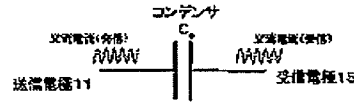
(8)

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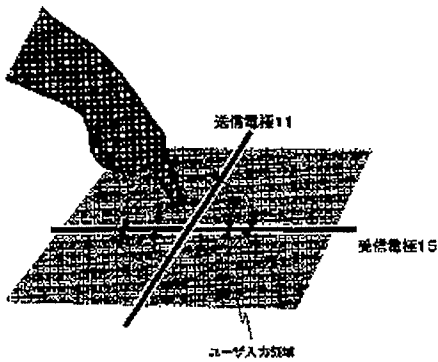
【図2】



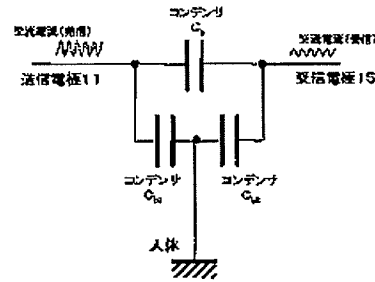
【図3】



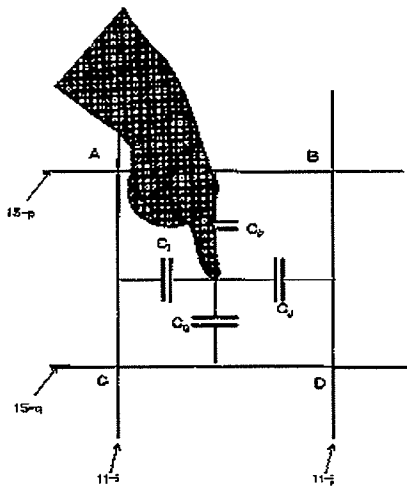
【図4】



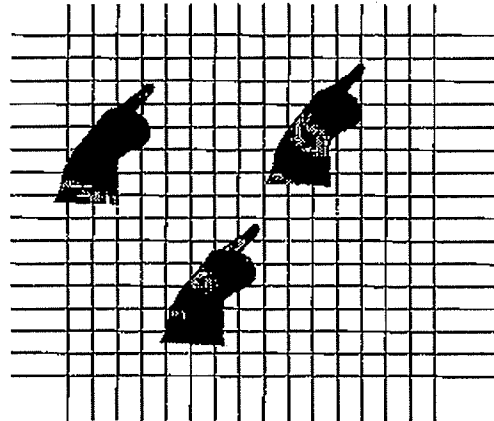
【図5】



【図6】



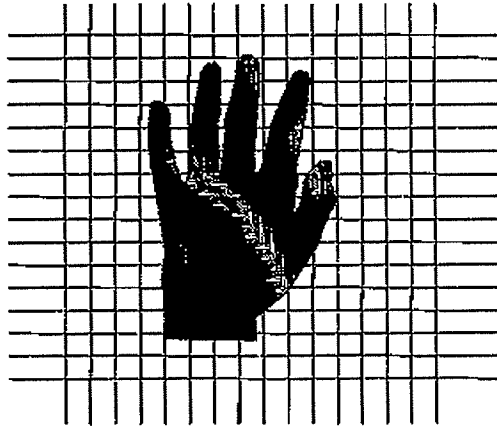
【図7】



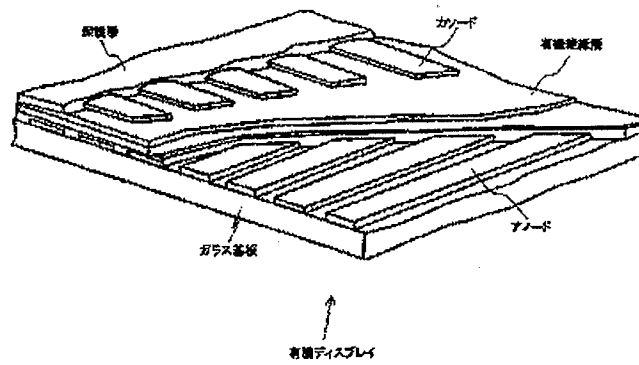
(9)

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【図8】



【図9】



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【公報種別】 特許法第 17 条の 2 の規定による補正の掲載
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 【F I】
 G 0 6 F 3/033 3 6 0 D

【手続補正書】

【提出日】 平成 15 年 8 月 14 日 (2003.8.14)

【手続補正 1】

【補正対象書類名】 明細書
 【補正対象項目名】 発明の名称
 【補正方法】 変更
 【補正の内容】
 【発明の名称】 ユーザ入力装置

【手続補正 2】

【補正対象書類名】 明細書
 【補正対象項目名】 特許請求の範囲
 【補正方法】 変更
 【補正の内容】
 【特許請求の範囲】

【請求項 1】

情報処理装置に対するユーザからのデータ又はコマンドの入力を受容するユーザ入力装置であって、

ユーザが人体などの誘電性の物体を使って入力操作を行なうユーザ入力手段と、
 前記ユーザ入力手段に対する前記入力操作について、誘電性の物体の接触又は近接位置と、該誘電性の物体の接触又は近接状態での他の状態とを入力として検出する検出手段と、
 を備え、
 前記他の状態は前記ユーザ入力装置に対して入力操作する 1 以上の誘電性の物体の形状又は輪郭を含む、
 ことを特徴とするユーザ入力装置。

【請求項 2】

前記ユーザ入力手段は、誘電性の物体の近接又は接触によって変化する静電容量を有し、
 前記検出手段は、前記静電容量の変化に基づき前記入力操作を検出する、
 ことを特徴とする請求項 1 に記載のユーザ入力装置。

【請求項 3】

前記ユーザ入力手段は、
 複数の送信電極と、
 前記の各送信電極に交流電流を供給する発信器と、
 前記の各送信電極と接触しないように配置された複数の受信電極と、
 前記の各受信電極を流れる交流電流を受信する受信器とを備え、
 前記静電容量は、前記送信電極と前記受信電極との交差点に形成される、
 ことを特徴とする請求項 2 に記載のユーザ入力装置。

【請求項 4】

前記ユーザ入力手段では、複数の前記交差点の静電容量変化に基づき得られる検出値が統

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【公報種別】 特許法第 17 条の 2 の規定による補正の掲載
 【部門区分】 第 6 部門第 3 区分
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【公開番号】 特開 2002-342033(P2002-342033A)
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 【出願番号】 特願 2001-151499(P2001-151499)
 【国際特許分類第 7 版】
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 【F I】
 G 0 6 F 3/033 3 6 0 D

【手続補正書】

【提出日】 平成 15 年 8 月 14 日 (2003.8.14)

【手続補正 1】

【補正対象書類名】 明細書
 【補正対象項目名】 発明の名称
 【補正方法】 変更
 【補正の内容】
 【発明の名称】 ユーザ入力装置

【手続補正 2】

【補正対象書類名】 明細書
 【補正対象項目名】 特許請求の範囲
 【補正方法】 変更
 【補正の内容】
 【特許請求の範囲】

【請求項 1】

情報処理装置に対するユーザからのデータ又はコマンドの入力を受容するユーザ入力装置であって、

ユーザが人体などの誘電性の物体を使って入力操作を行なうユーザ入力手段と、
 前記ユーザ入力手段に対する前記入力操作について、誘電性の物体の接触又は近接位置と、該誘電性の物体の接触又は近接状態での他の状態とを入力として検出する検出手段と、
 を備え、
 前記他の状態は前記ユーザ入力装置に対して入力操作する 1 以上の誘電性の物体の形状又は輪郭を含む、
 ことを特徴とするユーザ入力装置。

【請求項 2】

前記ユーザ入力手段は、誘電性の物体の近接又は接触によって変化する静電容量を有し、
 前記検出手段は、前記静電容量の変化に基づき前記入力操作を検出する、
 ことを特徴とする請求項 1 に記載のユーザ入力装置。

【請求項 3】

前記ユーザ入力手段は、
 複数の送信電極と、
 前記の各送信電極に交流電流を供給する発信器と、
 前記の各送信電極と接触しないように配置された複数の受信電極と、
 前記の各受信電極を流れる交流電流を受信する受信器とを備え、
 前記静電容量は、前記送信電極と前記受信電極との交差点に形成される、
 ことを特徴とする請求項 2 に記載のユーザ入力装置。

【請求項 4】

前記ユーザ入力手段では、複数の前記交差点の静電容量変化に基づき得られる検出値が統

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合される、
ことを特徴とする請求項 3 に記載のユーザ入力装置。

【請求項 5】

前記の複数の送信電極には、前記発信器から前記交流電流が時分割で供給される、
ことを特徴とする請求項 3 に記載のユーザ入力装置。

【請求項 6】

前記ユーザ入力手段では、前記受信器で受信される前記交流電流の強度変化に基づき、前記静電容量の変化が検出される、
ことを特徴とする請求項 3 に記載のユーザ入力装置。

【請求項 7】

前記ユーザ入力手段に対する入力操作は、前記情報処理装置で動作するアプリケーション・プログラムに対するデータ入力又はコマンド入力に関するものである、
ことを特徴とする請求項 1 に記載のユーザ入力装置。

【請求項 8】

情報処理装置に対するユーザからのデータ又はコマンドなどの入力を受容するユーザ入力装置であって、
ユーザが人体などの誘電性の物体を使って入力操作を行なうユーザ入力手段と、
前記ユーザ入力手段に対する前記入力操作について、誘電性の物体の接触又は近接位置と、前記ユーザ入力装置に該誘電性の物体がどの程度接近乃至接触しているかを入力として検出する検出手段と、
を具備することを特徴とするユーザ入力装置。

【請求項 9】

情報処理装置に対するユーザからのデータ又はコマンドの入力を受容するユーザ入力装置であって、
ユーザが人体などの誘電性の物体を使って入力操作を行なうユーザ入力手段と、
前記ユーザ入力手段に対する前記入力操作について、誘電性の物体の接触又は近接位置と、該誘電性の物体の接触又は近接状態での他の状態とを入力として検出する検出手段と、
を備え、
前記検出手段は、複数の誘電性の物体それぞれについて、接触又は近接の位置と他の状態とを独立に検出する、
ことを特徴とするユーザ入力装置。

【請求項 10】

前記検出手段は、接触又は近接位置の統合処理を通じて、複数の誘電性の物体を区別する、
ことを特徴とする請求項 1 3 に記載のユーザ入力装置。

【手続補正 3】

【補正対象書類名】明細書

【補正対象項目名】0054

【補正方法】変更

【補正の内容】

【0054】

したがって、人体と電極との複数の交差点からの値を統合することで、各交差点の中間にある手の位置を計測することができる。すなわち、本実施形態に係る非接触ユーザ入力装置 1 の位置計測の精度は、各電極間の交差点の間隔よりも細かくすることができる。

PATENT ABSTRACTS OF JAPAN

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(51)Int.Cl.

G06F 3/033

(21)Application number : 2001-151499

(71)Applicant : SONY CORP

(22)Date of filing : 21.05.2001

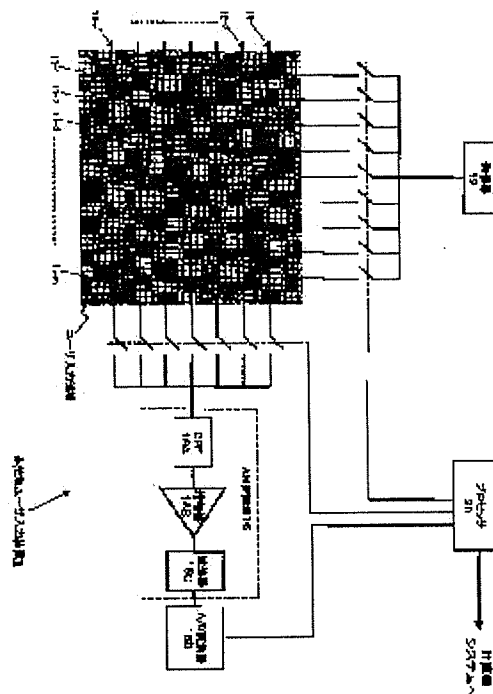
(72)Inventor : REKIMOTO JIYUNICHI

(54) NON-CONTACT TYPE USER INPUT DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To recognize the information of two or more points and the shape of an approaching object.

SOLUTION: A non-contact type user input device is provided with a plurality of linear transmission electrodes, a transmitter supplying an AC current for transmission to the respective transmission electrodes, a plurality of linear reception electrodes arranged so as not to be in contact with the respective transmission electrodes and a receiver receiving the AC current flowing through the reception electrodes. A capacitor is formed at each intersection of the transmission electrode and the reception electrode, a parallel capacitor is formed corresponding to the approach of the fingertip of a user and the capacitance of the capacitor changes corresponding to the approaching degree of the fingertip. Recognition is performed by utilizing the change of the AC current passing through the capacitor between the electrodes.



VIA EFS WEB
Patent
Docket No. 106842009000
Client Reference No. P3266US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Steve HOTELLING et al.

Application No.: 10/840,862

Filing Date: May 6, 2004

For: MULTIPOINT 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 full English professional translations of foreign documents JP-59-214941 and JP-2002-342033. English Abstracts of these foreign documents JP-59-214941 and JP-2002-342033 were previously submitted in an Information Disclosure Statement electronically filed on December 19, 2008, and later considered by the Examiner. A copy of the Examiner's initialed Form PTO/SB/08a/b is attached for the Examiner's convenience. The Examiner is requested to make these documents of further record.

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

1a-1043251

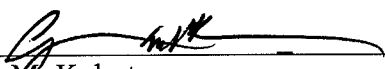
APLNDC00027010

The information contained in this Supplemental 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.

A filing fee was submitted with the December 19, 2008, electronic filing of the Information Disclosure Statement, so Applicants do not believe an additional fee is required. However, 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 Commissioner 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: August 28, 2009

Respectfully submitted,

By: 
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Electronic Acknowledgement Receipt

EFS ID:	5978920
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/Lisa Bronk
Filer Authorized By:	Glen Masashi Kubota
Attorney Docket Number:	106842009000
Receipt Date:	28-AUG-2009
Filing Date:	06-MAY-2004
Time Stamp:	20:43:28
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	200900TRANS.pdf	40938 <small>c73822bfacb53c2851ea0e8a6692f502c3748043</small>	no	1

Warnings:

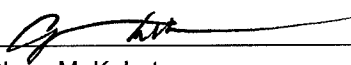
Information:

2		200900SIDS.pdf	262366 e41e7bcd11c2293240ace9d9db0a86ff2c43388d	yes	6
Multipart Description/PDF files in .zip description					
		Document Description	Start	End	
		Transmittal Letter	1	2	
		Information Disclosure Statement (IDS) Filed (SB/08)	3	3	
		Transmittal Letter	4	5	
		Information Disclosure Statement (IDS) Filed (SB/08)	6	6	
Warnings:					
Information:					
3	Foreign Reference	200900JP214941TRANSL.pdf	633390 6223dea48f1b2263606196682a8c9fd967557407	no	14
Warnings:					
Information:					
4	Foreign Reference	200900JP342033TRANSL.pdf	2003339 2d150e30585f26be922687dac9ab3663ebbab386	no	35
Warnings:					
Information:					
Total Files Size (in bytes):			2940033		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<h1>TRANSMITTAL FORM</h1> <p><i>(to be used for all correspondence after initial filing)</i></p>	Application Number	10/840,862
	Filing Date	May 6, 2004
	First Named Inventor	Steve HOTELLING
	Art Unit	2629
	Examiner Name	Kimnhung T. Nguyen
Total Number of Pages in This Submission	56	Attorney Docket Number Client Ref. P3266US1

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input checked="" type="checkbox"/> Information Disclosure Statement (Supplemental) <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): (2) English Translations – (49 pages)
Remarks		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	MORRISON & FOERSTER LLP (Customer No. 69753)		
Signature			
Printed name	Glenn M. Kubota		
Date	August 28, 2009	Reg. No.	44,197