



(43) International Publication Date  
27 September 2012 (27.09.2012)

(51) International Patent Classification:  
*G06F 3/042* (2006.01)

(21) International Application Number:

PCT/JP2012/056612

(22) International Filing Date:

8 March 2012 (08.03.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2011-066606 24 March 2011 (24.03.2011) JP  
61/470,696 1 April 2011 (01.04.2011) US

(71) Applicant (for all designated States except US): **NITTO DENKO CORPORATION** [JP/JP]; 1-2, Shimohozumi 1-chome, Ibaraki-shi, Osaka, 5678680 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SHIMIZU, Yusuke** [JP/JP]; c/o NITTO DENKO CORPORATION, 1-2, Shimohozumi 1-chome, Ibaraki-shi, Osaka, 5678680 (JP). **NAKAMURA, Kei** [JP/JP]; c/o NITTO DENKO CORPORATION, 1-2, Shimohozumi 1-chome, Ibaraki-shi, Osaka, 5678680 (JP). **NINOMIYA, Akito** [JP/JP]; c/o NITTO DENKO CORPORATION, 1-2, Shimohozumi 1-chome, Ibaraki-shi, Osaka, 5678680 (JP).

(74) Agents: **SAITOH, Yukihiro** et al.; City Corp. Minamimorimachi 802, 2-7, Minamimorimachi 2-chome, Kita-ku, Osaka-shi, Osaka, 5300054 (JP).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

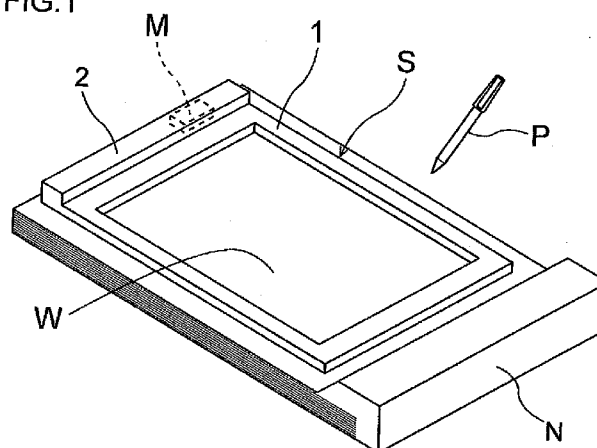
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: DESK NOTEPAD DEVICE

FIG.1



(57) Abstract: A desk notepad device is provided which records the movement path of a writing implement to store the movement path as electronic data by merely writing a note directly on a paper sheet placed within a frame with the writing implement. This desk notepad device includes a desk notepad tool, and an optical sensor including at least one pair of light-emitting and light-receiving elements mounted to a rectangular frame. The optical sensor senses the interception of light beams traveling from the light-emitting element to the light-receiving element which is caused by the writing implement within the frame to thereby output information about the position of the writing implement. When a writing operation is performed on a paper sheet revealed within the frame of this optical sensor, the movement path of the tip of the writing implement is stored as electronic data in a storage means.



WO 2012/128159 A1

## Description

## DESK NOTEPAD DEVICE

## Technical Field

5           The present invention relates to a desk notepad device including an optical position detecting means.

## Background Art

          There are some notepad tools, such as electronic  
10   note processors, that digitally process notes and the like (see Japanese Patent No. 3746378). For example, an electronic notepad device which converts handwritten notes and the like into digital form (into images) includes a display (a touch panel) with a touch sensor which is  
15   capable of displaying inputted notes and the like thereon. By bringing a finger, a purpose-built stylus and the like into contact with the display and then moving the tip thereof, the movement path of the tip of the finger and the like or handwriting (position information) is  
20   inputted as information such as a note to appear on the aforementioned display and the like. Also, the movement path of the tip appearing on the aforementioned display and the like is stored as electronic data such as an image in the aforementioned electronic notepad device.

25           The electronic notepad device as described above

includes a touch position detecting means for detecting the touch position of the purpose-built stylus, a finger of a person who manipulates a device and the like two-dimensionally (in x- and y-directions). In cooperation with displays produced on a flat display such as a monitor and a liquid crystal screen disposed under the panel of the monitor, the touch position detecting means allows a user to manipulate the aforementioned electronic notepad device and the like. Conventionally, examples of this touch position detecting means (the touch sensor) used in many cases include those employing a resistive method, a capacitive method, an electromagnetic induction method and the like from the viewpoints of costs, performance, durability and the like. The touch panels based on these methods have a structure such that a large number of electrical contacts are arranged in a matrix near the surface of each of the panels.

#### Summary of Invention

An electronic notepad device as mentioned above is convenient because a user can easily enter characters and the like thereinto. However, there is still a strong demand mainly from users unskilled in the manipulation of computers, electronic information devices and the like and from elderly people to leave notes so that their

handwriting is left directly on media such as paper sheets, rather than such electronic notes that their handwriting, characters and the like appear on a display and the like.

A desk notepad device is provided which records  
5 the movement path of a writing implement and the like to store the movement path as electronic data by merely writing a note and the like directly on a paper sheet placed within a frame with the writing implement.

The desk notepad device comprises a desk notepad  
10 tool capable of having a paper sheet filed therein, the paper sheet capable of being written upon by a writing implement; a frame-shaped optical sensor surrounding at least part of the paper sheet, the optical sensor including a rectangular frame, and at least one pair of  
15 light-emitting and light-receiving elements mounted to the rectangular frame, the optical sensor sensing the interception of light beams traveling from the light-emitting element to the light-receiving element which is caused in association with the writing implement  
20 within the frame to thereby output information about the position of the writing implement within the frame; and a storage means for storing therein the movement path of a tip of the writing implement as electronic data when a writing operation is performed on part of the paper  
25 sheet revealed within the frame of the optical sensor

with the writing implement.

The desk notepad device includes the  
aforementioned frame-shaped optical sensor placed on a  
writing paper sheet so that at least part of the paper  
5 sheet is revealed within the frame thereof, and the storage  
means for storing therein the movement path information  
about the writing implement obtained from this optical  
sensor as electronic data. Thus, when the writing  
operation is performed on part of the paper sheet revealed  
10 within the frame of the aforementioned optical sensor  
with the writing implement and the like, the path  
(handwriting) is left on the aforementioned paper sheet,  
and is also stored as electronic data in the aforementioned  
storage means. Thus, the desk notepad device  
15 automatically converts the movement path of the writing  
implement into electronic form by merely writing a note  
and the like directly on the paper sheet placed within  
the frame with the writing implement without giving  
special consideration to the conversion into electronic  
20 form. Also, the aforementioned information in  
electronic form may be taken (reproduced) from the  
aforementioned storage means by the use of a personal  
computer and the like. The sharing of the information  
with others and the storing of knowledge, records and  
25 the like are accomplished easily. This provides

convenience.

The desk notepad device includes, as a means (optical sensor) for detecting the touch position of the tip of the writing implement, the optical sensor (described above) including the rectangular frame, and the at least one pair of light-emitting and light-receiving elements mounted to the rectangular frame, the optical sensor sensing the interception of light beams traveling from the aforementioned light-emitting element to the light-receiving element which is caused in association with the writing implement within the aforementioned frame to thereby output information about the position of the writing implement within the frame. The surface for the detection of the touch position has no electrical (physical) contacts. The desk notepad device therefore has high durability, and is less susceptible to dust, contamination, and the like. Additionally, a high writing pressure as in a resistive method, a capacitive method, an electromagnetic induction method and the like is not required during the writing operation with the writing implement. Thus, the writing operation is performed in a natural manner without concern for the sensor.

The desk notepad device employs, as the aforementioned frame-shaped optical sensor, an optical

sensor such that: the frame of the optical sensor includes first and second sections opposed to each other in the form of the frame; light-emitting elements are arranged in the first section and light-receiving elements are arranged in the second section; the light-emitting elements and the light-receiving elements are positioned to face an interior of the frame; and light beams emitted from the light-emitting elements toward the light-receiving elements produce a lattice of vertical and horizontal light beams crossing each other within the frame, can employ general-purpose components, for example, light-emitting diodes (LEDs) and the like serving as these light-emitting elements (a light source) and photodiodes (PDs) serving as the light-receiving elements. This advantageously allows the formation of the aforementioned optical sensor at low costs. Additional advantages lie in high impact resistance and in high durability.

The desk notepad device employs, as the aforementioned frame-shaped optical sensor, an optical sensor such that: modules each including a light-receiving element array composed of a plurality of light-receiving elements and the light-emitting element in vertically stacked relation are disposed on two corners, respectively, on opposite ends of one side

among the four sides of the frame of the optical sensor;  
a tape-like retroreflector is provided on the inner side  
surface of three sides other than the one side lying  
between these modules; and light beams emitted from the  
5 light-emitting element of one of the modules are reflected  
from the retroreflector to travel back into the  
light-receiving element array of the one module, can  
specify the position of the tip of the aforementioned  
writing implement by triangulation through the use of  
10 a small number of components. This desk notepad device  
also has the advantage of being formed at low costs by  
using general-purpose components.

#### Brief Description of Drawings

15 FIG. 1 is a view illustrating an overall  
configuration of a desk notepad device.

FIG. 2 is a plan view illustrating a schematic  
configuration of the desk notepad device according to  
a first embodiment.

20 FIG. 3(a) is a plan view illustrating a schematic  
configuration of the desk notepad device according to  
a second embodiment, and (b) is an enlarged view of a  
portion indicated by Z thereof.

#### 25 Description of Embodiments



Next, embodiments according to the present invention will now be described in detail with reference to the drawings. It should be noted that the present invention is not limited to the embodiments.

5           FIG. 1 is a view illustrating an overall configuration of a desk notepad device according to an embodiment.

          This desk notepad device includes a frame-shaped optical sensor S surrounding at least part of a paper  
10 sheet W (a sheet included in a desk notepad tool N) capable of being written upon by a writing implement P, and a storage means M for storing the movement path of the tip of the writing implement P within the frame of the optical sensor S as electronic data. The aforementioned optical  
15 sensor S includes a rectangular frame 1, and at least one pair of light-emitting and light-receiving elements (both not shown) mounted to this frame 1. The optical sensor S senses the interception of light beams traveling from the aforementioned light-emitting element to the  
20 light-receiving element which is caused in association with the writing implement P within the aforementioned frame 1 to thereby output information about the position of the aforementioned writing implement P and the like within the frame 1.

25           A communication (power) cable (optional), a

battery for driving the communication (power) cable, a control means such as a driver for the aforementioned light-emitting element and the light-receiving element, and a communication means (wired or wireless) for communicating with information devices such as personal computers are incorporated in a thick-walled thick-frame section 2 and the like in the aforementioned desk notepad device, but all are not shown.

In a case where the aforementioned optical sensor and the storage means are integrally formed as a storage device in the aforementioned desk notepad device and the storage device is placeable on or removable from a paper sheet when the aforementioned optical sensor is placed on the paper sheet, the desk notepad device is convenient because the aforementioned paper sheet can be easily replaced with a new one. Further, even when the paper sheet is replaced with a new one, the aforementioned stored information (the movement path) may be easily taken (reproduced) from the storage means of the aforementioned storage device by the use of a personal computer and the like.

As a specific example of the aforementioned desk notepad device, the desk notepad device according to a first embodiment will be described in which a large number of light-emitting diodes (LEDs) serving as light-emitting

elements (a light source) and a large number of photodiodes (PDs) serving as light-receiving elements are arranged in the frame 1 of an optical sensor S1 to form a lattice of light beams for the detection of the tip T of the writing implement P within the frame of the optical sensor S1.

FIG. 2 is a plan view illustrating a schematic configuration of the desk notepad device according to the first embodiment. For ease of description in this figure, the direction of the short sides X1 and X2 of the frame 1 is defined as a horizontal direction (x-direction) whereas the direction of the long sides Y1 and Y2 of the frame 1 is defined as a vertical direction (y-direction), and light beams (invisible infrared light) in a lattice form within the frame 1 are indicated by dash-double-dot lines. The number of LEDs and PDs and the number of light beams in a lattice form are shown as abbreviated, and electrical interconnect lines and the like within this frame 1 are indicated by dotted lines. A battery for driving the desk notepad device, a communication means (a cable or a radio antenna) for communicating with information devices such as personal computers, and the like are not shown (the same applies to Fig. 3 to be described later).

The desk notepad device according to this first embodiment includes: the optical sensor S1 having a touch

position detecting means for detecting the position (x and y coordinates) of the tip (the touch position T) of the writing implement P in the rectangular region (sensing region) within the frame-shaped frame 1 by being placed  
5 on a paper sheet W capable of being written upon by the writing implement P; and a storage means M (built-in) for storing movement path information (change in x and y positions) about the tip position of the writing implement P obtained by this optical sensor S1 and also  
10 serving as a control means for the light-emitting elements and the light-receiving elements.

As shown in FIG. 2, a light source including a large number of LEDs 3 serving as a light-emitting section of the aforementioned touch position detecting means and arranged within the frame 1 are provided in part of the  
15 frame 1 of the optical sensor S1. A light-receiving section including a large number of PDs 4 corresponding to the respective LEDs 3 is provided in part (the sides X2 and Y2) of the frame 1 opposed to the part (the sides  
20 X1 and Y1) of the frame 1 where the aforementioned LEDs 3 are arranged. These LEDs 3 and the PDs 4 are arranged and positioned along the inner edges of the aforementioned frame-shaped frame 1 so that the tips thereof face inward. Under the control of the storage means M serving also  
25 as a controller (control means) for both the LEDs 3 and

the PDs 4, the aforementioned LEDs 3 are caused to emit light beams simultaneously or sequentially in a scanning direction, thereby forming a lattice of vertical and horizontal light beams orthogonal to each other  
5 (dash-double-dot lines) in the rectangular sensing region within the frame 1.

Infrared LEDs (infrared light-emitting diodes) of the type which emits near-infrared light beams (at a wavelength of 700 to 2500 nm) are preferable as the LEDs  
10 3 used as the aforementioned light-emitting elements (the light source). A linear sensor array including a large number of light-receiving elements arranged in a line in the form of a bar or an array, an image sensor, and the like in addition to the aforementioned photodiodes  
15 (PDs) may be used as the light-receiving elements.

The detection of the touch position T of the writing implement P using the desk notepad device according to the aforementioned first embodiment is done by the following procedure. First, as shown in FIG. 1, the  
20 optical sensor S1 (the storage device) including the storage means M serving also as the controller is removably placed on a paper sheet W so as to surround at least part of the paper sheet W. Next, for calibration, while the LEDs 3 of the aforementioned light-emitting section are  
25 caused to emit light beams sequentially one by one (from

the end), the intensity of light beams (lattice light beams) reaching the PDs 4 corresponding to (opposed to) the LEDs 3 is measured when the light beams are emitted and when the light beams are not emitted, and threshold values for the detection and non-detection of an object based on the interception of light beams are determined for each of the PDs 4, and are stored in the form of a table and the like in the aforementioned storage means M.

10           Next, the storage means M serving also as the aforementioned controller causes the aforementioned LEDs 3 to sequentially emit light beams. While the sensing region of the optical sensor S1 is scanned, the tip of the writing implement P is brought down onto part of the paper sheet W revealed within the frame of this optical sensor S1. Then, as shown in FIG. 2, some of the light beams traveling in a lattice form within the  
15           aforementioned frame are intercepted by the tip of the writing implement P. Such an intercepted location is sensed by corresponding ones of the PDs 4 of the  
20           aforementioned touch position detecting means, whereby the coordinate positions (x and y axes; with reference to the "touch position T" in FIG. 2) of the tip of the aforementioned writing implement P within the frame are  
25           specified. The coordinates are stored in the

aforementioned storage means M.

Then, when a user moves the aforementioned writing implement P to write a note and the like, the path (written information such as the note and the like) of the tip of the aforementioned writing implement P in accordance with the movement is detected, and the path is stored as digital data (electronic data) in the aforementioned storage means M. That is, at the same time that the user writes a note and the like on part of the paper sheet W revealed within the frame of the optical sensor S1 with the writing implement P, the information such as the note and the like is recorded in a memory and the like in the storage means M serving also as the aforementioned controller.

The desk notepad device according to the first embodiment as mentioned above automatically converts the movement path of a writing implement into electronic form by merely writing a note and the like directly on the paper sheet placed within the frame with the writing implement without giving special consideration to the conversion into electronic form. Also, the aforementioned information in electronic form may be taken (reproduced) from the aforementioned storage means M by the use of a personal computer and the like. The sharing of the information with others and the storing

of knowledge, records and the like are accomplished easily. Further, the desk notepad device according to the aforementioned first embodiment may employ general-purpose components, for example, the  
5 light-emitting diodes (LEDs) serving as the light-emitting elements (the light source) and the photodiodes (PDs) serving as the light-receiving elements. This is advantageous in allowing the formation of the desk notepad device at low costs.

10           Next, the desk notepad device according to a second embodiment will be described which includes modules (C1 and C2) disposed on two corners, respectively, of the frame 1 of an optical sensor S2 and each including a light-emitting element and a light-receiving element  
15 array, and which specifies the position of the tip of the writing implement P within the frame by a triangulation method by means of the two modules.

FIG. 3(a) is a plan view illustrating a schematic configuration of the desk notepad device according to the second embodiment, and FIG. 3(b) is an enlarged view  
20 of a portion indicated by Z of FIG. 3(a). Also in these figures, the direction of the short sides X1 and X2 of the frame 1 is defined as a horizontal direction (x-direction) whereas the direction of the long sides  
25 Y1 and Y2 of the frame 1 is defined as a vertical direction



(y-direction), and a battery, a communication means and the like which are provided in the aforementioned thick-frame section 2 are not shown.

The desk notepad device according to this second  
5 embodiment also includes: the optical sensor S2 having a touch position detecting means for detecting the position (x and y coordinates) of the tip (the touch position T) of the writing implement P in the rectangular region (sensing region) within the frame-shaped frame  
10 1 by being placed on a paper sheet W capable of being written upon by the writing implement P; and the storage means M (built-in) for storing movement path information (change in x and y positions) about the tip position of the writing implement P obtained by this optical sensor  
15 S2.

The desk notepad device according to the aforementioned second embodiment is different from the desk notepad device according to the above first embodiment in that the light-receiving and -emitting  
20 modules (camera modules C1 and C2) each including a vertical combination of the light-emitting element (LED 3) and the light-receiving element array (an image sensor 5) as shown in FIG. 3(b) are disposed on corners 1a and 1b, respectively, on opposite ends of one side (in this  
25 example, X2) among the four sides of the frame 1 of the

optical sensor S2, and in that a tape-like retroreflector (a retroreflective tape 6) is affixed to the inner side surface of three sides (X1, Y1 and Y2) other than the aforementioned one side (X2) lying between these camera modules C1 and C2, as shown in FIG. 3(a). The storage means M serves also as a controller (control means) for the LEDs 3 and the image sensors 5, as in the aforementioned first embodiment.

In the optical sensor S2 according to the  
10 aforementioned second embodiment having this configuration, light beams emitted from the LEDs 3 in the respective camera modules C1 and C2 are reflected from the aforementioned retroreflective tape 6 to travel back toward the camera modules C1 and C2 from which the  
15 light beams are emitted, so that crossing of radial light beams occurs within the frame in such a manner that the light beams from each of the camera modules C1 and C2 diverge in a ripple or wave pattern, as shown in FIG. 3(a).

20 Infrared LEDs (infrared light-emitting diodes) of the type which emits near-infrared light beams (at a wavelength of 700 to 2500 nm) are preferable as the light-emitting elements (the light source) for the aforementioned camera modules C1 and C2. An image sensor  
25 such as CCD and CMOS image sensors, a CMOS linear sensor

array including a large number of light-receiving elements arranged in a line, and the like may be used as the light-receiving element array.

The retroreflector attached to the inner side surface of the three sides (X1, Y1 and Y2) of the  
5      aforementioned frame 1 may be either of a microprism type or of a glass bead type. For ease of handling, the tape-like form is used as the retroreflector in the aforementioned example. Instead, a coating having a  
10     retroreflective property and the like may be applied to the inner side surface of the aforementioned three sides (X1, Y1 and Y2).

The detection of the touch position T of the writing implement P using the desk notepad device according to  
15     the aforementioned second embodiment is done by the following procedure. First, as shown in FIG. 1, the optical sensor S2 (the storage device) including the storage means M serving also as the controller is removably placed on a paper sheet W so as to surround at least part  
20     of the paper sheet W. Next, for calibration, while the LEDs 3 of the aforementioned respective camera modules C1 and C2 are caused to emit light beams, the intensity of light beams (retroreflected light beams) traveling back to the image sensors 5 of the respective camera  
25     modules C1 and C2 is measured when the light beams are

emitted and when the light beams are not emitted, and threshold values for the detection and non-detection of an object based on the interception of light beams are determined for each of the camera modules C1 and C2, and  
5 are stored in the form of a table and the like in the aforementioned storage means M.

Next, while the storage means M serving also as the aforementioned controller causes the aforementioned LEDs 3 to emit light beams, the tip of the writing implement  
10 P is brought down onto part of the paper sheet W revealed within the frame of this optical sensor S2. Then, as shown in FIG. 3(a), some of the crossing light beams traveling within the aforementioned frame are intercepted by the tip of the writing implement P. Such an intercepted  
15 location is sensed by corresponding light-receiving elements in the aforementioned camera modules C1 and C2. Using a computation device and the like (not shown), the intercepted (light-intercepted) position sensed by the storage means M serving also as the aforementioned  
20 controller is determined by the triangulation method, and the coordinate positions (x and y axes; with reference to the "touch position T" in FIG. 3(a)) of the tip of the aforementioned writing implement P within the frame are specified. The coordinates are stored in the storage  
25 means M.

Then, when a user moves the aforementioned writing implement W to write a note and the like, the path (written information such as the note and the like) of the tip of the aforementioned writing implement P in accordance with the movement is detected and computed, and digital data (electronic data) about the path is stored in the aforementioned storage means M. That is, at the same time that the user writes a note and the like on part of the paper sheet W revealed within the frame of the optical sensor S2 with the writing implement P, the information such as the note and the like is recorded in a memory and the like in the storage means M serving also as the aforementioned controller.

The desk notepad device according to the second embodiment as mentioned above automatically converts the movement path of a writing implement into electronic form by merely writing a note and the like directly on the paper sheet placed within the frame with the writing implement without giving special consideration to the conversion into electronic form. Also, the desk notepad device according to the aforementioned second embodiment may employ general-purpose components, for example, the light-emitting diodes (LEDs) serving as the light-emitting elements (the light source) and the image sensors such as CCD and CMOS image sensors serving as

the light-receiving element array. Combined with a small number of optical components constituting the desk notepad device, this allows the formation of the desk notepad device at low costs.

5           <Operation Check of Desk Notepad Device>

The optical sensor described in each of the aforementioned first and second embodiments was placed on a paper sheet for the desk notepad tool. A note was written on part of the paper sheet revealed within the  
10 frame with a writing implement. Then, each desk notepad device and a notebook-sized personal computer were connected to each other via a wireless LAN so that communication was established therebetween.

Information stored in a memory of the aforementioned desk  
15 notepad device was reproduced using the notebook-sized personal computer. The result was that both the desk notepad device according to the aforementioned first embodiment and the desk notepad device according to the second embodiment were able to cause a note identical  
20 with that written on the aforementioned paper sheet to appear on a display of the aforementioned notebook-sized personal computer.

Although a specific form of embodiment of the instant invention has been described above and  
25 illustrated in the accompanying drawings in order to be

more clearly understood, the above description is made by way of example and not as a limitation to the scope of the instant invention. It is contemplated that various modifications apparent to one of ordinary skill in the art could be made without departing from the scope of the invention which is to be determined by the following claims.

The desk notepad device according to the present invention is capable of converting information such as a note into electronic form at the same time that the information such as the note is written on a paper sheet revealed within the frame.

## Claims

1. A desk notepad device comprising:

a desk notepad tool capable of having a paper sheet  
filed therein, the paper sheet capable of being written  
5 upon by a writing implement;

a frame-shaped optical sensor surrounding at least  
part of the paper sheet, the optical sensor including  
a rectangular frame, and at least one pair of  
light-emitting and light-receiving elements mounted to  
10 the rectangular frame, the optical sensor sensing the  
interception of light beams traveling from the  
light-emitting element to the light-receiving element  
which is caused in association with the writing implement  
within the frame to thereby output information about the  
15 position of the writing implement within the frame; and

a storage means for storing therein a movement path  
of a tip of the writing implement as electronic data when  
a writing operation is performed on part of the paper  
sheet revealed within the frame of the optical sensor  
20 with the writing implement.

2. The desk notepad device according to claim 1,

wherein the frame of the frame-shaped optical  
sensor includes first and second sections opposed to each  
other in the form of the frame;

25 wherein light-emitting elements are arranged in



the first section and light-receiving elements are arranged in the second section;

wherein the light-emitting elements and the light-receiving elements are positioned to face an interior of the frame; and

wherein light beams emitted from the light-emitting elements toward the light-receiving elements produce a lattice of vertical and horizontal light beams crossing each other within the frame.

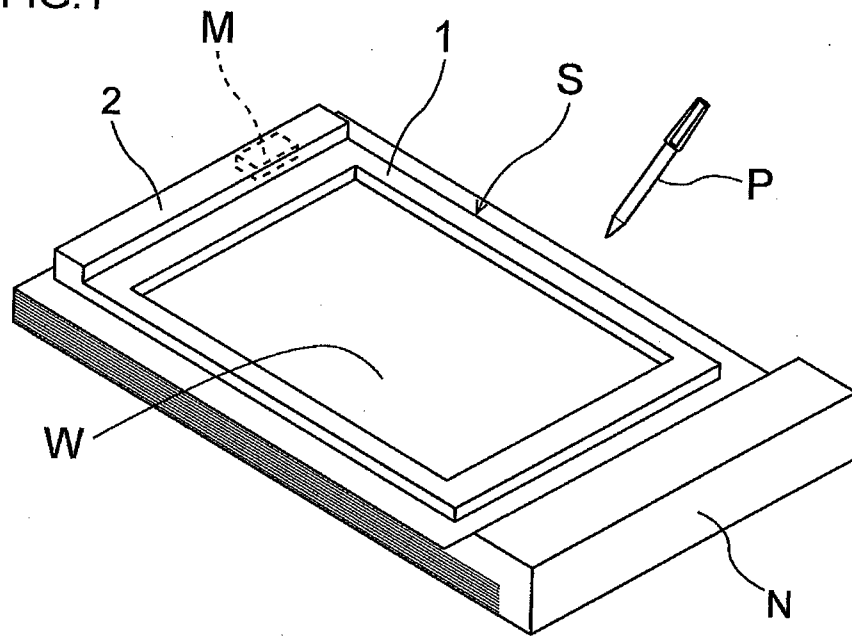
3. The desk notepad device according to claim 1, wherein modules each including a light-receiving element array composed of a plurality of the light-receiving elements and the light-emitting element in a vertically stacked relation are disposed on two corners, respectively, on opposite ends of one side among the four sides of the frame of the frame-shaped optical sensor;

wherein a tape-like retroreflector is provided on the inner side surface of three sides other than the one side lying between the modules; and

wherein light beams emitted from the light-emitting element of one of the modules are reflected from the retroreflector to travel back into the light-receiving element array of the one module.

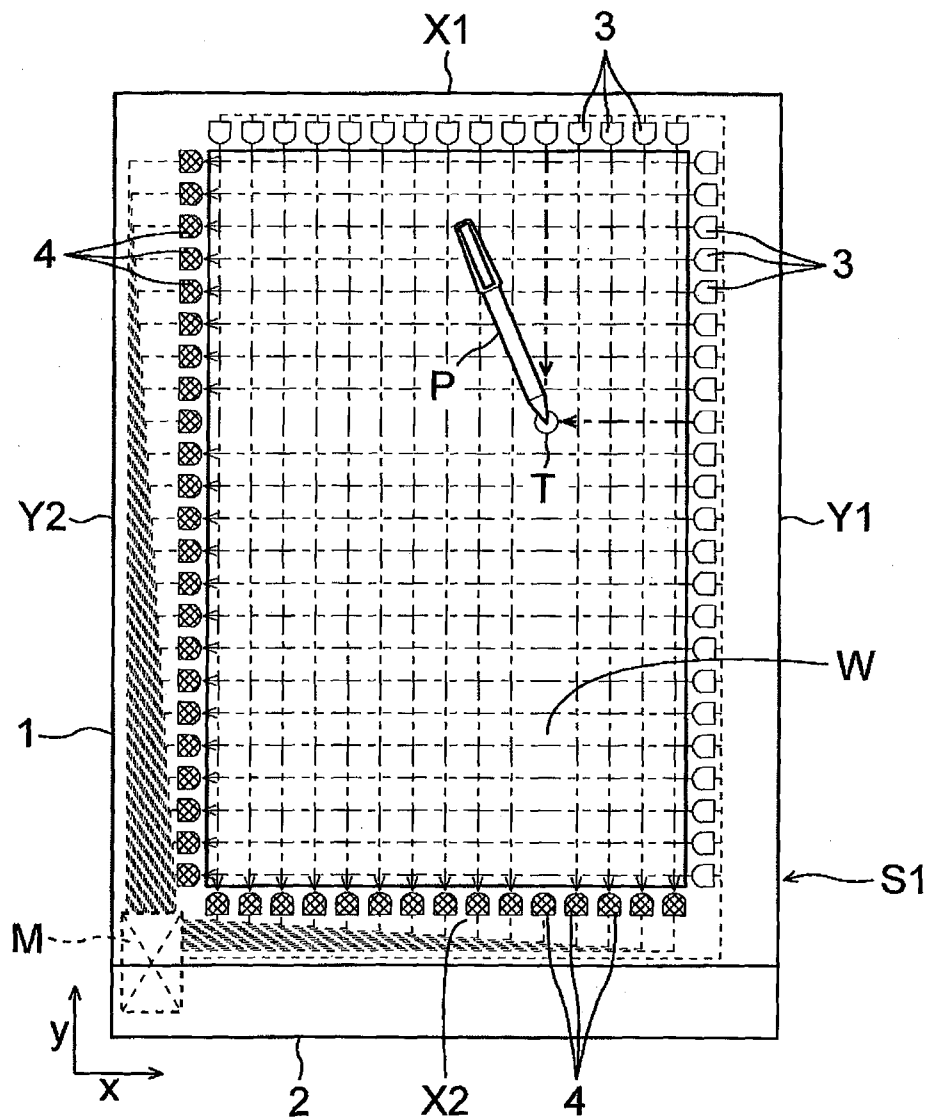
1/3

FIG.1



2/3

FIG.2





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/056612

## A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. G06F3/042 (2006.01) i

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)

Int.Cl. G06F3/042

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

Published examined utility model applications of Japan 1922-1996  
 Published unexamined utility model applications of Japan 1971-2012  
 Registered utility model specifications of Japan 1996-2012  
 Published registered utility model applications of Japan 1994-2012

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

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5509087 A (Casio Computer Co., Ltd.) 1996.04.16,	1-2
Y	column 2, line 45 - column 3, line 43, FIG 1,2 & JP 4-274510 A	3
Y	US 6362468 B1 (Saeilo Japan, Inc.) 2002.03.26, column 7, line 63 - column 8, line 22, fig 7 & JP 2000-353048 A & EP 1059605 A2 & KR 10-2001-0014970 A & CN 1277349 A	3
A	JP 2002-312478 A (Ricoh Co., Ltd.) 2002.10.25, Fig 17 (No Family)	1-3

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family 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 application or patent 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

16.04.2012

Date of mailing of the international search report

01.05.2012

Name and mailing address of the ISA/JP

**Japan Patent Office**

3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan

Authorized officer

DOI Hitoshi

Telephone No. +81-3-3581-1101 Ext. 3521

5E 9371