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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/260,879	11/23/2021	RE48830	093265-0063	3220

20277 7590 11/03/2021

MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING
500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

MAXELL, LTD., Kyoto, JAPAN, Assignee (with 37 CFR 1.172 Interest);

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

20277 7590 07/08/2021
MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING
500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/260,879	01/29/2019	Masaaki YAMADA	093265-0063	3220

TITLE OF INVENTION: INFORMATION PROCESSING APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	10/08/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
NASSER, ROBERT L	3992	345-173000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 McDermott Will & Emery LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE OR COUNTRY)
MAXELL, LTD.	KYOTO, JAPAN

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-0417

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Tomoki Tanida/ Date October 8, 2021

Typed or printed name Tomoki Tanida Registration No. 60453

Samsung - Exhibit 1005 - Page 2

Docket No.: 093265-0063
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:	:	Customer Number: 20277
Masaaki YAMADA	:	Confirmation Number: 3220
Application No.: 16/260,879	:	Group Art Unit: 3992
Filed: January 29, 2019	:	Allowed: July 8, 2021
For: INFORMATION PROCESSING APPARATUS	:	Examiner: R. L. Nasser

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE UNDER 37 C.F.R. § 1.104(e)

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

Applicant thanks the Examiner for the Notices of Allowances and statement of Reasons for Allowance mailed on July 8, 2021 and November 23, 2020, indicating that claims 1-5 are allowed. Without withdrawing any of the allowed claims from issue, Applicant submits these comments.

The Examiner made characterizations and assertions about the claims and the related prior art in the statement of Reasons for Allowance. Although Applicant agrees with the Examiner's ultimate conclusions that the claims are patentable because the prior art does not teach or suggest the claimed features set forth in the claims, Applicant does not necessarily agree with each or every characterization and assertion contained in the Examiner's statement.

Furthermore, it is understood that the Examiner's characterizations were for purposes of referring to the prior art, and do not in any way imply that the claims are limited by words not actually present in the claims. Therefore, unless expressly noted otherwise, Applicant declines to subscribe to any statement or characterization contained in the Notice of Allowance and its accompanying Reasons for Allowance.

Further, during the reissue proceeding, the claims of the application were subject to various rejections. See e.g., Non-Final Office Action, dated January 22, 2020 and Final Office Action August 5, 2020. For example, then pending claims 8-34 were rejected under 35 USC § 112 and for impermissible broadening under 35 USC § 251 as the reissue application was filed two years after the original issue date. As Applicant stated in its previous responses, Applicant's cancellation of claims 8-34 and silence as to certain rejections should not be taken as an acquiesce to each of the rejections or . Indeed, Applicant asserts that new claims 8-34 were supported by the specification but Applicant did not specifically traverse these rejections under 35 USC § 112 because the cancelation of claims 8-34 to overcome the rejection under 35 USC § 251 rendered the remaining rejections moot. Further, Applicant canceled claims 8-34 to expedite allowance of claims 1-7 and to overcome the alleged impermissible broadening, not because Applicant agreed with the Examiner's rejections under 35 USC § 112 and not because Applicant agreed to disclaim claim scope of claims 8-34 during prosecution.

The Examiner is thanked for his time and patience and Applicant agrees that the claims are patentable over the cited references.

Please charge any additional required fees, charge any underpayments, or credit any overpayment, to Deposit Account No. 50-0417, under Order No. 093265-0063 from which the undersigned is authorized to draw.

Respectfully submitted,

MCDERMOTT WILL & EMERY LLP

/Tomoki Tanida/

Tomoki Tanida
Registration No. 60,453

Please recognize our Customer No. 20277 as our correspondence address.

The McDermott Building
500 North Capitol Street, NW
Washington, DC 20001-1531
Phone: (202) 756-8196 TT:mb
Facsimile: (202) 756-8087
Date: October 8, 2021

Electronic Patent Application Fee Transmittal

Application Number:	16260879
Filing Date:	29-Jan-2019
Title of Invention:	INFORMATION PROCESSING APPARATUS
First Named Inventor/Applicant Name:	Masaaki YAMADA
Filer:	Tomoki Tanida/Monique Blakey
Attorney Docket Number:	093265-0063

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
REISSUE ISSUE FEE	1511	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1200**

Electronic Acknowledgement Receipt

EFS ID:	43989954
Application Number:	16260879
International Application Number:	
Confirmation Number:	3220
Title of Invention:	INFORMATION PROCESSING APPARATUS
First Named Inventor/Applicant Name:	Masaaki YAMADA
Customer Number:	20277
Filer:	Tomoki Tanida/Monique Blakey
Filer Authorized By:	Tomoki Tanida
Attorney Docket Number:	093265-0063
Receipt Date:	08-OCT-2021
Filing Date:	29-JAN-2019
Time Stamp:	17:44:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1200
RAM confirmation Number	E202108H44292160
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	issue_fee.pdf	381704 6652682210fd8d0be31c5c010e76472d67d85c6e	no	1
Warnings:					
Information:					
2	Post Allowance Communication - Incoming	comments.pdf	27687 777ffe2e978f3e31e19622d0694e21a8b20ea594	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	37922 4092419b5ccf171b75a4ddbc83cfb5f2e1bf9c91	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	447313		

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.

New Applications Under 35 U.S.C. 111

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

National Stage of an International Application under 35 U.S.C. 371

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

New International Application Filed with the USPTO as a Receiving Office

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

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NOTICE OF ALLOWANCE AND FEE(S) DUE

20277 7590 07/08/2021

MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING
500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

EXAMINER	
NASSER, ROBERT L	
ART UNIT	PAPER NUMBER
3992	

DATE MAILED: 07/08/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/260,879	01/29/2019	Masaaki YAMADA	093265-0063	3220

TITLE OF INVENTION: INFORMATION PROCESSING APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	10/08/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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

By fax, send to: (571)-273-2885

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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

20277 7590 07/08/2021
MCDERMOTT WILL & EMERY LLP
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500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/260,879	01/29/2019	Masaaki YAMADA	093265-0063	3220

TITLE OF INVENTION: INFORMATION PROCESSING APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	10/08/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
NASSER, ROBERT L	3992	345-173000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

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NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Samsung - Exhibit 1005 - Page 10

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/260,879	01/29/2019	Masaaki YAMADA	093265-0063	3220

20277 7590 07/08/2021

MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING
500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

EXAMINER	
NASSER, ROBERT L	
ART UNIT	PAPER NUMBER
3992	

DATE MAILED: 07/08/2021

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

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Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. 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.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/260,879	Applicant(s) YAMADA, Masaaki	
	Examiner ROBERT L NASSER	Art Unit 3992	AIA (FITF) Status No

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to the RCE filed 2/22/2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-5 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   a) ☑ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☑ Certified copies of the priority documents have been received in Application No. 13366983 .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 2/22/2021.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/ROBERT L NASSER/
Primary Examiner, Art Unit 3992

DETAILED ACTION

I. ACKNOWLEDGEMENTS

This Office Action addresses U.S. Application No. 16/260,879 (the "879 Application" or "instant application"). Based upon a review of the instant application, the actual filing date of the instant application is December 11, 2017. Because the instant application was on or after September 16, 2012, the statutory provisions of the America Invents Act ("AIA") will govern this proceeding.

The instant application is a reissue application US Patent No. 8,654,093, ("'093 Patent"), which was filed as US Application 13/366983 ("the '983 Application"), entitled "INFORMATION PROCESSING APPARATUS."

This office action is being issued following Applicant's response of 2/22/2021, which included: 1) a request for RCE and 2) an IDS.

Based upon Applicant's statements as set forth in the instant application and after the Examiner's independent review of the '093 patent itself and its prosecution history, the Examiner finds that he cannot locate any ongoing proceeding before the Office or current ongoing litigation involving the '093 patent. Also based upon the Examiner's independent review of the '093 patent itself and the prosecution history, the Examiner cannot locate any previous reexaminations, supplemental examinations, or certificates of correction.

II. CLAIM STATUS

The '093 Patent issued with claims 1-7 ("Patented Claims"). The preliminary amendment filed with this reissue application adds claims 8-33. The preliminary amendment of 4/8/2019 adds claim 34. The amendment of 7/22/2020 amends claims 1 and 2 and cancels claims 6-34.

The Amendment of 11/5/2020 amends claim 1. As of the date of this Office Action, the status of the claims is:

a. Claims 1-5 ("Pending Claims").

b. Claims 1-5 are treated on the merits below ("Examined Claims")

III. AMENDMENTS OF 11/5/2020

The amendment to the filed on 11/5/20207/22/2020 have been entered and considered.

I

IV. PRIORITY CLAIMS

Based upon a review of the instant application and '093 patent, the Examiner finds that the '093 patent does not claim any domestic priority.

Based upon a review of the '093 Patent itself, the Examiner finds that Applicant is claiming foreign priority under 35 USC § 119(a) to Japanese document 2011-025576, filed February 9, 2011.

Because the effective filing date of the instant application is *not* on or after March 16, 2013, the AIA First Inventor to File ("AIA-FITF") provisions do *not* apply. Instead, the earlier 'First to Invent' provisions apply.

V. REISSUE DECLARATION

The reissue declaration filed 7/22/2020 is approved.

VI. ALLOWABLE SUBJECT MATTER

Claims 1-5 are allowable.

Claims 1-5 define over the art in that none of the art associates a numeral password with the first information, where the first information comprises first input information corresponding to a pad of the finger and second input information corresponding to a second portion of a finger, as claimed. The combination used in the last office action, Kuncl and Townsend, distinguished between the finger touch and a palm or side of hand touch, but does not have the reference identification information being based on a first portion of a finger, the pad, and a second portion of the finger. In addition, while Ghassabian does have reference information corresponding to multiple finger portions, the device does not associate a numeral password with the first information, corresponding to first and second portions of the finger

VII. CONCLUSION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT L NASSER whose telephone number is (571)272-4731. The examiner can normally be reached on M-F 8-6.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexander Kosowski can be reached on (571) 272-3744. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/ROBERT L NASSER/
Primary Examiner, Art Unit 3992

Conferees:
/JOSHUA D CAMPBELL/
Primary Examiner, Art Unit 3992

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/260,879	YAMADA, Masaaki
	Examiner	**Art Unit**
	ROBERT L NASSER	3992

CPC						
Symbol					**Type**	**Version**
G06F	/	1	/	1626	F	2013-01-01
G06F	/	3	/	0412	I	2013-01-01
G06F	/	3	/	04842	I	2013-01-01
G06F	/	3	/	0488	I	2013-01-01
G06F	/	21	/	31	I	2013-01-01
G06F	/	2221	/	2109	A	2013-01-01
G06F	/	2221	/	2117	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	5	
/ROBERT L NASSER/ Primary Examiner, Art Unit 3992	16 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office — Part of Paper No.: 20210616

Samsung - Exhibit 1005 - Page 18

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/260,879	YAMADA, Masaaki
	Examiner	**Art Unit**
	ROBERT L NASSER	3992

INTERNATIONAL CLASSIFICATION				
CLAIMED				
G06F	/	3	/	041
G09G	/	5	/	10

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	5	
/ROBERT L NASSER/ Primary Examiner, Art Unit 3992	16 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office — Part of Paper No.: 20210616

Samsung - Exhibit 1005 - Page 19

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/260,879	YAMADA, Masaaki
	Examiner	**Art Unit**
	ROBERT L NASSER	3992

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1														
2	2														
3	3														
4	4														
5	5														
6	6														
7	7														

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	5	
/ROBERT L NASSER/ Primary Examiner, Art Unit 3992	16 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office

Part of Paper No.: 20210616

Samsung - Exhibit 1005 - Page 20

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/260,879	YAMADA, Masaaki
	Examiner	Art Unit
	ROBERT L NASSER	3992

CPC - Searched*		
Symbol	**Date**	**Examiner**
G06F 3/041, 21/31	11/10/2020	nasser
G09G 5/10	11/10/2020	nasser
G06F 3/041, 21/31	06/16/2021	nasser
G09G 5/10	06/16/2021	nasser

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
east search attached	01/09/2020	nasser
east search	11/10/2020	nasser
search attached	06/16/2021	nasser

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/260,879	YAMADA, Masaaki
	Examiner	Art Unit
	ROBERT L NASSER	3992

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
G06F	3/041, 21/31	11/10/2020	NASSER
G09G	5/10	11/10/2020	NASSER
G06F	3/041, 21/31	06/16/2021	nasser
G09G	5/10	06/16/2021	nasser

United States Patent And Trademark Office	**Application No.** 16/260,879	**Art Unit** 3992
Reissue Terminal Disclaimer Review Form	**Examiner** ROBERT L NASSER	**AIA Status** No

Original Patent Number of Patent to be Reissued is: 8654093	**The Maintenance fee status is:** ◉ up to date ○ not up to date (Consult with SPRS)

Is there a terminal disclaimer filed and accepted during the prosecution of (i) the current reissue application, (ii) the underlying patent, and/or (iii) reexamination proceeding(s) of the underlying patent?

◉ NO
○ YES (Complete the rest of the form)

The reissue patent is subject to Terminal Disclaimer(s) that was/were:

☐ filed and accepted (DISQ or DISQ.E.FILE) during the prosecution of the current reissue application. (Enter terminal disclaimer(s) filing date(s) below).

1. _____ 2. _____ 3. _____

The underlying patent of the current reissue application is subject to Terminal DIsclaimer(s) that was/were:

☐ accepted (DISQ or DISQ.E.FILE) and of record in the prosecution of the underlying patent and/or reexamination procceeding(s) of the underlying patent. (Enter application/control no(s) and terminal disclaimer(s) filing date(s) below).

1. _____ _____ 2. _____ _____ 3. _____ _____

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16260879
Filing Date	2019-01-29
First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7593000	B1	2009-09-22	Chin	
	2	6954862	B2	2005-10-11	Serpa	
	3	7605804	B2	2009-10-20	Wilson	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	10-2010-0003572	KR	A	2010-01-11	Irevo, Inc	w/English translation	☒

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.L.N./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16260879
	Filing Date	2019-01-29
	First Named Inventor	Masaaki YAMADA
	Art Unit	3992
	Examiner Name	R. L. Nasser
	Attorney Docket Number	093265-0063

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/ROBERT L NASSER/	Date Considered	06/16/2021

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.L.N./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16260879
Filing Date	2019-01-29
First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement 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 the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Tomoki Tanida/	Date (YYYY-MM-DD)	2021-02-22
Name/Print	Tomoki Tanida	Registration Number	60,453

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.L.N./

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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

Bibliographic Data

Application No: 16/260,879

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /ROBERT L NASSER/ [ ]

Examiner's Signature | Initials

Title: INFORMATION PROCESSING APPARATUS

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/29/2019	345	3992	093265-0063
RULE			

APPLICANTS

MAXELL, LTD., Kyoto, JAPAN

INVENTORS

Masaaki YAMADA, Yokohama, JAPAN

CONTINUING DATA

This application is a REI of 13366983 02/06/2012 PAT 8654093

FOREIGN APPLICATIONS

JAPAN JP2011-025576 02/09/2011

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/06/2019

STATE OR COUNTRY

JAPAN

ADDRESS

MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING
500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001
UNITED STATES

FILING FEE RECEIVED

$5,120

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	"8654093".pn.	(USPAT)	OR	OFF	OFF	2019/12/09 03:52 PM
L2	1	"8982086".pn.	(USPAT)	OR	OFF	OFF	2019/12/09 03:54 PM
L3	0	"8654093".pn. and fingerprint	(USPAT)	OR	OFF	OFF	2019/12/10 01:16 PM
L4	0	"8654093".pn. and finger adj print	(USPAT)	OR	OFF	OFF	2019/12/10 01:16 PM
L5	0	"8654093".pn. and finger adj print	(USPAT)	OR	ON	ON	2019/12/10 01:17 PM
L6	0	"8654093".pn. and fingerprint	(USPAT)	OR	ON	ON	2019/12/10 01:17 PM
L7	1	"8654093".pn. and reference	(USPAT)	OR	ON	ON	2019/12/10 01:18 PM
L8	0	"8654093".pn. and threshhold	(USPAT)	OR	ON	ON	2019/12/10 01:20 PM
L9	1	"8654093".pn. and threshold	(USPAT)	OR	ON	ON	2019/12/10 01:20 PM
L10	0	"20050162407"	(USPAT)	OR	ON	ON	2019/12/10 05:10 PM
L11	1	"20050162407"	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/10 05:10 PM
L12	25	touch adj (screen or panel) same ((fingertip or (finger adj tip)) with (fingerpad or (finger adj pad)))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/10 05:12 PM
L13	108	("2007/0097096").URPN.	(USPAT)	OR	OFF	OFF	2019/12/11 12:23 PM
L14	3	L13 and ((fingertip or (finger adj tip)) and (fingerpad or (finger adj pad)))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 12:29 PM
L15	0	("8654093").URPN.	(USPAT)	OR	OFF	OFF	2019/12/11 12:32 PM
L16	4	touch adj (screen or panel) and (password same ((fingertip or (finger adj tip)) with (fingerpad or (finger adj pad))))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 12:34 PM
L17	4	touch adj (screen or panel) and (password same ((fingertip or (finger adj tip)) same (fingerpad or (finger adj pad))))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 12:35 PM

L18	4	(password same ((fingertip or (finger adj tip)) same (fingerpad or (finger adj pad))))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 12:35 PM
L19	0	(pid same ((fingertip or (finger adj tip)) same (fingerpad or (finger adj pad))))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 12:35 PM
L20	1	(code same ((fingertip or (finger adj tip)) same (fingerpad or (finger adj pad))))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 12:36 PM
L21	2	("20050162407" | "5844547").PN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2019/12/11 12:36 PM
L22	1	"8654093".pn. and range	(USPAT)	OR	ON	ON	2019/12/11 01:29 PM
L23	687910	touch adj (screen or panel)	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 02:32 PM
L24	12567	L23 and (contact adj area)	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/11 02:32 PM
L25	809	((fingertip or (finger adj tip)) same (fingerpad or (finger adj pad)))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/16 06:17 PM
L26	173	touch adj (screen or panel) and ((fingertip or (finger adj tip)) with (fingerpad or (finger adj pad)))	(US-PGPUB; USPAT)	OR	ON	ON	2019/12/16 06:18 PM
L27	0	unlock with screen with contact adj area with threshold	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 11:34 AM
L28	0	unlock$3 with screen with contact adj area with threshold	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 11:34 AM
L29	29	unlock$3 with screen with area with threshold	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 11:35 AM
L30	14348	unlock with screen wqith id adj code	(USPAT)	OR	OFF	OFF	2020/01/06 12:57 PM
L31	0	unlock with screen w\ith id adj code	(USPAT)	OR	OFF	OFF	2020/01/06 12:58 PM
L32	0	unlock with screen with id adj code	(USPAT)	OR	OFF	OFF	2020/01/06 12:58 PM
L34	350	unlock with screen with passcode	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/06 12:58 PM
L35	0	tocu adj (screen or panel) and ((two adj step) with authentication)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/06 01:04 PM
L36	261	touch adj (screen or panel) and ((two adj step) with authentication)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/06 01:04 PM

L37	2	"20100253471" and authentication	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/06 01:08 PM
L38	279	unlock with screen with passcode and touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/06 01:11 PM
L39	0	unlock with screen with passcode and touch	(EPO)	OR	OFF	OFF	2020/01/06 01:20 PM
L40	1	unlock with touch with area	(EPO)	OR	OFF	OFF	2020/01/06 01:20 PM
L41	15	unlock with area	(EPO)	OR	OFF	OFF	2020/01/06 01:21 PM
L42	1	"2148497"	(EPO)	OR	OFF	OFF	2020/01/06 01:21 PM
L43	0	"20100020035" and password	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:23 PM
L44	2	"20100020035" and code	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:23 PM
L45	2	"20100020035" and pass$4	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:23 PM
L46	693596	touch adj (screen or panel)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:26 PM
L47	3036	L46 and accident$5 with area	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:27 PM
L48	48	L46 and detect with accident$5 with area	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:27 PM
L49	149	L46 and detect$3 with accident$5 with area	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:27 PM
L50	28	L46 and detect$3 with accident$5 with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:31 PM
L51	7072	L46 and detect$3 with finger with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:34 PM
L52	53268	L46 and detect$3 with finger or heel with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:35 PM
L53	5	L46 and detect$3 with finger with heel with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:35 PM
L54	7	L46 and detect$3 with glanc$3 with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:36 PM
L55	29	L46 and detect$3 with inadvertent with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:36 PM
L56	6	("20040046744" | "20080042994" | "20110050576" | "20110154390" | "20110221684").PN. OR ("8248385").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/01/06 01:38 PM
L57	5	L56 and area	(US-PGPUB; USPAT;	OR	OFF	OFF	2020/01/06

			USOCR)				01:38 PM
L58	4	L46 and identif$6 with (inadvertent$3 or accident$5) with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:41 PM
L59	1	"10416876".pn. and accidental	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:42 PM
L60	1	"10416876".pn. and ignor$5	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:43 PM
L61	1	"10416876".pn. and area	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 01:43 PM
L62	463	L46 and (inadvertent$3 or accident$5) with area with touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:10 PM
L63	1536433	L62 nor L55	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:10 PM
L64	434	L62 not L55	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:10 PM
L65	350	L34 not L48	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:11 PM
L66	425	L64 not L48	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:11 PM
L67	2	"20070152976" and area	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:15 PM
L68	171901	touch adj (screen or panel) and mobile adj device	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:57 PM
L69	1124	L68 and (keypad with (password or passcode or (pass adj word) or (pass adj code)))	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 02:59 PM
L70	0	"201200075098" and touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 03:38 PM
L71	2	"20120075098" and touch	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 03:38 PM
L72	1	"20050253814"	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 04:06 PM
L73	0	tocuh adj (screen or paneL) AND (PASSCODE WITH REGOSTRATION)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 04:12 PM
L74	0	tocuh adj (screen or paneL) AND (PASSCODE WITH REGiSTRATION)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 04:12 PM
L75	136	touch adj (screen or paneL) AND (PASSCODE WITH REGiSTRATION)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/06 04:13 PM
L76	1	"8718874".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 09:29 AM

L77	1	"4352960".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 09:52 AM
L78	725227	smartphone or smart adj phone	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 09:59 AM
L79	532	L78 and ((passcode or (pass adj code)) with register$5)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 10:00 AM
L80	323	((cellular adj (telephone or phone)) or cellphone) and ((passcode or (pass adj code)) with register$5)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:47 PM
L81	7400	((cellular adj (telephone or phone)) or cellphone) and ((password or (pass adj word)) with register$5)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:47 PM
L82	4294	((cellular adj (telephone or phone)) or cellphone) and ((password or (pass adj word)) near7 register$5)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:47 PM
L83	725227	smartphone or smart adj phone	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:48 PM
L84	5628	L83 and ((password or (pass adj word)) near7 register$5)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:48 PM
L85	3565	L83 and ((password or (pass adj word)) near7 registration)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:52 PM
L86	4464287	"20070238449" ands register$4	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:57 PM
L87	1	"20070238449" and register$4	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 01:57 PM
L88	1	"20070238449" and register$4 same password	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 02:01 PM
L89	369	L83 and ((password or (pass adj word)) with (initializ$ or (set adj up))) with (stor$3)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 02:03 PM
L90	1	"20100180336"	(USPAT)	OR	OFF	OFF	2020/01/07 02:28 PM
L91	2	"20100180336"	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/07 02:28 PM
L92	1942720	"20050253814" and touch panel	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:40 PM
L93	0	"20050253814" and touch panel	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 04:40 PM
L94	1	"20050253814" and touch screen	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 04:40 PM
L95	1	"20050253814" and	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07

		finger					04:41 PM
L96	0	"20050253814" and finger and password	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 04:42 PM
L97	0	"20050253814" and finger and pass word	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 04:42 PM
L98	0	"20050253814" and finger and pass code	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 04:42 PM
L99	0	"20050253814" and finger and passcode	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 04:42 PM
L100	134	unlock with screen with passcode	(USPAT)	OR	OFF	OFF	2020/01/07 04:52 PM
L101	1	"8654093".pn.	(USPAT)	OR	OFF	OFF	2020/01/07 04:52 PM
L102	0	L101 and ghassabian.in.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:52 PM
L103	25	touch adj (screen or panel) same ((fingertip or (finger adj tip)) with (fingerpad or (finger adj pad)))	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L104	0	L103 and ghassabian.in.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L105	0	L104 and ghassabian.in.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L106	4	touch adj (screen or panel) and (password same ((fingertip or (finger adj tip)) with (fingerpad or (finger adj pad))))	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L107	0	L106 and ghassabian.in.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L108	4	touch adj (screen or panel) and (password same ((fingertip or (finger adj tip)) same (fingerpad or (finger adj pad))))	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L109	0	L108 and ghassabian.in.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L110	0	L109 and ghassabian.in.	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/07 04:53 PM
L111	1	"20050253814" and (touch or contact)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 04:58 PM
L112	1	"20050253814" and (processor or controller)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:00 PM
L113	1	"20050253814" and (microprocessor or controller)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:04 PM
L114	0	"20050253814" and (microprocessor)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:04 PM

L115	1	"20050253814" and (computer)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:05 PM
L116	1	"20050253814" and tip same flat	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:10 PM
L117	0	"8654093".pn. and finger same edge	(USPAT)	OR	OFF	OFF	2020/01/07 05:22 PM
L118	0	"8654093".pn. and edge	(USPAT)	OR	OFF	OFF	2020/01/07 05:22 PM
L119	2	"20100180336" and security	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/07 05:23 PM
L120	2	"20100180336" and unlock	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/01/07 05:23 PM
L121	0	"20050253814" and unlock$3	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:24 PM
L122	1	"20050253814" and security	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:24 PM
L123	1	"20050253814" and lock$3	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/07 05:24 PM
L124	3503	calibrat$4 with display with instructions	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:11 AM
L125	2256	L124 and (touch adj (screen or panel))	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:21 AM
L126	84	L124 and (touch adj (screen or panel)) and (calibrat$4 same finger)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:22 AM
L127	1321	calibrat$4 with (display near10 instructions)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:22 AM
L128	55	L127 and (touch adj (screen or panel)) and (calibrat$4 same finger)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:23 AM
L129	2	"20070195067" and instructions	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:25 AM
L130	61	calibrat$4 with (display near10 instructions) and (calibrat$4 with (touch adj (screen or panel)))	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:29 AM
L131	1	"8654093".pn. and shaded	(USPAT)	OR	OFF	OFF	2020/01/08 10:42 AM
L132	1	"8654093".pn. and (tap$3 or flick$3 or drag$4 or pinch$3)	(USPAT)	OR	OFF	OFF	2020/01/08 10:43 AM
L133	0	"20050253814" and pinch$3	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:46 AM
L134	1	"20050253814" and tap$4	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:46 AM
L135	0	"20050253814" and flick$3	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 10:46 AM
L136	4370	touch adj (screen or panel) and (tap$4 same flick$4 saem drag$4 same pinch$4) same	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 10:47 AM

		finger					
L137	643	touch adj (screen or panel) and (tap$4 same flick$4 same drag$4 same pinch$4) same finger	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 10:47 AM
L138	643	touch adj (screen or panel) and (tap$4 same flick$4 same drag$4 same pinch$4) same finger	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 10:48 AM
L139	589	L138 and (smartphone or phone of telephone or cellphone)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 10:49 AM
L140	643	touch adj (screen or panel) and (tap$4 same flick$4 same drag$4 same pinch$4) same finger and flick$3 and drag$4 and pinch$3 and tap$4	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 11:02 AM
L141	589	L140 and (smartphone or phone of telephone or cellphone)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 11:02 AM
L142	35	L138 and (smartphone or phone of telephone or cellphone) and (mov$3 with icon with drag$4)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 11:14 AM
L143	3804	(smartphone or phone of telephone or cellphone) and (mov$3 with icon with drag$4)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 11:15 AM
L144	1022	(smartphone) and (mov$3 with icon with drag$4)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 11:18 AM
L145	0	"8654093".pn. and sufficient	(USPAT)	OR	ON	ON	2020/01/08 11:27 AM
L146	1	"8654093".pn. and contact	(USPAT)	OR	ON	ON	2020/01/08 11:27 AM
L147	1	"8654093".pn. and range with threshold	(USPAT)	OR	ON	ON	2020/01/08 11:27 AM
L148	274105	touch adj (screen or panel)	(USPAT)	OR	ON	ON	2020/01/08 01:32 PM
L149	992035	touch adj (screen or panel)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 01:33 PM
L150	0	(touch adj (screen or panel)) same capacative adj plates	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 01:34 PM
L151	56	(touch adj (screen or	(US-PGPUB; USPAT;	OR	ON	ON	2020/01/08

		panel)) same capacitive adj plates	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)				01:35 PM
L152	27	(touch adj (screen or panel)) same capacitive adj plates same sensor	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 01:35 PM
L153	495	(touch adj (screen or panel)) and capacitive adj plates same sensor	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 01:36 PM
L154	0	"8654093".pn. and capacitive	(USPAT)	OR	OFF	OFF	2020/01/08 01:44 PM
L155	1	"8654093".pn. and capac$9	(USPAT)	OR	OFF	OFF	2020/01/08 01:45 PM
L156	0	"8654093".pn. and plate	(USPAT)	OR	ON	ON	2020/01/08 01:46 PM
L157	17233	(touch adj (screen or panel)) same sensors same capacitance	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 01:49 PM
L158	4220	(touch adj (screen or panel)) same sensors same capacitance	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/01/08 01:49 PM
L159	166	(touch adj (screen or panel)) same sensors same capacitance same grid	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/01/08 01:55 PM
L160	3596	touch adj (screen or panel) and (sufficient near3 contact)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 03:27 PM
L161	106	touch adj (screen or panel) and (sufficient near3 contact) with (determin$3) with whether	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 03:27 PM
L162	5	L149 and (unlock$ same (finger with tip) same (finger with pad))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/08 03:34 PM
L163	0	ryu.in. and (unlock$3 with contact with area)	(EPO)	OR	ON	ON	2020/01/08 03:39 PM
L164	0	ryu.in. and (unlock$3 with contact with area)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 03:39 PM
L165	998	ryu.in. and (contact with area)	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 03:39 PM
L166	49	L148 and L165	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 03:39 PM
L167	1	"2148497"	(EPO)	OR	ON	ON	2020/01/08 03:40 PM

L168	3	(mobile adj terminal) adj event adj control adj method	(US-PGPUB; USPAT; EPO)	OR	ON	ON	2020/01/08 03:41 PM
L169	3	(mobile adj terminal) adj2 event adj control adj method	(US-PGPUB; USPAT; EPO)	OR	ON	ON	2020/01/08 03:41 PM
L170	2	"20100020035" and area	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/08 03:42 PM
L171	1	"20050253814" and (security)	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 04:13 PM
L172	1	"20050253814" and tip	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/08 04:18 PM
L173	2	"20100020035" and area	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/09 10:21 AM
L174	992877	touch adj (screen or panel)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 10:24 AM
L175	100	L174 and (unlock$ with finger with portion)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 10:24 AM
L176	1	"8654085".pn. and (finger with portion)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 10:30 AM
L177	2	"20100045608" and (finger with portion)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 10:33 AM
L178	2	"20100045608" and unlock$3	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 10:35 AM
L179	11	("20030076306" | "20040204129" | "20040207606" | "20040263488" | "20060044280" | "20060218325" | "20080100586" | "6340979" | "7800592").PN. OR ("8654085").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/01/09 10:38 AM
L180	9	L179 and finger	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/01/09 10:41 AM
L181	1	"20040204129" and (firm and light)	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/01/09 10:44 AM
L182	2	L179 and unlock$3	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/01/09 10:46 AM
L183	2	"20100020035" and unlock$3	(US-PGPUB; USPAT)	OR	ON	ON	2020/01/09 10:51 AM
L184	0	"20050253814" and	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09

		unlock$3					10:51 AM
L185	1	"20050253814" and security	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 10:52 AM
L186	0	"20040204129" and (firm and light) and shad$3	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/01/09 11:00 AM
L187	0	"20100045608" and unlock$3 and shad$4	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 11:01 AM
L188	10	L174 and display with touch with shad$ with circle$4	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 11:05 AM
L189	188	L174 and display with shad$ with circle$4	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 11:07 AM
L190	9	L174 and display with contact adj area with shad$3	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 11:10 AM
L191	136	L174 and display with contact near10 shad$3	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 11:13 AM
L192	92	L174 and display with contact near10 shadow	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 11:14 AM
L193	44	L191 not L192	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/01/09 11:14 AM
L194	2	"20120284297"	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:28 AM
L195	2	"20120289201"	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:30 AM
L196	1	"20120192100"	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:30 AM
L197	1	"20120229406"	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:32 AM
L198	0	"20120229406" and hsape	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:32 AM
L199	1	"20120229406" and shape	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:32 AM
L200	1	"20120229406" and shape with unlock	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:32 AM
L201	1	"20070097096"	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:34 AM
L202	0	"20070097096" and unlock$3	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:35 AM

L203	111	blow.in.	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:46 AM
L204	8	blow.in. and touch	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/01/09 11:46 AM
L205	2	"20120075098"	(US-PGPUB; USPAT)	OR	ON	ON	2020/07/27 03:57 PM
L206	1	"20070152976"	(USPAT)	OR	OFF	OFF	2020/07/27 04:38 PM
L207	2	"20070152976"	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/07/27 04:38 PM
L208	2	"20070152976" and accident$3	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/07/27 04:50 PM
L209	2	"20070152976" and unintentional	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/07/27 04:51 PM
L210	2	"20060236013"	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/07/27 05:38 PM
L211	2	"20080201548"	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/07/27 05:39 PM
L212	41	("0000002"|"0000008"|"0000084"|"0000088"|"0000200"|"0000201"|"0000802"|"0006509"|"0008059"|"0008605"|"0020070"|"0020120"|"0693722"|"2000139192"|"20020181747"|"20040000008"|"20040252867"|"20060075256"|"20080158170"|"20080267465"|"20100000001"|"20100020020"|"20100070931"|"20100180336"|"20110175804"|"20110310024"|"20120000002"|"20120000007"|"20120000274"|"20120084734"|"20120299860"|"6795569"|"6970584"|"7289824"|"7697729"|"7725511"|"7877707"|"8224392"|"8654093"|"8683582"|"8860689"|"9223948").PN.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:32 PM
L213	6	L212 and (finger adj (pad or tip))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:33 PM
L214	19	"6509847".pn. or "6795569".pn. or "6973226".pn. or "6970584".pn. or "7289824".pn. or "7697729".pn. or "7725511".pn. or "7877707".pn. or "8023700".pn. or "8059872".pn. or	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:41 PM

		"8224392".pn. or "8498406".pn. "8605959".pn. or "8683582".pn. or "8745490".pn. or "8860689".pn. or "8878791".pn. or "9223948".pn. or "8654093".pn.					
L215	7	L214 and (finger adj (pad or tip))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:41 PM
L216	3	L215 not L213	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:41 PM
L217	42	"20020163508" "20020181747" "20030139192" "20030152253" "20040085300" "20040252867" "20060075256" "20060284853" "20070014442" "20080049987" "20080069412" "20080158170" "20080267465" "20090046065" "20090083847" "20090165145" "20100020020" 20100Q20035 "20100044121" "20100060571" "20100066701" "20100070931" "20100079380" "20100110228" "20100138914" "20100180336" "20100231356" "20100265185" "20110175804" "20110310024" "20120032979"	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:45 PM
L218	59	"20120075098" or "20120084734" or "20120192100" or "20120200515" or "20120229406" or "20120274662" or "20120285297" or "20120299860" or "20120319977" or "20160034177" or "20100066701" or "20100070931" or "20100079380" or	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:49 PM

		"20100110228" or "20100138914" or "20100180336" or "20100231356" or "20100265185" or "20110175804" or "20110310024" or "20120032979" or "20080049987" or "20080069412" or "20080158170" or "20080267465" or "20090046065" or "20090083847" or "20090165145" or "20100020020" or "20100020035" or "20100044121" or "20100060571" or "20020163508" or "20020181747" or "20030139192" or "20030152253" or "20040085300" or "20040252867" or "20060075256" or "20060284853" or "20070014442"					
L219	1	"20020181747"	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:50 PM
L220	1	"20020163508"	(US-PGPUB)	OR	OFF	OFF	2020/12/28 04:52 PM
L221	3	matusis.in.	(US-PGPUB)	OR	OFF	OFF	2020/12/28 04:52 PM
L222	59	"20120075098" or "20120084734" or "20120192100" or "20120200515" or "20120229406" or "20120274662" or "20120285297" or "20120299860" or "20120319977" or "20160034177" or "20100066701" or "20100070931" or "20100079380" or "20100110228" or "20100138914" or "20100180336" or "20100231356" or "20100265185" or "20110175804" or "20110310024" or "20120032979" or "20080049987" or "20080069412" or	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:54 PM

		"20080158170" or "20080267465" or "20090046065" or "20090083847" or "20090165145" or "20100020020" or "20100020035" or "20100044121" or "20100060571" or "20020163508" or "20020181747" or "20030139192" or "20030152253" or "20040085300" or "20040252867" or "20060075256" or "20060284853" or "20070014442"					
L223	11	L222 and finger near (tip or pad)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:54 PM
L224	24	L222 and finger near5 (tip or pad)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 04:54 PM
L225	1	"8498406".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/28 05:09 PM
L226	16	"7593000".pn. OR "6954862".pn. OR "7605804".pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, EA, ES, FR, GB, JP, KR, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/06/11 09:57 AM
L227	3	"7593000".pn. OR "6954862".pn. OR "7605804".pn.	(USPAT)	OR	ON	ON	2021/06/11 09:57 AM
L228	2	L227 AND (fingertip OR fingerpad OR finger ADJ (tip OR pad))	(USPAT)	OR	ON	ON	2021/06/11 10:01 AM
L229	3	"7593000".pn. OR "6954862".pn. OR "7605804".pn.	(USPAT)	OR	ON	ON	2021/06/16 10:47 AM
L230	2	L229 AND (fingertip OR (finger ADJ tip) OR (finger ADJ pad))	(USPAT)	OR	ON	ON	2021/06/16 10:50 AM
L231	41	("0000002" OR "0000008" OR "0000084" OR "0000088" OR "0000200" OR "0000201" OR "0000802" OR "0006509" OR "0008059" OR "0008605" OR "0020070" OR "0020120" OR	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/06/16 10:54 AM

		"0693722" OR "2000139192" OR "20020181747" OR "20040000008" OR "20040252867" OR "20060075256" OR "20080158170" OR "20080267465" OR "20100000001" OR "20100020020" OR "20100070931" OR "20100180336" OR "20110175804" OR "20110310024" OR "20120000002" OR "20120000007" OR "20120000274" OR "20120084734" OR "20120299860" OR "6795569" OR "6970584" OR "7289824" OR "7697729" OR "7725511" OR "7877707" OR "8224392" OR "8654093" OR "8683582" OR "8860689" OR "9223948").pn.					
L232	4	L231 AND ((ingertip OR (finger ADJ tip) OR (finger ADJ pad)))	(USPAT)	OR	ON	ON	2021/06/16 10:54 AM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	37245	g06f3/041.cpc. OR g09g5/10.cpc. OR g06f21/31.cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/06/16 11:01 AM
N2	20595	N1 AND (touch adj5 (screen OR panel OR pad))	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/06/16 11:02 AM
N3	7	N2 AND (fingerpad OR (finger ADJ pad)).clm.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/06/16 11:02 AM
N4	25	N2 AND (fingerpad OR (finger near3 pad)).clm.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/06/16 11:02 AM

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/260,879	01/29/2019	Masaaki YAMADA	093265-0063	3220

20277 7590 03/01/2021

MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING
500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

EXAMINER	
NASSER, ROBERT L	

ART UNIT	PAPER NUMBER
3992	

DATE MAILED: 03/01/2021

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

The request for deferral/suspension of action under 37 CFR 1.103 has been approved.

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	16260879	Filing Date	2019-01-29	Docket Number (if applicable)	093265-0063	Art Unit	3992
First Named Inventor	Masaaki YAMADA			Examiner Name	R. L. Nasser		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☒ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months 3
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 50-0417

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Tomoki Tanida/	Date (YYYY-MM-DD)	2021-02-22
Name	Tomoki Tanida	Registration Number	60453

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16260879
Filing Date	2019-01-29
First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7593000	B1	2009-09-22	Chin	
	2	6954862	B2	2005-10-11	Serpa	
	3	7605804	B2	2009-10-20	Wilson	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	10-2010-0003572	KR	A	2010-01-11	Irevo, Inc	w/English translation	☒

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16260879
Filing Date	2019-01-29
First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16260879
Filing Date	2019-01-29
First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement 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 the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Tomoki Tanida/	Date (YYYY-MM-DD)	2021-02-22
Name/Print	Tomoki Tanida	Registration Number	60,453

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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DECLARATION OF ACCURACY

I, Carl T. Sullivan, declare the following:

1. I am over 18 years of age and competent to make this declaration.
2. I am a qualified Korean to English translator.
3. I have translated the attached document identified as KR20100003572 – Sohn.
4. I affirm that the translated text has been translated and edited to the best of my ability and knowledge to accurately reflect the content, meaning, and style of the original text and constitutes in every respect a correct and true translation of the original document.
5. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

I hereby certify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Dated and signed on October 16, 2020.

(Translator's Signature)

(Translator's Printed Name)

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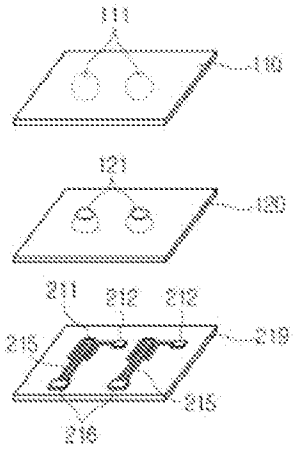
Total number of claims: Total of 12 claims

(54) Multiple input processing apparatus

(57) Abstract

The present invention is to realize an input apparatus capable of various inputs with a single contact operation; it provides a multiple input processing apparatus comprising a user contact unit in which a plurality of contact areas are formed, a touch sensing unit configured to output a first output value when a user's contact pressure relative to at least one of the plurality of contact areas reaches a first threshold amount and output a second output value when a second threshold amount is reached; and a signal processing unit that performs predefined signal processing using the first and second output values.

Representative Drawing– FIG. 2



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Scope of Patent Claims

Claim 1

A multiple input processing apparatus comprising a user contact unit in which a plurality of contact areas are formed,

a touch sensing unit configured to output a first output value when a user's contact pressure relative to at least one of the plurality of contact areas reaches a first threshold amount and output a second output value when a second threshold amount is reached; and

a signal processing unit that performs predefined signal processing using the first and second output values.

Claim 2

The multiple input processing apparatus according to claim 1, wherein the first threshold amount represents a contact of a user's finger on the user contact unit, and the second threshold amount represents a pressing of the user's finger on the user contact unit.

Claim 3

The multiple input processing apparatus according to claim 2, wherein the contact detection unit is equipped with a first detection means for outputting the first output value when the contact is sensed, and a second detection means for outputting the second output value when the pressure is sensed.

Claim 4

The multiple input processing apparatus according to claim 3, wherein the first detection means is a capacitive sensor that senses the capacitance that changes due to the contact of the user's finger, and the second detection means is a mechanical switch operated by the pressing of the user's finger.

Claim 5

The multiple input processing apparatus according to claim 4, wherein the mechanical switch is a dome switch equipped with at least two contact points and the connection between the contacts is interrupted by the pressing.

Claim 6

The multiple input processing apparatus according to claim 5, wherein the contact between the capacitive sensing terminal of the capacitive sensor and the mechanical switch is simultaneously arranged on the PCB layer for each of the plurality of contact areas.

Claim 7

The multiple input processing apparatus according to claim 5 or claim 6, wherein the user contact part comprises and is constituted of a protective layer contacted by a user's finger and a silicon layer having an elastic dome formed thereon for forming a dome switch at a position corresponding to each of the plurality of contact areas.

Claim 8

A multiple input processing apparatus, comprising a user contact unit in which a plurality of contact areas are formed;

a capacitive sensor wherein, when the capacitance or contact time changed by the user's contact with at least one of

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the plurality of contact areas reaches a first threshold amount, a first output value is output, and when a second threshold amount is reached, a second output value is output; and

a signal processing unit that performs predefined signal processing using the first and second output values.

Claim 9

The multiple input processing apparatus according to any one from among claim 1 through claim 6, and claim 8, further comprising a sound generating means for generating a first sound when the signal processing unit outputs the first output value, and for generating a second sound when the signal processing unit outputs the second output value.

Claim 10

The multiple input processing apparatus according to any one from among claim 1 through claim 6, and claim 8, further comprising a vibration generating means for generating a first vibration when the signal processing unit outputs the first output value, and for generating a second vibration when the signal processing unit outputs the second output value.

Claim 11

A multiple input processing method, wherein, as a method for processing a plurality of inputs by a user's finger, the method comprises a step of outputting a first output value when a user's contact pressure relative to at least one of the plurality of contact areas reaches a first threshold amount, and outputting a second output value when a second threshold amount is reached; and a step of performing predefined signal processing using the first and second output values.

Claim 12

The multiple input processing method according to claim 9, wherein the first threshold amount represents the contact of the user's finger, and the second threshold amount represents the pressing by the user's finger.

Specification

Detailed Description of the Invention

Technical Field

<1> The present invention relates to a multiple input processing apparatus, and more particularly to a multiple input processing apparatus capable of simultaneously sensing a user's touch and press.

Background Art

<2> Recently, in electronic apparatuses, instead of buttons for user input, touch pads have become widely applied because of convenience in design and operation. However, the button or touch pad being used has been designed to receive only one input for one button or a finger contact area.

<3> Therefore, in order to input various symbols or numbers, it has been necessary to provide a button or contact area corresponding to each number of the symbols or numbers. In order to solve this problem, methods such as changing an input symbol or number by pressing or touching a button or a contact area several times, of installing a separate switch key, etc. and of pressing or contacting the switch key at the same time, are being used.

<4> However, these input methods are complex and inconvenient because they require pressing or contacting two or more times to perform a desired input.

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<5> In addition, when desiring to enter a password that requires security, such as an ATM apparatus or a digital door lock, if someone sees the action of using a button or a touch pad to enter the number, the fatal disadvantage occurs in which the password can be exposed.

Details of the Invention

Problem to be Solved by the Invention

<6> Accordingly, an object of the present invention is to realize an input apparatus capable of performing various inputs with a single contact operation.

<7> In addition, the present invention is to provide an input apparatus capable of improving security by preventing the password from being exposed even if the number input operation is exposed during the course of the password input or the like.

Means of Solving the Problem

<8> To achieve the above object, the multiple input processing apparatus according to the present invention comprises a user contact unit in which a plurality of contact areas are formed, a touch sensing unit configured to output a first output value when a user's contact pressure relative to at least one of the plurality of contact areas reaches a first threshold amount and output a second output value when a second threshold amount is reached; and a signal processing unit that performs predefined signal processing using the first and second output values.

<9> Here, the first threshold amount represents a contact of the user's finger with the user contact unit, and the second threshold amount represents the pressing of the user's finger against the user contact unit.

<10> In addition, the touch detection unit is equipped with a first detection means for outputting the first output value when the contact is sensed, and a second detection means for outputting the second output value when the pressing is sensed.

<11> Further, the first detection means is a capacitive sensor that senses the capacitance that changes due to the contact of the user's finger, and the second detection means is a mechanical switch operated by the pressing of the user's finger.

<12> Moreover, the mechanical switch is a dome switch equipped with at least two contact points and the connection between the contacts is interrupted by the pressing.

<13> Additionally, the contact between the capacitive sensing terminal of the capacitive sensor and the mechanical switch is simultaneously arranged on the PCB layer for each of the plurality of contact areas.

<14> Also, the user contact unit comprises and is constituted of a protective layer contacted by a user's finger and a silicon layer having an elastic dome formed thereon for forming a dome switch at a position corresponding to each of the plurality of contact areas.

<15> Additionally, the multiple input processing apparatus comprises a user contact unit in which a plurality of contact areas are formed; a capacitive sensor wherein, when the capacitance or contact time changed by the user's contact with at least one of the plurality of contact areas reaches a first threshold amount, a first output value is output, and when a second threshold amount is reached, a second output value is output; and a signal processing unit that performs predefined signal processing using the first and second output values.

<16> Furthermore, the present invention may further comprise a sound generating means for generating a first sound when the signal processing unit outputs the first output value, and generating a second sound when the signal processing unit outputs the second output value; and may further comprise a vibration generating means for generating a first vibration when the signal processing unit outputs the first output value, and for generating a second vibration when the signal processing unit outputs the second output value.

<17> In addition, the present invention provides a multiple input processing method, wherein, as a method for processing a plurality of inputs by a user's finger, the method comprises a step of outputting a first output value when a user's contact pressure relative to at least one of the plurality of contact areas reaches a first threshold amount, and outputting a second output value when a second threshold amount is reached; and a step of performing predefined signal processing using the first and second output values.

<18> Herein, the first threshold amount represents the contact of the user's finger, and the second threshold amount represents the pressing by the user's finger.

Effects

<19> According to the present invention as described above, with an electronic apparatus capable of user input in the form

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of a touch pad, a plurality of inputs can be performed even with a single contact operation for one contact area, thereby simplifying user input.

<20> In addition, even when security is required, such as when inputting a password, safe input is possible.

Specific Details for Carrying Out the Invention

<21> Hereinafter, the present invention as described above will be described with reference to the drawings.

<22> First, a multi-input processing apparatus according to an exemplary embodiment of the present invention comprises and is constituted of a user contact unit (100), a touch sensing unit (200), and a signal processing unit (300) as schematically illustrated in FIG. 1.

<23> The user contact unit (100) is generally made of a flat panel, and a contact area (111), which is a position where the user touches a finger, is displayed on the surface by printing or the like. In addition, the user contact unit (100) has some elasticity so that when the user presses it with a finger, it can be slightly deformed and restored.

<24> The touch sensing unit (200) comprises a PCB substrate (219) disposed to overlap with the user contact unit (100), and in which a sensing means (210) is disposed for outputting a predetermined signal by detecting a contact of a user's finger at each position corresponding to a plurality of contact areas in the overlapped state.

<25> The signal processing unit (300) detects whether the user's finger touches or approaches the user's contact unit (100), receives a signal output from the detection means in response thereto, converts the signal into a signal format that can be used later by a microprocessor and the like, and outputs it.

<26> At this time, the sensing means (210) of the touch sensing unit (200) measures the pressure or contact time generated by the user's finger touching or pressing the user's contact unit, and determines whether the measurement result is comprised in either the first threshold value region or the second threshold value region bounded by at least one reference value. In addition, signals having different values corresponding to each area are output. Thereafter, the signal processing unit (300) converts each signal to have a digital or analog signal format used by a microprocessor of an electronic apparatus using the output values of the multiple input processing apparatus of the present invention.

<27> According to this operation, it becomes possible to receive a plurality of inputs for one contact area.

<28> Further, the sensing means of the multiple input processing apparatus according to an embodiment of the present invention comprises a first sensing means for sensing a first threshold value and a second sensing means for sensing a second threshold value. Moreover,

as the first sensing means, a capacitance sensing sensor for sensing a contact pressure corresponding to the first threshold value region is used, and as the second sensing means, a mechanical switch for sensing the contact pressure corresponding to the second threshold value region is used.

<29> In this configuration, when the user touches the contact area (111) with a finger at a level corresponding to the first threshold area, a contact signal is output as a signal corresponding to the first threshold area. Meanwhile, when the user presses the contact area (111) with a contact pressure corresponding to the second threshold area, not only is the contact signal output from the first sensing means, but also the mechanical switch is pressed, so that a press signal, which is a signal corresponding to the second threshold area, is also simultaneously output. In this case, when the contact signal and the press signal are simultaneously output, the signal processing unit (300) determines that the user wants to input a press corresponding to the second threshold area and outputs the press signal.

<30> Next, with reference to FIG. 2, a configuration of a multiple input processing apparatus according to an embodiment of the present invention will be described in more detail. Referring to FIG. 2, the multi-input processing apparatus shows a dome (121) and a silicon layer (120) constituting the user contact unit (100), and a PCB layer (210) constituting the contact sensing unit (200). The signal processing unit (300) is omitted.

<31> First, the PCB layer (210) is disposed with electrodes and circuit elements for forming a sensing means for sensing a contact of a user's finger, which becomes the lowest layer of a plurality of input processing apparatus. In an embodiment of the present invention, as a first sensing means for sensing the contact of a user's finger, a capacitance sensing sensor is used that senses a change in capacitance caused by approaching or touching a human body using at least one electrode and outputs a contact signal; at least two contact points are disposed as a second sensing means for detecting a user's press, and a mechanical switch is used to output a press signal by an interruption in which the contact points are in contact with each other or separated by the user's press.

<32> These capacitive sensors and mechanical switches are simultaneously disposed in the same contact area. To this end, at a position corresponding to each of the contact areas (111) on the surface of the PCB layer (210), a pattern of a capacitance sensing electrode (211), which is an electrode for sensing capacitance, and a pattern of a switching contact (215) for performing a mechanical switching operation, are simultaneously formed. The mechanical switch structure and the structure for sensing the touch of the user's finger are simultaneously arranged on the patterns, thereby establishing

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the present invention.

<33> In addition, in each contact (215) and electrode (211), a switching circuit (216) and a capacitance sensing circuit (212) for outputting the contacts (215) and the contacts sensed by the electrodes (211) as electrical signals are disposed. the outputs of these circuits are then output through the signal processing unit (300).

<34> Referring to FIG. 2, two switching contact (215) patterns are formed side by side in each contact area (111) of the PCB layer (210), and in addition, it can be confirmed that a pattern of the capacitance sensing electrode (211) is formed adjacent to the contact point (215). However, it is natural that the shape of the pattern for simultaneously forming each contact (215) and electrode (211) is not limited thereto.

<35> Next, in the dome (121), as the uppermost layer of the multiple input processing apparatus, a plurality of contact regions (111), which are portions that the user contacts with their fingers, are formed; at least in the contact area (111) on the surface of the dome (121), numbers, characters, or symbols to be input by contact are displayed by printing or the like.

<36> Meanwhile, at least the contact area (111) of the dome (121) is made of a material through which electromagnetic energy of the human body can pass so that a change in capacitance caused by the human body can be detected. A general plastic film or the like can transmit human body energy. However, due to this transmission characteristic, when a finger contacts or approaches any one of the contact areas (111), in the contact area (111) of a portion other than the contact area (a portion where an input by contact is not desired), the change in capacitance can be simultaneously sensed. Therefore, in the case of using an energy-transmitting plastic film, it is preferable to apply a material having an effect of blocking human body energy on a portion other than the contact area (111).

<37> The silicon layer (120) has a dome (121) formed with a contact protrusion (122) for interrupting the switching contact (215) formed on the PCB layer (210). When the dome (121) is pressed from the outside, the contact protrusion (122) is lowered to contact the two switching contacts (215) at the same time, and when the pressure is released, the original dome shape is restored by the elasticity of the silicon material, and the contact protrusion (122) rises. Meanwhile, a conductive material is applied to a portion of the contact protrusion (122) that comes into contact with the switching contact to enable electrical connection between the switching contacts (215).

<38> FIG. 3 is a side cross-sectional view of a combination of a protective layer, a silicon layer, and a PCB layer shown in FIG. 2. Referring to FIG. 3, a structure can be seen in which the silicon layer (120) is disposed in contact with the dome (121) and the PCB layer (210) is also disposed in contact with the silicon layer (120).

<39> Here, a contact protrusion (122) facing downward is formed in the dome (121) of the silicon layer (120), and two switching contacts (215) are disposed in the PCB layer (210) that is under the contact protrusion (122). In addition, capacitance sensing electrodes (211) are disposed on both sides of the switching contact (215). Further, at least outside of the dome (121), a support part (123) for maintaining a constant distance between the PCB layer (210) and the dome (121) is formed.

<40> In this structure, if the user only touches the contact area (111) of the dome (121), the capacitance sensing electrode (211) senses a change in capacitance, and the capacitance sensing circuit (212) outputs a contact signal. In addition, when the user touches the contact area (111) with a finger and presses it further, by the pressing of the dome (121) and the dome (121) of the silicon layer (120), the contact protrusion (122) comes into contact with the switching contacts (215) and the switching contacts (215) are connected to each other to output a pressing signal from the switching circuit (216).

<41> That is, when only the user's finger touches, only the capacitance sensing circuit (212) outputs the contact signal, but when the user presses the dome switch after contacting, not only the contact signal but also the switching circuit (216) outputs a pressing signal. When only the contact signal is input, the signal processing unit (300) outputs a signal corresponding to the contact, and when the contact signal and the pressing signal are simultaneously input, outputs a signal corresponding to the pressing.

<42> Accordingly, in the multiple input processing apparatus according to an embodiment of the present invention, when the user only makes contact with a finger on the contact area (111), the first signal processing corresponding to the contact is performed, and when the user presses the contact area (111) with a finger, a second signal processing corresponding to the pressing is performed.

<43> Next, another embodiment of the shape of the touch sensing unit (200) will be described with reference to FIG. 4. In this embodiment, the shape of the switching contact (215) and the capacitance sensing electrode (211) is further improved. That is, referring to FIG. 4, a configuration in which at least one of the two switching contacts (215) is used as the capacitance sensing electrode (211) is shown. According to this configuration, since it is not necessary to form a separate capacitive sensing electrode (211), it is possible to achieve simplicity in manufacturing and design, and to realize a reduction in manufacturing cost.

<44> Moreover, the multi-input processing apparatus according to another embodiment of the present invention is equipped

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with only a capacitance sensing sensor that detects a change in capacitance due to a user's finger contact, enabling different signal processing according to the contact and pressing pressure according to the present invention.

<45> That is, referring to FIG. 5, it is possible to schematically confirm the relationship between the pressure of the user's finger contacting the contact area and the size of the measured capacitance. In other words, the capacitance between the finger and the capacitance sensing electrode (211) shows a pattern that decreases according to the pressure of the finger. At this time, the size of the capacitance is divided based on the first threshold value and the second threshold value, and when the capacitance is measured by the value of each region, different signals are output.

<46> That is, when the user touches the contact area with a finger and then releases it, when the measured minimum value of the capacitance is greater than the first threshold value, a contact signal may be output, and when it is less than the second threshold value, a press signal may be output. Of course, there may be one or more threshold values.

<47> According to this configuration, since there is no need to arrange a separate mechanical switch, it is possible to facilitate design and reduce manufacturing cost.

<48> A multiple input processing apparatus according to another embodiment of the present invention, as shown in FIG. 6, may further comprise an input display means (400) for indicating the completion of each input when the user makes an input by touch or pressing.

<49> By such an input display means (400), when the user inputs by simply touching the contact point (210), the first sound is generated or the first vibration is generated, and when the user presses the contact point (210), the second sound or the second vibration is generated.

<50> According to this configuration, it is possible for the user to accurately classify and confirm the input made by the user, and to perform the input operation more conveniently.

<51> Next, a method of using a multiple input processing apparatus according to an embodiment of the present invention will be described. Here, an example applied to an apparatus for inputting a password of a digital door lock will be described.

<52> The multi-input processing apparatus according to the present invention applied to a digital door lock enables a plurality of inputs in a single contact area, so that a standard of a password can be modified. That is, a general password consists of simple symbols such as "1, 2, 3, 4" consisting only of numbers or symbols displayed on a touch pad or keypad. However, according to the present invention, at least two input methods of touch and press can be applied for each symbol, and it can be applied to at least one of the symbols constituting the password. In other words, the password can be configured as "1 by touch input," "2 by pressing input," "3 by touch input," and "4 by pressing input".

<53> In addition, when the user enters the password of the digital door lock, it is possible to perform user authentication by accurately manipulating the touch and press of each symbol.

<54> According to the password configured in this way, even when the numbers or symbols constituting the password are exposed to the surroundings, since it is not easily exposed whether the input operation is a touch or a press, it is possible to improve security for a apparatus that inputs a password using a touch pad.

Brief Description of the Drawings

<55> FIG. 1 is a diagram schematically showing a configuration of a multiple input processing apparatus according to an embodiment of the present invention.

<56> FIG. 2 is a diagram showing the configuration of a multiple input processing apparatus according to an embodiment of the present invention.

<57> FIG. 3 is a side cross-sectional view of a combination of a protective layer, a silicon layer, and a PCB layer shown in FIG. 2.

<58> FIG. 4 is a view showing another embodiment of the contact and electrode pattern of the touch sensing unit.

<59> FIG. 5 is a graph showing the relationship between contact pressure and capacitance.

<60> FIG. 6 is a diagram schematically showing a configuration of a multiple input apparatus according to another embodiment of the present invention.

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Figures

FIG. 1

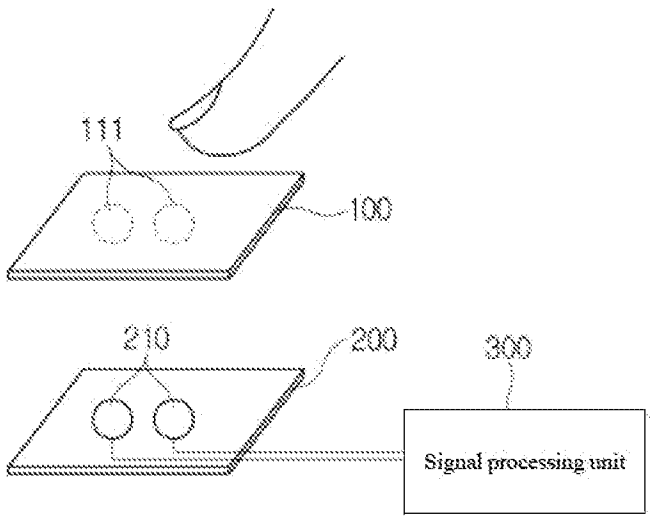
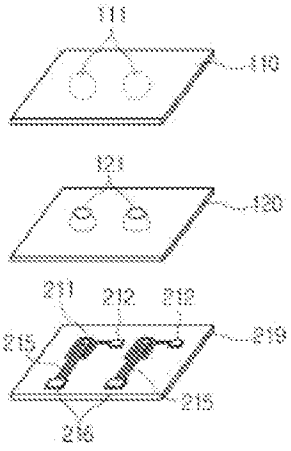


FIG. 2



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FIG. 3

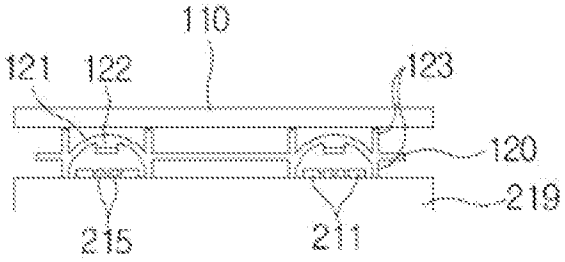


FIG. 4

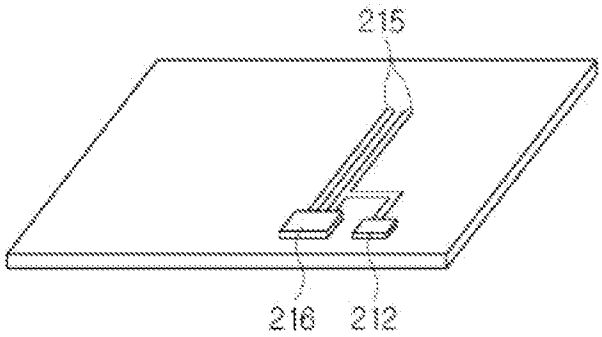
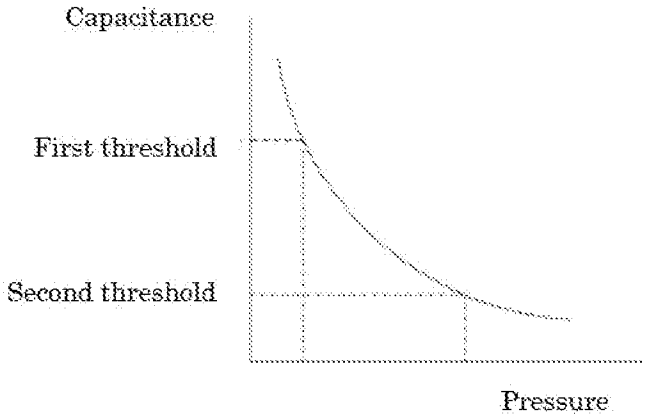
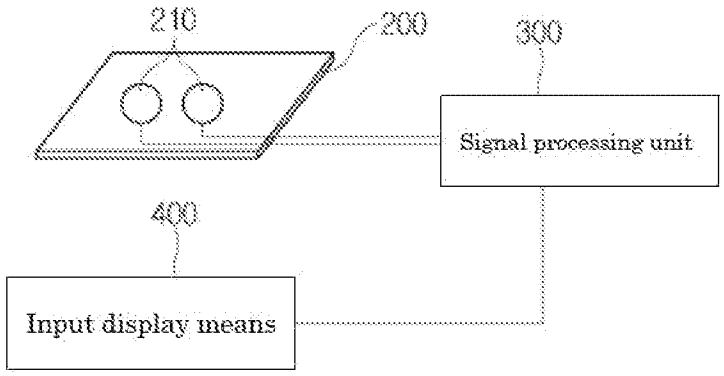


FIG. 5



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FIG. 6



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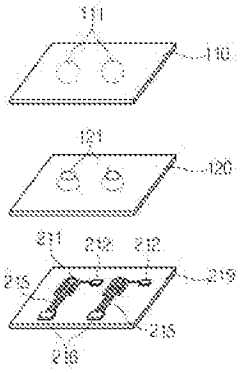
전체 청구항 수 : 총 12 항

(54) 복수 입력 처리 장치

(57) 요 약

본 발명은 한 번의 접촉 동작으로 다양한 입력을 할 수 있는 입력 장치를 실현하기 위하여, 복수의 접촉 영역이 형성되어 있는 사용자 접촉부와, 상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 접촉 감지부와, 상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함하는 복수 입력 처리 장치를 제공한다.

대 표 도 - 도2



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특허청구의 범위

청구항 1

복수의 접촉 영역이 형성되어 있는 사용자 접촉부와,

상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 접촉 감지부와,

상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함하는 복수 입력 처리 장치.

청구항 2

제1항에 있어서,

상기 제1의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락에 의한 누름을 나타내는 것을 특징으로 하는 복수 입력 처리 장치.

청구항 3

제2항에 있어서,

상기 접촉 감지부는,

상기 접촉을 감지하면 상기 제1 출력값을 출력하는 제1 감지수단과, 상기 누름을 감지하면 상기 제2 출력값을 출력하는 제2 감지수단을 구비하는 것을 특징으로 하는 복수 입력 처리 장치.

청구항 4

제3항에 있어서,

상기 제1 감지수단은 사용자 손가락의 상기 접촉에 의해 변화하는 정전용량을 감지하는 정전용량 센서이고, 상기 제2 감지수단은 사용자 손가락의 상기 누름에 의해 동작하는 기계적인 스위치인 것을 특징으로 하는 복수 입력 처리 장치.

청구항 5

제4항에 있어서,

상기 기계적인 스위치는 적어도 두 개의 접점을 구비하고 상기 누름에 의해 상기 접점간의 접속이 단속되는 돔 스위치인 것을 특징으로 하는 복수 입력 처리 장치.

청구항 6

제5항에 있어서,

상기 정전용량 센서의 정전용량 감지용 단자와 상기 기계적인 스위치의 접점은, PCB층에, 상기 복수의 접촉 영역마다 동사에 배치되어 있는 것을 특징으로 하는 복수 입력 처리 장치.

청구항 7

제5항 또는 제6항에 있어서,

상기 사용자 접촉부는, 사용자 손가락이 접촉하는 보호층과 상기 복수의 접촉 영역마다 대응하는 위치에 돔 스위치를 형성하기 위한 탄성 돔이 형성된 실리콘층을 포함하여 이루어진 것을 특징으로 하는 복수 입력 처리 장치.

청구항 8

복수의 접촉 영역이 형성되어 있는 사용자 접촉부와,

상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉에 의해 변화한 정전용량 또는 접촉

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시간이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 정전용량 센서;

상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함하는 복수 입력 처리 장치.

청구항 9

제1항 내지 제6항, 제8항 중 어느 한 항에 있어서,

상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 음향을 발생하고, 상기 신호 처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 음향을 발생하는 음향 발생 수단을 더 포함하는 것을 특징으로 하는 복수 입력 장치.

청구항 10

제1항 내지 제6항, 제8항 중 어느 한 항에 있어서,

상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 진동을 발생하고, 상기 신호 처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 진동을 발생하는 진동 발생 수단을 더 포함하는 것을 특징으로 하는 복수 입력 장치.

청구항 11

사용자 손가락에 의한 복수의 입력을 처리하기 위한 방법으로서,

복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 단계;

상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 단계를 포함하는 복수 입력 처리 방법.

청구항 12

제3항에 있어서,

상기 제1의 임계량은 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 사용자 손가락에 의한 누름을 나타내는 것을 특징으로 하는 복수 입력 처리 방법.

명 세 서

발명의 상세한 설명

기 술 분 야

<1> 본 발명은 복수 입력 처리 장치에 관한 것으로서, 더욱 상세하게는, 사용자의 터치와 누름을 동시에 감지할 수 있는 복수 입력 처리 장치에 관한 것이다.

배 경 기 술

<2> 최근, 전자 기기에서 사용자 입력을 위한 버튼을 대신하여, 디자인 및 조작의 편리성 때문에 터치 패드가 많이 적용되고 있다. 그러나 사용되고 있는 버튼 또는 터치 패드는, 하나의 버튼 또는 손가락 접촉 영역에 대해서 하나의 입력만을 받을 수 있도록 되어 있다.

<3> 그래서 다양한 기호 또는 숫자등을 입력하기 위해서는 그 기호 또는 숫자의 각각의 개수에 대응하는 버튼 또는 접촉 영역이 구비되어야 했다. 한편, 이러한 문제점을 해결하기 위해서, 하나의 버튼 또는 접촉 영역을 여러번 누름 또는 접촉함으로써 입력되는 기호 또는 숫자를 변경시키는 방법, 별도의 전환 키 등을 설치하고 이 전환 키와 동시에 누름 또는 접촉하는 방법이 사용되고 있다.

<4> 하지만, 이러한 입력 방법들은 원하는 입력을 행하기 위해서 2회 이상의 누름 또는 접촉을 행해야 하기 때문에 복잡하고 불편하였다.

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<5> 또한, ATM 장치나 디지털 도어락 등과 같이 보안성이 요구되는 비밀번호를 입력하고자 하는 경우에는, 번호를 입력하기 위하여 버튼 또는 터치 패드를 사용하는 동작을 누군가 보게 된다면, 비밀번호가 노출될 수 있다는 치명적인 단점을 갖는다.

발명의 내용

해결 하고자하는 과제

<6> 따라서, 본 발명은 한 번의 접촉 동작으로 다양한 입력을 할 수 있는 입력 장치를 실현하고자 하는 것을 목적으로 한다.

<7> 또한, 본 발명은 비밀번호 입력 등에 있어서 번호 입력 동작이 노출되더라도 비밀번호가 노출되지 않도록 하여, 보안성을 향상시킬 수 있는 입력 장치를 제공하고자 한다.

과제 해결수단

<8> 상기 목적을 달성하기 위한 본 발명에 따른 복수 입력 처리 장치는, 복수의 접촉 영역이 형성되어 있는 사용자 접촉부와, 상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 접촉 감지부와, 상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함한다.

<9> 여기에서, 상기 제1의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락에 의한 누름을 나타낸다.

<10> 또한, 상기 접촉 감지부는, 상기 접촉을 감지하면 상기 제1 출력값을 출력하는 제1 감지수단과, 상기 누름을 감지하면 상기 제2 출력값을 출력하는 제2 감지수단을 구비한다.

<11> 또한, 상기 제1 감지수단은 사용자 손가락의 상기 접촉에 의해 변화하는 정전용량을 감지하는 정전용량 센서이고, 상기 제2 감지수단은 사용자 손가락의 상기 누름에 의해 동작하는 기계적인 스위치인 것을 특징으로 한다.

<12> 한편, 상기 기계적인 스위치는 적어도 두 개의 접점을 구비하고 상기 누름에 의해 상기 접점간의 접속이 단속되는 돔 스위치인 것을 특징으로 한다.

<13> 또한, 상기 정전용량 센서의 정전용량 감지용 단자와 상기 기계적인 스위치의 접점은, PCB층에, 상기 복수의 접촉 영역마다 동시에 배치된다.

<14> 또한, 상기 사용자 접촉부는, 사용자 손가락이 접촉하는 보호층과 상기 복수의 접촉 영역마다 대응하는 위치에 돔 스위치를 형성하기 위한 탄성 돔이 형성된 실리콘층을 포함하여 이루어진다.

<15> 또한, 본 발명에 따른 복수 입력 처리 장치는, 복수의 접촉 영역이 형성되어 있는 사용자 접촉부와, 상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉에 의해 변화한 정전용량 또는 접촉 시간이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 정전용량 센서를 포함한다.

<16> 또한, 본 발명은, 상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 음향을 발생하고, 상기 신호 처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 음향을 발생하는 음향 발생 수단을 더 포함할 수도 있으며, 상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 진동을 발생하고, 상기 신호 처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 진동을 발생하는 진동 발생 수단을 더 포함할 수도 있다.

<17> 또한, 본 발명은 사용자 손가락에 의한 복수의 입력을 처리하기 위한 방법으로서, 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 단계; 상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 단계를 포함하는 복수 입력 처리 방법을 제공한다.

<18> 여기에서, 상기 제1의 임계량은 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 사용자 손가락에 의한 누름을 나타낸다.

효 과

<19> 상술한 바와 같은 본 발명에 의하면, 터치패드 형태의 사용자 입력이 가능한 전자 장치에 있어서, 하나의 접촉

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영역에 대한 한 번의 접촉 동작으로도 복수의 입력이 가능하게 되어 사용자 입력이 간편해진다.

<26> 또한, 비밀 번호의 입력과 같이 보안성을 요구하는 경우에도, 안전한 입력이 가능하게 된다.

발명의 실시를 위한 구체적인 내용

<21> 상술한 바와 같은 본 발명을, 이하에서 도면을 참조하여 설명한다.

<22> 먼저, 본 발명의 일 실시예에 따른 복수 입력 처리 장치는, 도 1에 개략적으로 도시된 바와 같이, 사용자 접촉부(100)와 접촉 감지부(200)와 신호 처리부(300)를 포함하여 이루어진다.

<23> 사용자 접촉부(100)는, 일반적으로 평평한 패널로 이루어지며, 표면에는 사용자가 손가락을 접촉할 위치가 되는 접촉 영역(111)이 인쇄 등에 의해 표시된다. 또한, 사용자 접촉부(100)는 약간의 탄성을 가져 사용자가 손가락으로 누를 때 약간의 변형 및 복원이 가능하도록 한다.

<24> 접촉 감지부(200)는, 사용자 접촉부(100)와 겹쳐지도록 배치되며, 겹쳐진 상태에서 복수의 접촉 영역에 대응하는 위치마다에 사용자 손가락의 접촉 등을 감지하여 미리 지정된 신호를 출력하는 감지 수단(210)이 배치된 PCB 기판(219)을 포함한다.

<25> 신호 처리부(300)는, 사용자 접촉부(100)에 사용자 손가락의 접촉 또는 접근 여부를 감지하여 그에 대응하여 감지 수단에서 출력한 신호를 수신하고, 이 신호를 추후 마이크로프로세서 등에서 이용할 수 있는 신호 형태로 변환하여 출력한다.

<26> 이때, 접촉 감지부(200)의 감지 수단(210)은, 사용자 손가락이 사용자 접촉부에 접촉하거나 누름에 의해 발생하는 압력 또는 접촉 시간 등을 측정하고, 그 측정 결과가 적어도 하나의 기준치를 경계로 하는 제1의 임계값 영역 및 제2의 임계값 영역 중 어느 영역에 포함되는 지를 판정한다. 그리고 각 영역에 해당하는 서로 다른 값을 갖는 신호를 출력하게 된다. 이후 신호 처리부(300)에서 각각의 신호를, 본 발명의 복수 입력 처리 장치의 출력값을 이용하는 전가 장치의 마이크로프로세서에서 사용하는 디지털 또는 아날로그 신호 형태를 갖도록 변환하게 된다.

<27> 이러한 동작에 의하면 하나의 접촉 영역에 대하여 복수의 입력을 받아들이는 것이 가능하게 된다.

<28> 한편, 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 감지 수단은, 제1의 임계값을 감지하기 위한 제1 감지수단과 제2의 임계값을 감지하기 위한 제2 감지수단을 구비한다. 그리고 제1 감지수단으로는 제1의 임계값 영역에 해당하는 접촉 압력을 감지하기 위한 정전용량 감지 센서를 이용하고, 제2 감지수단으로는 제2의 임계값 영역에 해당하는 접촉 압력을 감지하기 위한 기계적인 스위치를 이용한다.

<29> 이러한 구성에서는, 사용자가 손가락을 제1의 임계값 영역에 해당하는 수준으로 접촉 영역(111)을 접촉하면 제1의 임계값 영역에 대응하는 신호로서 접촉 신호가 출력된다. 한편, 사용자가 제2의 임계값 영역에 해당하는 수준의 접촉 압력으로 접촉 영역(111)을 누르는 경우에는, 제1 감지 수단에서 접촉 신호가 출력될 뿐만 아니라 기계적인 스위치까지 눌려짐으로써 제2의 임계값 영역에 대응하는 신호인 누름 신호도 동시에 출력된다. 이렇게 접촉 신호 및 누름 신호가 동시에 출력되는 경우, 신호 처리부(300)는 사용자가 제2의 임계값 영역에 해당하는 누름을 입력하고자 하는 것으로 판단하고 누름 신호를 출력하게 된다.

<30> 다음으로, 도 2를 참조하여, 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 구성을 더욱 상세하게 설명한다. 도 2에 따르면, 복수 입력 처리 장치는 사용자 접촉부(100)를 구성하는 돔(121)과 실리콘층(120), 및 접촉 감지부(200)를 구성하는 PCB층(210)을 도시하고 있다. 신호 처리부(300)는 생략하였다.

<31> 먼저, PCB층(210)은 사용자 손가락의 접촉을 감지하는 감지 수단을 형성하기 위한 전극들 및 회로 소자들이 배치되며, 복수 입력 처리 장치의 최하층이 된다. 본 발명의 일 실시예에서는, 사용자 손가락의 접촉을 감지하기 위한 제1 감지수단으로 인체의 접근 또는 접촉에 의해 발생하는 정전용량의 변화를 적어도 하나의 전극을 이용하여 감지하고 접촉 신호를 출력하는 정전용량 감지 센서를 이용하고, 사용자의 누름을 감지하기 위한 제2 감지수단으로 적어도 두 개의 접점이 배치되고 사용자의 누름에 의해 이 접점들이 서로 접촉하거나 분리되는 단속에 의해 누름 신호를 출력하는 기계적인 스위치를 이용한다.

<32> 이러한 정전용량 감지 센서와 기계적인 스위치는 동일한 접촉 영역에 동시에 배치된다. 이를 위하여, PCB층(210)의 표면에서 접촉 영역(111)의 각각에 대응하는 위치에는, 정전용량을 감지하기 위한 전극인 정전용량 감지 전극(211)의 패턴과 기계적인 스위칭 동작을 행하기 위한 스위칭 접점(215)의 패턴이 동시에 형성되어 있다. 그리고 이 패턴들 상에 기계적인 스위치 구조와 사용자 손가락의 터치를 감지하기 위한 구조가 동시에 배치됨으

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로써, 본 발명이 성립된다.

<33> 그리고 각각의 접점(215) 및 전극(211)에는, 이 접점(215)들 및 전극(211)에서 감지한 접촉을 전기적인 신호로서 출력하기 위한 스위칭 회로(216) 및 정전용량 감지 회로(212)가 배치된다. 이 회로들의 출력은 이후 신호 처리부(300)를 거쳐 출력된다.

<34> 도 2를 참조하면, PCB층(210)의 각각의 접촉 영역(111)에 두 개의 스위칭 접점(215) 패턴이 나란하게 형성되어 있으며, 또한, 이 접점(215)에 인접하게 정전용량 감지 전극(211)의 패턴이 형성된 것을 확인할 수 있다. 한편, 각 접점(215) 및 전극(211)을 동시에 형성하기 위한 패턴의 형태는 이에 한정되는 것이 아님은 당연하다.

<35> 다음, 돔(121)은, 복수 입력 처리 장치의 최상층으로서 사용자가 손가락으로 접촉하는 부분인 복수의 접촉 영역(111)이 형성되어 있으며, 적어도 돔(121) 표면의 접촉 영역(111)에는 접촉에 의해 입력할 숫자나 문자 또는 기호가 인쇄 등에 의해 표시되어 있다.

<36> 한편, 돔(121)에서 적어도 접촉 영역(111)은 인체에 의한 정전용량의 변화를 감지할 수 있도록 인체의 전자기적 에너지가 통과할 수 있는 재질로 이루어진다. 일반적인 플라스틱 필름 등은 인체의 에너지가 투과될 수 있다. 하지만 이러한 투과 특성에 의해, 손가락이 어느 하나의 접촉 영역(111)에 접촉하거나 접근하는 경우에 이 접촉 영역 이외의 부분(접촉에 의한 입력을 원하지 않는 부분)의 접촉 영역(111)에서도 정전 용량의 변화를 동시에 감지하게 될 수 있다. 따라서, 에너지 투과성의 플라스틱 필름을 사용하는 경우, 접촉 영역(111) 이외의 부분에는 인체 에너지를 차단하는 효과가 있는 물질을 도포하는 것이 바람직하다.

<37> 실리콘층(120)은, PCB층(210)에 형성된 스위칭 접점(215)을 단속하기 위한 접촉돌기(122)가 형성된 돔(121)이 형성된다. 돔(121)은 외부로부터 눌려지면 접촉돌기(122)를 하강시켜 두 개의 스위칭 접점(215)에 동시에 접촉시키고, 눌려짐이 해제되면 실리콘 재질의 탄성에 의해 원래의 돔 형태로 복원되어 접촉돌기(122)가 상승한다. 한편, 접촉돌기(122) 중 스위칭 접점과 접촉하게 되는 부분에는 전도성 물질이 도포되어 스위칭 접점(215)간의 전기적인 연결을 가능하게 한다.

<38> 도 3은 도 2에 도시된 보호층, 실리콘층 및 PCB층이 결합된 형태에 대한 측단면도이다. 도 3을 참조하면, 돔(121)의 하부에 실리콘층(120)이 접촉 배치되며, 또한 PCB층(210)도 실리콘층(120)에 접촉 배치된 구조를 볼 수 있다.

<39> 여기에서 실리콘층(120)의 돔(121)의 내부에는 아래쪽을 향하는 접촉돌기(122)가 형성되어 있고, 접촉돌기(122)의 아래쪽이 되는 PCB층(210)에는 두 개의 스위칭 접점(215)이 배치되어 있다. 또한, 스위칭 접점(215)의 양측에 정전용량 감지 전극(211)이 배치되어 있다. 또한, 적어도 돔(121)의 바깥쪽에는 PCB층(210)과 돔(121)을 일정한 간격을 유지하도록 하기 위한 지지부(123)가 형성되어 있다.

<40> 이러한 구조에서, 사용자가 손가락을 돔(121)의 접촉 영역(111)에 단지 접촉하는 경우에는 정전용량 감지 전극(211)에서 정전용량의 변화를 감지하게 되고, 정전용량 감지 회로(212)에서는 접촉 신호를 출력하게 된다. 또한, 사용자가 접촉 영역(111)에 손가락을 접촉한 후 더욱 압력하여 누르게 되면, 돔(121)과 실리콘층(120)의 돔(121)의 눌려짐에 의해 접촉돌기(122)가 스위칭 접점(215)에 접촉하게 되고 스위칭 접점(215)이 서로 도통되어 스위칭 회로(216)에서 누름 신호를 출력하게 된다.

<41> 즉, 사용자 손가락이 접촉만을 행하는 경우에는 단지 정전용량 감지 회로(212)에서만 접촉신호를 출력하게 되지만, 사용자가 접촉 후 돔 스위치까지 누르는 경우에는 접촉신호뿐만 아니라 스위칭 회로(216)에서도 누름 신호를 출력하게 된다. 신호 처리부(300)는 접촉 신호만 입력되는 경우에는 접촉에 대응하는 신호를 출력하게 되고, 접촉신호와 누름 신호가 동시에 입력되는 경우에는 누름에 대응하는 신호를 출력하게 된다.

<42> 이에 의해, 본 발명의 일 실시예에 따른 복수 입력 처리 장치는, 접촉 영역(111)에 대하여 사용자가 손가락의 접촉만을 행한 경우에는 접촉에 대응하는 제1의 신호처리를 행하게 되고, 접촉 영역(111)에 대하여 사용자가 손가락으로 누르는 경우에는 누름에 대응하는 제2의 신호처리를 행하게 된다.

<43> 다음으로, 도 4를 참조하여, 접촉 감지부(200)의 형태에 대한 또다른 실시예를 설명한다. 본 실시예에서는 스위칭 접점(215)과 정전용량 감지 전극(211)의 형태를 더욱 개선하고자 한다. 즉, 도 4를 참조하면, 두 개의 스위칭 접점(215) 중의 적어도 어느 하나를 정전용량 감지 전극(211)으로 겸용하도록 하는 구성을 나타내고 있다. 이러한 구성에 의하면 별도의 정전용량 감지 전극(211)을 형성하지 않아도 되기 때문에 제조 및 설계의 단순함을 도모하고, 제조 비용의 절감을 실현할 수 있게 된다.

<44> 한편, 본 발명의 또다른 실시예에 따른 복수 입력 처리 장치는, 사용자 손가락의 접촉에 의한 정전용량의 변화

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를 감지하는 정전용량 감지 센서만을 구비하고, 본 발명에 따른 접촉 및 누름 압력에 따른 서로 다른 신호 처리를 가능하게 한다. 즉, 손가락이 접촉 영역(111)에 접촉하는 경우의 정전용량의 변화량과, 손가락으로 누르는 경우의 정전용량의 변화량을 각각 제1의 임계값 영역과 제2의 임계값 영역으로 하고, 정전용량의 변화가 각각의 영역에 해당하는 경우 제1 출력값 및 제2 출력값을 구분하여 출력하도록 하는 구성도 가능하다.

<45> 즉, 도 5를 참조하면, 사용자 손가락이 접촉 영역에 접촉하는 압력과 측정되는 정전용량의 크기의 관계를 개략적으로 확인할 수 있다. 즉, 손가락과 정전용량 감지 전극(211)과의 사이에서의 정전용량은, 손가락의 압력에 따라 감소하는 양상을 나타낸다. 이때, 정전용량의 크기를 제1의 임계값과 제2의 임계값을 기준으로 분할하고, 각 영역의 값으로 정전용량이 측정될 때, 각각 다른 신호를 출력하게 된다.

<46> 즉, 사용자가 손가락으로 접촉 영역에 접촉한 후 떼었을 때, 측정된 정전용량의 최소값이 제1의 임계값보다 큰 경우에는 접촉 신호를 출력하도록 하고 제2의 임계값보다 작은 경우에는 누름 신호를 출력하도록 할 수 있다. 물론 기준이 되는 임계값은 하나 또는 복수일 수 있다.

<47> 이러한 구성에 의하면 별도의 기계적인 스위치를 배치할 필요가 없어지므로, 설계의 용이함 및 제조 비용의 절감 효과를 도모할 수 있게 된다.

<48> 본 발명의 또다른 실시예에 따른 복수 입력 처리 장치는, 도 6에 도시된 바와 같이, 사용자가 터치 또는 누름에 의한 입력을 행하는 경우, 각 입력의 완료를 표시하기 위한 입력 표시 수단(400)을 더 포함할 수도 있다.

<49> 이와 같은 입력 표시 수단(400)에 의해, 사용자가 접촉지점(210)에 단지 접촉함으로써 입력을 행하면 제1 음향을 발생하거나 제1 진동을 발생하도록 하고, 사용자가 접촉지점(210)을 누름으로써 입력을 행하면 제2 음향이나 제2 진동을 발생하도록 한다.

<50> 이러한 구성에 의하면, 사용자가 자신이 행한 입력을 정확히 구분 및 확인할 수 있게 되어, 더욱 편리하게 입력 동작을 행할 수 있게 된다.

<51> 다음으로, 본 발명의 일 실시예에 따른 복수 입력 처리 장치를 이용하는 방법에 대하여 설명한다. 여기에서는 디지털 도어락의 비밀번호 입력용 장치에 적용되는 것을 예를 들어 설명한다.

<52> 디지털 도어락에 적용되는 본 발명에 따른 복수 입력 처리 장치는 하나의 접촉 영역에서 복수의 입력이 가능하다는 특징에 의해, 비밀 번호의 규격을 변형시킬 수 있게 된다. 즉, 일반적인 비밀 번호는 터치 패드나 키패드에 표시된 숫자 또는 기호만으로 이루어진 "1, 2, 3, 4" 등의 단순한 기호들로 이루어진다. 그러나 본 발명에 의하면, 각 기호마다 터치와 누름의 적어도 두 가지 입력 방식이 적용될 수 있으며, 비밀 번호를 구성하는 기호 중 적어도 하나에 대하여 적용시킬 수 있다. 즉, 비밀 번호를 "터치 입력에 의한 1", "누름 입력에 의한 2", "터치 입력에 의한 3", "누름 입력에 의한 4"와 같이 구성할 수 있게 된다.

<53> 그리고 사용자는 디지털 도어락의 비밀 번호 입력시 각각의 기호에 대한 터치와 누름을 정확히 조작함으로써 사용자 인증을 행할 수 있게 된다.

<54> 이와 같이 구성되는 비밀 번호에 의하면, 비밀 번호를 구성하는 숫자 또는 기호가 주변으로 노출된 경우에 있어서도, 입력 동작이 터치인지 누름인지에 대해서는 쉽게 노출되지 않으므로, 터치 패드를 이용하여 비밀 번호를 입력하는 장치에 대한 보안성을 향상시킬 수 있게 된다.

도면의 간단한 설명

<55> 도 1은 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 구성을 개략적으로 나타낸 도면.

<56> 도 2는 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 구성을 나타낸 도면.

<57> 도 3은 도 3은 도 2에 도시된 보호층, 실리콘층 및 PCB층이 결합된 형태에 대한 측단면도.

<58> 도 4는 접촉 감지부의 접점 및 전극 패턴에 대한 또다른 실시예를 나타낸 도면.

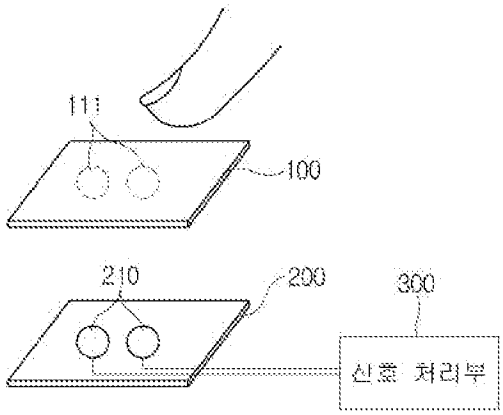
<59> 도 5는 접촉 압력과 정전용량과의 관계를 나타낸 그래프.

<60> 도 6은 본 발명의 또다른 실시예에 따른 복수 입력 장치의 구성을 개략적으로 나타낸 도면.

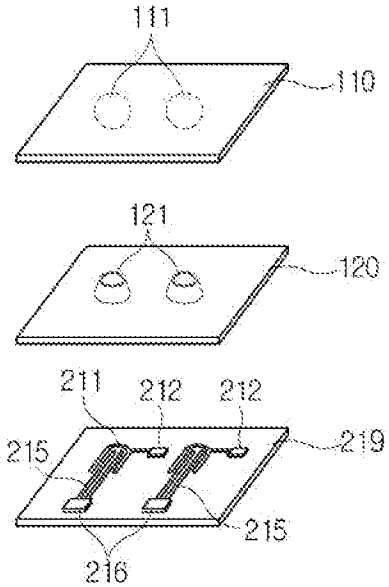
IPR2021-00362
Samsung - Exhibit 1005 - Page 71
Apple EX1013 Page 19

도면

도면1

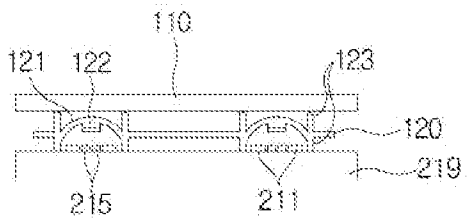


도면2

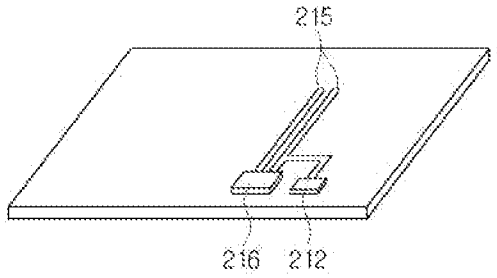


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Samsung - Exhibit 1005 - Page 72
Apple EX1013 Page 20

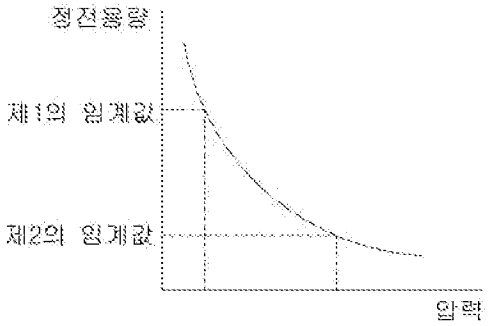
도면3



도면4

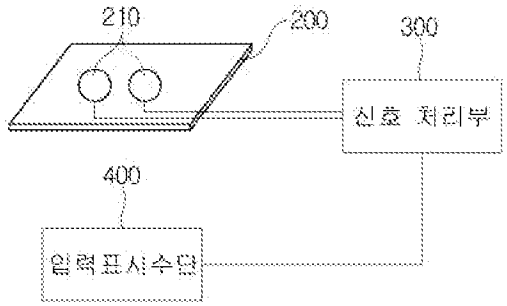


도면5



IPR2021-00362
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Apple EX1013 Page 21

도면5



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Apple EX1013 Page 22

Electronic Patent Application Fee Transmittal

Application Number:	16260879
Filing Date:	29-Jan-2019
Title of Invention:	INFORMATION PROCESSING APPARATUS
First Named Inventor/Applicant Name:	Masaaki YAMADA
Filer:	Tomoki Tanida/Monique Blakey
Attorney Docket Number:	093265-0063

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
PETITION FEE- 37 CFR 1.17(H) (GROUP III)	1464	1	140	140
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1360	1360
		Total in USD ($)		**1500**

Electronic Acknowledgement Receipt

EFS ID:	41988642
Application Number:	16260879
International Application Number:	
Confirmation Number:	3220
Title of Invention:	INFORMATION PROCESSING APPARATUS
First Named Inventor/Applicant Name:	Masaaki YAMADA
Customer Number:	20277
Filer:	Tomoki Tanida/Monique Blakey
Filer Authorized By:	Tomoki Tanida
Attorney Docket Number:	093265-0063
Receipt Date:	22-FEB-2021
Filing Date:	29-JAN-2019
Time Stamp:	18:04:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1500
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National Stage of an International Application under 35 U.S.C. 371

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

New International Application Filed with the USPTO as a Receiving Office

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/260,879	01/29/2019	Masaaki YAMADA	093265-0063	3220

20277 7590 01/08/2021

MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING
500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

EXAMINER
NASSER, ROBERT L

ART UNIT	PAPER NUMBER
3992	

NOTIFICATION DATE	DELIVERY MODE
01/08/2021	ELECTRONIC

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
16/260,879		YAMADA, Masaaki	093265-0063

MCDERMOTT WILL & EMERY LLP
THE MCDERMOTT BUILDING 500 NORTH CAPITOL STREET, N.W.
WASHINGTON, DC 20001

EXAMINER	
ROBERT L NASSER	
ART UNIT	PAPER
3992	20201228

DATE MAILED: _____

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Commissioner for Patents

IDS of 12/18/2020 (attached) has been considered.

/A.J.K/ Supervisory Patent Examiner, Art Unit 3992	/ROBERT L NASSER/ Primary Examiner, Art Unit 3992

PTO-90C (Rev.04-03)

PTO/SB/08a (02-18)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16260879
Filing Date	2019-01-29
First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	2	6795569		2004-09-21	Setlak	
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	Examiner Name	R. L. Nasser
	Attorney Docket Number	093265-0063

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Attorney Docket Number	093265-0063

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	Examiner Name	R. L. Nasser
	Attorney Docket Number	093265-0063

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	First Named Inventor	Masaaki YAMADA
	Art Unit	3992
	Examiner Name	R. L. Nasser
	Attorney Docket Number	093265-0063

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FOREIGN PATENT DOCUMENTS

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Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2003-529130	JP	A	2003-09-30	gar	w/English translation; corresponds to U.S.8498406 and U.S.2005/0253814 (previously cited)	☒
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	5	2010/073243	WO	A1	2010-07-01	Zimchoni, Benjamin		☐

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	MANABE et al, "Proposal of New Imput Systems," NTT Technology Reports,Technical Journal, Vol, 9, No. 4, March 2008, pp. 37-42	☐
	2	MONROSE Fabian et al., "Keystroke dynamics as a biometric for authentication," Elsevier Science, Future Generation Computer Systems Vol. 16, 2000, pp. 351-359	☐
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.L.N/

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	First Named Inventor	Masaaki YAMADA
	Art Unit	3992
	Examiner Name	R. L. Nasser
	Attorney Docket Number	093265-0063

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EXAMINER SIGNATURE

Examiner Signature	/ROBERT L NASSER/	Date Considered	12/28/2020

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16260879
Filing Date	2019-01-29
First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement 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 the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Tomoki Tanida/	Date (YYYY-MM-DD)	2020-12-18
Name/Print	Tomoki Tanida	Registration Number	60,453

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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First Named Inventor	Masaaki YAMADA
Art Unit	3992
Examiner Name	R. L. Nasser
Attorney Docket Number	093265-0063

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6509847		2003-01-21	Anderson	
	2	6795569		2004-09-21	Setlak	
	3	6937226		2005-08-30	Sakurai et al.	
	4	6970584		2005-11-29	O'Gorman et al.	
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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020163506	A1	2002-11-07	Matusis	
	2	20020181747	A1	2002-12-05	Topping	
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	10	20080049987	A1	2008-02-28	Champagne et al.	
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	21	20100066701	A1	2010-03-18	Ningrat	
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2003-529130	JP	A	2003-09-30		w/English translation; corresponds to U.S.8498406 and U.S.2005/0253814 (previously cited)	☒
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	5	2010/073243	WO	A1	2010-07-01	Zimchoni, Benjamin		☐

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	MANABE et al, "Proposal of New Imput Systems," NTT Technology Reports,Technical Journal, Vol, 9, No. 4, March 2008, pp. 37-42	☐
	2	MONROSE Fabian et al., "Keystroke dynamics as a biometric for authentication," Elsevier Science, Future Generation Computer Systems Vol. 16, 2000, pp. 351-359	☐
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	4	APC Biopod Quick Installation Guide, Part Number: 990-1705, APC, www.apc.com, 2 pages, 2003	☐
	5	DIEFENDERFER, Graig T., "FINGERPRINT RECOGNITION," Thesis, Naval Postgraduate School, June 2006, 153 pages	☐
	6	BLASKO, Gabor et al., "A Wristwatch-Computer Based Password-Vault," IBM Research Report, Computer Science, March 2005, 19 pages	☐
	7	CHAN, K.C., et al., "Fast Fingerprint Verification Using Subregions of Fingerprint Images," IEEE Transactions on Circuits and Systems for Video Technology, Vol. 14, No. 1, January 2004, pp. 95-101	☐
	8	YAU, Wei-Yun et al., "Nonlinear phase portrait modeing of fingerpriint orientation," 8th International Conference on Control, Automation, Robotics and Vision China, December 2004, pp. 1262-1267	☐
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	10	WANG, Feng, et al., "Empirical Evaluation for Finger Input Properties In Mutli-touch Interaction," CHI, Tabletop Gestures, April 2009, pp. 1062-1072	☐

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JP,2003-529130,A

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Bibliography Close

(19) [Publication country] Japan Patent Office (JP)

(12) [Kind of official gazette] Published Japanese translations of PCT international publication for patent applications (A)

(11) [Publication number of Japanese translation of PCT international application] JP 2003 - 529130A (P2003-529130A)

(43) [Publication date of Japanese translation of PCT international application] Hei sei 15(2003) September 30 (2003.9.30)

(54) [Title of the invention] Integrated keypad system

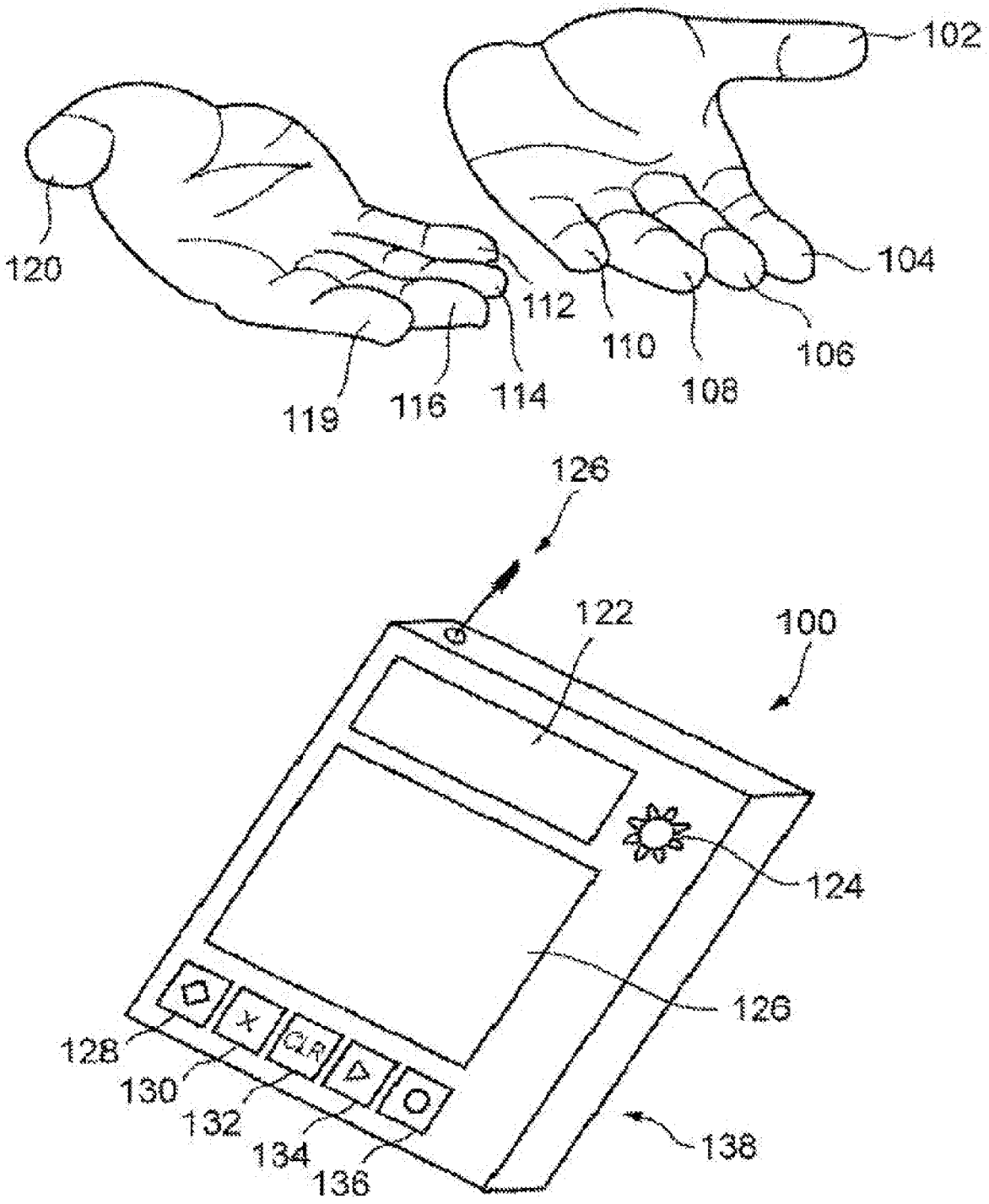
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G06F 3/023 340
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G10L 15/00
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G06F 3/023 340 Z
3/00 601
G10L 3/00 551 A
551 P
571 R
[Request for examination] Unrequested
[Request for preliminary examination] Y
[Total number of pages] 119
(21) [Application number] Japanese Patent Application No. 2001-533628 (P2001-533628)
(86)(22)[Filing date]Heisei 12(2000) October 27 (2000.10.27)
(85) [Submission date of translated text] Heisei 14(2002) April 30 (2002.4.30)
(86) [International application number] PCT/US00/29647
(87) [International publication number] WO01/031788
(87) [International publication date] Heisei 13(2001) May 3 (2001.5.3)
(31) [Application number of the priority] 60/163,996
(32) [Priority date] Heisei 11(1999) October 27 (1999.10.27)
(33) [Priority claim country] U.S. (US)
(31) [Application number of the priority] 60/164,656
(32) [Priority date] Heisei 11(1999) November 4 (1999.11.4)
(33) [Priority claim country] U.S. (US)
(31) [Application number of the priority] 60/164,597
(32) [Priority date] Heisei 11(1999) November 10 (1999.11.10)
(33) [Priority claim country] U.S. (US)
(31) [Application number of the priority] 60/169,149
(32) [Priority date] Heisei 11(1999) December 6 (1999.12.6)
(33) [Priority claim country] U.S. (US)
(31) [Application number of the priority] 60/194,767
(32) [Priority date] Heisei 12(2000) April 3 (2000.4.3)
(33) [Priority claim country] U.S. (US)
(31) [Application number of the priority] 60/208,619
(32) [Priority date] Heisei 12(2000) June 1 (2000.6.1)

(33) [Priority claim country] U.S. (US)
(31) [Application number of the priority] 60/220,578
(32) [Priority date] Heisei 12(2000) July 25 (2000.7.25)
(33) [Priority claim country] U.S. (US)
(81) [Designated country/region] EP (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, G R, IE, IT, LU, MC, NL, PT, SE), OA (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG), AP (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), EA (A M, AZ, BY, KG, KZ, MD, RU, TJ, TM), AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, I D, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,M W,MX,NO,NZ,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,US,UZ,VN, YU,ZA,ZW
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(57) [Overview]
The data input system includes a data symbol group including at least one of an E nglish character symbol, a numeral symbol, and a command (128 to 136). Each s

ubgroup is associated at least with a portion of a user's finger (102 - 120). The system also includes a keypad 126 defining a plurality of keys, each key including at least one of the symbols. At least one finger recognition system (100) is configured to recognize a portion of a finger when the key is touched and to select a subgroup symbol associated with a portion of the finger that interacts with the key.



Scope of Claims	Open

Detailed Description	Open
Drawings	Open
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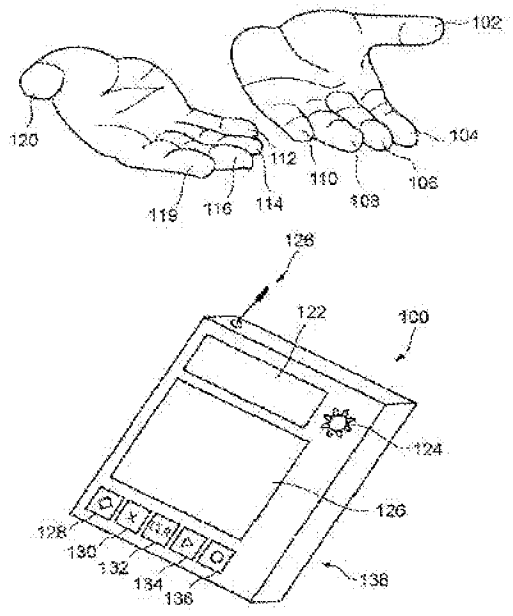
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(54)【発明の名称】　一体型キーパッドシステム

(57)【要約】
データ入力システムで、サブグループに分かれた英文字記号と数字記号とコマンド（１２８～１３６）のうちの少なくとも一つを含むデータ記号グループを備える。各サブグループは、少なくともユーザの指（１０２～１２０）の一部に関連付けてある。このシステムはまた、複数のキーを画成したキーパッド（１２６）を備え、各キーが記号のうちの少なくとも一つを含む。少なくとも一つの指認識システム（１００）が、キーに指を触れたときに指の一部を認識し、そのキーと相互作用する指の一部に関連するサブグループ記号を選択するようよう構成してある。



【特許請求の範囲】

【請求項１】

データ入力システムであって、

アルファベット記号、数字記号およびコマンドのうちの少なくとも１つを含むデータ記号グループであって、サブグループに分割され、各サブグループがユーザの指の少なくとも一部に対応する前記データ記号グループと、

複数のキーを定義するキーパッドであって、各キーが前記記号のうちの少なくとも１つを含む前記キーパッドと、

指がキーに触れたときに、該指の前記一部を認識し、該キーと相互作用する該指の一部に対応する前記サブグループの記号を選択するよう構成された少なくとも一つの指認識システムと、を備えること

を特徴とするデータ入力システム。

【請求項２】

請求項１記載のデータ入力システムであって、

そのキーと相互作用する前記指の一部により選択された前記複数のサブグループの記号のうちの一つを選択する少なくとも一つの追加の認識手段をさらに備えること

を特徴とするデータ入力システム。

【請求項３】

請求項１記載のデータ入力システムであって、

前記キーパッドが、それぞれキーに対応する複数の感応パッドを備えることを特徴とするデータ入力システム。

【請求項４】

請求項３記載のデータ入力システムであって、

前記複数の感応パッドは、３行４列に構成された位置を定義し、そして、各感応パッドが前記キーに対応すること

を特徴とするデータ入力システム。

【請求項５】

請求項１記載のデータ入力システムであって、

前記少なくとも一つの感応パッドのうちの少なくとも一つが単一のパッドからなり、該パッド上のキーに対応して複数位置を定義するよう構成してあることを特徴とするデータ入力システム。

【請求項６】

請求項２記載のデータ入力システムであって、

前記追加の認識手段は、音声認識システムであること

を特徴とするデータ入力システム。

【請求項７】

請求項２記載のデータ入力システムであって、

前記追加の認識手段は、口唇認識システムであること

を特徴とするデータ入力システム。

【発明の詳細な説明】

【０００１】

（関連出願との相互参照）

本出願は、本出願人の同時係属出願である米国仮特許出願第６０／１６３,９９６号（１９９９年１０月２７日出願）、第６０／１６４,６５６号（１９９９年１１月４日出願）、第６０／１６４,５９７号（１９９９年１１月１０日出願）、第６０／１６９,１４９号（１９９９年１２月６日出願）、第６０／１９４,７６７号（２０００年４月３日出願）、第６０／２０８,６１９号（２０００年６月１日出願）、第６０／２２０,５７８号（２０００年７月２５日出願）に基づくもので、ここに優先権の恩典を請求する。上記出願は全て、その開示全体が恰もそれら全体に記載されているかの如く、漏れ無くここに参照用に組み込むものとする。

【０００２】

（発明の属する技術分野）

本発明は、キーパッド、指、手、言語、口唇、顔面等の検出システムに係り、より詳しくはキーパッド（例えば、標準の電話機キーパッド）で、全文及び機能入力を自然で簡単で迅速な方法により提供できるよう、上記の認識システムと組み合わせて使用できる指パッド認識装置を有するキーパッドに関する。

【０００３】

（発明の背景）

小型化は最近の技術的前進に対する鍵を握る要素であり、大きさだけの理由で実用不能とされかねない多数の装置の製造を可能にするものである。かくして、現在、我々は原形のメインフレームよりもよりもさらに強力でより小さなデスクトップコンピュータを有する。また、ディジタル時計やビデオゲーム機や一般機器は、遥かに小型化の利益を体現するものである。事実、例えば携帯型コンピュータや携帯電話機の本質は、まさしく主要な特徴であるその大きさにある。

【０００４】

さらに、主に人間側の制約が原因で、幾つかの分野における小型化促進に対し多くの障害が存在する。例えば、自分の財布に収まる携帯型コンピュータを所持

することは望ましいが、この種のコンピュータはこのコンピュータとの人的相互作用を可能にする大型入力装置なしでは使用することが出来ない。換言すれば、携帯電話（現在、インターネットや電子メールやモバイルコマースやＳＭＳ（ショート・メッセージ・サービス）等としても使用されている）やノートブックや携帯情報端末（ＰＤＡ）などの複雑な小型コンピュータや装置は、ユーザが電話番号を入力し電子メールを送信し文字を転写するなどするのに、キーボードやテンキーパッドや他の入力装置が必要である。かくして、小型化技術が進むほど、幾つかの装置の真の小型化を妨げる他の人的要因へ掛かり合うことになる。

【０００５】

周知の如く、精巧な技術的製品への鍵を握る特徴は、その簡単な操作にある。上記の機器や同様の装置にとって、迅速で、簡単で、そして、最重要なことであるが自然なテキストや機能の入力システムは、不可欠である。

【０００６】

人々が慣れ親しんでいる電話機型のキーパッドは、小型の電子機器や遠隔通信機器用の最も一般的な入力装置である。それは、携帯型有線電話機やＰＤＡやノートブックやラップトップやファクシミリやテレビジョン受像機或いは他の電子装置のリモコンやカメラなどの多くの電子装置内に組み込まれている。このキーパッドは通常１２個のキーを有するが、その一方でテキストやメッセージの書き込みに用いる文字ならびに機能キーの数はこの数値の７倍にもなる。例えば、コンピュータのキーボードは８０以上のキーを備えるが、他方それらのキーの一部は２つの文字や記号や機能に用いられている。

【０００７】

電話機のキーパッドでは、キー（例えば、携帯電話のキーパッド）数が不足するため、通常の電話機のキーパッドの各キーは文字グループと通常１つの数字を含んでいる。インターネットの使用やショートメッセージの入力でさえ、消費者のために多くの複雑さを強いるものである。

【０００８】

小さな通信装置を使用し、テキストと機能を如何に速く簡単に入力させるかという基本的なマンマシンインタフェースを解決する提案がなされている。

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【０００９】

一つの解決策は、キーが表示するものの中から文字や記号を選択するのに単一キーの複数押しを用いるものである。このシステムは現在、大半の携帯電話のキーパッドに使用されている。それは、時間を浪費する方法であって、ユーザを苛立たせるものである。

【００１０】

そのシステムを改善するため、単語明瞭化（word disambiguating）ソフトウェア製品が開発された。辞書データベースと言語モデルが、押圧されたキーに従う可能性のある単語の走査ならびに提示に用いられている。その後、ユーザは提示された候補の中から所望の単語を選択する。この種の手法は、辞書単語には無い多数の問題を抱えていたり、或いはユーザに所望の単語を選択するよう集中を強いる。加えて、数字や一つの文字を入力するのは、ここでも時間のかかる作業となる。

【００１１】

この課題を解決するため、外部小型キーボードが製作もされているが、それらはユーザに２つの異なる機器の携帯を強い、簡単に持ち運びできるという小型電子製品の基本コンセプトを阻害している。

【００１２】

この種の限界を克服しようとした一つの最新技術が、音声／話し言葉認識技術である。音声認識は、個々の音声から対応するコンピュータ入力命令や単語や機能に対応するものとして１以上の音声パターンを認識する手法である。例えば、キーボード上の字をタイプ打ちするのではなく、ユーザがその字を発声し、そこで認識装置がその字の音声パターンをその字の対応するコンピュータ入力文字へ関連付ける。このように、ユーザ音声が全入力を提供するため、各人は入力装置なしで斯の如く装置を動作させることができる。残念ながら、個々人の音声の多くの複雑な側面を考えると、入力装置に完全に置き換わる十分なレベルで音声パターンを精確に認識することのできる認識装置はまだ存在しない。

【００１３】

その上、いくつかの文字、例えば「Ｂ」や「Ｐ」や「Ｄ」や「Ｔ」などの幾つ

かの文字は、言語エンジンを簡単に混乱させてしまう。これは必ずしもエンジンの欠点ではなく、何故ならこれらの文字には人も同様に簡単に判断に迷うことがあるからである。以下に掲げるのは、音声／話し言葉認識システムの問題点と短所の一部リストである。

【００１４】

－　唯一の言語向け、それも大半は英語である。

【００１５】

－　認識できるのは一人に限られる。

【００１６】

－　外部の騒音妨害（特に移動体遠隔通信機器の使用時）がある。

【００１７】

－　補正の不便さが原因で、小さなディスプレイを備えた装置に不向きである（特に、携帯電話のような小さな液晶を備えた機器の使用時）。

【００１８】

－　単語発声時に多くの間違い（断続的発声）が生じやすい。

【００１９】

－　異なる単語なのに発音が似たもの（例えば、ｔｗｏとｔｏｏ）がある。

【００２０】

－　数字の書き込み時にユーザの意思を予測できない（ｔｗｅｎｔｙ　ｆｏｕｒと２４）。

【００２１】

－　数字と記号の混ざったものの書き込み時にユーザの意思を予測できない（例えば、ｓｉｘ　ｂｙ　ｆｏｕｒが、６　ｂｙ　４か６×４なのか）。

【００２２】

－　文字（例えば、ＢとＰ）どうしの識別が困難である。

【００２３】

さらに、小型化が焦点であるにも拘わらず、携帯型の他の電子装置は、多くの安全性と効率問題を抱えている。例えば、携帯電話を置き忘れるか逸失した個人は、窃盗者や他人が電話を使用して不当な課金が発生する前に自らへの通信サー

ビスを断つべく速やかに処置しなければならない。この種の不正使用を防止する一つの周知の方法は、コードシステムを用いて携帯電話や他の装置をロックすることである。多くの場合に有効ではあるが、このシステムは、ダイヤル前に冗長な方法で電話を作動させなければならない真正な所有者にとって、骨の折れる非効率的なものである。同様に、コードシステムでもって先ず装置をロックしたり他の時間のかかる非効率的な手順を用いることなく、多くの電子装置の不正使用を防止する単純な方法は存在しない。

【００２４】

従って、必要なのは、上記の人的制約の板挟みを解決し、小型化が真の可能性の実現を継続できるようにすることである。さらに、この種の技術はまた、従来技術と比較してとりわけ装置の不正使用を防止することのできるより安全で効率的なメカニズムのための手段を備えねばならない。加えて、音声認識技術の信頼性を改善する技術もまた望ましいものである。必要なのは、好ましくは限られた数のキー（例えば、電話機のキーパッド）を備えた身近な入力装置を用いた文字単位でのデータ入力方法であり、各キーがコンピュータのキーボードや同様の装置に存在する文字や記号や機能を含み、指、音声、話し言葉、口唇、眼球、顔面などの他の認識システムの一部と結合され、個々のキー入力動作から個々の文字の識別を可能にするものである。

【００２５】

（発明の概要）

各ユーザの指のパターンの違いを認識するよう構成された１以上の電子パッドからなる指紋検出装置を用いる。この種のパターンは、指全体或いはその一部の指特徴（例えば、大きさや形や色など）に関係するものである。このパターンはまた、指先（指紋、大きさ、形）や爪（形、大きさ、明るさ）などの表層特徴などの他の情報に関係する。この種のパターンの違いは、翻って通信的に用いることができ、これにより人による入力が、個人の指を指紋検出装置に当てる操作を介して電子装置に伝えられるようになる。かくして、各人は電話番号を電話装置へ入力し、コンピュータに文字を入力し、ＰＤＡなどに様々なマクロや機能をトリガーするのに指紋検出装置と併せ指を使うことができる。

【００２６】

まず最初に、指紋検出装置がプログラムされ或いは教示（teach）されて、特定の指を数字や文字やマクロや他の動作などの対応記号や機能にマップ（写像）しなければならない。かくして、例えば各指を別個の数字にマッピングし（例えば、０～９が１０個の算用数字を構成し、それらが特定の人の１０本の指のそれぞれに対応する）、かくして、人の手と指パッドだけで電話番号をダイヤルできるようにするのに、この方法を用いることができる。これにより、多くの数字キーとは対照的に一つのパッドだけが必要とされ、空間が節約される。

【００２７】

特に、１以上の記号や機能が互いにマッピングできるようになる。例えば、本発明の一実施例によれば、指紋検出装置は、特定の指による二度叩きを一つの数字に対応させて解釈し、と同時に一方でまた同じ指による１回叩きを他の数字へ対応させるよう構成される。

【００２８】

実例を挙げれば、１回叩きの人差し指は数字「２」に対応させ、同じ指の２回叩きは数字「７」に対応させることができる。１０個の算用数字は全て、順に人の手と一つの指紋パッドでもって入力することができる。同様に、この方法を文字や記号や他の機能の入力へ拡張することができる。

【００２９】

代替例では、各指は電子パッドの異なる隅部（comer）のような指位置に基づく異なる記号や機能へマップされる。かくして、電子パッドの右手上方の角部叩きは、右手下方の角部などとは異なって解釈されよう。また、１以上のパッドを、必要に応じて同じ目的達成のため設けることができる。

【００３０】

この指紋検出装置の一つの主要な長所は、その大きさである。電話機用に大きなテンキーパッドを所持せず、人はむしろ上記の方法を用いたより小さな指紋パッドを用いることができる。同様に、コンピュータキーボードは、ＰＤＡ入力装置などと同様に、置換或いは修正が可能である。

【００３１】

一態様によれば、指紋検出装置は、それらの指紋に基づいて指を識別区別するよう構成される。しかして、これによってユーザには安全の長所がもたらされるが、それは指パッドが特定の指に基づいて作動するだけで、不正なユーザの手では役立たないからである。

【００３２】

またさらなる他の態様によれば、指検出装置は、指紋検出以外の方法による指の特徴の生物学的違いを検出する。これらの生物学的違いは、大きさや形や位置や温度などを含む。かくして、例えば指検出装置は形とその大きさに基づいて素早く１本の指を他の指から識別するよう構成できる。この手法は、完全な或いは部分的な指紋スキャン（走査）の冗長かつ複雑な作業を不要にする。指紋や指の生物学的認識には、任意種の感応タッチパッドやタッチスクリーンや熱的或いは光学的或いは他の認識手段のような異なる検出システムや装置を用い得ることは理解されたい。

【００３３】

本発明のさらに他の態様によれば、検出装置は正確性と使用の便宜を高めるべく多様な形態を受容するよう構成される。例えば、検出装置は、指検出装置と音声認識装置の両者として構成でき、検出装置は個人の指及び音声パターン双方からの入力に基づいて対応する文字或いは機能を識別する。

【００３４】

本方法は安全性を高めるだけでなく、別個の文字や単語及び／又は機能のより簡単でより迅速な入力を個人に可能にもする。実例を挙げれば、この方法なしでは、英数字の入力に自らの指の使用を望む個人は、３以上の文字や記号を各指に割り当てねばならず、その訳は人の指よりも多くの数の文字及び数字が存在するからである。それ故、文字入力時に１本の指を叩くだけでは不十分であり、それは入力装置が依然としてその指に割り当てられた幾つかの文字どうしを識別する必要があるからである。かくして、入力の多様な形態を提供することで、この問題は解決する。各人が自分の指を検出パッドに配置する際に、その人はまた所望の文字や機能を喋ることもできる。個人の音声が、検出装置に特定の指に割り当てられた多くの文字の識別を可能にする。加えて、音声認識の限界は取り払われ

るが、それは指検出装置が音声認識をより大きな範囲ではなく幾つかの文字や記号の一つにまで絞り込むからである。例えば、電話機キーパッドの文字配置を組み合わせたこのシステムを用いることにより、文字「Ｂ」と「Ｐ」は音声認識エンジンが誤認識せず、何故ならこれらが異なるグループ（例えば、キー）２と７に分かれて位置するからである。同じことが、それぞれキー３，８に位置する文字「Ｄ」と「Ｔ」についても当てはまる。

【００３５】

上記態様が、ここに説明する指検出装置のどれを用いても音声認識を活用するよう構成されていることが分かる。例えば、音声認識を指紋検出とともに動作させるよう組み合わせることができる。さらに、音声認識はまた、指紋以外の生物学的特徴に基づき指検出を用いて動作するよう組み合わせることができる。ここやその他で説明するように、それが光学的走査式装置を用いて動作するよう構成することもできる。

【００３６】

上記の説明は、後述する詳細な説明が理解され、かつ業界への現在の貢献がよりよく理解されることを目的に、本発明のより重要な特徴をより広めに記載してある。本発明の他の目的と特徴は、添付図面を併せ考察される下記の詳細な説明から明瞭となろう。しかしながら、図面は純然たる図解目的であり、添付の特許請求の範囲にて参照すべき本発明の限定を意図したものではないことは了解されたい。

【００３７】

（発明の実施の形態）

図１を参照するに、ユーザの指のそれぞれのパターンの違いを認識するよう構成した指紋検出パッド１２６を備える本発明の一実施例になる指検出インタフェース１００が図示してある。この種のパターンの差異は翻って通信的に利用可能であり、人による入力が指を指紋検出装置に触れる操作を介して電子装置へ電子的に伝送されるようできる。

【００３８】

本発明の一実施例になる指紋検出インタフェース１００は、表示スクリーン１

２２と、インジケータ光１２４と、コマンド釦１２８～１３６と、スイッチ１３８と、無線通信手段１２６と、をさらに備える。簡単に言えば、各人は指指１０２～１２０などの複数の指を用い、入力信号を出力しようとして指紋検出パッド１２６に触れるが、指紋検出装置１００が今度は通信手段１２６を介して電話機やコンピュータなどの別の装置へその信号を伝送する。供給される入力信号種は、どの指又はどの指の一部が用いられ、その指でどんな動きがなされたかを含む複合的要因に基づくものである。例えば、各人は自らの右の親指を二度叩きして１つの信号を出力し、自らの左の人差し指を強打して他の信号を出力することができる。この種の指紋検出の方法と用途は、以下により詳細に説明する。かくして、指紋検出装置は、よりかさ張るコンピュータキーボードや電話機テンキーパッドや他のどんな入力装置にも代わって用いることができる。

【００３９】

引き続き図１を参照するに、表示スクリーン１２２が指紋検出メカニズムのオプションの可視指示として備わっている。例えば、指紋装置を介する電話番号を入力する個人は、電話番号検出時に表示スクリーン上に表示されるこの電話番号を見ることができる。一実施例によれば、表示スクリーンはバッファとして機能し、個人は表示スクリーンを見て、あらゆるエラーを補正し、続いて電話機のような対応装置にバッファ情報を伝送することができる。以下に説明するように、コマンド釦１３２，１３４はこの目的に用いることができる。

【００４０】

加えて、インジケータ光１２４は、指紋装置の操作を指示するよう点滅及び／又はビープ音を発生するよう構成できる。かくして、各人は表示スクリーンを見ることなく指紋パッドを使用することができ、各指に対する指紋検出メカニズムが完了する際にインジケータ光が点滅するかビープ音を発生する。このことが指示とともに個々のユーザへ発信され、これによりユーザは他の指或いは信号へと続くことができる。

【００４１】

上記したように、コマンド釦１２８～１３６には、幾つかの役立つ機能が備わっている。例えば、コマンド釦１２８，１３０は、装置を起動或いはプログラム

するのに用いることができる。当然ではあるが、指紋検出装置はプログラムするか教示（teach）し、これにより数字や文字やマクロや他の動作のような対応する記号や機能を用いて特定の指紋をマッピングしなければならない。かくして、コマンド釦１２８，１３０を記録及び選択釦として機能させ、１以上の記号又は機能を選択して特定の指紋をもって写像されるようにできる。さらに、コマンド釦１３２，１３４を用いて、バッファ内或いは表示スクリーン上で情報をそれぞれクリア或いは伝送するのに用いることができる。同様に、コマンド釦１３６が指紋装置にバッファシステムを迂回させる指示を与え、電話機のような対応装置へ全情報を直接伝送することができる。無論、一実施例において、コマンド釦は一切設けず、システムの全機能を指紋パッドを介して達成することもできる。

【００４２】

さらに、スイッチ１３８は、電源のオン／オフスイッチや検出モードスイッチや個人ユーザスイッチなどの追加機能を備える。例えば、指紋装置は、１以上の個人の指紋をマッピングするよう設計できる。効率目的に、スイッチの一つをどの個人が指紋装置を使用しているかを示すよう構成し、照合させねばならない指紋の数を制限することで装置の処理時間を低減することができる。さらに、検出モードスイッチは、指紋を数字や文字や機能などとして解釈すべきであるかどうかのような主用途を指示するのに用いることができる。かくして、文字の打ち込み時、スイッチを単一の指叩きを一般的な文字へ写像するよう装置に指示することができ、またこれに対し電話番号のダイヤル時にはこのスイッチが装置に指示して、一回だけの指叩きを数字などにマップさせることができる。

【００４３】

図示の指紋装置は本発明の一実施例であるが、そのように限定されるものでないことは理解される。代替実施例では、指紋装置は、個別外部装置ではないコンピュータや電話機の一部として組み込むことができる。加えて、無線通信以外のどんな技術も用いることができる。

【００４４】

図２を参照するに、マッピングテーブル２００が図示してあり、それはデータベースシステムがどのように個々の指紋を一つ以上の対応する号や機能にマッピ

ングできるかについて説明するものである。一実施例に従って示すように、マッピングテーブル２００は、識別番号２１２のような数字識別番号の形で指紋を格納する指紋ＩＤ指数２０２を含んでいる。さらに、マッピングテーブル２００は、特定の動きを機能記号へ割り当てるマップ指数２０４～２１０を含む。

【００４５】

実例を挙げるに、識別番号２１２に対応する指をもって一回叩きすることで、数字「０」が生成され、これに対し同じ指の二度叩きが数字「６」を生成する。翻って、１回叩きと二回叩きだけを用いることにより、１０個の算用数字の全てを人の手と一つの指紋パッドをもって入力することができる。同様に、この方法を、文字や、記号や、滑動（glide motion）２１０などを用いる機能の入力に拡張することができる。

【００４６】

無論、マッピングテーブルは、幾つかの指の一つを必要に応じて全部或いは一部マッピングすることでのみ指示できる。同様に、マッピングテーブルは、同じ機能や記号を多数の指に割り当てるか、同じ指を対応する手に割り当てるなどできる。

【００４７】

特に、図２のマッピングテーブルは、指紋装置に局地的に、或いはデータベースに遠隔的に、或いは中央局に集中的にさえ格納できる。事実、中央ステーションにマッピングデータを格納することは、各人をしてその指紋コードの再プログラムを強制することなく、中央局の領域内のほぼ全ての指紋装置を使用できるようにさせる。無論この特徴は、指紋装置の安全性の恩恵を一部犠牲にするかも知れない。

【００４８】

図３を参照するに、指紋検出パッド３０２を有する従来型の腕時計３００が図示してある。この実施例によれば、このパッドは、かさ張る入力装置を含ませる必要なく電話機やラジオや他の装置を組み込むのに用いることができる。かくして、ユーザ３０６はヘッドフォン／マイクロフォン３０４を腕時計や電話機などの用途に難無く取り付けることができる。

【００４９】

同様に、図４を参照するに、表示スクリーン４０２やコマンド釦４０６だけでなく指紋検出パッド４０４を有する計算機４００が図示してある、このように、小型計算機には、ここでは指紋パッドを介して多くの大型の科学或いはコンピュータ計算機よりも多くの機能をより小さな空間に組み込むことができる。ここで、上記に用いた方法と同じように、様々な指紋と動きを機能と数学計算にマッピングできる。

【００５０】

図５は、図１の指紋検出装置１００と同様であるが、４つの指紋パッド５０２～５０８を有する指紋検出装置５００を例示するものである。一実施例によれば、二回叩きや強打などの異なる動きを用いるのではなく、ユーザは多数の指紋パッドを用いて異なる記号や機能に対応することができる。無論、この種の装置は、多数の指紋パッドと多数の動きなどの両方の用途を組み込むことができる。同様に、４つの指紋パッドを保有せず、一つのパッドを用いることができるが、この一つのパッドの各四隅のそれぞれにはセンサが設けてある。

【００５１】

図６ａは、手首に組み付けた電話装置６００を例示するものである。電話番号をダイヤルするためのかさ張るテンキーパッドを持たせるのではなく、ここではオプションのコマンド釦６０４と共に用いる指紋パッド６０２が用いられ、より少ない空間で同じ仕事が達成される。

【００５２】

同様に、図６ｂには、オプションのコマンド釦６５６だけでなく、２つの指紋パッド６５２，６５４を備えた別の腕巻き電話装置が図示してある。上記のごとく、追加された１以上の指紋パッドは利便性などを増すよう構成することができる。この種の指紋パッドは、特にこの装置を人の手首に位置させるため、より大きなテンキーパッドを設けるよりも便利である。

【００５３】

上記ならびにここに記述した指紋検出装置が、多くの環境のうちの一つにおいて動作するよう構成できることが分かる。例えば、個々の指は音符に写像でき、

各人はその指で指紋パッドを叩くことにより曲を演奏することができる。この実施例によれば、７本の指を７つの異なる音符に割り当てることができ、異なるパッド或いは１本の指又は一つのパッドの異なる部分をより高音の音符又はより低音の音符に割り当てることができる。

【００５４】

さらに別の実施例において、指紋装置は、指全体ではなく人の指の最小部分だけを走査するよう構成できる。本実施例では、装置は必ずしも安全性の尺度には関係していないが、１本の指を他の指から識別したり、１本の指の一部位を同じ指或いは別の指の他の部位と識別することに関連するものである。それ故に、どの指或いはそのどの部位が用いられたのかを知るのに十分な最低量の走査が必要とされる。無論、装置は速度対安全性特性に多少とも依存して走査するよう構成することができる。

【００５５】

本発明のさらに別の実施例では、装置は、指紋以外の個人の指の中の生物学的相違点を走査するよう構成することができる。これらの生物学的相違点は、大きさや形状や位置や温度などを含む。かくして、例えば指紋検出装置は、その大きさと形状などに基づいて１本の指を他の指から素早く識別するよう構成できる。この手法は、完全指紋や部分指紋を走査する冗長で複雑な仕事を不要にする。

【００５６】

一実施例によれば、生物学的違いの走査手法は、一人の人物の指の識別に係わるだけである。このように、この指紋検出装置は、例えば、手の５本の指又は２本の手の１０本の指の中から親指又は親指の一部を人差し指又は人差し指の一部から識別する指の形状及び／又は大きさの解読を必要とするだけである。これは、一人の親指を別の人の親指から識別しなければならないよりも単純で迅速な作業である。この手法は、多数の親指と人差し指などのデータベースを介して達成できるものである。人が指紋パッドにタッチした際に、検出装置はその指をデータベース内の「テンプレート」指と照合する。例えば、もっとも親指に最も近い一致をみせる指は、親指と分類されるなどである。無論、より能率的にそれら個々の指を認識するシステムを、各人がプログラム或いは「教示」することができ

る。

【００５７】

図７を参照するに、本発明のさらに他の実施例になる遠隔指検出装置７００が図示してある。検出装置７００は、上述した実施例の指紋パッドを用いずに指と指の動きを走査検出する光学的或いは他のスキャニング装置７０２を備える。スキャニング装置７０２は、指７０４のような指或いは指の一部をキャプチャ（捕捉）することにより動作し、指画像のデータベースに対して指画像を分析して指が親指か人差し指かその他であるかを判定する。この種のデータベースは、ユーザ構成に基づいて特化するか、或いは手の様々な指の周知の生物学的差異に基づいて一般化することができる。

【００５８】

かくして、各人はパッドに触れることなく、スキャニング装置を介して電話番号をダイヤルするか文字を入力することができる。事実、各人の指は遠隔制御器として動作するよう構成でき、そこでスキャニング装置はテレビジョン受像機のような装置に接続されよう。例えば、各人は指７０４でもって発信し、テレビジョン受像機の音量ボリュームを増加させるべきであることを指示できる。同様に、他の指でテレビジョン受像機のチャネル制御を操ることができる。事実、遠隔スキャニング装置は、電子機器や光スイッチや水回りと浴室の備品などのうちのいずれか１以上のものに設置することができる。検出装置の不要な動作を避けるため、検出装置が走査開始すべきことを知るよう個人は所望の指でもって指摘したり或いは発信することができる。

【００５９】

引き続き図７を参照するに、走査線７０６～７１２は、本発明の一実施例の走査（スキャニング）ならびに検出プロセスを示すものである。実例を挙げるに、走査の一方法には、スキャニング装置７０２を通常の走査線７０６，７１０を介して指７０４全体を通常走査するよう構成することが含まれる。この手法は、全走査親指の画像を前記したデータベース内の他の一般化或いは特化親指画像と比較しよう。形状や位置などの他の要因もまた、走査過程内で要因として絡んでくる。他の走査方法は、スキャニング装置７０２を幅狭の走査指７０２へ構成し、

これにより指７０４の一部だけが例えば走査線７０６，７０８をもって走査する。これは、迅速で恐らくより効率的な方法となるが、それは指のより小さな部分を走査するからである。さらに別の方法は、スキャニング装置７０２を、例えば走査線７０６，７１２をもって手全体或いは手の一部を幅広に走査する構成とする。この手法は、検出装置をしてより大きな画像を観察し指７０４をより良く識別できるようにする。例えば、このスキャニング装置は、その指７０４が手の他の４本の指の右にあることを知り、それが親指に違いないことを知ろう。この手法は、手のその他の指を検出するのに同様に利用できよう。

【００６０】

上記実施例が、本発明のシステムを介して指或いは指の異なる部分を検出或いは識別するのに用い得る多数の方法の例示に過ぎないことを理解されたい。例えば、本発明の一実施例に従って爪検出を用いることができ、そこでは構造や寸法や外観が異なる爪に基づいて異なる指が識別される。

【００６１】

装置の安全性を向上させるため、本発明の一実施例になるスキャニング装置は、各人の指の画像をより良く認識すべくプログラム或いは「教示」することができる。そのようなプログラム方法は、個々の指それぞれを様々な角度からスキャニングし、スキャニングした指の三次元コンピュータ画像を生成することを含むものである。この手法は、指紋検出装置にそれが真っすぐに或いは横に逸れて配置されたかに無関係に指或いは指の位置をより良く検出させるようにするが、それは全ての角度からの指の完全な画像だからである。加えて、一実施例によれば、各指にはその位置か又は真っすぐか脇にずれたかといった方向に基づき、異なる文字或いは機能を割り当てることができる。

【００６２】

一実施例になる別の指方向指示方法は、通常の走査及び／又は検出へ向け先ず指を定常配置する。次に、指を横向き或いは上向きに切り替え、異なる入力コマンド等を指示する。　さらに、他の実施例によれば、多数の指を個別使用されているそれらに加えて使用することができる。例えば、人差し指は一つの文字或いは数字に対応でき、親指は別のものに対応でき、併せ用いる親指と人差し指を両

方一緒に用いることでさらに別の文字や数字などに対応させることができる。

【００６３】

別の実施例によれば、スキャニング装置はパッドと併せ使用できる。かくして、個々の指の走査はパッドに触れる前から開始されるが、指がパッドに触れるまでは完全なスキャニングは実行されない。この特徴は、偶然の指動きが検出装置を作動させないという保証を望む人にとって望ましいものとなる。さらに、それは、例えば誰かが電話番号をダイヤルする際に指を休止させるパッドや置き台が存在するときに、一部の人にはより快適なものとなる。スキャニングがパッド（例えば、あらゆる種類の感応パッド）自体によってなし得、二次元或いは三次元の画像を生成することを理解されたい。画像は、異なる記号や機能に割り当てることができる。例えば、上方位置の指（例えば、指の先端）でパッドに触れることは機能又は文字に対応し、正規の位置にある同じ指或いは別の指（例えば、指の腹）でパッドに触れることは、他の機能或いは数字に対応する。

【００６４】

本発明のさらに他の実施例によれば、検出装置は多様な形態の入力を受容して使用の精度と容易さを高めるよう構成してある。例えば、検出装置は指検出と音声認識装置の両方として構成でき、その場合検出装置は、個々の指と音声パターンの両方からの入力に基づいて対応する文字又は機能を識別する。

【００６５】

本方法が精度を高めるだけでなく、個人をして別個の文字及び／又は機能をより簡単にかつより素早く入力させもする。実例を挙げるならば、本方法なしでは、自らの指を使って英数字の入力を望む各人は各指に３以上の文字又は記号を割り当てねばならず、何故なら人の指を上回る多くの文字と数字が存在するからである。それ故に、文字入力時に単に指を触れるだけでは不十分であり、何故なら入力装置はその指に割り当てられた幾つかの文字どうしを依然として識別する必要があるからである。かくして、入力の多様な形態を提供することで、この問題は解決される。

【００６６】

各人が自分の指を検出パッドに置いた際に、人はまた所望の文字や機能を喋る

こともできる。個人の音声は、検出装置をして特定の指に割り当てられた多くの文字どうしの識別を可能にする。加えて、音声認識の限界が取り払われ、何故なら指検出装置が音声認識をしてより広い範囲ではなく幾つかの文字や記号の一つへ絞り込むからである。

【００６７】

さらに、入力の多様な形態の使用は処理観点からも有益である。たとえ各指に対し唯一の機能或いは文字が割り当てられていようとも、例えば音声認識の使用が、運指方向の供給によって指検出装置の負担を軽減することになる。かくして、検出装置は、音声認識ならびに指認識装置の両方からの情報を活用し、より素早くかつより高い精度をもって正確な検出結果に集中できる。

【００６８】

図８を参照するに、上記の検出装置８００は本発明の一実施例に従って図示してある。検出装置８００は、図７を参照して考察した指と指の動きを検出走査する光学的スキャニング装置８０２を備える。さらに、図８は音声パターンを検出する認識装置８０４と表示スクリーン８０６からなる。

【００６９】

実例を挙げるに、検出装置８００を介して入力を提供する一方法は、先ず指８０８のような指を光学的装置８０２によりスキャニングさせる。別の実施例では、音声認識と別形態のスキャニングを最初に行なうことができることも理解されたい。その後、認識装置に応答して、表示スクリーン８０６がその指に関連する１以上の文字や記号や機能を表示する。例えば、指８０８は数字の２や文字Ａ，Ｂ，Ｃや記号＠に関連付けてもよい。本実施例の方法がディスプレイ８０６なしで動作するよう構成できることは理解されたい。ここで、例えば個人８１０のような個人は、幾つかの選択肢を有する。１つの選択肢は、指８０８を１回以上叩いて４つの文字或いは記号のいずれを選択したいのかを指示する。他の選択肢は、所望の文字或いは記号が点滅するか他の指示があるまで、指８０８を所定場所に保持することである。他の選択肢は、前記した音声認識を使用することである。この選択肢によれば、各人８１０は所望の文字又は記号に対応する音声サンプルをもたらし、検出装置８００は音声認識装置８０４を介して記号を選択する。

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【００７０】

この手法は、指及び音声検出技術の限界の多くを克服する。音声及び指パターン両方といった入力形態を有することで、この装置は対応する文字や機能などの分離と識別がより良く可能である。例えば、音声認識装置には文字及び／又は記号の小さなリストから選択するよう要求されるだけであるため、不正確な音声認識の限界の大半は取り払われる。

【００７１】

事実、本発明の一実施例によれば、入力形態の一つはテンキーパッド或いは電話機キーパッドのような他の標準的な入力装置を介するものである。図１０を参照するに、キー１０２０のような９つのキーと音声認識装置１０４０を保有する電話キーパッド１０００が図示してある。かくして、各人は、例えば入力装置と共に音声検出を組み込むことで、この種のキーパッドから文字や記号をより簡単に選択できるようになる。実例を挙げるに、その文字を選択せずに別の方法で２以上のキーを押すのではなく、数字「３」（１０２０）を押して「Ｅ」と言うことで、各人は電話機パッド上で文字「Ｅ」を選択できる。これは、素早くかつ簡単で、かつ最も重要なことには文字選択にとって自然なシステムである。

【００７２】

上記の実施例が、ここに説明する指検出装置のいずれを用いても音声認識が活用できるようさらに構成できることは理解されたい。例えば、音声認識を指紋検出に組み合わせて動作させられるようにできる。さらに、音声認識はまた、指紋以外の生物学的特徴に基づく指検出と共に動作するよう組み合わせることができる。音声認識はまた、図８に記載した光学的スキャニング装置に加え視線方向認識システムなどの他のどんな装置とも動作するよう構成できる。

【００７３】

特に、本発明の一実施例によれば、指検出装置は、個人の手の１０本の指の中に、全ての一般使用される文字と記号を割り当てるよう構成できる。実例を挙げると、図９はサンプルマッピングテーブルを示すもので、それは全ての数や字や多くの文字を手の異なる指にマッピングするものである。本発明の代替実施例になる多くの追加のマッピング規格ならびにテーブルが存在することを、理解され

たい。

【００７４】

さらに別の実施例によれば、本発明の指パッド検出装置は、キーボードとして動作するよう構成できる。実例を挙げるに、図１１を参照すると、従来のキーボードのレイアウト１１００が複数のキーを有するものとして図示してある。この従来のレイアウトは、いくつかの不利な点を有する。例えば、大半のタイピストがキーボード上の様々なキーの位置とレイアウトに精通しているにも拘わらず、タイピングシーケンスを始める前になお自分の手を適当な位置に位置決めする必要がある。かくして、タイピストはまず最初に自らの左手の小指を文字「Ａ」に、そして次の指を文字「Ｓ」に置くなどしなければならない。一旦、この最初の位置決めが終了すると、タイピングシーケンスが始まり、その場合経験を積んだタイピストは前述の初期配置に対する相対的な位置に基づいてどのキーを押すべきかを知る。この技法を用いれば、キーボードを見る必要はなく、タイピング作業の速度が上がる。残念ながら、多くのタイピストは、しばしば最初の配置を誤ってしまい、例えば誤って左手の小指を文字「Ｓ」上に置いてしまうことがある。このことで誤った初期配置がなされ、そこで例えば各指はその正規の位置から１キー分右にずれて誤配置されてしまう。その後、タイピングシーケンス全体が行われ、判読不能な出力を生ずるだけとなってしまうが、それは意図したキーが隣接キーによって誤って置換されてしまうからである。

【００７５】

図１１ａを参照するに、本発明の一実施例になる中央の指パッド領域１１０４と５個の周辺指パッド部１１０６～１１１４を有する指パッドキーボード１１０２が図示してある。指パッド部１１０４～１１１４の追加は、指検出の追加用途をもって従来のキーボード１１００の限界を打破する。かくして、例えば各人の左側の小指は指検出を介して恒久的に文字「Ａ」に割り当てることができ、次の指は文字「Ｓ」に割り当てるなどできる。上記のごとくキーボードの適正キー上に指を位置させるのではなく、指パッドが指の位置に基づいてキーの位置を動的に較正する。

【００７６】

事実、中央の指パッド部１１０４を参照するに、平坦なパッドを除いて、キーは一切存在しない。タイピストが最初に自らの指を中央パッド上に配置するときに、人物の対応する指の位置に基づいて検出装置がキーの位置を較正する。かくして、タイピストは文字「Q」と「A」と「Z」を自らの小指に割り当てることができる。較正時に、タイピストの小指は文字「A」に対応し、「A」の下側或いは上側の位置は、左側の小指が触れた時は、それぞれ文字「Z」と「Q」に対応する。同様に、左手の人差し指は、「F」，「G」，「T」，「V」などの多数の文字を割り当てることができる。中央の指パッドは、指検出と較正位置を用い、どのキーが押されたのかを動的に判定する。一実施例によれば、各人が自らの手をキーボードから外す度に、指パッドキーボードがキー位置を再較正する。

【００７７】

本発明の一実施例によれば、周辺部指パッド部１１０６～１１１４が様々な機能に対応する。例えば、正規の小指キーを備えたタッチパッド部１１０８は、従来のキーパッド上のシフトキーに対応させることができる。同様に、親指で触れたときに、指パッド部１１１０は従来のキーボードのスペースバーキーへ対応させることができる。さもなくば、一実施例によれば、親指でもって指パッド部のいずれかに触れることをスペースバーキーへ対応させることができる。

【００７８】

本発明のさらに他の実施例によれば、中央の指パッド部１１０４は、表示スクリーン又はビデオ出力装置として同時に動作するように構成できる。かくして、例えばコンピュータのモニタとキーボードは、１台の装置として一体化できる。これはキーが指検出パッドと取り替えることができることで可能であり、表示画像について平坦もしくは平坦面がもたらされる。

【００７９】

代替実施例において、上記の一体型表示スクリーンは、指パッドキーボードの使用に対応する１以上のディスプレイを備える構成とすることができる。例えば、キーボードがタイピストの指の位置に基づいて、自らを較正する都度、一体型表示スクリーンはそれらの較正された位置に対応キーの画像を表示できる。加えて、押されたときに表示画像をハイライト表示し、特定の文字又は命令が検出さ

れたことをタイピストに指示することができる。加えて、一体型ディスプレイは、異なる言語或いは文字配列などに基づいてその外観を変えるよう構成することができる。

【００８０】

さらに本発明の他の実施例によれば、本発明の指パッド検出装置は、改良型キーパッドとして動作するよう構成できる。実例を挙げれば、図１２を参照するに、キー１２０２のような１２個のキーを有する従来の電話機キーパッド１２００が図示してある。キーパッド１２０２は各キーに割り当てられる１以上の記号を有するため、特定の記号を選択するのに多くの選択が要求される。一般的に、この種のキーパッドは、デフォルトによって各キーに数字が割り当ててある。かくして、キー１２０２を押圧することで、数字「３」が自動的に生成される。キーパッドの使用時に数字はより頻繁に所望されるので、これは効率的なシステムであることが分かる。しかしながら、文字や他の記号を望む場合は、キーパッド或いは他のシステムを調整してデフォルトの設定を一時的に外さねばならない。当然、このシステムは、キーと文字の両方が頻繁に必要とされるときは不利であり、何故ならキーを１回だけ押すことは曖昧な選択であるからである。

【００８１】

本発明の一実施例では、異なる数字や文字や機能が人の手の指の一部或いは全部に割り当てられた指検出キーパッド（図１０）が提供される。従って、例えば一つの指でキー１０２０（図１０）を押すことで、数字「３」が生まれ、同じキーを別の指で押すことで、文字「Ｄ」が生まれるなどである。このように、キーパッド上の各キーの全ての記号は一つのキーの押圧によって入力することができる。

【００８２】

一実施例によれば、上記の指検出キーパッドは、キーの押圧時に対応数字がデフォルトにより出力されるよう構成することができる。対応文字の一つを出力するため、特に割り当てた指を用いることもできる。かくして、特定の中指を「Ｂ」や「Ｅ」などのキーパッドのキーの中程の文字に割り当てることができる。同様に、右側のキー文字に対し右の指を割り当てるなどである。他の全ての指や非

検出の指や割り当てた指は、デフォルトの数字に対応させることができる。

【００８３】

図１３を参照するに、本発明の一実施例になる改良型多機能のキーパッド１３００が図示してある。キーパッド１３００は、上記の指検出システムを用い、キーボード１１００（図１１）の殆どのキーなどの複数のキー（例えば、標準的なキーボード）を、キーパッド（標準的なキーパッド）の限定されたキーと一体化してある。例えば図１３の実施例では、これらの記号と文字は３グループに配置され、すなわち数字と算用記号を含む第１アルファベット（ＡＬＰＨＡ１）１３０６（算用）と、英数文字とテキスト編集用に用いる記号と機能を含む第２アルファベット（ＡＬＰＨＡ２）１３０４と、残るＰＣコマンド（ＰＣ Ｃｍｎｄｓ）１３０２とである。本発明の他の実施例では、キーパッド１３００が多少のキー等と、ここに説明したシステムに従う機能を依然として保持することができる。

【００８４】

キーパッド１３００は、キー１３２０のような複数のキーと英数釦１３０８とＰＣコマンド釦１３１０と電源釦１３１２と送信／終了釦１３１４とメニュー釦１３１６と実行釦１３１８を含む複数のコマンド釦を備えるものである。簡単に言えば、これらのコマンド釦は、表示モードの切り替えやメニュー構造の処理や電源のオンオフなどの仕事を実行するよう構成してある。

【００８５】

コマンド釦１３０８，１３１０は、それを押すことで、幾つかの異なる構成の一つを選択する。例えば、図１３を引き続き参照するに、英数釦１３０８は押圧時に第１アルファベット（例えば、数字）構成１３０６或いは第２アルファベット構成１３０４を選択できる。さらに、ＰＣコマンド釦１３１０は、押圧時にＰＣコマンド構成１３０２を選択する。図示のごとく、これらの構成はそれぞれ異なる文字や記号や機能を表示する。例えば、第１アルファベット構成の選択時には、タッチキー１３２０が記号「&」や「6」や「＼」を生ずる。特に、指と音声検出といった様々な要因が、３つの記号のうちのいずれが選択されたかを決定する。一実施例によれば、指や音声や他の入力が一切与えられない場合は、デフ

ォルト結果が出力される。前の実施例では、数字「６」はデフォルト記号ともなる。他の２つの記号のうちの一つを選択するは、ユーザは例えば単語「アップ」や「ダウン」を発声し、記号の呼称やキー上の記号位置記号を発する。

【００８６】

かくして、僅かな追加キーも追加しなくてはならないということもなく、多数の文字と数字と記号が改良型キーパッド１３００により選択できる。さらに図解するように、例えばユーザが文字「０」の選択を望む場合、ユーザは先ずコマンド釦１３０８を介して第２英数構成１３０４を選択する。その後、ユーザはキー１３２０を選択し、かくして所望記号がキーに対応する。この選択はまだ曖昧であるため、ユーザはそこで別の形態の入力をもたらす。入力のこの他の形態は、音声認識や口唇認識や指認識などである。例えば、ユーザはキー１３２０を押す際に文字「０」を発音或いは発声してその選択をすることができる。ユーザが上記入力のうちの１つを用いなかった場合、キーは上向きの矢印機能のような特定の記号又は機能へのデフォルトとなろう。

【００８７】

一実施例によれば、文字や記号の一部が一つのキーの押圧によって利用可能とされる。例えば、稀にしか使用しない記号や機能は複数釦に割り当てることができる。実例を挙げれば、例えば記号「＞」を稀にしか使用しない場合、それを一つのキーにではなく、二つのキーに割り当てることもできる。かくして、記号「＞」を選択するのに、そこでユーザは割り当てられた二つのキーを同時に押さねばならない。これは、より乱雑でないキーパッドを望む者にとって、有利なことである。加えて、この種の技法を用いることで、より小さな改良型キーパッドさえ可能となる。

【００８８】

特に、改良型キーパッド１３００は、幾つかの実施例のうちの一つによって構成できる。一実施例によれば、図示の如く、各構成からの全ての文字がキーパッド上で同時視認可能である。構成選択時に、この構成に対応する文字が点灯し、ユーザに対し利用可能な文字或いは記号の指示をもたらす。本発明の他の実施例によれば、選択された構成に対応する文字又は記号だけが図示してある。かくし

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て、キーパッド１３００は外観の点で構成１３０２，１３０４，１３０６などに似たディスプレイを有することができる。

【００８９】

一実施例によれば、追加効率を求め上記の様々な入力形態が組み合わせられることは理解されたい。例えば、改良型キーパッド１３００は、音声と口唇の動きの両方を検出し、所望の記号を素早く区別できる。同様に、口唇認識を指認識（例えば、指先や指の腹）と合わせて用いるなどできる。

【００９０】

口唇認識は、高い騒音量を抱える公共の場所で特に役立つものである。音声認識装置を混乱させずに、例えば口唇の動きに基づいて記号を検出する光センサ１４２８（図１４）などの光センサを用いることもできる。本発明の他の実施例によれば、顔面認識が同様に用い得ることも同じく分かり、その場合に顔相と顔の特徴を検出してここに説明した装置への入力がもたらされる。さらに、一実施例では、顔面と口唇の認識を同時に用い、さらに精度を増すことができる。同様に、ここに開示された全ての認識形態は、１以上の他の認識形態と併せ使用し、改善された便利さと精度をもたらすことができる。

【００９１】

図１３ａを参照するに、図１３を参照して上記した認識技術が図示してあり、そこでは個別／別個の指が様々なキーに割り当ててある。この実施例では、０から９の文字配列が１０本の異なる指に割り当ててある。例えば、感応パッド上の異なる指の位置を、異なる文字グループに割り当てることもできる。例えば、指の左の親指の上方位置（指の先端）には、英数記号「｛」と「６」と「｜」を割り当てる。同じ指の下方位置（指の腹）には、文字「Ｊ」，「Ｋ」，「Ｌ」と機能「←」を割り当てる。さらに、例えば同じ指の爪でパッドを押すことで、「ＰＵ」コマンドを選択することもできる。文字を選択するため、音声認識のような追加の認識システムを用いることもできる。このシステムはまた、コンピュータのキーボードと置き換えることもできる。

【００９２】

図１４を参照するに、上記の指選択パッド１４０８と音声認識システム１４２

６と口唇認識光学装置１４２８をさらに備える本発明の他の実施例になる改良型キーパッド１４００が図示してある。この実施例によれば、上記のコマンド釦を介する構成選択ではなく、指認識が対応構成の選択に用いられる。例えば、キー１４０２が第２アルファベットならびに第１アルファベットの構成を、右側１４０４と左側１４０６にそれぞれ同時に表示する。例えば、指１４２２，１４２４を用い、対応構成から選択することもできる。実例を挙げれば、指１４２４に第２アルファベットの構成（左側１４０６）を割り当て、指１４２４に第１アルファベットの構成（右側１４０４）を割り当てることができる。かくして、指１４２４でもってキー１４０２を押圧することで、第１アルファベット構成から記号を選択することになる。その後、キー１４０２の記号「?」と「2」と「&」の間の曖昧さを解決するため、前述した如く、或いは図１４ｂの実施例で後述する如く、音声認識や口唇認識を設けることができる。さもなくば、複数の指を用い、指検出手段による曖昧さを解決することもできる。いかなる指も或いは指のいかなる部分も、上述の側１４０４，１４０６のいずれにも割り当てられることが分かる。また、いかなる構成も、任意の側１４０４，１４０６に配置できる。一実施例によれば、２つ以上の側もまた組み込むことができる。例えば、上記のＰＣコマンド構成は、図１３，図１４ｂ（１４５８）に示したキーの底面に配置することができる。コマンドを選択するために、ユーザは指又は指の一部でもって例えばコマンドが割り当てられた釦を押圧する。１以上のコマンドキーがキーに割り当てられた場合、上記した音声などの追加の認識システムを用いることができる。

【００９３】

キーパッド面に一体型の検出パッドやキーパッド被覆キーや自成キーパッドキーを被せられることが分かろう。検出パッドはまた、複数のより小さなパッドから作ることができ、各パッドがキーパッドの異なるキーや自成キーパッドキーを覆う。キーパッドを一体型感応パッドで構成でき、例えば線分により１２個の四角に理論的に分割し、各四角をキーパッド上の位置に従って特定のキーとして規定できることも特筆しなければならない。

【００９４】

一実施例によれば、記述した指認識方法のいずれかを用いる較正（キャリブレーション）ステップを用い、個々の指、すなわちパッド上の指の位置（指先或いは指の腹）を様々な構成に割り当てるのに用いることができる。このステップには、指パッド１４０８或いは２以上のキーパッドのキーに対し１或いは２以上の指を押し当て、将来の予測用データをキーパッドに供給することが含まれる。一実施例によれば、２本の指の間での検出が、より大きな指とより小さな指の区別の単純な仕事であって、２つの異なる大きさの指が用いられることも留意されたい。このことは、パッドに触れる指先や指の腹の部分のような指位置に当てはまる。当然、代替実施例では、上記した検出手段のような、より洗練された指紋或いは指形検出手段を用いることもできる。

【００９５】

本発明の他の実施例によれば、指パッド１４０８は、上記説明した実施例と同じく、指パッド入力装置として構成することもできる。かくして、文字や記号や機能を一つの指に割り当て、キーパッドの押圧（例えば、キーパッドのキーへの指の押し当て）を要することなく、システムへ入力をもたらすことができる。音声と口唇の認識もまた、指パッド１４０８と共に用いて追加の機能をもたらすことができる。同様に、一実施例では、指パッド１４０８は、キーパッド装置１４００から一括して除外してしまうこともできる。

【００９６】

図１４ｂを参照するに、多数の指や多数の指位置を用いて能率的に動作させるよう構成した本発明の他の実施例になる改良型キーパッド１４５０が図示してある。一実施例では、この種の効率は、英数の全文字を各キーの左側の英語のアルファベットの全文字を各キーの左側に配置し、全算用数字をキーの右側に配置することで達成される。実例を挙げるならば、キー１４５２は、他の記号の中に文字を有する左側１４５６と、他の記号の中に数字を有する右側１４５４をもって構成してある。ここに記載したシステムが例示だけのものであって、上側或いは下側などの多くの体裁に従って構成することができることは理解されたい。

【００９７】

特に、一実施例において文字と数字を区別する装置構成を採った一つの理由は

、通常ユーザはタイピング時に文字と数字を同時に入力しないからである。さらに、１つのモードから別のモードへの移行を制限するため、両モードで頻繁に用いられる一部文字は、１以上の側（例えば、数字側と英数側）に設けることもできる。例えば、記号「－」には、数字構成のキー１４０７と英数構成のキー１４０９が備わっている。図１３では、文字「．」が数字モードのキー１３０７と英数モードのキー１３０９に備わっている。さらなる効率性に向け、図１４ａに示すように、カーソル（左、右、上）や他の文字が個別釦１４３０上に備わっていて、それらの場所を両モードで頻繁に使用可能な他の文字が占有できるようにしてある。例えば、図１４ａに示すように、文字「（」は釦１４３４の右側のグループに割り当ててあったが、ここではカーソル「→」に代えて釦１４３２の左側のグループにも割り当てることができる。キー「１４３０」は、全モードに共通とし得る。

【００９８】

引き続き図１４ｂを参照するに、各人は幾つかの指の一つを介して任意の表示文字を選択できる。例えば、３本の指を文字記号（例えば、英数モード）に割り当てることができ、ここでは行１４６２～１４６６に示すように、各指が３つの垂直行の一つに対応している。例えば小指キーのような第４の指に、全ての行中の数字（例えば、数字モード）を対応させることができる。かくして、小指でどれかキーを押すことにより、対応数字（例えば、数値デフォルト文字）が出力される。非デフォルト数値文字を選択するため、ユーザは音声認識や口唇認識のような他の入力を設け、選択ができるようにしなければならない。例えば、ユーザは音声や口唇などを用いて単語「上」や「下」を発声し、所望の文字や機能の位置を識別することができる。同様に、対応する英数モード指をもって任意のキーを押すことで、中央の文字或いは他のデフォルト文字のような英数デフォルト文字が出力される。非デフォルトの字や文字を選択するために、例えば音声や口唇などの他の入力を設け、選択できるようにしなければならない。例えば、ユーザは音声や口唇その他をもって「上」や「下」や「左」や「右」の単語を発し、所望の字や文字や機能の位置を識別することができる。

【００９９】

同様に、一実施例によれば、ユーザはキー上にその位置を設けずに、実際に所望の字や文字や機能を喋ることができる。さらに、一実施例によれば、親指や他の指を用い、同様に改良型キーパッドに設けたＰＣすなわちコンピュータ機能に用いることができる。一実施例によれば、３本の指でなく、１本の指や指の部位やその指の位置だけが入力装置上で文字を表わすのに必要であることが分かる。

【０１００】

図１４ｂに示すように、英数構成がキーパッドキーの左側（例えば、キー１４５２の左側）に配置してある。キー２～９は、通常は、電話機のキーパッドキー（上部１４５６）上の標準的な位置に配置された３乃至４の文字を含む。追加の文字や機能は、キーの左中程（例えば、中央部１４５６）に位置している。キー（例えば、１４５４）上に位置する英数構成の文字と機能を区別するため、ユーザは先ず例えば英数モードが割り当てられたキーを指或いは指の一部で押すことにより、そのキーの英数グループを選択する。ユーザが音声のような他の認識手段を組み合わせない場合は、システムはキーの左中央に位置するデフォルトの文字や機能（例えば、←）を選択する。ユーザがキー上の文字の一つを選択したい場合は、彼は単純にその文字を綴るとよい。

【０１０１】

キーに対して一切文字が割り当てられていない１４５５のような他の釦にとって、通常は３つの英数記号が与えられる。それらは、キー上の左上部と左中央と左下部に位置する。デフォルトは、依然として左中央の文字となる。それは、文字を含む釦について前記した如くに選択される。他の文字又は機能を選択するため、ユーザは例えば左上部の文字について「上」と、また左下部の文字について「下」と発音してもよい。

【０１０２】

数字モードの機能と文字は、キーパッドキーの右側に配置される。各キーは、通常最高３つの文字を有していて、一つが右上部、もう一つが右中央、残りの一つが右下部にある。０から９までの数字や「」や「＃」などの標準的な電話機キーパッド上の他の記号は、その常習的な位置をキー上に占めることができる。それらは、例えばキー（例えば１４５４）上の右中央に配置できる。数字或いは

算用記号を選択するため、ユーザは先ず英数モード用に説明した数字割り当て指をもって数字モードを選択する。ユーザがいかなる追加の認識手段も使用しない場合、そこでシステムはキー（例えば、キー１４５５上の「１」）の右中央のデフォルト文字を選択する。キーの右上部或いは右下部上の算用記号を選択するのに、ユーザは例えば単語「上」或いは「下」を用いて、キー上のその位置を喋って、音声などの追加の認識手段を用いることができる。

【０１０３】

ＰＣコマンドのような他の機能は、例えばキー（例えば、１４５８）の中央下部など、キーパッドの異なるキー上に配置できる。ＰＣコマンドのようなコマンドを選択するため、ユーザは例えばコマンドが割り当てられた釦を指又は指の一部で押すことができる。１以上のコマンドがキーに割り当てられた場合、より細かな認識システムに対し「上」や「下」などの音声による追加の認識システムが付加できる。

【０１０４】

上記の実施例は、ユーザの使いやすいシステムである。それは、以下の多くの長所を有する。

【０１０５】

－　キーパッドは、標準の電話機型でよい。

【０１０６】

－　コンピュータキーボード上に存在する全ての文字とコマンドと機能は、そこで利用可能である。

【０１０７】

－　文字はキーパッドキー上の常套的な位置に配置される。

【０１０８】

－　数字もまたキーパッドキーの標準的な位置に配置される。

【０１０９】

－　文字を選択するため、ユーザは対応するキーを押して、自然に文字を綴る。

【０１１０】

－　数字を選択したりダイヤルするのにユーザは単に対応釦を押せばよい。

【０１１１】

－　使用する数字や英数構成内の記号や機能をデフォルトとしておくことにより、ユーザはただ対応釦を押すことでそれらを選択できる。

【０１１２】

－　他の全ての数字及びアルファベット記号或いは機能（より低頻繁で使用）についてはユーザはただ対応キーを押し、単語「上」又は「下」を発声する。

【０１１３】

－　全てのコマンドについて、ユーザはただ対応釦を押すだけである。

【０１１４】

一実施例によれば、本発明の認識装置が所望の文字や数字や記号を満足に出力しない場合に、ユーザが「後退」又は誤り指示キーを選択することに留意されたい。このキーは、「ＢＫ」キー１４５８か、おそらくは例えば釦１４６０のような誤り指示釦である。その後、入力装置は代替選択（それは当初意図された選択と一致するか又は一致しない）を提供し、そこにおいて、ユーザは「後退」キーやその他を再び選択することができる。一実施例によれば、「後退」キーは、他の選択を提供することのなく単に先の選択を取り消す。むしろ、一実施例によれば、入力装置は同じ誤りが繰り返されないよう、先の選択を記憶できる。本発明の一実施例によれば、綴り検査装置を設け、打ち込まれた単語の正確な綴りに基づいて検出の質を高めることができる。例えば、ユーザが単語を打ち込み、検出装置が対応文字の一つを識別するのが困難である場合、正確な綴りの単語を完成する文字が一実施例に従って選択されよう。このために、このシステムはそのメモリ内に１以上の言語と機能のデータベースを含むとよい。

【０１１５】

図１４ｃを参照するに、本発明の他の実施例によれば、改良型キーパッド１４７０が図示してある。キーパッド１４７０は、非アルファベット順に配置された文字の配列を表示する。キーパッド１４７０は、本発明の口唇や音声や他の認識技術の効果を高めるよう構成してある。具体的には、この種の認識技術を介して最も容易に識別可能な文字は、同じキー上に一緒に保存してある。同様に、識別

が困難な文字は、別々のキー上に配置してある。これは、入力装置にとって識別が最も困難である２つの文字間で頻発する誤りを減らす可能性を秘めるものである。改良型キーパッド１４７０が多くの可能な装置のうちの一つだけを表示し、その他は文字の識別可能性に基づいて構成されることは理解されたい。一実施例によれば、電話機のキーに備わったトーン或いはトーン変換が、文字が異なる配置であるにも拘わらず依然として維持できる点は特筆される。一実施例によれば、文字検出時にはいつも、その文字に常習的に関連するキーに対応するトーンが供給される。これは、他の電話機装置やシステムとの旧版互換性をもたらすものである。

【０１１６】

図１４ｄ，１４ｅを参照するに、図１５ｂ，１５ｃを参照して記述した配列と同様、個々の手とキーの水平配置がそれぞれ図示してある。一実施例によれば、図１４ｂ，１４ｃは、指に割り当てた英数グループと釦に割り当てた数字グループを図示するものである。図示１４ｄ，１４ｅでは、釦の配列は異なる。

【０１１７】

本発明の他の実施例によれば、改良型キーパッド装置はとりわけ指検出用に光センサ或いは圧力検出手段を代替配設できる。実例を挙げれば、図１５を参照するに、光センサ１５０２と圧力検出手段１５０４を有する改良型キーパッド１５００が図示してある。本発明の他の実施例において、光センサと圧力検出手段は、より効率的な検出用に他の存在なしで或いは他の存在と併せ別個に動作可能であることは理解されたい。さらにまた、この実施例の光検出手段と圧力検出手段が、図１５の改良型キーパッド１５００に加え上記した検出入力装置のような他の装置と共に動作するよう構成できることもまた理解されよう。この種の検出手段を用いることで、本発明の一実施例になるパッドが不要となることは特筆しておく。各人は、例えば光学式や光式やレーザー式の検出手段を用い、平面のパッドなどを用いることなく、空中の指或いは他の動きを検出できる。

【０１１８】

光センサ１５０２は、２通りの検出を用いることで動作する。第１に、センサはキーパッド上の指の位置を検出し、第２にセンサは使用する指の大きさ及び／

又は形状を割り出す。指の位置は、２方向光検出光線の相交差するＸ座標とＹ座標に基づいて割り出される。例えば、光センサは水平と垂直の両方に突出させることができる。指などの遮蔽被写体を検出する水平と垂直の光線が励起させられる。かくして、指の位置は起動された水平ならびに垂直の光センサがキーパッドの二次元パッドと交差する箇所と同じ場所にある。

【０１１９】

使用している特定の指の大きさ及び／又は形状は、起動された光センサの数に基づいて決定される。より広いかより大きな指は、当然ながらより多くのセンサを作動させるが、この場合光センサは十分な感度と解像度をもって構成される。かくして、大きさ判定と形状判定に基づき、使用した特定の指が区別できる。場所と正確な指が一旦識別されると、この種のキーパッドや入力装置は上記した実施例のうちの一つと同様の仕方で動作できる。

【０１２０】

圧力検出手段１５０４は、指の場所と使用する特定の型の指を検出することができる。この場所は、圧力機構に基づいて割り出される。すなわち、検出された圧力を有する場所は、指が押圧している場所である。さらに、非常に高感度の圧力検出装置は、圧力が検出される精確な領域に基づいて指の精確な大きさを計測することもできる。光センサと同様、異なる寸法の指をそうした仕方で検出することができる。特に、この種の高感度の圧力検出装置は業界で入手可能である。例えば、「携帯型圧力検出装置・・・」と題するＴｒａｎｔｚａｓに対する米国特許第５，９５２，５８５号には、そうした装置が説明されており、ここではこれを参照用に本出願に組み込むものとする。この種のシステムは、上記実施例のうちの一つに対し同様の仕方で動作させることができる。圧力検出パッドと光検出手段は、指の位置を判定して例えばキーの押圧を割り出す第１のシステムと、指の大きさを計測してどの指が用いられたかを割り出す第２のシステムとを併せ用い得ることも理解されたい。

【０１２１】

本発明の一実施例によれば、上記した光及び圧力検知手段が他の種類の入力又は検出によっても動作するよう設定できる点は特筆される。例えば、音声又は口

唇の検出は、機能性と正確さを増すのに組み込むことができる。

【０１２２】

本発明の一実施例によれば、上記した光センサ及び／又は圧力検出手段を用いる装置は、キーや釦或いは同様の入力信号ツールなしで構成してある。事実、引き続き図１５を参照するに、中央の入力部にキーや釦を一切もたない窪んだパッド１５０６が図示してある。むしろ、どんなコマンドの画像も表示も、平面上に表示される。この実施例の構成は、幾つかの利点を備えるものである。具体的には、平坦かつ／又は平滑な面を備えたことで、窪んだパッド１５０６は追加の用途向けに構成できる。例えば、この種の装置は、ラッチだけでなく携帯型の腕巻き時計電話用の入力装置として両方に動作するよう構成できる。実例を挙げれば、電話が使用中でないときは、パッド１５０６の平坦な領域にロック機構或いはラッチ機構を組み込み、手首に巻いた腕巻き時計電話は封止する。かくして、パッドは動作停止させられて視界から消える。さらに、ラッチを解除して通常の用途向けにユーザの手首から電話機を取り除いたときは、光センサ或いは圧力検出手段を自動的に起動させることができる。特に、光センサはパッド１５０６上方の一定距離で動作するため、窪んだ領域はそうしたラッチ機構やロック機構にとって理想的である。

【０１２３】

図１８を参照するに、本発明の一実施例になる改良型キーパッド１８０６付きの上記の腕巻き時計電話／ＰＤＡ１８００が図示してある。簡単に言えば、電話機は上記した窪んだ改良型キーパッド１８０６にラッチ或いは接続される取り外し可能な部分１８０４を有する。接続を断ったときに、キーパッド１８０６等の付いた電話機として使用する目的で、送受話器１８０４を送受話器１８０２に対して開くことができる。

【０１２４】

ここに記載した入力及び認識装置が様々なツール及び／又は面を用いて構成できることは理解されよう。例えば、一実施例によれば、入力装置はキーを備えることができるが、その一方で別の実施例ではタッチ式感応表示スクリーンが用いるなどされる。同様に、カメラや光検出器やレーザー検出器や人造絹糸検出器を

含むいかなる認識装置も組み込むことができる。特に、一実施例によれば、面に関係なく、各キー又は面位置は、ユーザにより特化し、異なる機能や文字や記号などに対応させることができる。この面が万一、動的にユーザ変化を表示することができない技術のものであるとするならば、オーバーレイを設け、紙面或いは他の材料を介してユーザの特化に対応するキー画像をもたらすことができる。

【０１２５】

図１５ｂを参照するに、本発明の他の実施例になるキー１５５２のような垂直配列キーを有する改良型キーパッド１５５０が図示してある。キーパッド１５５０は、キーパッド１５００やキーパッド１４５０といった前述の装置に対し同様の機能をもって動作するよう構成してある。標準のキーパッド構造によって構成するのではなく、キーパッド１５５０は垂直に配置してある。このように、本発明の他の実施例によれば、従来のキーパッドの典型的な矩形構造以外の様々な装置が可能であることが分かろう。同様に、図１５ｃを参照するに、折り曲げたキーパッド１５７０が図示してあり、ユーザの両手がキー１５７２のようなキー上にもっと楽に休止できるよう構成してある。上記に詳述したように、これらの実施例はまた、この実施例のキーに加え、平滑な指パッド面のような他の入力面ならびに装置を備えるものである。

【０１２６】

図２９ａ，図２９ｂ，図２９ｃを参照するに、前記した技法を用いた複数片（multi-section）キーパッドが図示してある。閉位置（図２９ｃ参照）において、この装置はキーパッドの大きさを最小にする。図１６，図１７について記載したどんな手段によっても各薄片（section）が互いに接続されることは理解されたい。このキーパッドは、図２０～図２２に記載したように、液晶ディスプレイやイヤフォンやマイクロフォンやカメラなど（図２９ｂ）の他の特徴を有する。本例では、キーパッドは２つの薄片から出来ていて、その一方の薄片はそれぞれ４つのキーからなる行を２行含み、他方の薄片は４つのキーからなる１行を含む。このキーパッドは、腕巻き電話機や腕巻きＰＤＡ装置などの装置用に用いることができる。

【０１２７】

前に触れたように、文字や機能や記号やそれらの組み合わせは、１以上の指のスキャニング位置や位置や動きに割り当てることができる。例えば、感応パッド上の指の２つの異なる位置或いは異なる部分に対し、１以上の文字や機能や記号の２つのグループを割り当てることができる。スキャニングシステムは、熱や圧力や光学や他の任意の認識手段によって作ることができる。

【０１２８】

この方法は、改良型キーパッド１４００内の異なる文字グループの選択に用いることができる。本発明の他の実施例によれば、異なる構成を選択するのに異なる指を用いる代わりに、指の異なる部位を異なる構成の選択に用いることができる。例えば、指１４２２の先端部分１４２２ａを一つの然るべき機能に割り当て、指１４２２の腹の部分１４２２ｂを異なる機能に割り当てることができる。さらに、ユーザの指の様々な部分が検出できるよう、キーパッドのキーや釦を構成してある。かくして、キーパッドの釦の一つ或いはキーを先端部１４２２ａをもって押すことで、ユーザは英数構成を選択でき、同様にユーザは同じ指の腹の部分１４２２ｂをもって数字構成を選択できる。

【０１２９】

このシステムは、より多くの柔軟性をもたらし、ユーザに対し割り当て可能性を増すことができる。例えば、指１４２２の腹の部分１４２２ｂを有するキーパッドのキーを押すことにより、ユーザは英数構成を選択できる。ユーザはまた、同じ指１４２２の先端部分１４２２ａか例えば１４２４などの他の指の別の先端部分によりキーパッドのキーを押すことにより、数字構成を選択できる。コマンドは、例えば釦を親指か指の一部かその両方で押すことにより、選択できる。

【０１３０】

本発明の好適な実施例によれば、前に触れたように、キーパッドのキーや指認識システムや音声／話し言葉認識システムや文字の配置やキーパッド（例えば、電話機キーパッド）のキー上の記号及び機能（以下、記号と呼ぶ）を組み合わせることにより、釦を１度だけ押したり差したりすることで、ユーザがこれらの記号の一つを区別できるようにしてある。以下により詳細に説明するように、キーパッドキー用のクリックシステムとして他の区別手段を上述した組合せに付け加

えることができる。

【０１３１】

一部の実施例では、記号の選択が音声や指位置や指形状や指紋などの前述の文字／機能選択手段の全てを必要としないが、その一部だけ或いはその中の僅か一つを必要とすることを理解されたい。例えば、記号を選択する上記した手段の組合せは、各キーパッド或いはキーパッドのキーごとに異なるものもある。かくして、異なるキーパッドに対し、キー上の記号の異なる配置をもたらすことができる。このように、キーは例えば選択手段の一つが所望の記号を選択するよう要求するたった一つ或いは二つの記号を含む。

【０１３２】

前に触れたように、文字の選択に音声或いは会話認識を用いる実施例では、ユーザは英数文字が割り当てられた釦を指或いは指の一部をもって押し、それと同時に彼は彼自身が望んだ文字を喋ればよいだけである。英数構成内の他の全ての記号について、ユーザは喋る必要はないかも知れない。喋らずにキーを押すだけで、デフォルトとして記号を強制選択する。数字構成では、通常ユーザはキーごとに３つの可能性を有しており、彼が自らの声を用いない場合はデフォルトの記号が自動的に選択される。キー上の他の数字記号については、ユーザは自らの声を使って例えば「上」や「下」と言うか或いは自らが望む他の任意の音声信号を用いることができる（異なる指紋に対するこれらの音声信号ならびに割り当ての組み合わせは、１以上のユーザにより事前に機械に対し教示しておくことができる）。好ましくは、頻繁に使用する数字記号は、デフォルト選択として用いることができる。この場合、ユーザが数字記号を選択するのに彼の声を用いることは稀である。

【０１３３】

上記の実施例により、電話機キーパッドを通じて、ユーザは素早くかつ自然にテキストや機能を入力できる。

【０１３４】

本発明のさらに別の実施例では、キーパッドのキーはクリック感応パッドで作られている。クリック感応パッドは、２段階の指圧力に応答するよう構成してあ

る。軽圧力が一つの応答を生成し、重圧力が他の応答を生成し、その間クリックによってユーザに指示する。このクリックシステムは、他の任意の認識システムや特に前述の一つに組み合わせることができる。例えば、図１４では、クリックを指認識システムに組み合わせて構成を選択することができる。ユーザは、指１４２２でキーを軽く押圧することで英数構成を選択し、同じ指又は別の指でキーをもっと強く押すことで数字構成を用い、かくしてクリックを生ずることができる。

【０１３５】

上述のシステムはまた、ユーザ音声を用いない記号の選択を行なうのに役立つものである。一グループのシンボルが、キー上で利用可能である。ユーザは、各指に多数のこれらの記号を割り当てることができる。キーを押すキー上の指又は指の一部の特定の動きが、ユーザが望む記号を選択することになる。例えば、図２７ａでは、このキー上に８つの異なる記号が配置してある。それらは、２行４列に配置される。文字は、上側行２４０４と下側行２４０２の他の記号グループに配置してある。ユーザの４本の異なる指は、これらの４本の異なる列に１対１で割り当てることができる。釦を例えば指で押圧することにより、個々の列２４１２が選択される。ユーザが指の腹の部分で釦を下方位置（例えば、平坦部）へ押圧した場合、文字「Ｘ」が選択される。ユーザは、彼の指の先端部分によりキーを押圧することで「＋」を選択することができる。

【０１３６】

釦を押圧する指部の代わりに、クリックシステムをキーに追加できる。この場合、例えばユーザが対応する指により列２４１２を選択した後、彼はいかなる位置或いはいかなる部分も彼の指で押すことができる。ユーザは、釦を若干押圧することにより、文字「Ｘ」を選択できる。ユーザが「＋」記号の選択を望む場合、彼は釦をクリックするより大きな圧力をもって釦を押さねばならない。

【０１３７】

本発明のさらに別の実施例では、図２８に記号グループがキーパッドの各キーに割り当ててある。この実施例を通じて所望の記号を選択するため、例えば話し言葉／音声認識システムや指認識システムのような異なる認識システムを、各釦

ごとにクリックシステムを有するタッチ式感応パッドと組み合わせることができる。

【０１３８】

キーの記号のユーザ入力を包み込むため、それらはそのキー上の異なる行に配列するのがよい。図２８の例では、記号は３本の行に配置してある。上側の行は、例えば文字「ＡＢＣ」からなる。この行から文字を選択するのに、ユーザは指で釦を押すと同時に所望の文字を綴らねばならない。

【０１３９】

中間の行は、例えば２つの記号を含む。それらの記号のうちの１つを選ぶのに、異なる方法を用いることができる。左側の記号は指の先端部分に割り当てることができ、右側は別の指の先端部分に割り当てることができ、これらは両方とも釦をクリックすることなく触れることができる。「左」や「右」といった音声入力は、任意の指による例えば上方（指先端）位置の釦押圧に組み合わせた記号のうちの一つの選択に用いることができる。

【０１４０】

下側の行は、さらに２つの文字を備える。この行のシンボルを選択するのに、それをより強く押すことで釦のクリックを加えること以外、ユーザは第２の行と同じシステムを使用できる。選択手段の組合せの多くの変形が、本発明から逸脱することなく用い得ることは、当事者には理解されよう。

【０１４１】

図１４を参照するに、英数割り当て指をもって釦１４０３を押すか文字を喋るかしたときに、音声認識システム或いは話し言葉認識システムは、たった３個の文字「Ａ」「Ｂ」「Ｃ」のうちののどれが発声されたかを理解するよう試みる。システムが３つの文字音声だけの認識を使用するため、異なるユーザは発声訓練要件なしで同システムを使用できる。

【０１４２】

かくして、本発明の利点の多くは、用途が広くコンパクトでユーザに親しみやすい改善されたキーパッドシステムを提供するのに用いることができる。前述したように、電話機型キーパッドを介する記号入力或いは記号構成（例えば、英数

や数字や機能）の選択に指認識システムを用いることにより、ユーザは少なくとも下記の個別原理或いは複合原理に従って自らの指紋すなわち指の特徴を用いることができる。

【０１４３】

－　アルファベット文字グループや数字文字グループやコマンドグループのような少なくとも一つの記号構成を、少なくとも１本の指や指の組み合わせに割り当てることができる。

【０１４４】

－　少なくとも一構成の記号を、１本の指の少なくとも一部或いは少なくともその動きに割り当てることができる。

【０１４５】

上記原理によれば、ユーザは自らの都合に合わせ例えば下記を使用できる。

【０１４６】

－　例えば指の異なる部分でキーを押す（例えば、キーを指の先端部或いは指の腹の部分で押すかする）ことにより１本の指だけで異なる構成を選択する。

【０１４７】

－　１本以上の指が、それぞれ個々に異なる構成を選択する。例えば、人差し指で英数構成を、親指でＰＣコマンド構成を、小指で数字構成を選択する。

【０１４８】

－　１本以上の指が、それぞれ個々に同じ構成を選択する。例えば、ユーザは英数構成用に３本の中指を用いることができ、その一方で親指をＰＣコマンド用に、小指を数字構成用に用いる。

【０１４９】

－　少なくとも一つの構成を選択するのに少なくとも一つの指を用いる。例えば、コマンド記号「ｃｔｒｌ」を選択するのに、ユーザは自らの親指で釦を押し、コマンド記号「ｐｒ」を選択するのにユーザは「ｃｔｒｌ」釦を親指で「ｐｒ」釦を人差し指で同時に押す。

【０１５０】

人差し指認識の使用は、両腕の指に適用することは理解されよう。加えて、音

声や口唇や他の認識システムは、上記の認識システムに組み合わせることができる。

【０１５１】

前に触れたように、例えば文字を静かに話すため、マイクロフォンをユーザの口の前に配置することもできる。他の解決策は、耳骨振動を介して音声を入力できるようにするユーザの耳に嵌める市場入手可能なマイクロフォンを用いることである。

【０１５２】

上述の入力システムは、携帯電話や固定電話、ＰＤＡ、コンピュータ、ラップトップ、テレビジョン受像機や他の電子装置のリモコン、ファクシミリなどの多数の装置に一体化させることができる。加えて、前記したシステムによる独立した入力装置は、個別に製造でき、上記の製品用に外部入力装置として用いることができる。

【０１５３】

このシステムは、異なる言語の１以上の単語データベースを含むものである。予知的な単語認識システムもまた、単語自体が完全に入力される前にシステムに対し可能性のある単語を入力するシステムと組み合わせることができる。このシステムはユーザと掛かり合う必要さえなく、それを入力する機械によって、大半は全入力の終了前に所望の単語の自動選択を可能にする。これが可能であるのは、このシステムを通じて個々に文字や記号（例えば、文字単位）ならびに押されたキーについての非常に少ない数の対応語を選択するからであり、単語が完全に入力され終わる前に所望の単語を割り出すのは容易なことである。

【０１５４】

たとえユーザがその単語の間違った文字を入力したり、与えられた文字の識別に機械が失敗したとしても、大半の場合は他の単語の文字は正しく入力されるため、予知的な単語認識システムは間違った文字を自動的に修正できる。

【０１５５】

文字を発声する代わりに、ユーザは対応釦を押圧しつつ単語を話すことができることが理解されよう。この場合、前に触れたデータベースは、単語認識システ

ムによる所望文字の選択に用いられる。単語の区切りは、例えば「．（ピリオド）」や「，（カンマ）」や「、（セミコロン）」や、入力コマンドなどの多くの記号や機能によって割り出すことができる。

【０１５６】

感応キーパッドが、全てのキーに複合した一つのパッドか或いは各キーに複合した複数の個別のより小さなパッド（例えば、キーパッドの１２個のキー用の１２個の個別パッド）のいずれかで出来ることも理解されたい。

【０１５７】

本発明のさらに他の実施例によれば、指パッド検出装置８００や改良型キーパッド１４００のような１以上の上記装置を、小型表示スクリーンや通信／コンピュータカードとともに動作するよう構成することができる。この種のスクリーンやカードは、可撓性プラスチック液晶やディスプレイ用の同様の装置で構成することができる。無論、上述した入力装置が、ここに記述した小型表示スクリーンや通信／コンピュータカードに加え、他の装置と動作するよう用い得ることも理解されたい。例えば、改良型キーパッド１４００は、腕時計電話機やコンピュータやＰＤＡ装置などの一部として構成できる。この種の液晶が、携帯電話機のような液晶を必要とするどんな装置にも用い得ることもまた理解されたい。それらの間の通信は、無線でよい。

【０１５８】

図１６を参照するに、本発明の一実施例になる複数片（multi sectioned）液晶パッドが図示してあり、前面液晶部１６０２と、電池式の追加メモリ用の背面メモリスロット部１６０４と、改良型背面キーパッド部１６１２が備わっている。液晶パッド１６００の追加構成部品である内部ハードウェアなどの他の構成部分は図面中に図示していないことに留意されたい。

【０１５９】

さらに、複数片液晶パッド１６００は、例えばパッドをクレジットカードの半分の大きさに折り畳むためのヒンジ（蝶番）部１６１６を有する。他の実施例によれば、液晶パッドを折り畳んだ状態等ではなく内外に伸縮できることに留意されたい。特に、一実施例によれば、ヒンジ１６１６の全ヒンジ部分がパッド１６

００の背面部に位置し、これにより前面液晶部１６０２が平坦に見えて高い画像視認性などが得られる。引き続き図１６を参照するに、液晶パッド１６００の前面部は像１６０５として図示してあり、背面や後部は像１６０８として図示してあり、液晶パッド１６００の閉じた或いは折り畳んだ部分は像１６１０として図示してある。

【０１６０】

一実施例によれば、背面の改良型キーパッド部１６１２は、キーパッド１５００（図１５）と同様に動作する。例えば、光センサ手段は、光センサ手段１６１４のように入力検出と指検出用に設けることができる。さらに、改良型キーパッド１６１２を複数片液晶パッド１６００の前部にも取り付け、これにより液晶と改良型キーパッドの両方がより簡単に見て使用できるようになることも理解されたい。この種の実施例によれば、背面部は未使用のままであり、これにより折り畳み時に液晶パッド１６００はクレジットカードや小型装置同様、財布やポケット内に忍び込ませることができる。内部の密封部分は、液晶と改良型キーパッドからなる。

【０１６１】

本発明の一実施例によれば、液晶パッド１６００はＰＤＡや腕時計ＰＤＡやコンピュータや双方向型新聞などとして動作させることができる。実例を挙げれば、液晶パッド１６００は、例えば改良型キーパッド１６１２を介する追加入力手段だけでなく、追加液晶表示スクリーン用の小型コンピュータ装置へも取り付ける（或いは遠隔通信する）ことができる。さもなくば、手首に時計をすると同時に、その一方でこのカードをＰＤＡとして使用に供することができる。

【０１６２】

さもなくば、このカードを機能的液晶ディスプレイとして用い、電話や携帯電話や他の装置に付け足し、これにより液晶パッドを介する他の装置との相互作用を可能にすることもできる。例えば、コンピュータ自動化システムを電話機を介してダイヤルすると、液晶パッド１６００は液晶上に全てのコンピュータメニュー或いは他の自動化選択を表示するよう構成できる。このことで、所望の選択や場所を得ようとして電話キーの数字を押す面倒は回避される。さらに、液晶パッ

ド１６００は、追加音声と他のコンピュータ化された特徴を電話や他の通信装置に対し提供することができる。

【０１６３】

簡単に言えば、図１６ａ～１６ｅは、上記の液晶装置と改良型キーパッドの様々な実施例を示す。様々な複数片液晶とキーパッドの構成が、本発明の幾つかの実施例の一つに従って表示される。

【０１６４】

図１６ａの液晶装置が、液晶をもたないか小型液晶をもつ携帯電子機器や遠隔通信装置用の外部ディスプレイとして用い得ることを理解されたい。この場合、例えば手首に腕巻き電話機を有する人は、ポケットに追加のクレジットカード大の液晶を携帯する。クレジットカード大の液晶は、例えばユーザの電話機キーパッドにより入力されたショートメッセージの表示に用いることができる。クレジットカード大の液晶は、複数片（multi section）化できる。図１６ｂ，図１６ｃに示した液晶を開くか広げたりしたとき、標準的なＡ４／Ａ５の紙とほぼ同じ幅にでき、ユーザは実寸大の文書で作業できるようになる。遠隔通信装置と外部液晶との間の接続は、兎も角、有線でも無線でもどちらでもよいことは留意すべきである。

【０１６５】

さらに他の実施例では、外部液晶はオフィスやレストランのような多くの場所で利用可能である。例えば液晶の大きさに限界のある携帯電話の携帯者は、何処にも見当たるこの利用可能な外部液晶を用いることができる。一実施例では、ユーザは、所持電話機で知る秘密コードを外部液晶に入力し、その液晶と自身の電話機との間の通信を可能にする。使用後、ユーザは外部液晶を復号する。このシステムは、通信を所望の液晶だけに限定し、そばにある他の利用可能な液晶との接続を不要にする。

【０１６６】

図１６ｄは、外部の複数片（multi-sectioned）インタフェースを示しており、先に述べた実施例と関連して考察した改良型入力装置と、複数片化したクレジットカード大の液晶を備える。このクレジットカード大の液晶は着脱可能で、キ

ーパッドに無線接続できる。

【０１６７】

図１６ｅは、クレジットカード大のコンピュータを図示するものであり、前記実施例で説明した改良型入力装置と、メモリ（図示せず）と、電池及び他の備品と特徴（図示せず）と、複数区分化したクレジットカード大の液晶を備える。クレジットカード大の液晶は着脱可能で、無線でコンピュータへ接続される。電池やメモリなどのコンピュータの構成部品がクレジットカード大であり、かつ着脱可能であることも留意すべきである。

【０１６８】

図１６ｆは、クレジットカード大のコンピュータと遠隔通信装置を示すものであり、前に実施例で説明した改良型入力装置とメモリ（図示せず）と複数片化したクレジットカード大の液晶を備える。クレジットカード大の液晶は、コンピュータに対し着脱可能で無線接続することができる。

【０１６９】

図１７を参照するに、本発明の一実施例になる大型液晶パネル１７００が図示してある。液晶パネル１７００は、正面図１７００に示される前面液晶部１７０８と、オプションの入力装置或いは他の構成部品（図示せず）用の背面部とからなる。この種の入力装置は、上記した如く、前面部分にも配置できることは理解されたい。本発明の一実施例によれば、液晶パネル１７００はさらなる利便性と軽快性をもたらすようプラスチック製の可撓性材料で出来ている。

【０１７０】

大型液晶パネル１７００は、折り畳みヒンジ１７０６，１７０８を介してその大きさを約１／４に折り畳むことができる。特に、符号１７０２は半分に折り畳んだ大型液晶パネル１７００を例示するものである。さらに、符号１７０４は完全に折り畳んだ状態の液晶パネル１７００を例示するものである。大型液晶パネル１７００は、装置のコンパクトさ大きさとをさらに増減すべく、多少ともヒンジ機構を用いた構成とすることができる。

【０１７１】

本発明の一実施例によれば、液晶パネル１７００は、ディジタル新聞として動

作するよう構成できる。かくして、各人は１以上のニュースソースから量子化されたニュースをダウンロードし、その後に液晶パネル１７００を使用してニュース又は他の所望の情報を読むことができる。この種の装置は有利であり、何故ならニュースを一日中継続的に更新でき、ニュースの体裁とコンテンツをユーザが特化できるからである。

【０１７２】

例えば、１人のユーザは、液晶パネル１７００をプログラムし、３つの特定のソースからスポーツニュースをダウンロードするのみにできる。他のユーザは、ローカルニュースなどを見ることのみ可能である。液晶パネル１７００が、新聞により常習的に提供されてきた情報に加え情報を表示できることを理解されたい。事実、ディジタル環境は従来の新聞では得られなかった特別記事のための手段をもたらす。本発明の一実施例によれば、上記のダウンロードとアップロードと更新は、インターネットを介してなされる。同様に、一実施例によれば、ここに記述した全ての装置も、インターネットを介してデータをアップロード又はダウンロードするよう構成できる。

【０１７３】

一実施例によれば、液晶パネル１７００は、様々なダウンロード局においてユーザに提供される。所望のニュースをダウンロードするのにひょっとしたら延長もあり得る期間を待つことはなくなる。キオスクや同様のサイトが導入でき、そこでは個人がより迅速なダウンロード用に液晶パネル装置を授受できる。そうした場所は、平均的なユーザには利用不能な帯域や他の技術を保有することができる。一実施例によれば、この種の液晶パネル装置はニュース会社の所有物でもあり得、その場合、個人はディジタルニュース用にその装置を借用するか賃借りすることになる。この種の実施例は、大半のダウンロードがキオスクで行なわれ、子細に至らぬ最小のダウンロードが無線技術のような他の手段を介して行なわれ、液晶パネルをユーザが所持する間に必要に応じてニュースを更新するようにさせる。

【０１７４】

このシステム及び方法は、多くの長所がある。キオスクは、あらゆる通信社の

情報ならびに他の刊行物の最終版をもって恒久的に更新される。ユーザは、カード（以下、「ニュースカード」と呼ぶ）を所持する。液晶装置（以下、「ニュース液晶」と呼ぶ）は、ニュースカードを用いてキオスクから借りることができる。それは、そのキオスクや他のいかなるキオスクにも返却できる。ニュースカードは更新され、その所有者がニュース液晶を所持することを示す。ユーザは、キオスクの経営者に彼が所望する全ての刊行物の複写を提供するよう申し込むことができる。刊行物は局部的に複写を必要とするだけであるため、その手順は現実には瞬時にしてなされる。

【０１７５】

支払いについては、ユーザは彼のニュースカードか別の支払いシステムを利用する。ユーザが彼のニュース液晶を使用する場合、彼は彼がその期間中に購入した全ての出版物に対し毎月の明細を受信することができる。ユーザがニュース液晶を常時携帯したくない場合は、彼はただそれを最寄りのキオスクに預け、そうすれば彼のニュース液晶はそこで更新され、彼がニュース液晶を所持していないことを示す。ニュース液晶はフロッピー（登録商標）ディスク収容部を含み、ユーザをして彼の出版物を含むディスケットが取り出せるようにしてある。いつ何時でも、ユーザは他のキオスクにアクセスし他のニュース液晶を借りることができる。ディスケットは如何なる種類でもよく、またどんな会の所有物であってもよいことには留意されたい。ニュースディスクは、例えばプラスチック製液晶のような大きな可撓性を有する。それは、「次のページ」やズームのような機能を省いたキーパッドからなる。

【０１７６】

一実施例によれば、折り畳みを一切可能にしないよう、大型液晶パネルをヒンジなしで設計することができる。この種の装置は、上記のプラスチック液晶技術を用いて、柔軟性を付加するとよい。

【０１７７】

本発明の一実施例によれば、大型液晶パッド１７００はまた完全な演算型コンピュータ或いは同様の装置とすることもできる。例えば、液晶表示部は、表示スクリーンと入力装置の両方として動作できる。特に、前述したように図１１ａの

入力装置は、入力装置兼表示スクリーンとして動作するよう構成できる。さもなくば、入力手段を大きな液晶パッド１７００の別の部分に設けることもできる。さらに、記憶装置やプロセッサ手段のようなコンピュータの構成要素を、製作技術水準によってもたらされるコンパクトな形でもって取り付けることができる。

【０１７８】

図１９を参照するに、本発明のさらに別の実施例による改良型の２つのキーパッドを有するキーパッド装置１９０４が図示してある。図１３のキーパッド装置を備えたような一つのキーパッド上に多数の構成を組み合わせるのではなく、ここでは２つのキーパッドを設け、これにより数字構成と文字構成の両方が同時に使用可能としてある。無論、キーパッド装置１９０４がいかなる２つの構成も配設可能であることは理解されたい。

【０１７９】

引き続き図１９を参照するに、閉じた位置にあるキーパッド１９０２が図示してあり、この実施例のキーパッド装置が非使用時に半分に折り畳むことのできる様子が示してある。本発明の一実施例によれば、上の実施例にて説明したように、キーパッド１９０４は追加機能用に釦制御器１９０８のような釦制御器を備えるものである。さらに、上記実施例を用いて説明したように、音声検出や口唇検出や手検出などの他の特徴をキーパッド１９０４に追加することができる。

【０１８０】

図２０を参照するに、本発明のさらに他の実施例に従って表示パッドを含む取り外し可能な送受話器２００４を有する改良型キーパッド装置２００２が図示してある。当初閉じた位置に示したキーパッド装置２００２は、送受話器表示パッド２００４が実際の使用に取り外せるよう構成してある。かくして、本発明の一実施例によれば、キーパッド装置２００２は電話機或いは他の携帯型通信装置を用いて動作するよう構成することができる。キーパッド部分は、電話番号のダイヤル或いは文字のタイピングなどの入力用に用いることができる。送受話器内の表示パッドを出力ディスプレイとして用い、入力事項を見たり、インターネット或いは他の個人など外部ソースからのデータの読み取りに用いることができる。

【０１８１】

一実施例によれば、表示パッド２００４は、異なるキーパッド装置と交換可能に動作するよう構成できる。かくして、各人は便利さや機能性などのため、異なるキーパッド装置のものと表示パッドを交換できる。本発明の一実施例によれば、表示パッド２００４に安全コード或いはバーコード装置を設け、ディスプレイが適切な認証なしで他のキーパッドに取り付けられることのないようにできる点も留意されたい。さらに、表示パッドはメニューディスプレイを持たせ、ユーザにこの種の機能の選択をもたらすことができる。

【０１８２】

キーパッド装置２００２や表示スクリーン２００４はまた、カメラ２００６やマイクロフォン２０１０やイヤフォン２００８を設け、前記した認識技術を用いることもできる。本発明の一実施例によれば、例えば音声認識を用いることができる。実例を挙げるに、ユーザがキーパッド装置へ文字或いは単語を打ち込み、それと同時にこれらの単語を喋って音声認識により解釈されるようにする間に、一つの型の音声認識を動作させることができる。ユーザがまた喋った単語の全て或いはその一部を打ち込むため、認識精度は改善される。一実施例によれば、空白キーや終止符キー或いは他のどんな記号もキーパッドに追加し、新たな語の開始を発信させることができる。上記した音声認識が口唇や顔面或いはの他の形態の認識によっても用い得ることも理解されよう。このように、一実施例によれば、ユーザは口唇認識を用いて単語全体もまた発声することができる。

【０１８３】

図２１を参照するに、本発明の一実施例になる組み込み型表示スクリーン２１０４を有する送受話器２１０２が図示してある。図示のごとく、送受話器２１０２は携帯用に折り畳むこともできる。加えて、イヤフォンやカメラやマイクロフォンなどのような他の必要な構成要素とともに、送受話器の背面に表示パッド２１０４が設けてある。

【０１８４】

図２２は、表示スクリーンは無いが、図２１のそれと同様の送受話器２２０４を示すものである。むしろ、キーパッド装置２２０２と図２０の表示スクリーンは、本発明の一実施例によれば、送受話器装置に取り付けて図示してある。この

ように、ユーザは一つの装置内の送受話器や電話機やキーパッド及び／又は表示スクリーンを利用でき、ここではこれらの各構成要素は個々の用途に分離することができる。

【０１８５】

図２３乃至図２６は、本発明の一実施例に関連してキーパッドを動作させるのに用いるステップを例示するものである。改良型キーパッドが図示１４ｂに図示してあり、ユーザはこのシステムにより提供される全ての機能を動作させるよう用いることができる。かくして、ステップ３３０２における動作モードの選択により、ユーザはステップ３３００において、キーパッド上での操作を開始する。このシステムには対応する動作モードに対し１以上のユーザの指が割り当てられるよう予め構成してある点には留意されたい。例えば、本発明の一実施例では、システムは親指を「制御」モード操作に割り当てられる。小指は、数字モード処理に割り当てられる。３本の中指のうちのどれか或いは全てが、英数モード動作に割り当てられる。それ故に、図１４ｂを参照するに、小指を押した場合、システムは各釦の右側部分に位置する文字の機能を割り当てる。同様に、親指を押した場合は、システムは各釦の中央下部に位置する「制御」文字の機能を割り当て、３本の中指のどれかが押された場合は、システムは英数文字の機能を割り当てる。本発明がこの実施例の範囲に限定されず、所望モードの操作差別化に指装置の任意の形態が用いられることには留意されたい。例えば、ユーザの親指の腹の部分は、コマンド構成に割り当ててもよい。他のどんな指の腹の部分も英数構成に割り当てることができ、任意の指の先端部を数字構成に割り当てることもできる。

【０１８６】

ステップ３３０４においては、システムは、押圧された指に基づいてどの動作モードが選択されたかについて判定する。アルファベット（英数）モードが選択された場合、システムは図２４に示した如く、ステップ３３０６へ進んでアルファベット（処理）手順を開始する。数字モードが選択された場合、システムは図２５に図示したように、ステップ３３０８へ進んで数字（処理）手順を開始する。最後に、コマンドモードが選択された場合、システムは図２６に図示したよう

に、ステップ３３１０へ進んでコマンド（処理）手順を開始する。

【０１８７】

図２４に示したように、アルファベット手順はステップ３３２０から始まる。ステップ３３２２では、システムはユーザが文字か単語を発声したかどうか、或いはユーザが自らの口唇を動かしたかどうか、或いは機能を表わす顔の表情のような指示信号を発したかどうかを判定する。アルファベットモードであれば、システムは例えば打ち込みが要求されるアルファベットの各文字をユーザが発声する音声信号を受信しよう。例えば図１４を参照するに、アルファベットのうちの１つ例えば「Ａ」をシステムが認識したとき、システムはステップ３３２４へ進み、どの釦が同時に押されたかを判定する。例えば釦１４０６が押された場合、システムは、ステップ３３３０において、「Ａ」の発声と釦１４０６の押圧との組み合わせに基づき、対応文字「Ａ」を選択する。音声と指押しの組み合わせは、今なされている所望文字の打ち込みが終わるまで例えば釦１４０５を何回となく押圧する必要性を軽減する。

【０１８８】

ステップ３３２２における音声指示或いは口唇指示がアルファベットの発声ではなく「アップ」や「ダウン」の所定コマンドであれば、システムはステップ３３２６へ進み、釦の上部或いは下部に位置する文字を割り当てる。例えば、ユーザが図１４ｂの釦１４５５と組み合わせて「アップ」と発声した場合、ステップ３３３２において、システムは対応する「？」記号を選択する。しかしながら、システムが音声を認識しないか或いは対応する音声を聞かない場合は、ステップ３３４０へ進んでステップ３３００へ戻る。

【０１８９】

ステップ３３２２では、システムが音声を聞かないか又は口唇或いは他の顔の表情の動きを認識しないものの、ユーザが釦を押した場合、システムはステップ３３３４へ進み、対応するデフォルトの文字記号や機能を選択する。例えば、図１４ｂを参照するに、釦１４５５が口唇或いは他の顔の表情の動きを伴わずに押された場合、システムはタブ機能をデフォルト機能として選択する。ユーザは、ステップ３３３６において、表示窓を見て所望の文字が選択されたかどうかを判

定する。そうでない場合には、ユーザはステップ３３３８において、後退（ＢｋＳｐ）コマンドを発し、システムはステップ３３００へ戻って処理を開始する。

【０１９０】

ユーザが数字モードを選択した場合は、システムは図２５に示すステップ３３５０へ進む。再び、ステップ３３５２において、このシステムがユーザが「アップ」か「ダウン」のような所定の単語或いは非所定の単語を発したかどうか、或いはユーザが自らの口唇或いは他の顔相を動かして所定の或いは非所定の単語を示したかどうかを判定する。もしそうならば、システムはステップ３３５４へ進み、押圧釦とともにどの所定の単語が発されたのかを判定する。

【０１９１】

例えば、単語「アップ」の発声を伴って釦１４５４が押されると、システムは、ステップ３３５６において対応する「％」記号を選択する。しかしながら、システムが音声を認識しないか又は所定の音声を聞かない場合は、ステップ３３６４へ進んでステップ３３００へ戻る。他方、単語が発されない場合は、システムはステップ３３５８へ進み、デフォルト文字を選択する。例えば図１４ｂの数字「2」が、釦１４５４の押圧に応答する。どんな入力誤りの場合も、システムはステップ３３６２へ進み、図２４を参照して考察したのと同じ機能を実行する。

【０１９２】

最後に、ユーザがコマンド処理を選択する場合、システムはステップ３３７０へ進み、このステップ３３７２において、単語「アップ」或いは「ダウン」或いは前記説明した所定の単語でないものを発声するなど、ユーザが単語を発し、所定の信号を示す自らの口唇或いは顔相を動かしたかどうかを検出する。システムは、ステップ３３７６において、所定の発声と釦の押圧との組み合わせに応答し、対応コマンド或いは対応機能を選択する。しかしながら、システムが音声を認識しないか或いは所定の単語を聴取しない場合は、ステップ３３８０へ進みステップ３３００へ戻る。一言の単語も発されず、或いは口唇や顔面の動きが一切認識されない場合、システムはステップ３３７８へ進み、デフォルトの「コマンド」を選択する。このシステムは、そこでユーザによる次の動作に向け、ステップ

３３８０を去ってステップ３３００へ戻る。

【０１９３】

このように、代替実施例に適用した本発明の基本的な新規の特徴を図示し説明し指摘してきたが、開示発明の形態や詳細における様々な省略や代用や変更が、本発明の範囲から逸脱することなく当事者になし得ることは理解されよう。それ故に、ここに添付した特許請求の範囲にて示されるものだけに限定すべきことを意図するものである。図面は必ずしも実寸法で描かれていないが、その本質において、それらが単に概念的なものであることは理解さるべきである。

【図面の簡単な説明】

【図１】

図１は、指紋や指どうしの他の生物学的差異を介して装置に対する数字や文字や他の記号や命令の入力を可能にする本発明の一実施例になる指紋検出装置インタフェースを示す図である。

【図２】

図２は、本発明の一実施例になるデータベースのマッピングテーブル部分を示す図であり、１以上の対応する機能又は記号に論理的に写像される特定の指を例示してある。

【図３】

図３は、本発明の一実施例になる指検出パッドを有する腕時計を示す図であり、この腕時計はラジオや電話或いはコンソールやテンキーパッドや他のかさ張る入力装置が不要の他の装置として機能するよう構成してある。

【図４】

図４は、本発明の一実施例になる指紋検出パッドを有する計算機を示す図であり、指紋検出を介して各人は機能や他の命令を入力できるようにしてある。

【図５】

図５は、４つの指紋パッドを有する本発明の一実施例になる図１の指紋検出インタフェースを示す図である。

【図６ａ】

図６ａは、テンキーパッドに代えてダイヤル用の指紋パッドを有する本発明の

一実施例になる腕巻き型電話機を示す図である。

【図６ｂ】

図６ｂは、追加機能用に２つの指紋パッドを有する図６ａの腕巻き電話機を示す図である。

【図７】

図７は、指や手或いは指や手の一部を捉えて特定の対応する文字や数字や機能やコマンドを検出する本発明の一実施例になる光学的指検出置を示す図である。

【図８】

図８は、本発明の一実施例になる光学的指検出手段と音声認識手段の両方からなる検出装置を示す図である。

【図９】

図９は、本発明の一実施例になる指マッピングテーブルを示す図である。

【図１０】

図１０は、本発明の一実施例になる音声認識装置を有する電話機キーパッドを示す図である。

【図１１】

図１１は、従来のキーボードの正面図である。

【図１１ａ】

図１１ａは、拡張キーボード及び／又はディスプレイ装置として構成される本発明の一実施例の指パッド検出装置を示す図である。

【図１２】

図１２は、電話機キーパッドの正面図である。

【図１３】

図１３は、多数の構成を有する本発明の一実施例になる改良型キーパッド装置を示す図である。

【図１３ａ】

図１３ａは、本発明の一実施例により使用される図１３の改良型キーパッドを示す図である。

【図１４】

図１４は、口唇と音声と他の入力及び認識手段を有する本発明の一実施例になる改良型キーパッドを示す図である。

【図１４ａ】

図１４ａは、口唇と音声と他の入力及び認識手段を有する本発明の他の実施例になる改良型キーパッドを示す図である。

【図１４ｂ】

図１４ｂは、口唇と音声及び他の入力及び認識手段を有する本発明の他の実施例による改良型キーパッドを示す図である。

【図１４ｃ】

図１４ｃは、口唇と音声及び他の入力及び認識手段を有する本発明の他の実施例になる改良型キーパッドを示す図である。

【図１４ｄ】

図１４ｄは、図１４ｂの認識技術を利用して本発明の一実施例による改良型キーパッドを構成するキー配置を示す図である。

【図１４ｅ】

図１４ｅは、図１４ｂの認識技術を利用して本発明の一実施例による改良型キーパッドを構成するキー配置を示す図である。

【図１５】

図１５は、光センサと圧力検出手段からなる本発明の一実施例の改良型キーパッドを示す図である。

【図１５ｂ】

図１５ｂは、本発明の一実施例になる改良型キーパッドを構成するキー配置を示す図である。

【図１５ｃ】

図１５ｃは、本発明の一実施例になる改良型キーパッドを構成するキー配置を示す図である。

【図１６】

図１６は、本発明の一実施例になる改良型キーパッドからなる複数片液晶を示す図である。

【図１６ａ】

図１６ａは、本発明の一実施例になるクレジットカード大の液晶装置を示す図である。

【図１６ｂ】

図１６ｂは、本発明の一実施例になる複数片液晶を示す図である。

【図１６ｃ】

図１６ｃは、本発明の一実施例になる複数片液晶を示す図である。

【図１６ｄ】

図１６ｄは、本発明の一実施例になる改良型キーパッドからなる複数片液晶を示す図である。

【図１６ｅ】

図１６ｅは、本発明の一実施例になる複数片液晶及び改良型キーパッドを有するクレジットカード大のコンピュータを示す図である。

【図１６ｆ】

図１６ｆは、本発明の一実施例になるクレジットカード大のコンピュータと遠隔通信装置を示す図である。

【図１７】

図１７は、折り畳み性と小型性を増すよう多数の蝶番を設けた大型液晶パネルを示す図である。

【図１８】

図１８は、ロック機構を有する改良型窪んだキーパッドからなる腕巻き時計電話機及びＰＤＡを示す図である。

【図１９】

図１９は、２つのキーパッドを有する本発明の一実施例になる改良型キーパッド装置を示す図である。

【図２０】

図２０は、表示パッドを含む取り外し可能な送受話器を有する本発明の一実施例になる改良型キーパッド装置を示す図である。

【図２１】

図２１は、送受話器の背面部上に表示パッドを有する本発明の一実施例になる送受話器装置を示す図である。

【図２２】

図２２は、図２０の改良型キーパッドに着脱可能に接続されるよう構成した本発明の一実施例になる送受話器装置を示す図である。

【図２３】

図２３は、本発明の好適な実施例になる文字記号機能認識システムの一般的ステップに関するフローチャートを示す図である。

【図２４】

図２４は、好適な実施例になる英数文字と記号の認識ステップに関するフローチャートを示す図である。

【図２５】

図２５は、好適な実施例になる算用文字と記号の認識ステップに関するフローチャートを示す図である。

【図２６】

図２６は、好適な実施例によるコマンドと機能の認識ステップに関するフローチャートを示す図である。

【図２７ａ】

図２７ａは、本発明の一実施例のクリック感応パッドを用いた改良型キーパッドのキーを示す図である。

【図２７ｂ】

図２７ｂは、本発明の一実施例のクリック感応パッドを用いた改良型キーパッドのキーを示す図である。

【図２８】

図２８は、本発明の一実施例のクリック感応パッドを用いた改良型キーパッドのキーを示す図である。

【図２９ａ】

図２９ａは、本発明の一実施例の改良型複数片キーパッドを示す図である。

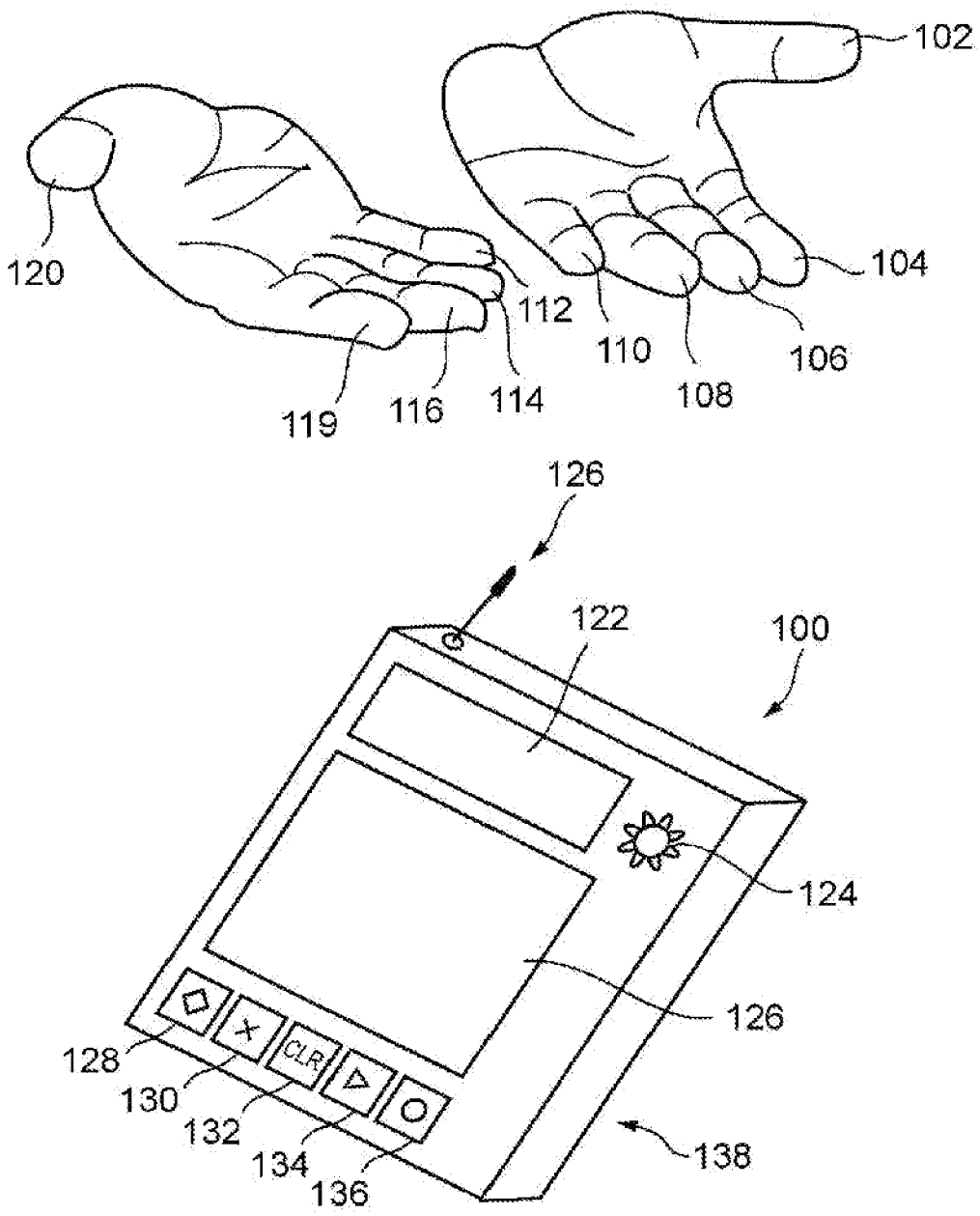
【図２９ｂ】

図２９ｂは、本発明の一実施例の液晶付き改良型複数片キーパッドを示す図である。

【図２９ｃ】

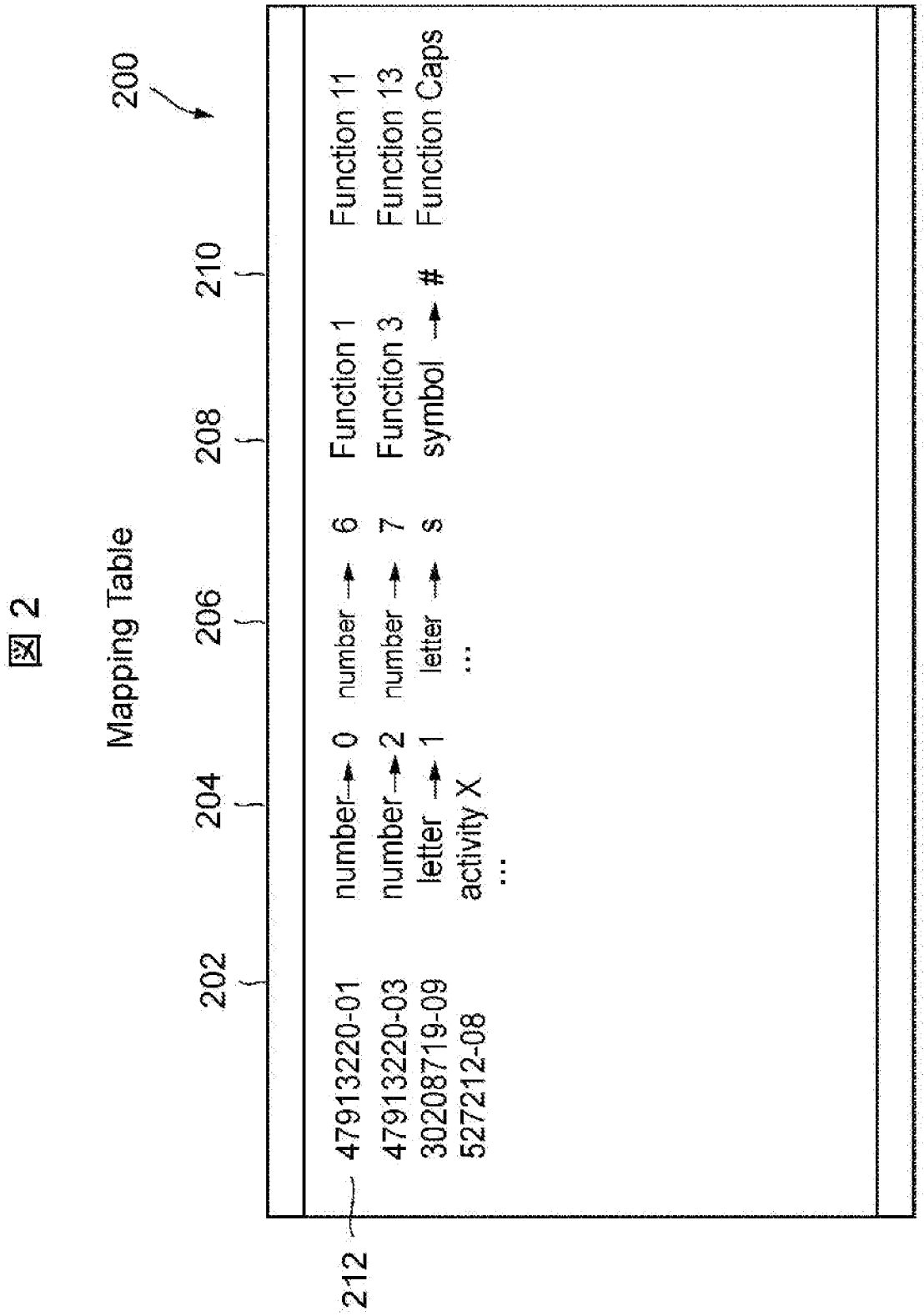
図２９ｃは、本発明の一実施例の閉じた位置にある改良型複数片キーパッドを示す図である。

【図１】

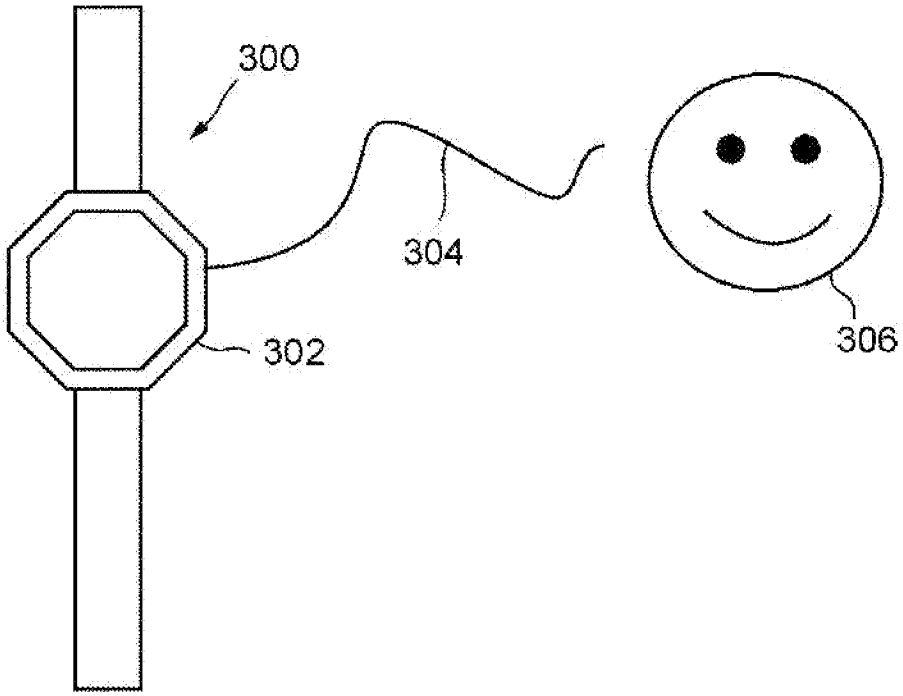


【図２】

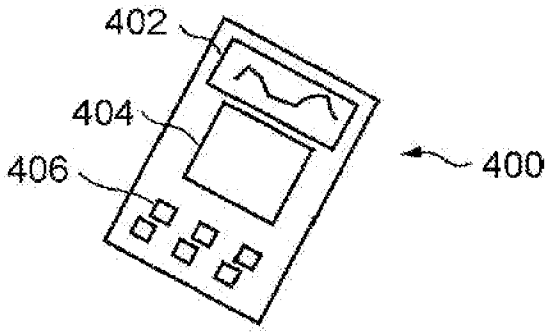
図２


200
Mapping Table
202
204
206
208
210
212
47913220-01 number → 0 number → 6 Function 1 Function 11
47913220-03 number → 2 number → 7 Function 3 Function 13
30208719-09 letter → 1 letter → s symbol → # Function Caps
527212-08 activity X ...
...

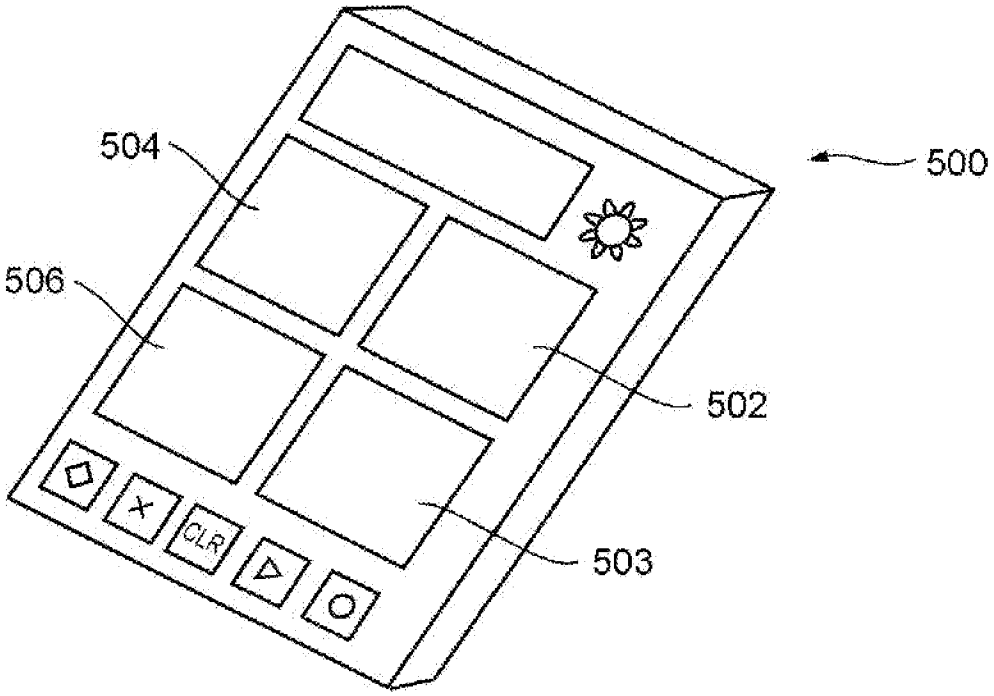
【図３】



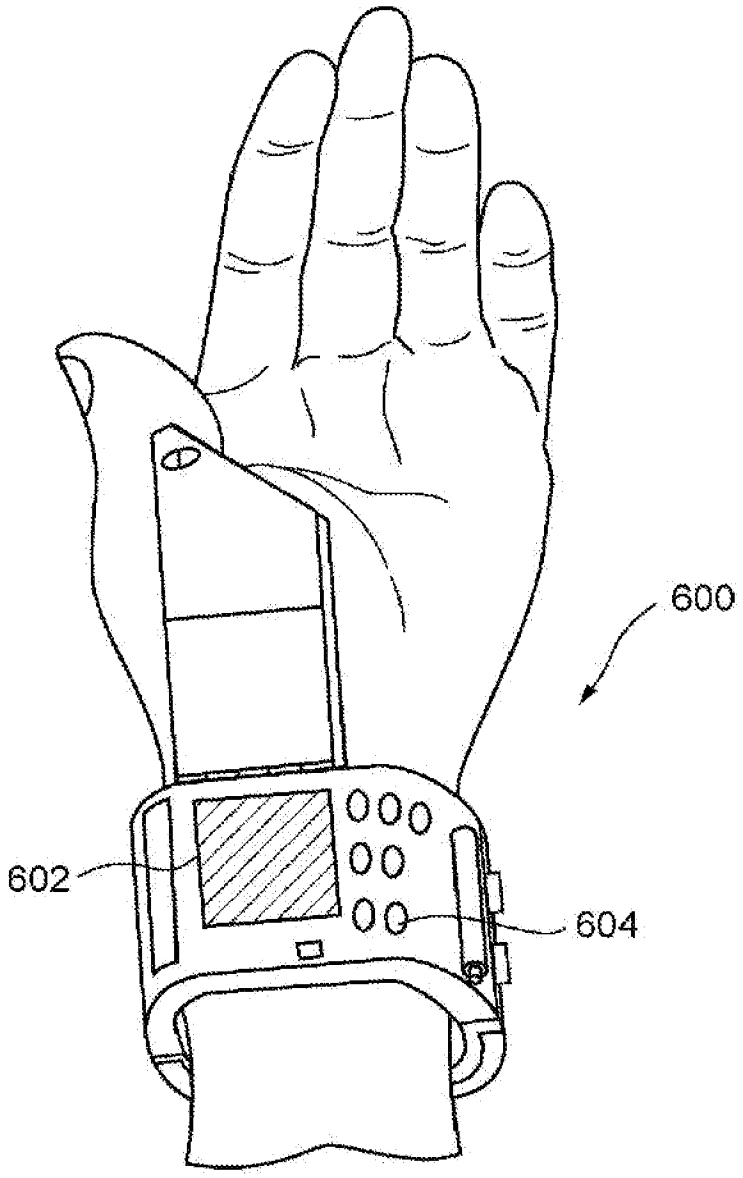
【図４】



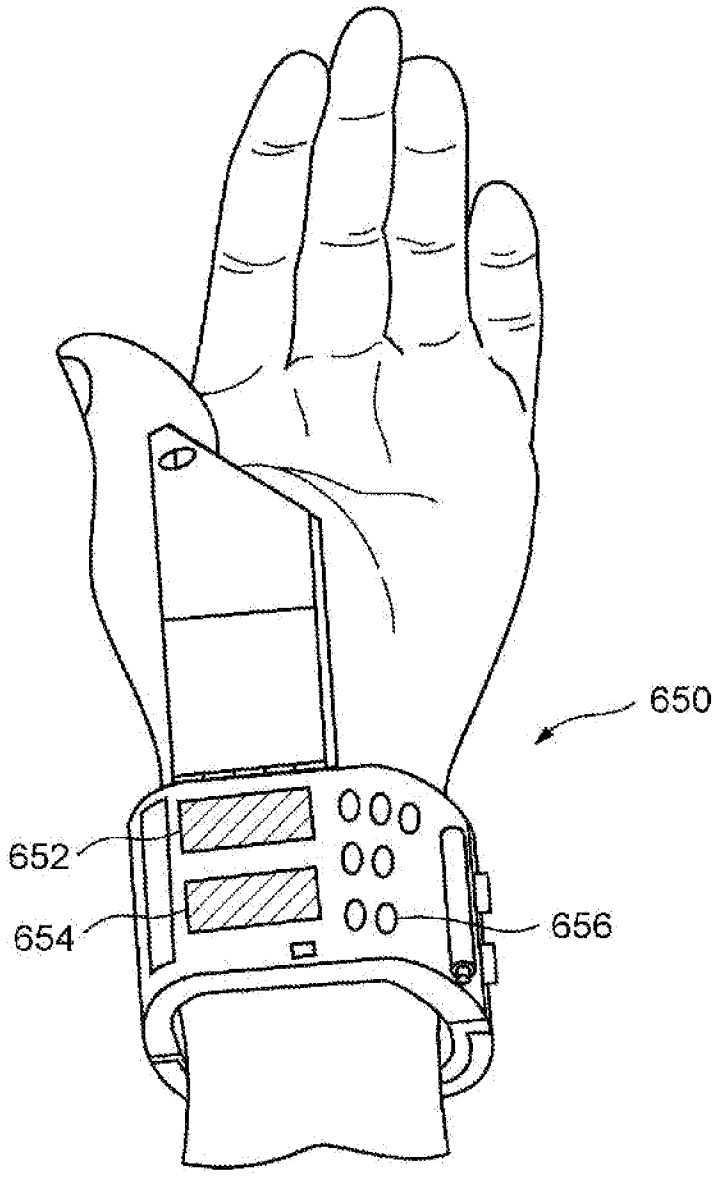
【図５】



【図６ａ】

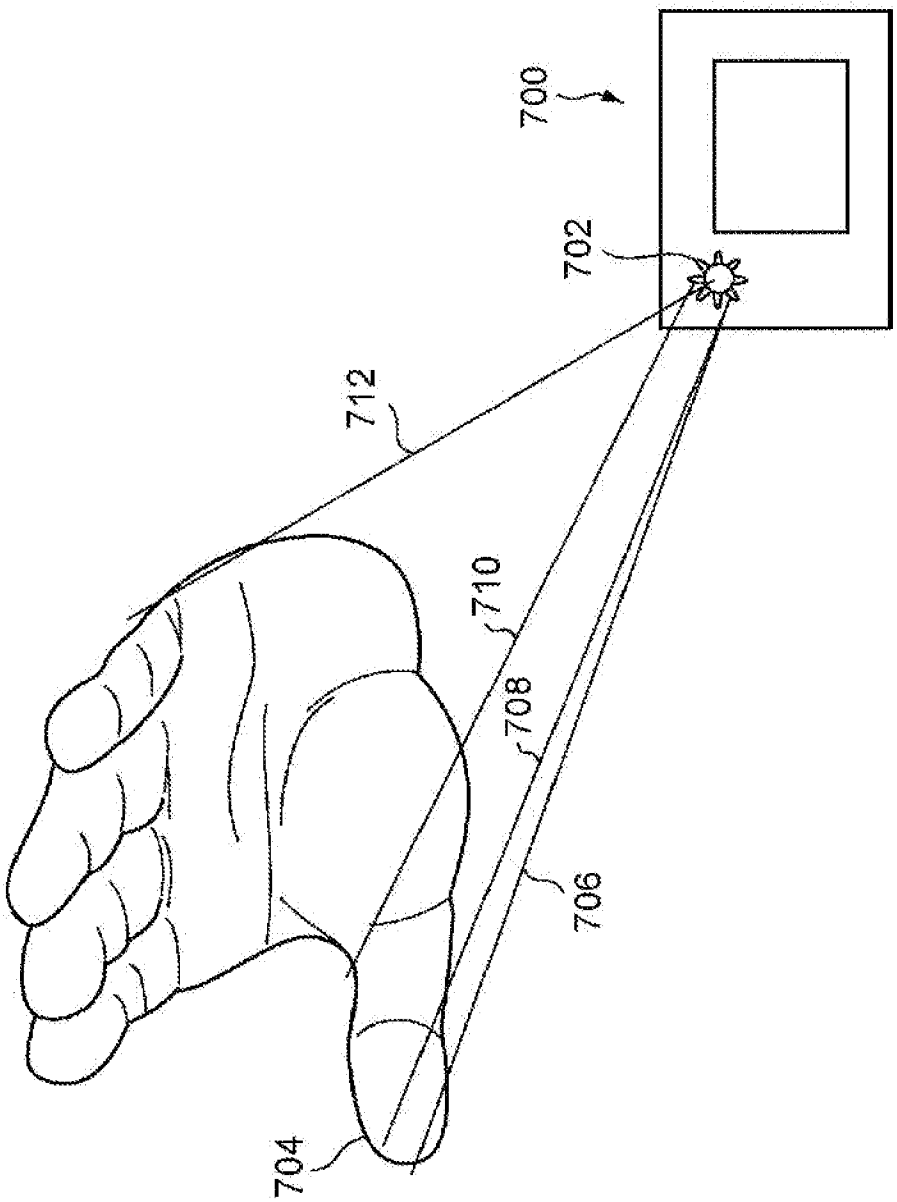


【図６ｂ】



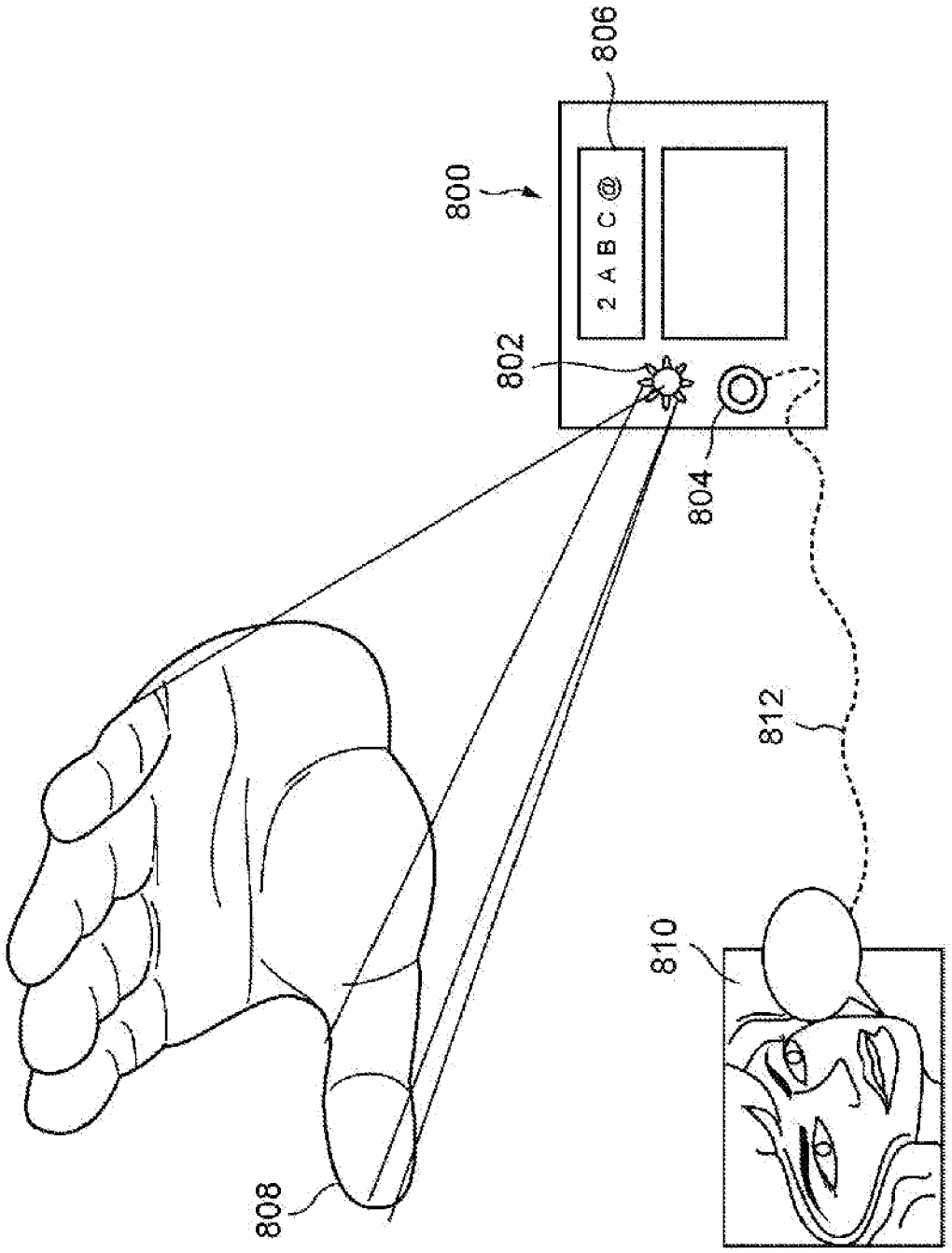
【図７】

図７



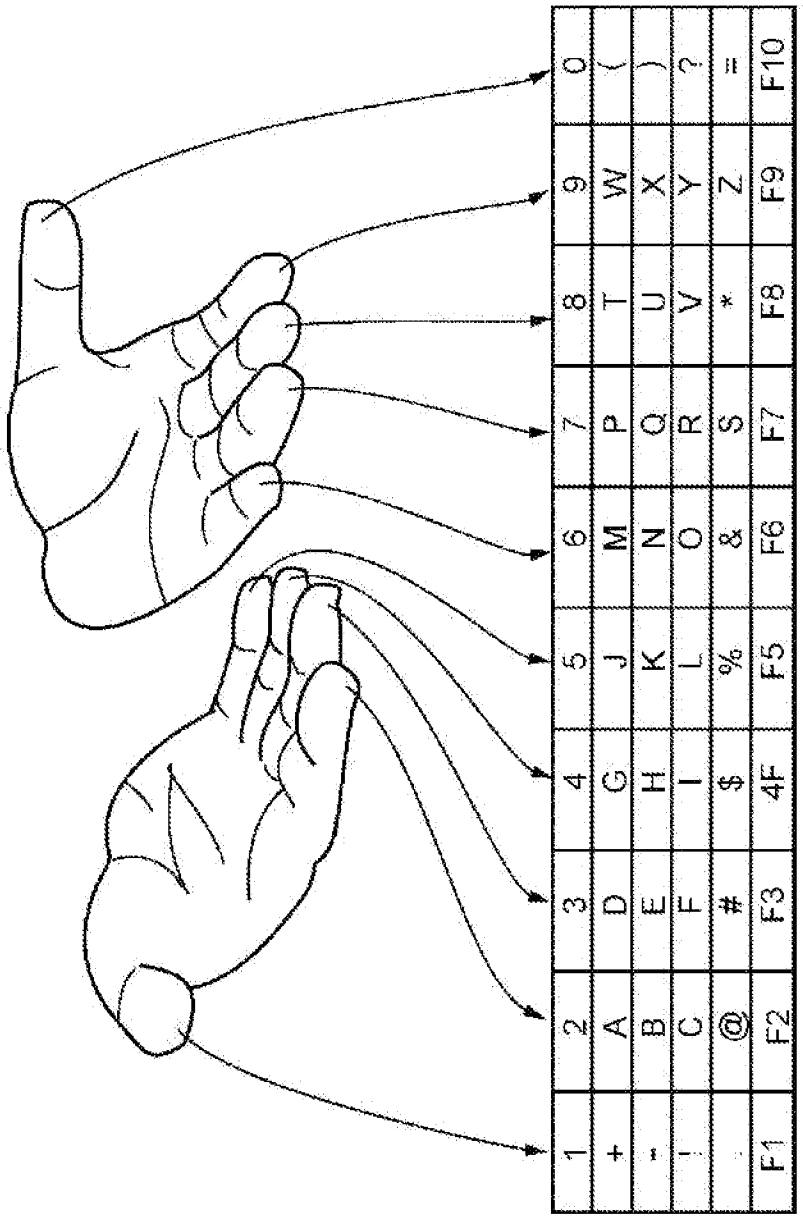
【図８】

図８

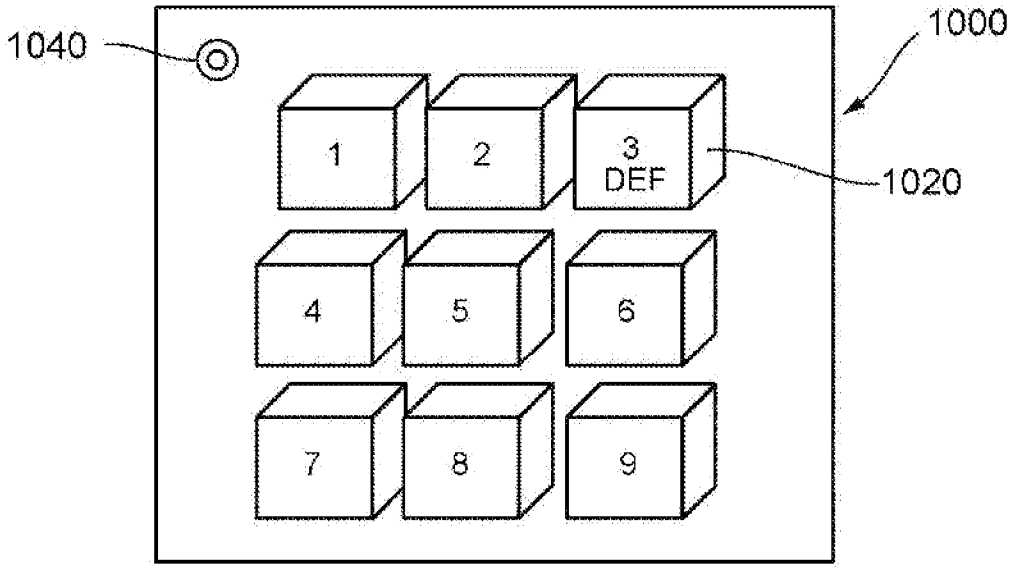


【図９】

図９

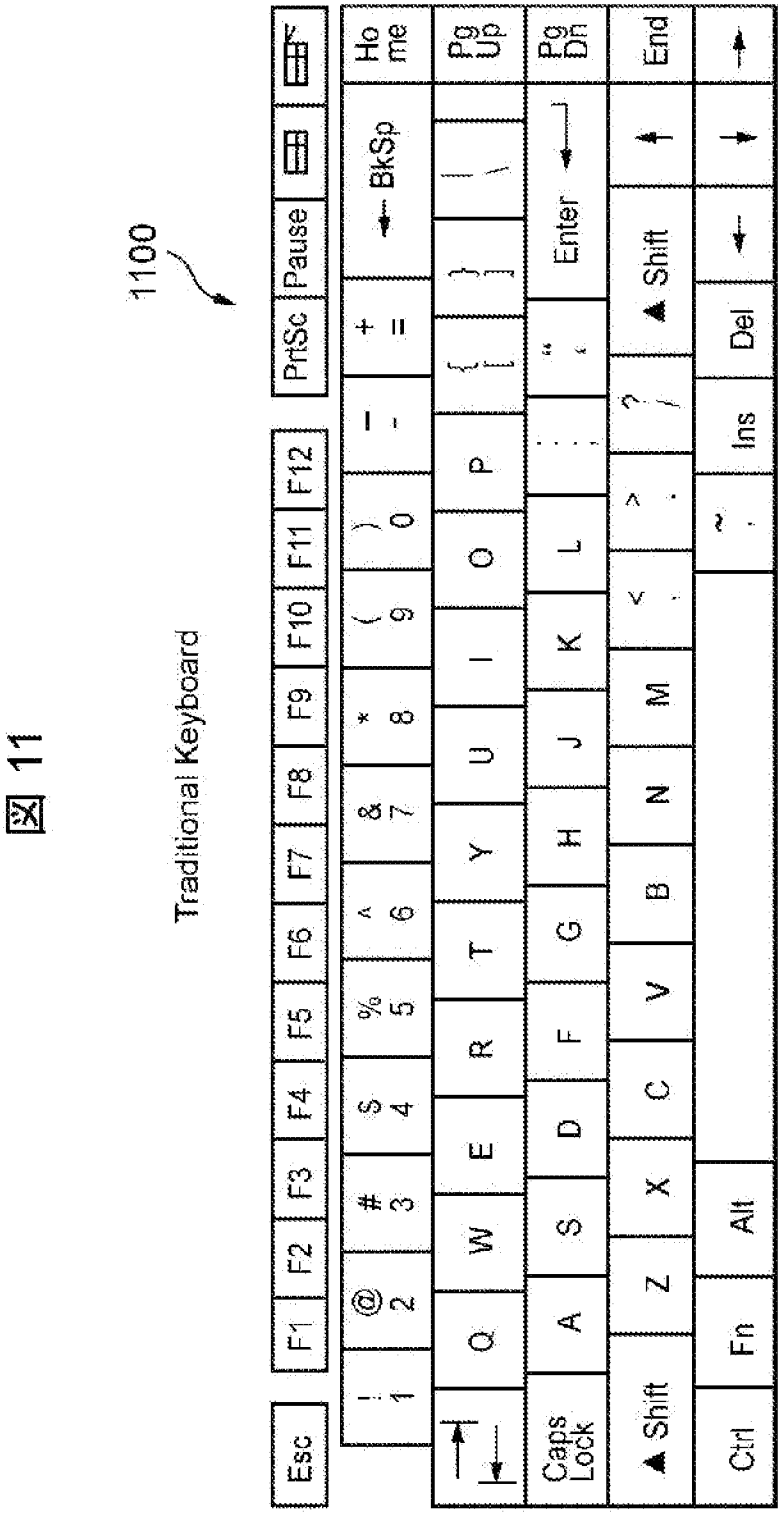

1 2 3 4 5 6 7 8 9 0
+ A D G J M P T W (F1 F2 F3 4F F5 F6 F7 F8 F9 F10
- B E H K N Q U X) ! C F I L O R V Y ? @ # $ % & S * Z = ;

【図１０】



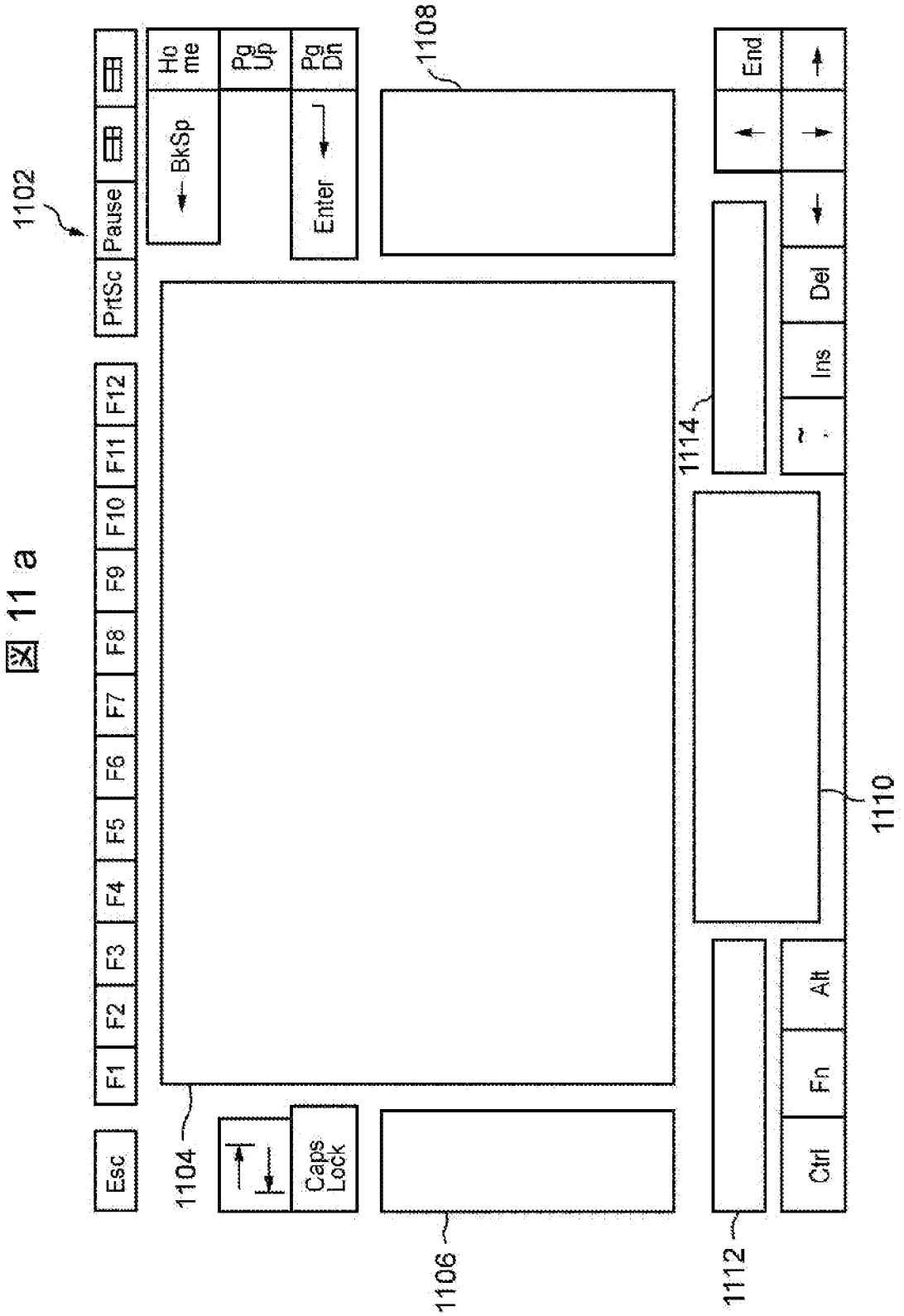
【図１１】

図 11

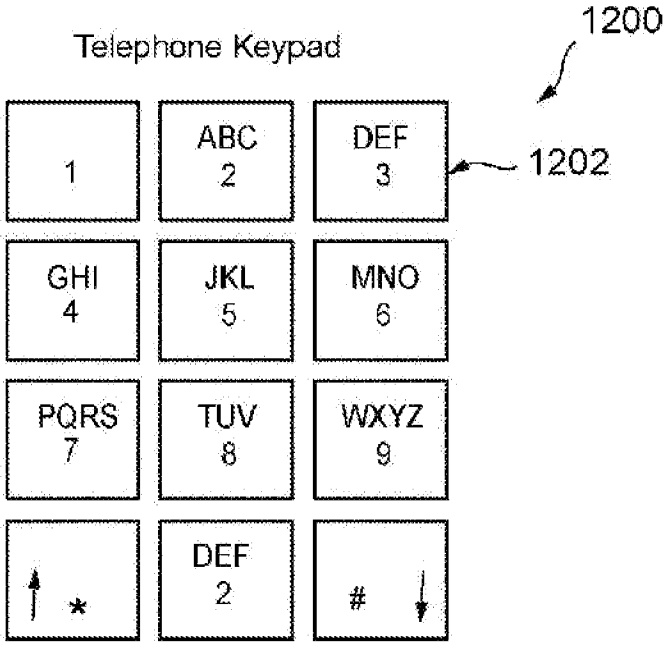

1100
Traditional Keyboard
Esc
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
PrtSc
Pause
Home
Pg Up
Pg Dn
End
BkSp
Enter
Caps Lock
Shift
Ctrl
Fn
Alt
Ins
Del

【図１１ａ】

図 11 a


1102
Esc
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
PrtSc
Pause
1104
Caps Lock
1106
BkSp
Home
Pg Up
Pg Dn
Enter
1108
1110
1112
Ctrl
Fn
Alt
1114
~ `
Ins
Del
End

【図１２】


Telephone Keypad
1200
1202
1
ABC 2
DEF 3
GHI 4
JKL 5
MNO 6
PQRS 7
TUV 8
WXYZ 9
*
DEF 2
#

【図１３】

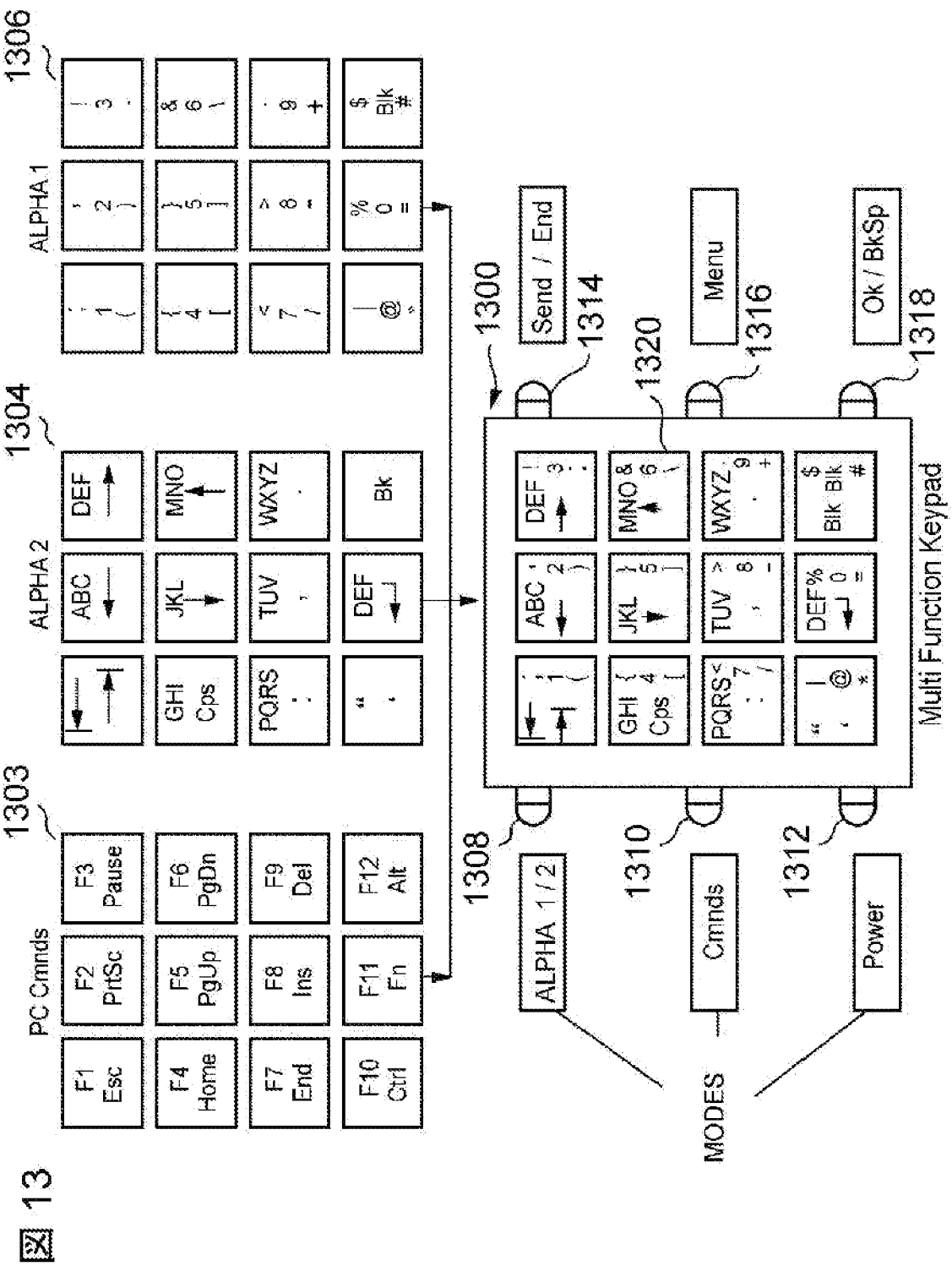
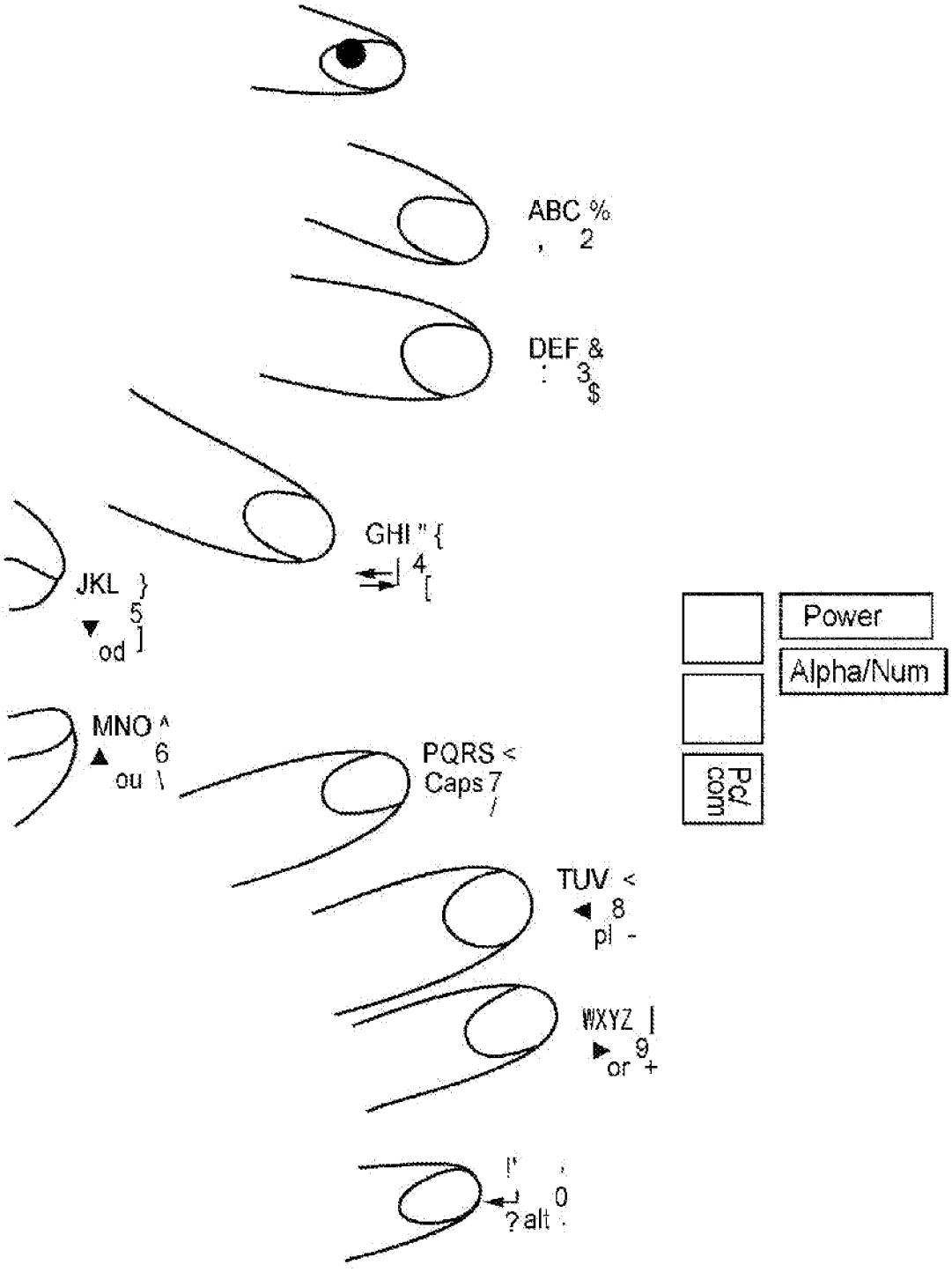

1306
ALPHA 1
1304
ALPHA 2
1303
PC Cmnds
F1 Esc
F2 PrtSc
F3 Pause
F4 Home
F5 PgUp
F6 PgDn
F7 End
F8 Ins
F9 Del
F10 Ctrl
F11 Fn
F12 Alt
ABC
DEF
GHI Cps
JKL
MNO
PQRS
TUV
WXYZ
Bk
1300
Send / End
1314
Menu
1316
Ok / BkSp
1318
1320
Multi Function Keypad
1308
1310
1312
ALPHA 1 / 2
Cmnds
Power
MODES

図 13

【図１３ａ】


ABC %
, 2
DEF &
: 3
$
GHI " {
4
[
JKL }
5
od]
MNO ^
6
ou \
PQRS <
Caps 7
/
TUV <
8
pl -
WXYZ |
9
or +
!' ,
0
?alt :
Power
Alpha/Num
Pc/
com

【図１４】

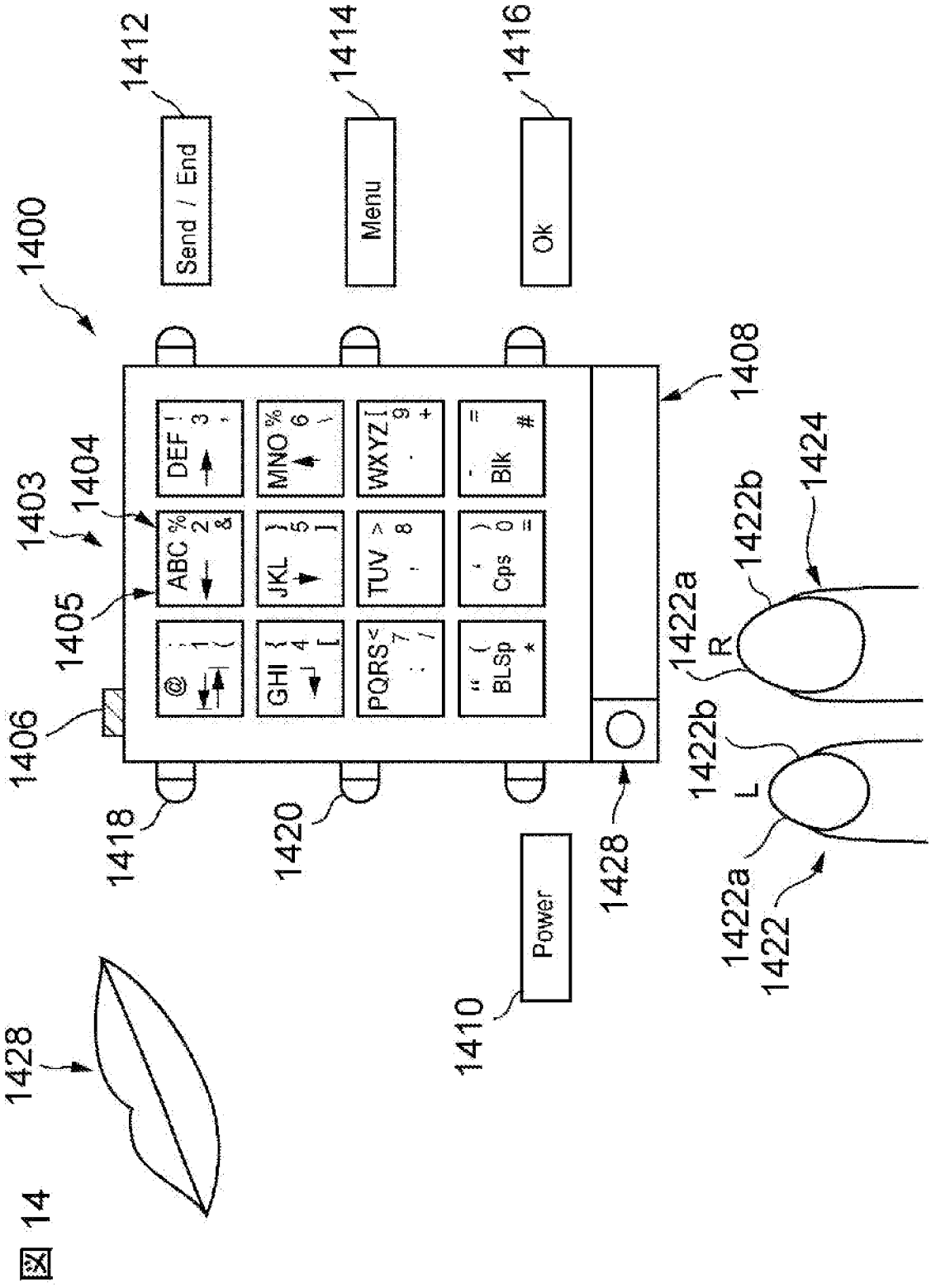
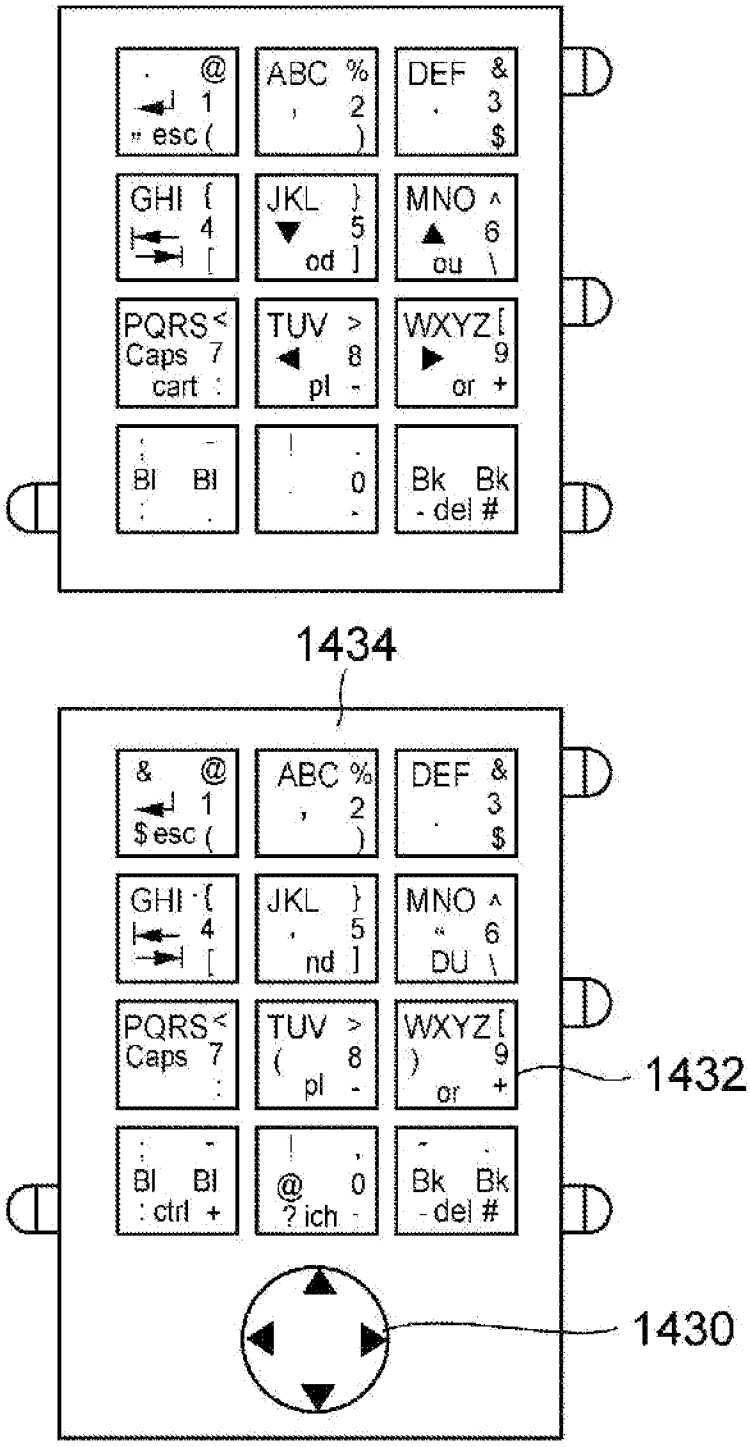
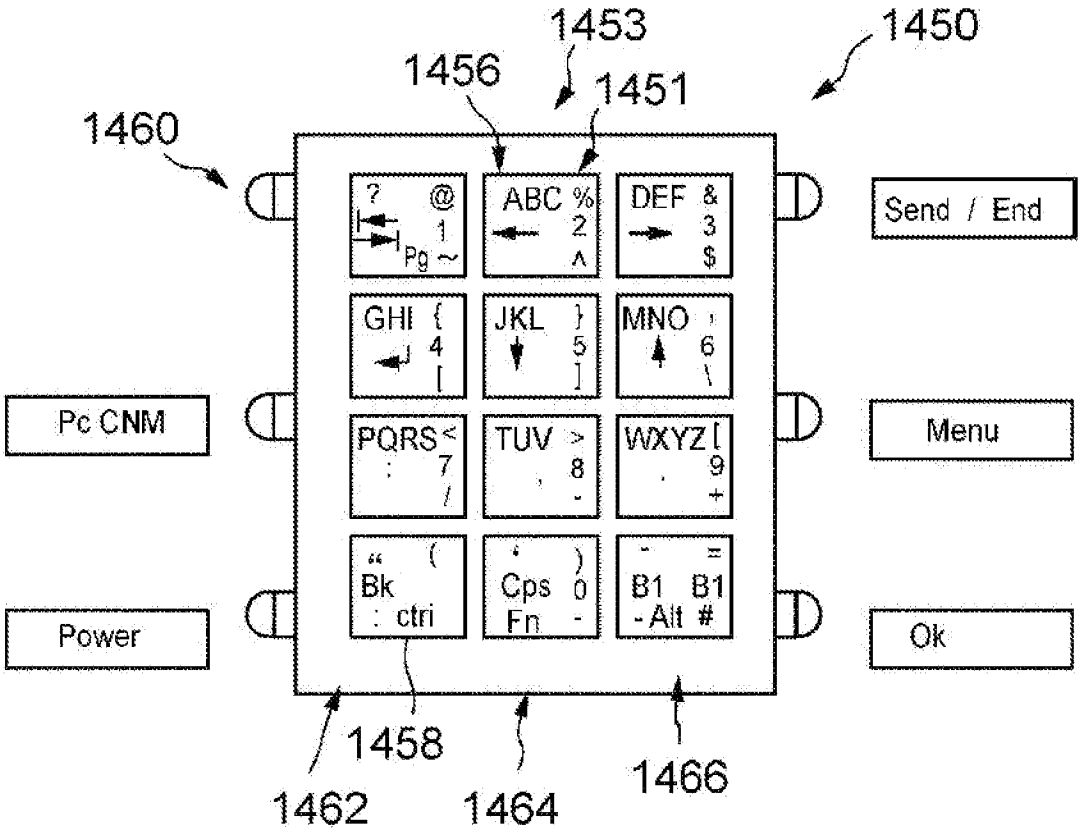

1400
1412
Send / End
1414
Menu
1416
Ok
1403
1404
1405
1406
1408
1418
1420
1428
1410
Power
1422a
1422b
1424
R
L
1422
ABC %
DEF !
MNO %
WXYZ
JKL
TUV
GHI
PQRS
BLSp
Cps
Blk
@
#

図 14

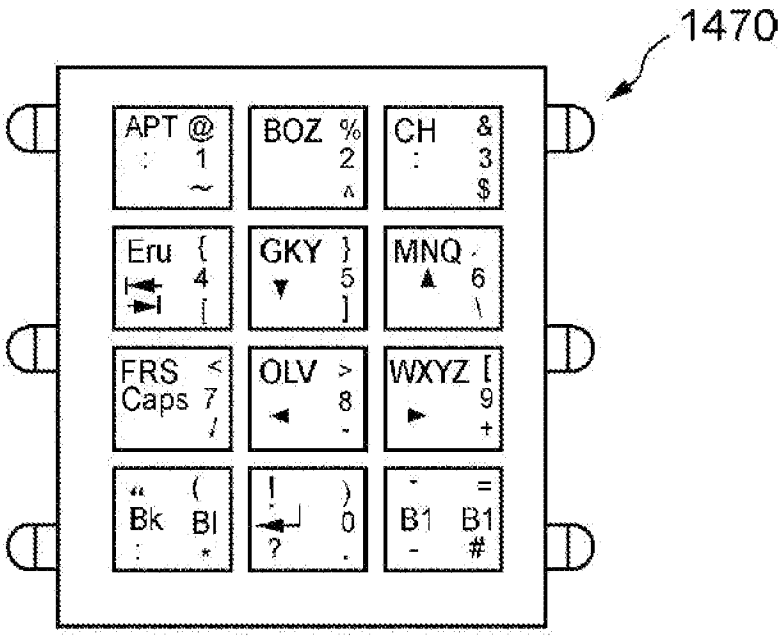
【図１４ａ】



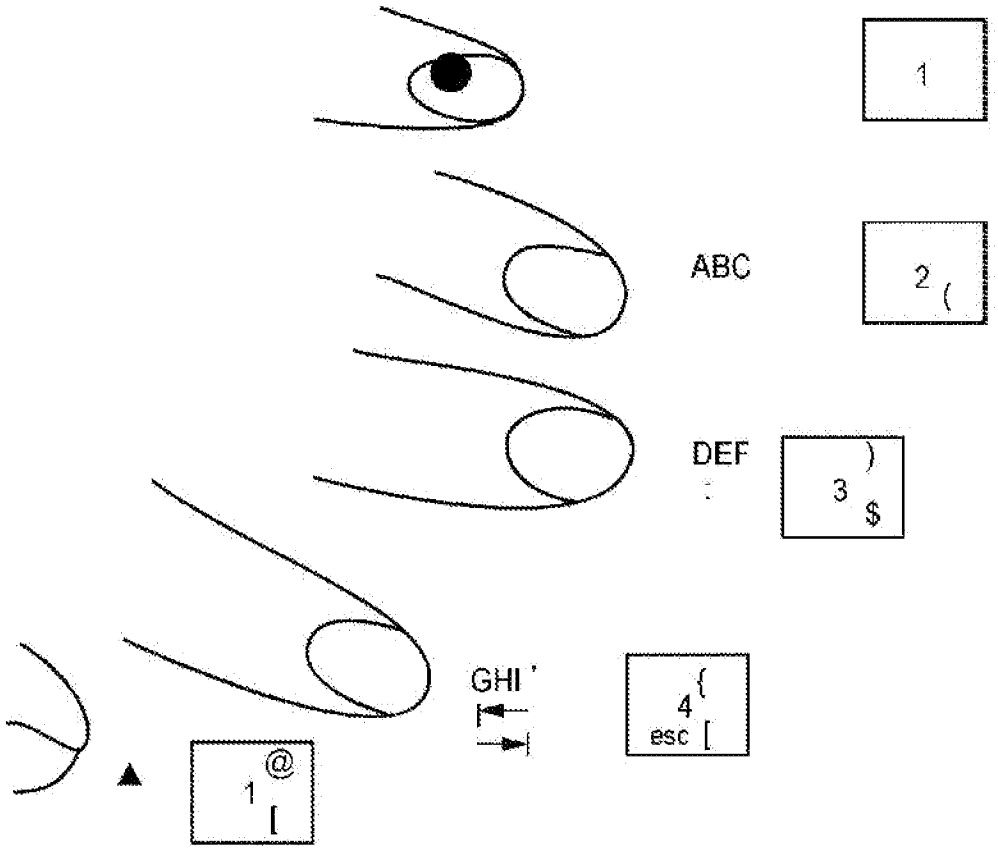
【図１４ｂ】


1453
1450
1456
1451
1460
? @ 1 Pg ~
ABC % 2 ^
DEF & 3 $
Send / End
GHI { 4 [
JKL } 5]
MNO 6 \
Pc CNM
Menu
PQRS < 7 /
TUV > 8 -
WXYZ [9 +
Bk ctri
Cps Fn 0 -
B1 B1 -Alt #
Power
Ok
1458
1462
1464
1466

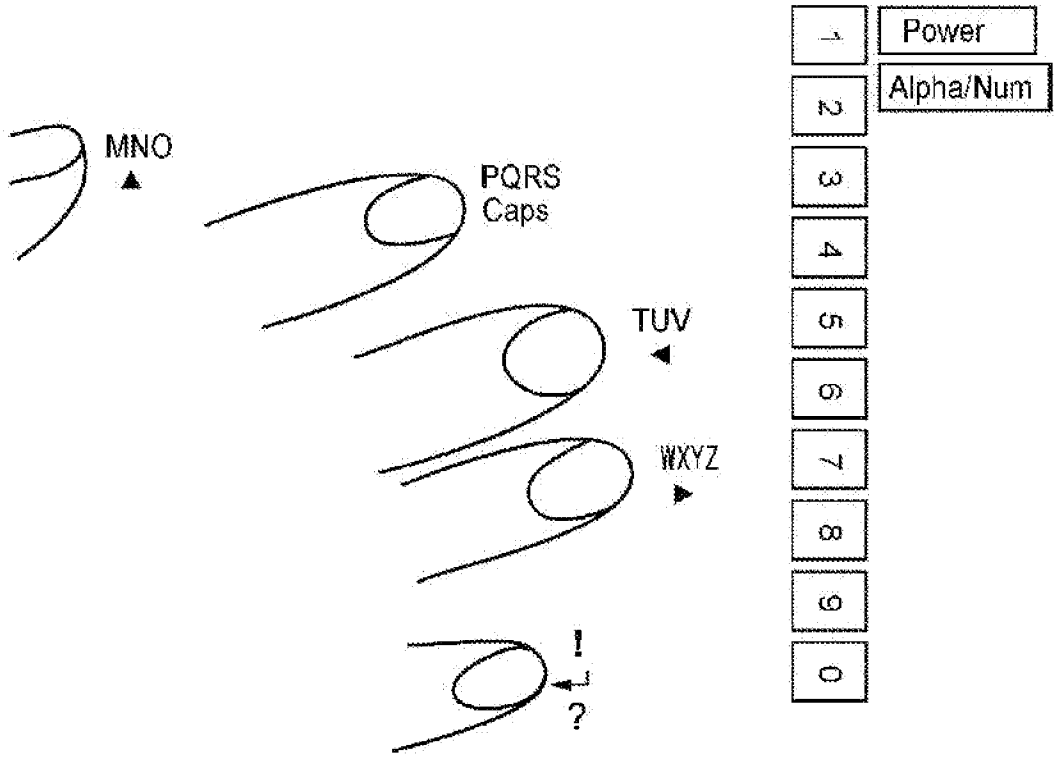
【図１４ｃ】


1470
APT @ 1 ~
BOZ % 2 ^
CH & 3 $
Eru { 4 [
GKY } 5]
MNQ 6 \
FRS < Caps 7 /
OLV > 8 -
WXYZ [9 +
Bk Bl
B1 B1 - #

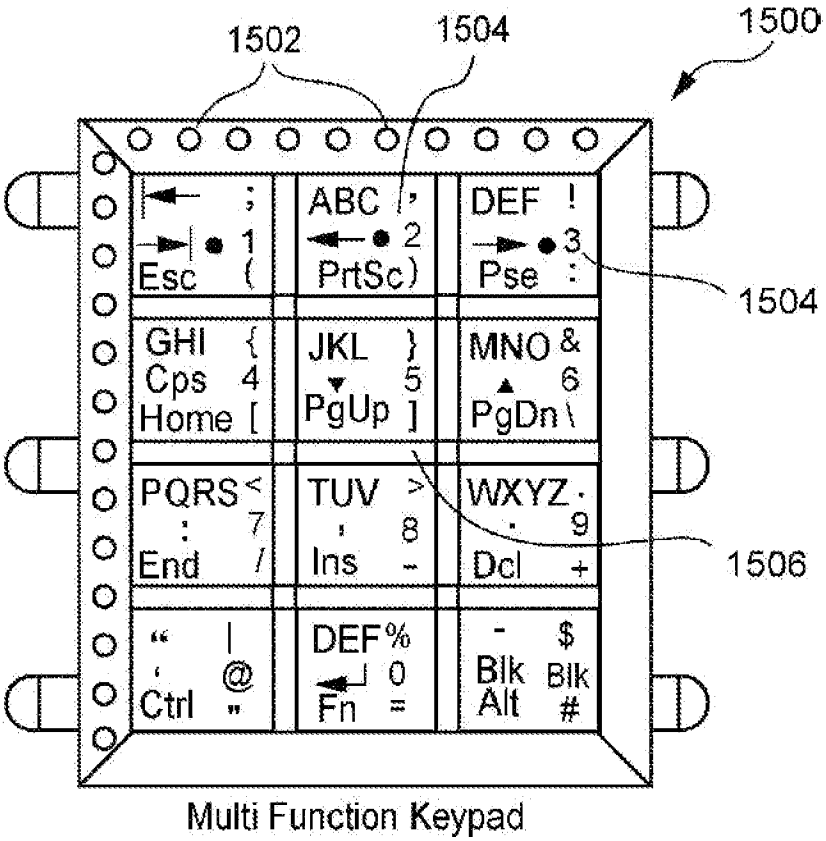
【図１４ｄ】


1
ABC
2 (
DEF
)
3
$
GHI '
4 {
esc [
@
1
[

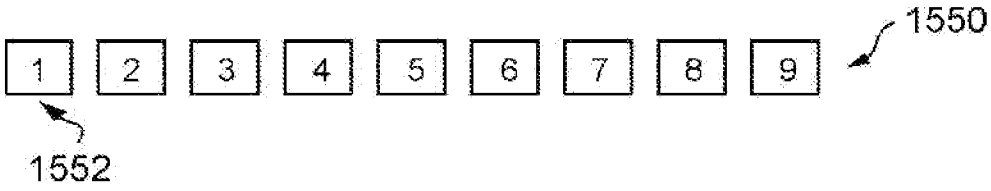
【図１４ｅ】


MNO
PQRS
Caps
TUV
WXYZ
!
?
1
Power
2
Alpha/Num
3
4
5
6
7
8
9
0

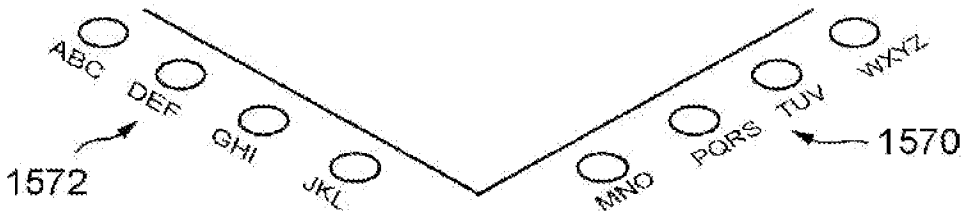
【図１５】



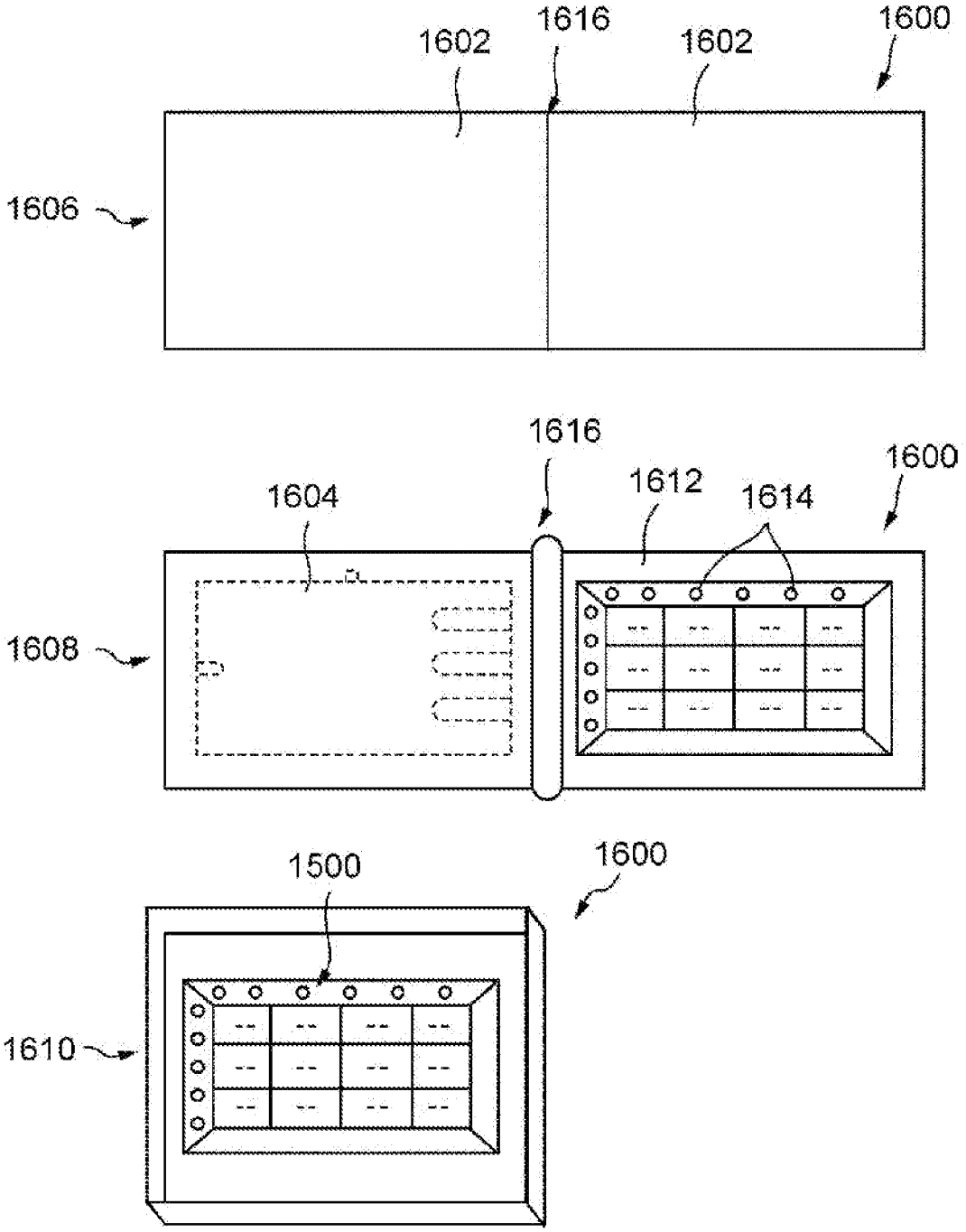
【図１５ｂ】



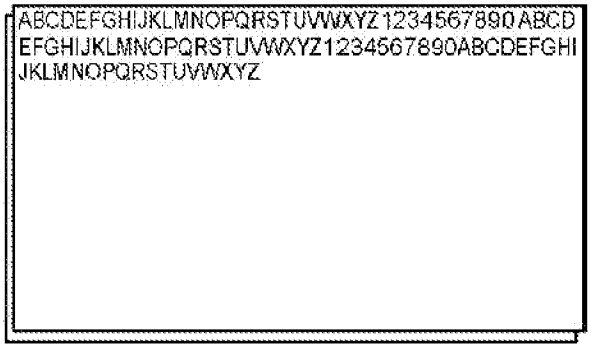
【図１５ｃ】



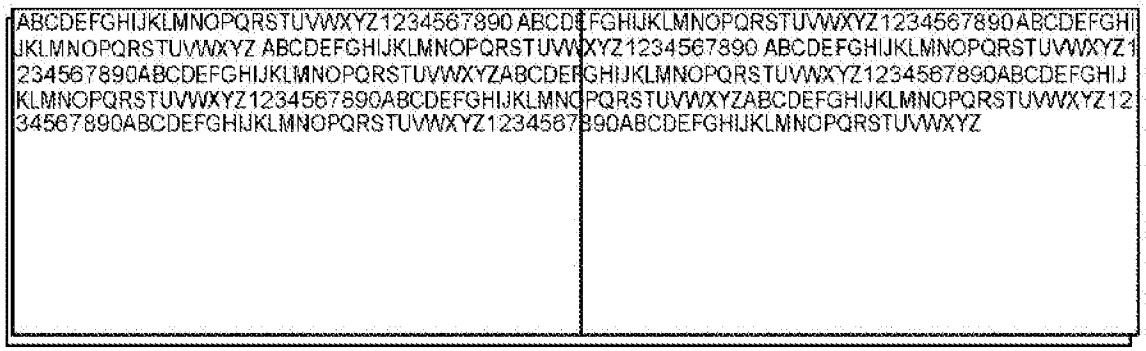
【図１６】


1602
1616
1602
1600
1606
1616
1600
1604
1612
1614
1608
1500
1600
1610

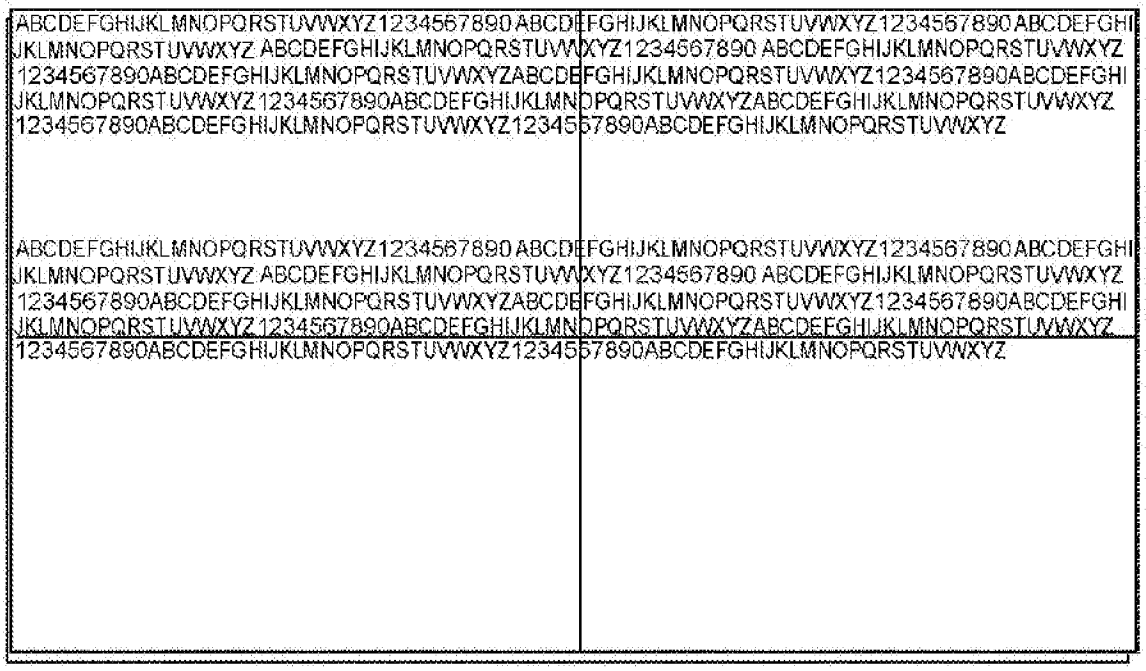
【図１６ａ】



【図１６ｂ】

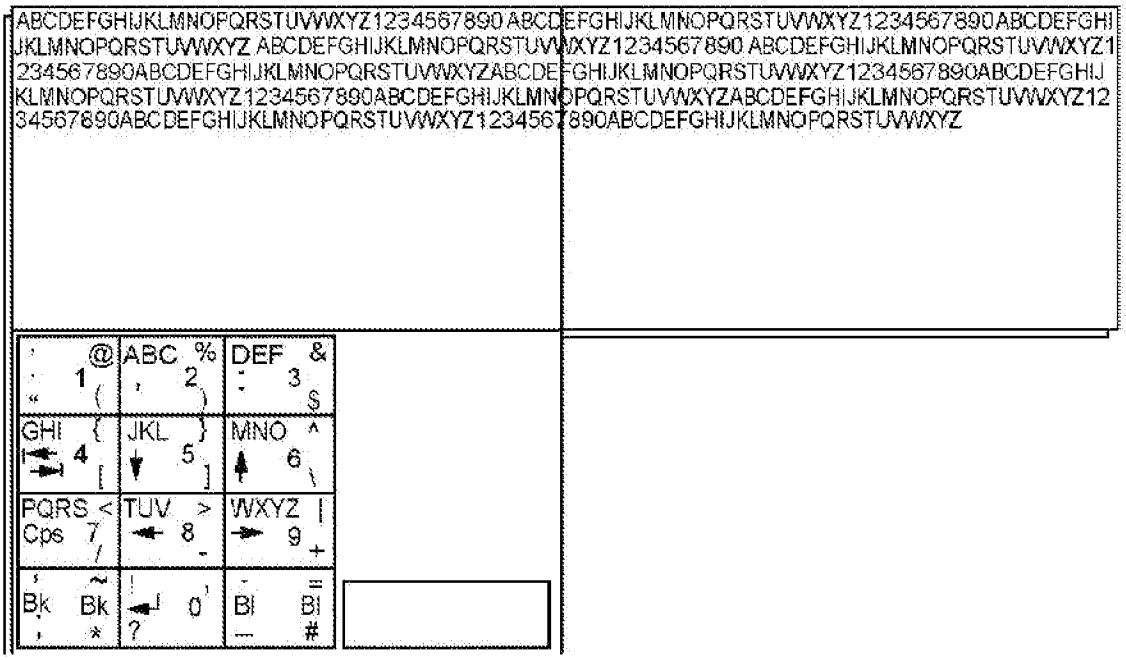


【図１６ｃ】

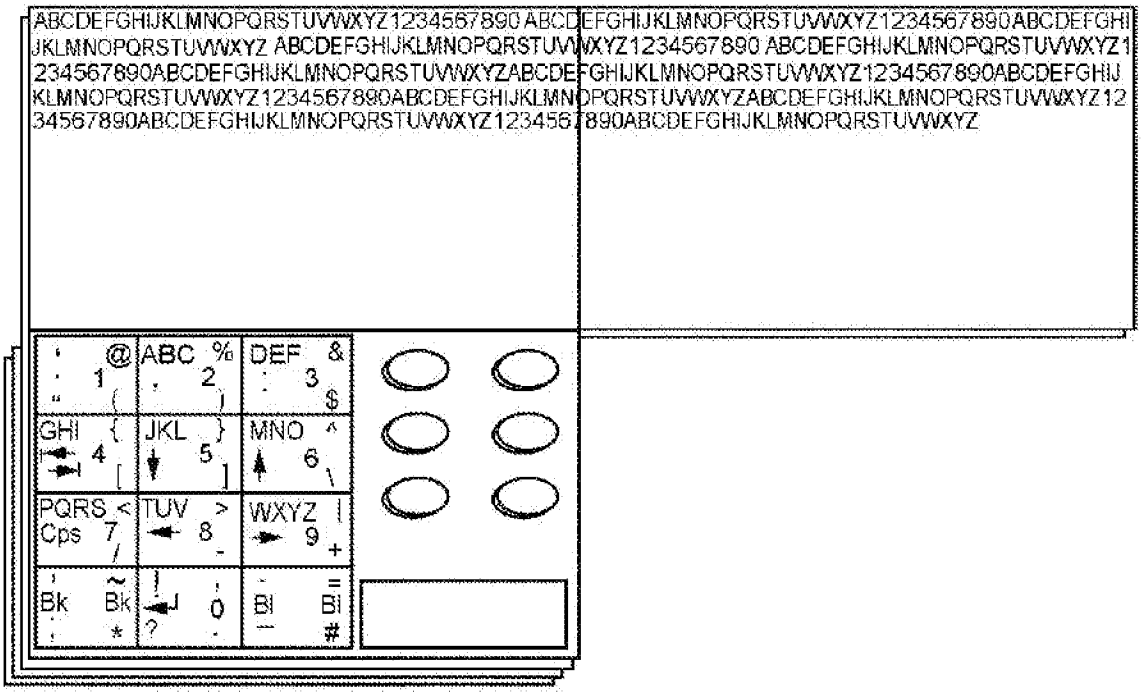


Display

【図１６ｄ】

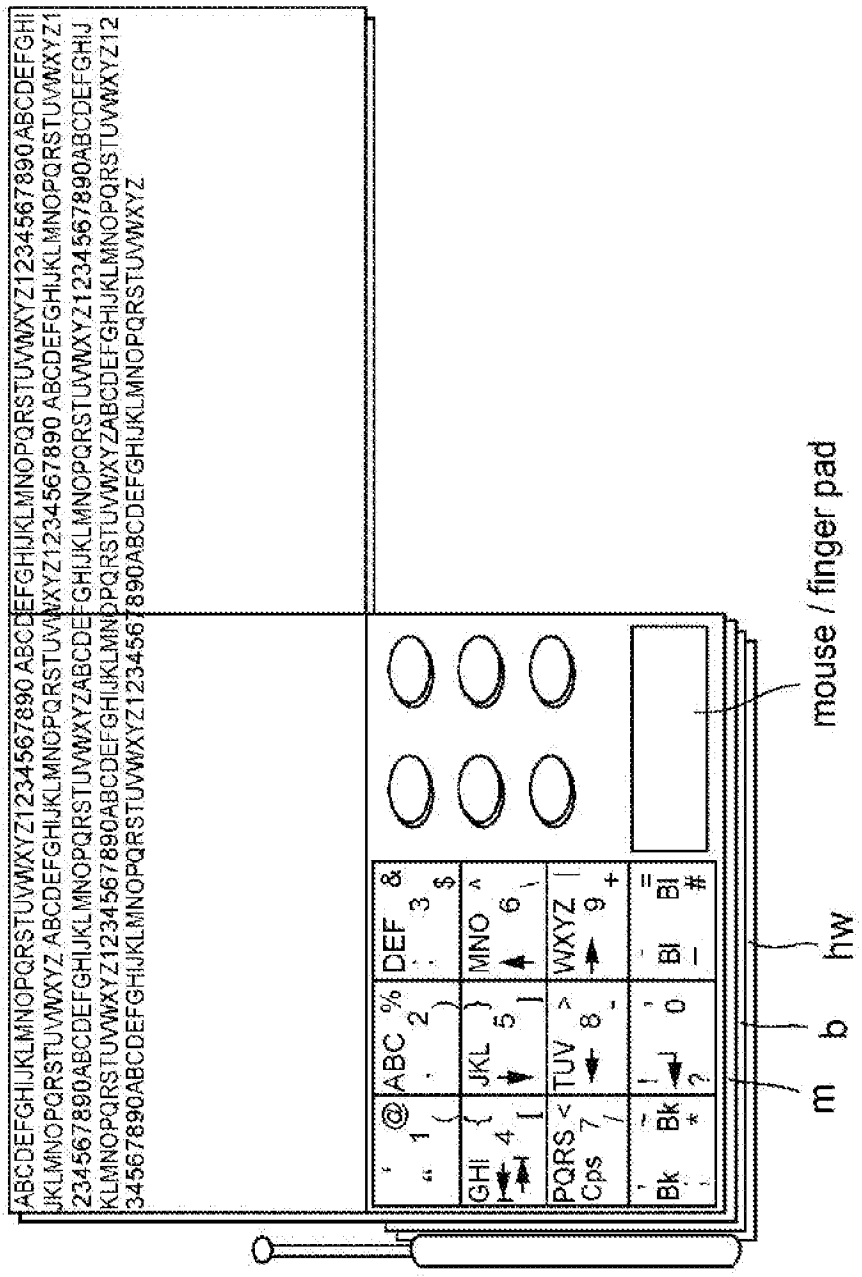

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABC
DEF
GHI
JKL
MNO
PQRS
TUV
WXYZ
Cps
Bk
Bk
Bl
Bl

【図１６ｅ】

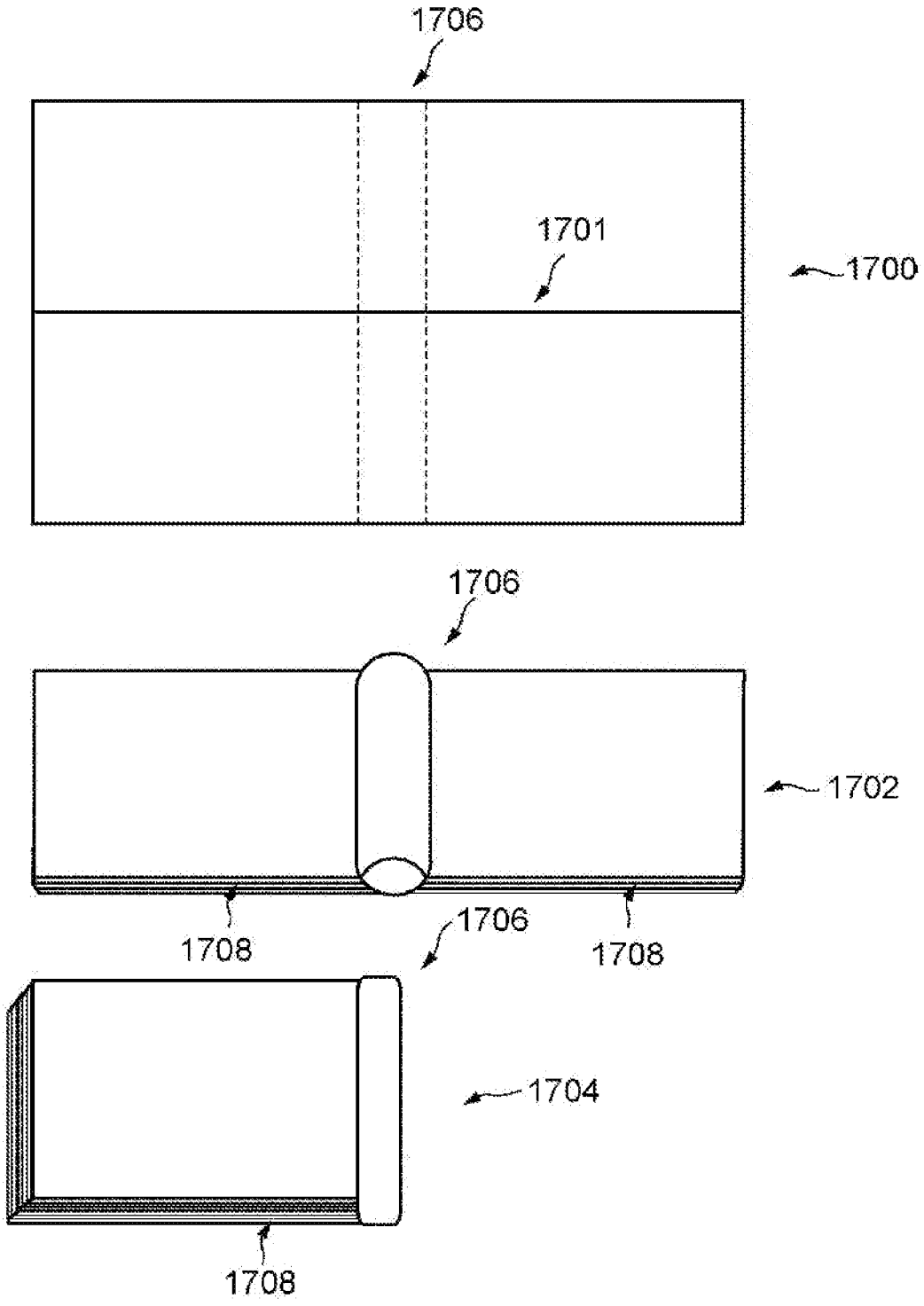

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABC
DEF
GHI
JKL
MNO
PQRS
TUV
WXYZ
Cps
Bk
Bk
Bl
Bl

【図１６ｆ】

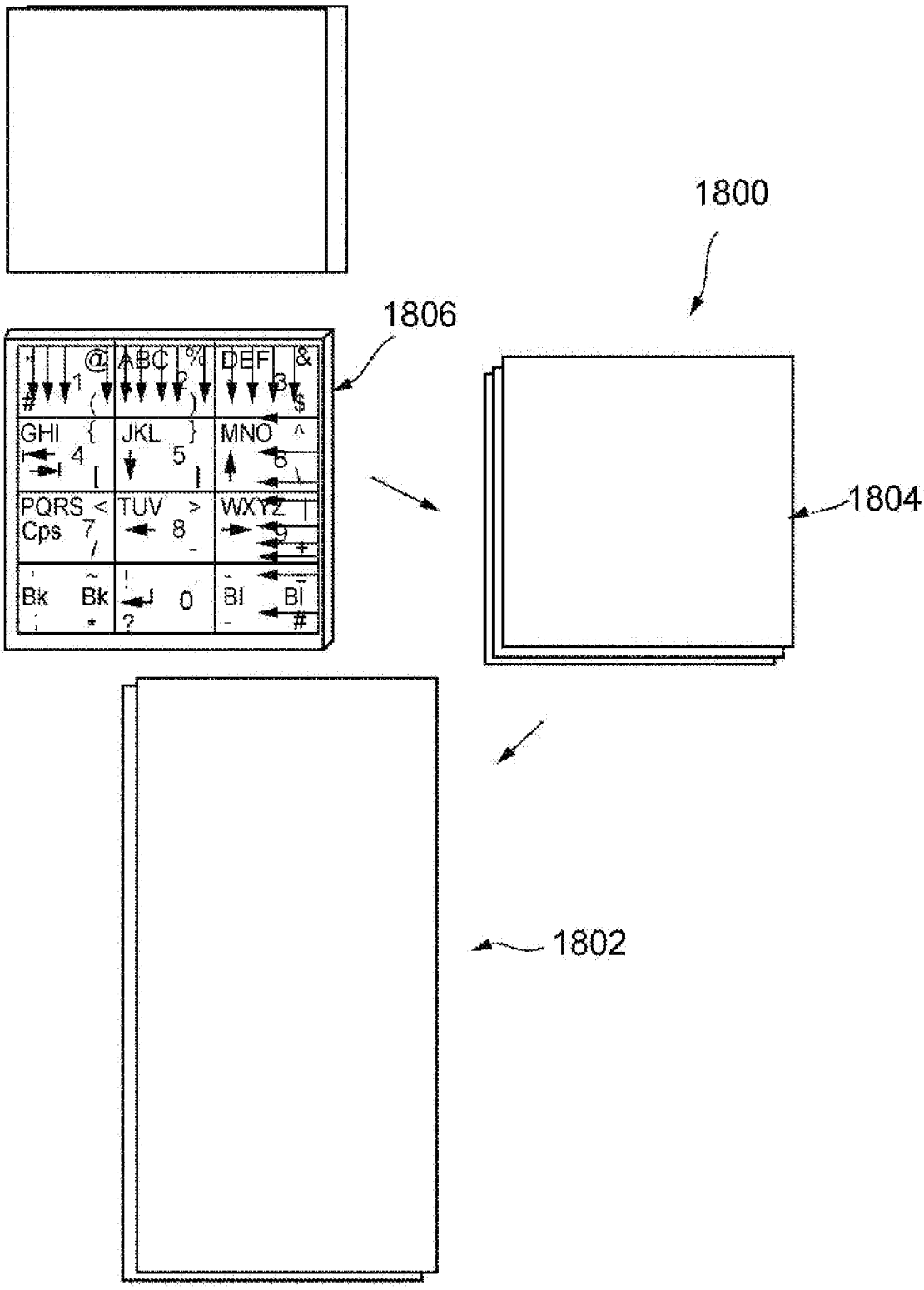
図 16 f


ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890ABCDEFGHI
JKLMNOPQRSTUVWXYZ ABCDEFGHIJKLMNOPQRSTUVWXYZ1
234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
KLMNOPQRSTUVWXYZ1234567890ABCDEFGHIJKLMNOPQRS
34567890ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
@ABC %
DEF &
JKL
MNO
TUV >
WXYZ
PQRS <
Cps
Bk
Bk
Bl
Bl
mouse / finger pad
m
b
hw

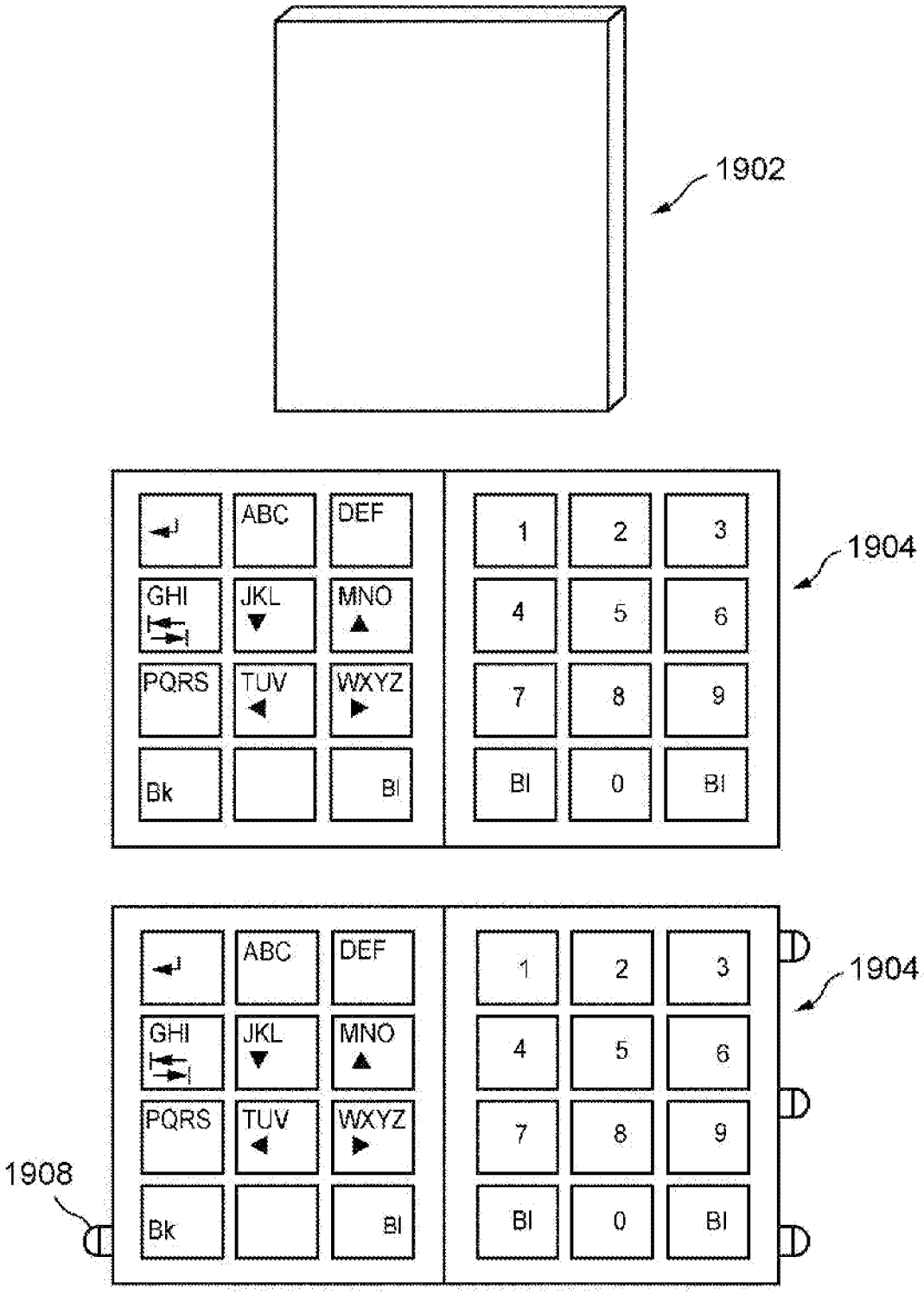
【図１７】



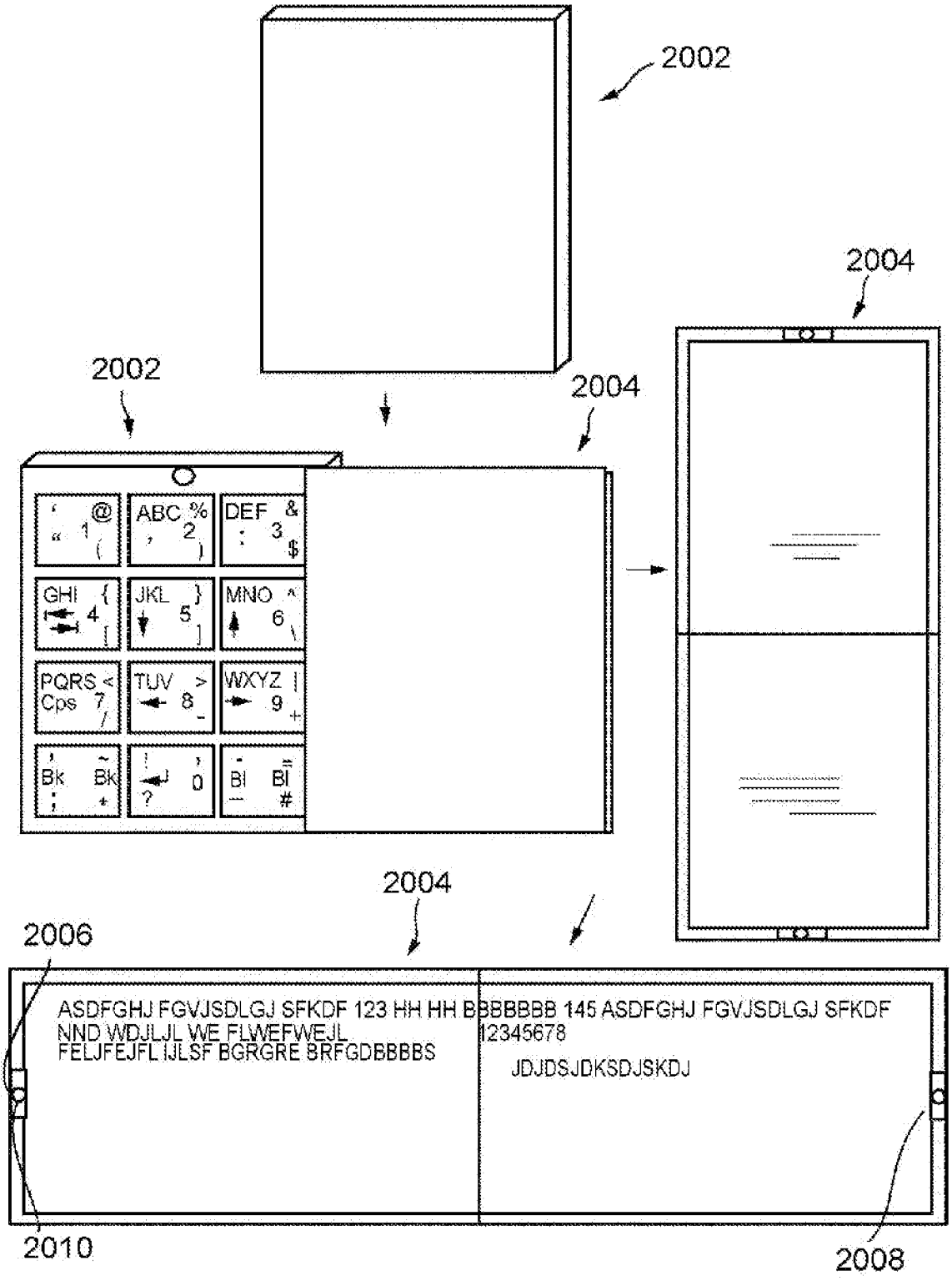
【図１８】



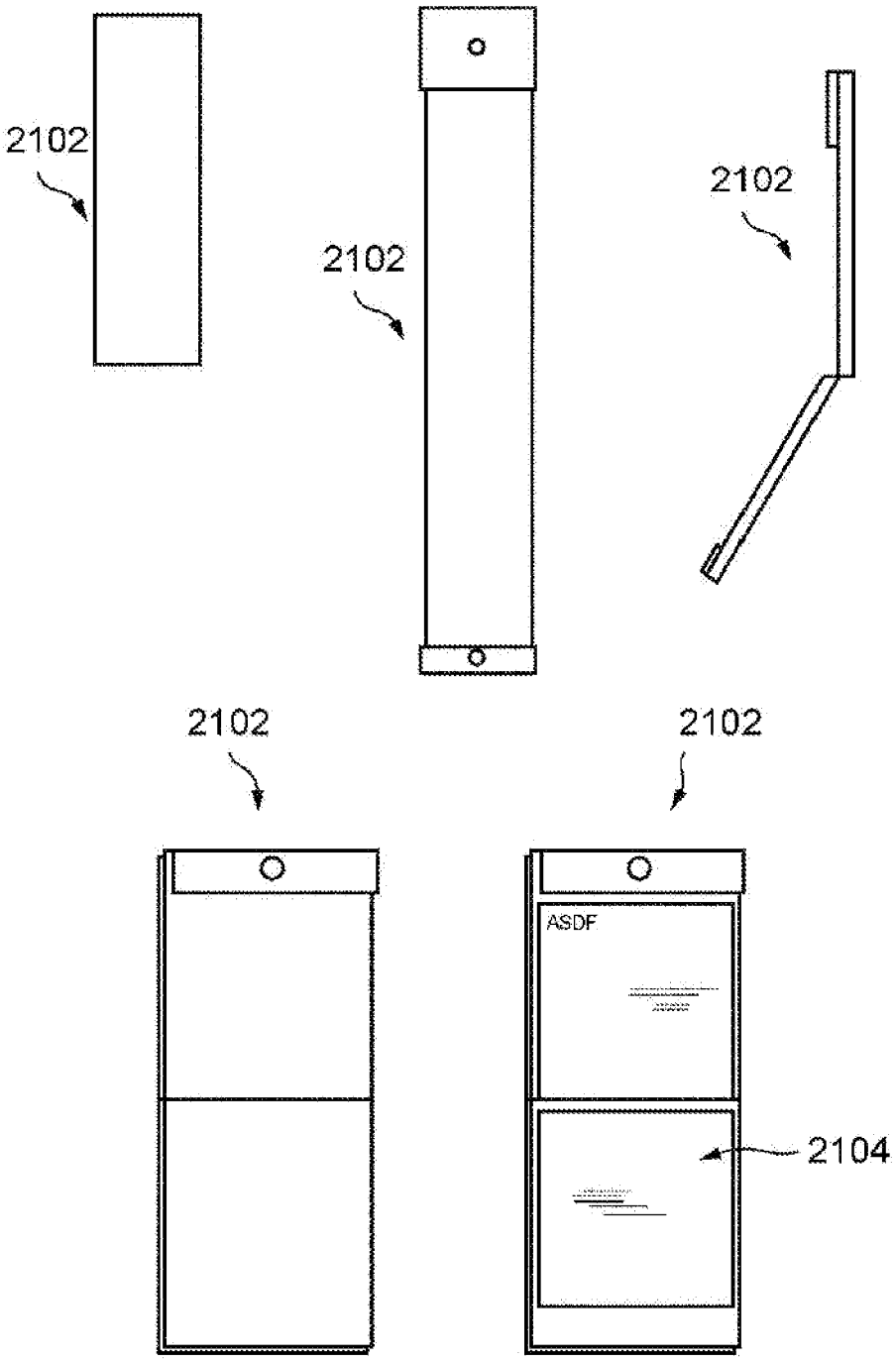
【図１９】


1902
1904
ABC
DEF
GHI
JKL
MNO
PQRS
TUV
WXYZ
Bk
Bl
1
2
3
4
5
6
7
8
9
0
1904
1908

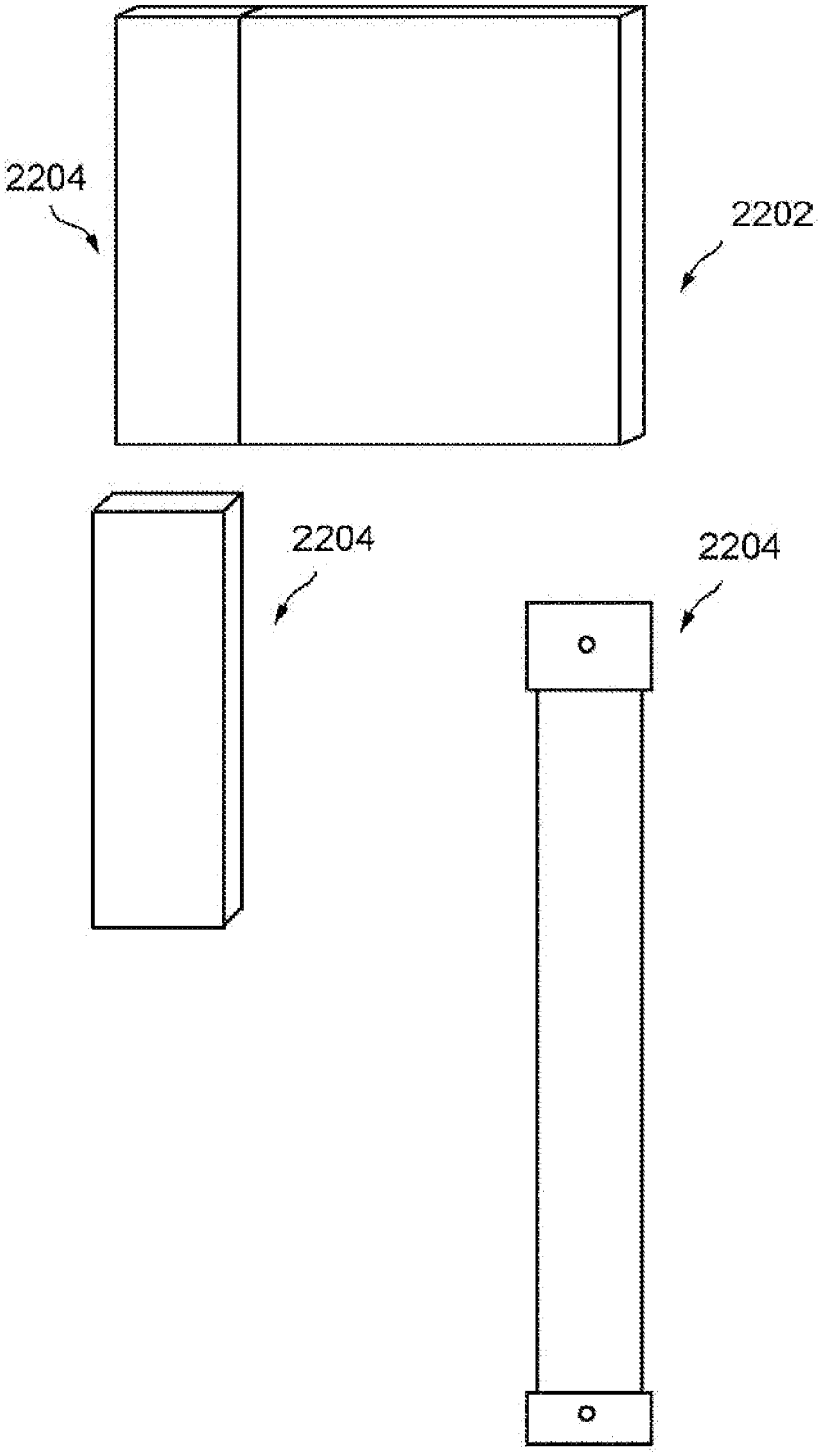
【図２０】


2002
2004
2002
2004
2004
2006
ASDFGHJ FGVJSDLGJ SFKDF 123 HH HH BBBBBBB 145 ASDFGHJ FGVJSDLGJ SFKDF
NND WDJLJL WE FLWEFWEJL
FELJFEJFL IJLSF BGRGRE BRFGDBBBBS
12345678
JDJDSJDKSDJSKDJ
2010
2008

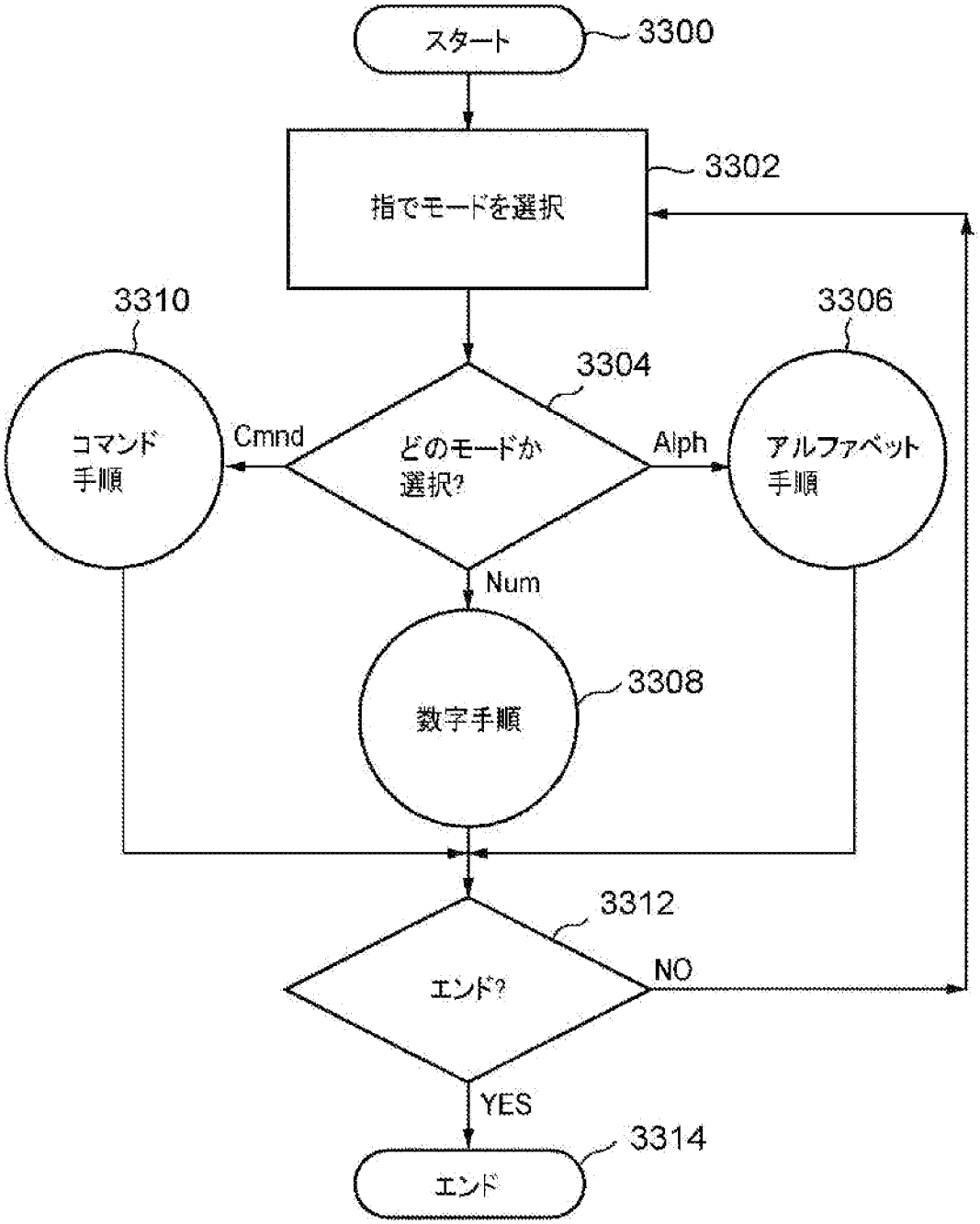
【図２１】



【図２２】

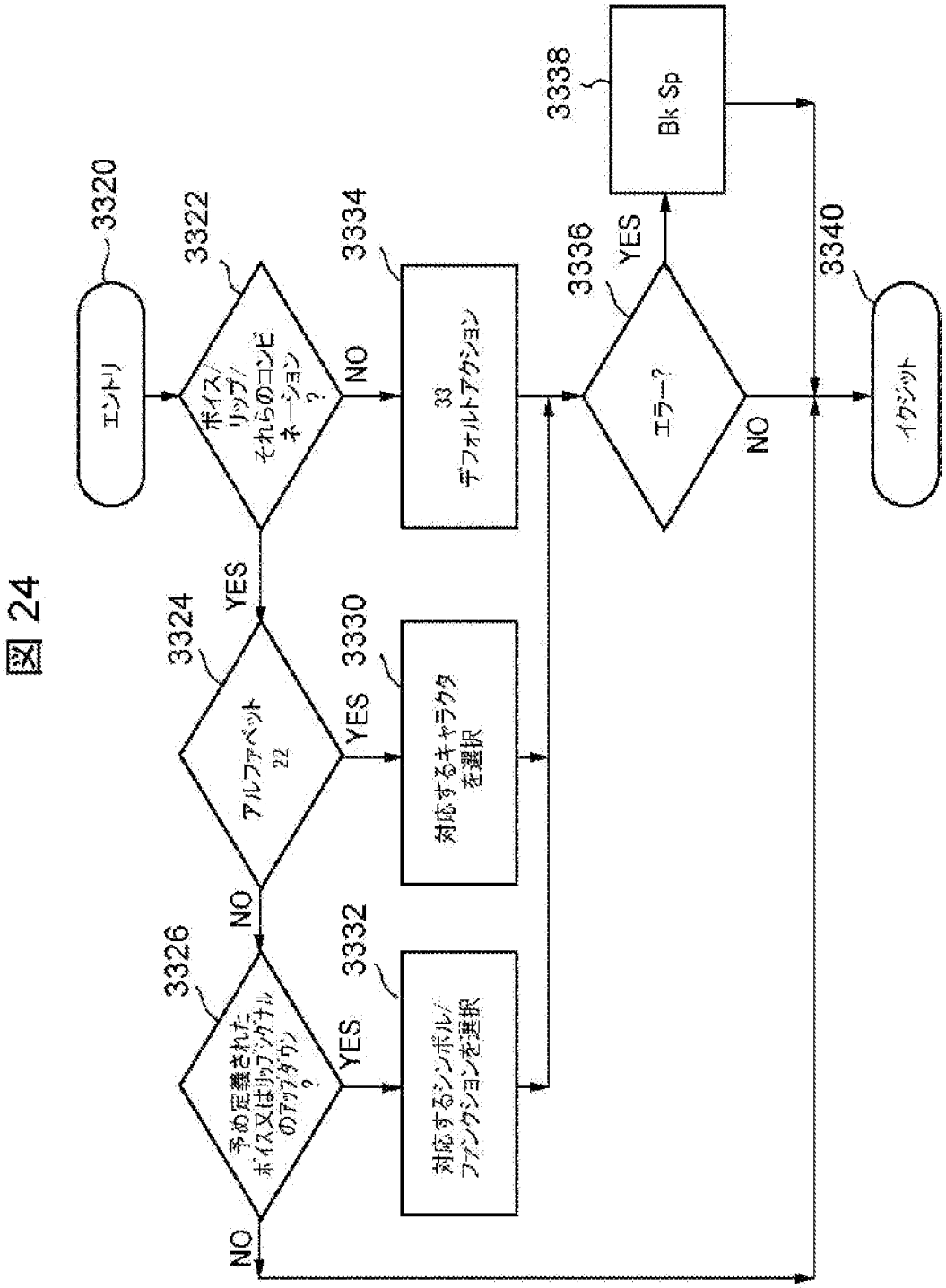


【図２３】

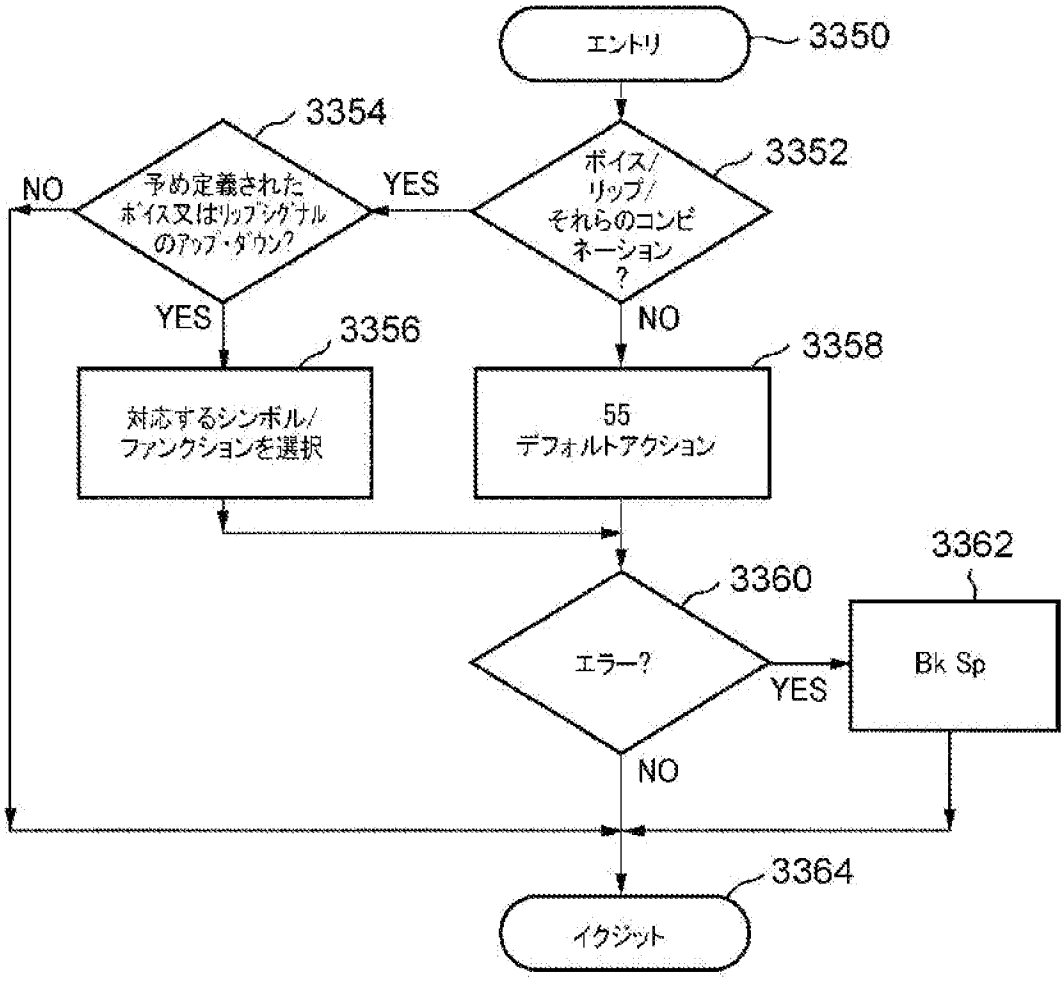

スタート
3300
指でモードを選択
3302
3310
3306
3304
コマンド
手順
Cmnd
どのモードか
選択?
Alph
アルファベット
手順
Num
数字手順
3308
3312
エンド?
NO
YES
3314
エンド

【図２４】

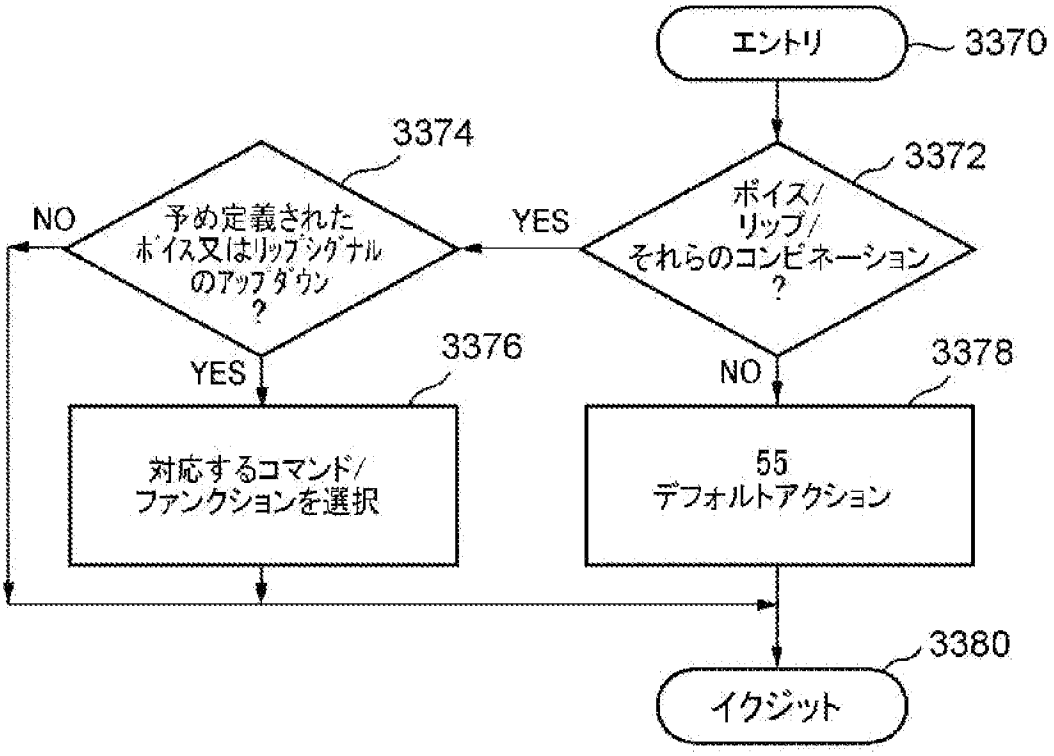
図 24


エントリ
3320
ボイス/リップ/それらのコンビネーション?
3322
NO
3334
33 デフォルトアクション
3336
エラー?
YES
3338
Bk Sp
NO
3340
イグジット
YES
3324
アルファベット 22
YES
3330
対応するキャラクタを選択
NO
3326
予め定義されたボイス又はリップシグナルのアップダウン?
YES
3332
対応するシンボル/ファンクションを選択
NO

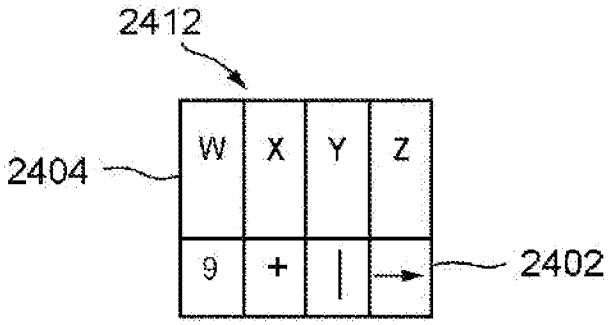
【図２５】


エントリ
3350
ボイス/
リップ/
それらのコンビ
ネーション
?
3352
予め定義された
ボイス又はリップシグナル
のアップ・ダウン?
3354
YES
NO
YES
NO
対応するシンボル/
ファンクションを選択
3356
55
デフォルトアクション
3358
エラー?
3360
YES
Bk Sp
3362
NO
イクジット
3364

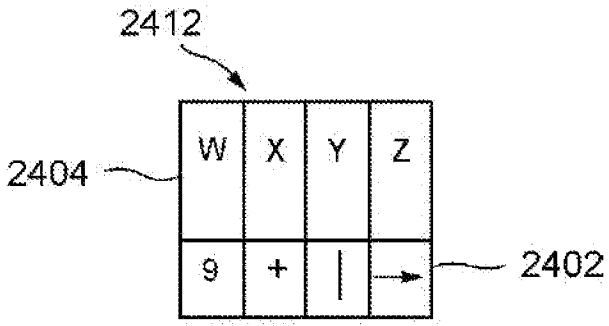
【図２６】



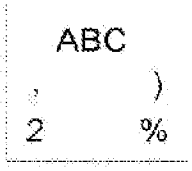
【図２７ａ】



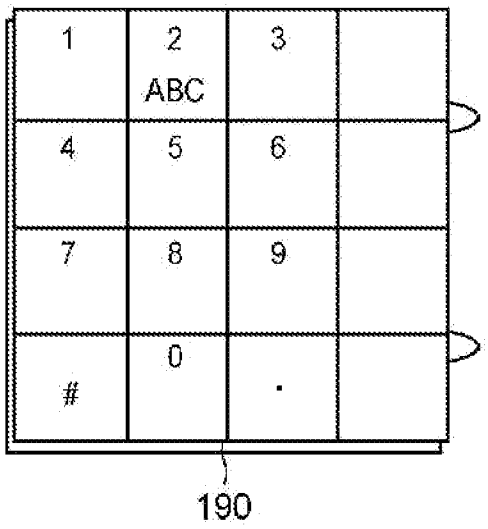
【図２７ｂ】



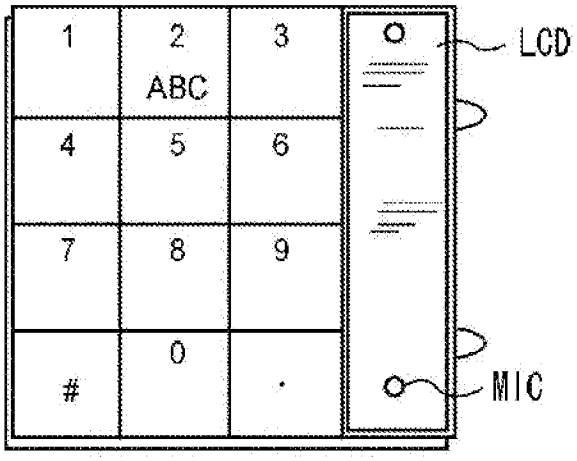
【図２８】



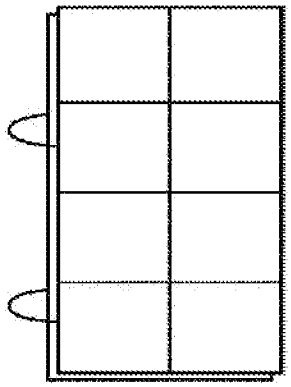
【図２９ａ】



【図２９ｂ】



【図２９ｃ】



【手続補正書】

【提出日】平成１４年６月１２日（２００２．６．１２）

【手続補正１】

【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】

データ入力システムであって、

複数のキーを定義（define）するキーパッドで、該各キーが記号グループのうちの少なくとも一つの記号を含み、該記号グループが英数記号と数字記号とコマンド記号のうちの少なくとも一つからなるサブグループに分割され、該各サブグループがユーザの指の少なくとも一部に関連付けられた前記キーパッドと、

前記複数のキーの少なくとも一つのキーと連携する指認識システムで、該少なくとも一つのキーが第１のサブグループからの少なくとも第１の記号と第２のサブグループからの少なくとも第２の記号を有していて、前記指が前記キーと相互作用したときに前記ユーザの指の前記一部を認識し、該ユーザの指の前記一部に関連する前記サブグループに対応する前記キー上の前記記号が選択されるよう構成した前記指認識システムと、を備えること

を特徴とするデータ入力システム。

【請求項２】

請求項１記載のデータ入力システムであって、

前記キーと相互作用する前記指の前記一部により選択された前記サブグループの記号の中から一つの記号を選択する少なくとも一つの追加の認識手段をさらに備えること

を特徴とするデータ入力システム。

【請求項３】

請求項２記載のデータ入力システムであって、

前記追加の認識手段は、音声認識システムであること
を特徴とするデータ入力システム。

【請求項４】
請求項２記載のデータ入力システムであって、
前記追加の認識手段は、口唇認識システムであること
を特徴とするデータ入力システム。

【請求項５】
請求項１記載のデータ入力システムであって、
前記キーパッドは、それぞれキーに対応する複数の感応パッドを備えること
を特徴とするデータ入力システム。

【請求項６】
請求項５記載のデータ入力システムであって、
前記複数の感応パッドは、３列４行に配列した１２個のキーを定義していること
を特徴とするデータ入力システム。

【請求項７】
請求項１記載のデータ入力システムであって、
前記キーパッドは、その上に複数位置を定義するよう構成した少なくとも一つの感応パッドを備え、該複数位置が複数のキーに対応すること
を特徴とするデータ入力システム。

【請求項８】
請求項７記載のデータ入力システムであって、
前記キーは、３列４行に配列してあること
を特徴とするデータ入力システム。

【請求項９】
請求項６又は８に記載のデータ入力システムであって、
前記１２個のキーのうち１０個が０から９までの数字に対応し、残る２つのキーが記号「*」と「＃」の一方に対応すること
を特徴とするデータ入力システム。

【請求項１０】

請求項６又は８に記載のデータ入力システムであって、

前記１２個のキーは、テキスト入力を可能にする英数文字に対応すること

を特徴とするデータ入力システム。

【請求項１１】

請求項１０記載のデータ入力システムであって、

前記英数文字が前記１２個のキーに分配されて、標準的な電話機キーパッドの英数配置を二重化してあること

を特徴とするデータ入力システム。

【請求項１２】

請求項６又は８に記載のデータ入力システムであって、

各言語内の前記記号は、前記言語における標準的な電話機キーパッドに配列されたものと同じ配列でもって前記１２個のキーに分配してあること

を特徴とするデータ入力システム。

【請求項１３】

請求項１記載のデータ入力システムであって、

コマンドが前記キーパッドの前記キーの少なくとも一つに分配させてあり、かつユーザの指の少なくとも一部に割り当ててあること

を特徴とするデータ入力システム。

【請求項１４】

請求項１記載のデータ入力システムであって、

前記記号の少なくとも一つがデフォルト記号であること

を特徴とするデータ入力システム。

【請求項１５】

請求項１４記載のデータ入力システムであって、

前記デフォルト記号は、指の対応部位でもって対応キーに触れるだけで選択されること

を特徴とするデータ入力システム。

【請求項１６】

請求項１記載のデータ入力システムであって、

文字は、対応キーを指の対応部位で触れ、該文字を発声することにより選択されること

を特徴とするデータ入力システム。

【請求項１７】

請求項１記載のデータ入力システムであって、

記号は、対応記号を指の対応部位で触れ、前記キー上の記号の位置を発声することにより選択されること

を特徴とするデータ入力システム。

【請求項１８】

請求項１７記載のデータ入力システムであって、

前記発声対象となる前記記号の位置は、上か下又は左か右であること

を特徴とするデータ入力システム。

【請求項１９】

請求項１記載のデータ入力システムであって、

前記キーパッドは、接触感応型面（touch-sensitive surface）であること

を特徴とするデータ入力システム。

【請求項２０】

請求項１記載のデータ入力システムであって、

前記データ入力システムは、腕巻き電話装置（wrist telephone device）内に設けてあること

を特徴とするデータ入力システム。

【請求項２１】

データ入力システムであって、

少なくとも一つの圧力レベルに応答するよう構成された複数のキーを定義（define）するキーパッドであって、各キーが記号グループのうちの少なくとも一つの記号を含み、該記号グループが、英数記号と数字記号とコマンド記号のうちの少なくとも一つからなるサブグループに分割されており、該サブグループが前記少なくとも一つの圧力レベルに関連付けてあるキーパッドと、

前記複数のキーの少なくとも一つのキーに結合した少なくとも一つの認識システムであって、該少なくとも一つのキーが少なくとも第１のサブグループからの第１の記号と少なくとも第２のサブグループからの第２の記号とを有しており、前記少なくとも一つの圧力レベルを認識し、該認識した圧力レベルに関連するサブグループに対応する前記キー上の前記記号を選択するように構成された認識システムと、を備えること

を特徴とするデータ入力システム。

【請求項２２】

請求項２１記載のデータ入力システムであって、

前記少なくとも一つのキーは、接触感応相互作用（touch-sensitive interaction）により動作すること

を特徴とするデータ入力システム。

【請求項２３】

請求項２２記載のデータ入力システムであって、

前記サブグループの一つは、前記少なくとも一つのキーに圧力をかけずに触れたときに前記キーに割り当てられること

を特徴とするデータ入力システム。

【請求項２４】

請求項２２記載のデータ入力システムであって、

前記接触感応相互作用により動作するキーは、光学式であること

を特徴とするデータ入力システム。

【請求項２５】

請求項２２記載のデータ入力システムであって、

前記接触感応相互作用により動作するキーは、感熱型であること

を特徴とするデータ入力システム。

【請求項２６】

請求項２１又は２３に記載のデータ入力システムであって、

前記選択された記号の中から一つの記号を選択する少なくとも一つの追加の認識手段をさらに備えること

を特徴とするデータ入力システム。

【請求項２７】

請求項２６記載のデータ入力システムであって、

前記追加の認識手段は、音声認識システムであること

を特徴とするデータ入力システム。

【請求項２８】

請求項２６記載のデータ入力システムであって、

前記追加の認識手段は、口唇認識システムであること

を特徴とするデータ入力システム。

【請求項２９】

請求項２１又は２２に記載のデータ入力システムであって、

前記サブグループの一つは、前記少なくとも一つの圧力レベル又は連続的な接触感応相互作用を与えるユーザにより起動されること

を特徴とするデータ入力システム。

【請求項３０】

請求項２１記載のデータ入力システムであって、

前記複数のキーは、３列４行に配列された１２個のキーを定義すること

を特徴とするデータ入力システム。

【請求項３１】

請求項２２記載のデータ入力システムであって、

前記キーパッドは、その上に複数の位置を定義するよう構成された少なくとも一つの感応パッドを備え、該位置が前記複数のキーに対応すること

を特徴とするデータ入力システム。

【請求項３２】

請求項３１記載のデータ入力システムであって、

前記キーは、３列４行に配列してあること

を特徴とするデータ入力システム。

【請求項３３】

請求項３０又は３２に記載のデータ入力システムであって、

前記１２個のキーのうち１０個が０から９までの数字に対応し、残りの２つのキーが文字「*」と「＃」の一方に対応すること

を特徴とするデータ入力システム。

【請求項３４】

請求項３０又は３２に記載のデータ入力システムであって、

前記１２個のキーのうち１０個がテキスト入力を可能にする英数文字に対応すること

を特徴とするデータ入力システム。

【請求項３５】

請求項３４記載のデータ入力システムであって、

前記英数文字が前記１２個のキーに分配されて、標準的な電話機キーパッドの英数配列を二重化してあること

を特徴とするデータ入力システム。

【請求項３６】

請求項３０又は３２に記載のデータ入力システムであって、

各言語中の前記記号は、前記言語の標準的な電話機キーパッドの配列と同じ配列でもって１２個のキー上に分配させてあること

を特徴とするデータ入力システム。

【請求項３７】

請求項２１又は２２に記載のデータ入力システムであって、

コマンドが前記キーパッドの少なくとも一つに分配させ、かつ前記少なくとも一つの圧力レベル及び／又は前記接触感応相互作用の一つに割り当ててあること

を特徴とするデータ入力システム。

【請求項３８】

請求項２１又は２２に記載のデータ入力システムであって、

デフォルト記号が、前記少なくとも一つの圧力レベル及び／又は接触感応相互作用により対応キーを押圧するだけで選択されること

を特徴とするデータ入力システム。

【請求項３９】

請求項２１又は２２に記載のデータ入力システムであって、

文字が、前記少なくとも一つの圧力レベル及び／又は接触感応相互作用により対応キーを押圧し、かつ該文字を発声するだけで選択されること

を特徴とするデータ入力システム。

【請求項４０】

請求項２１又は２２に記載のデータ入力システムであって、

記号が、前記少なくとも一つの圧力レベル及び／又は接触感応相互作用により対応キーを押圧し、かつ該キー上の前記記号の位置を発声するだけで選択されること

を特徴とするデータ入力システム。

【請求項４１】

請求項４０記載のデータ入力システムであって、

発声対象となる前記記号の位置は、上か下又は左か右であること

を特徴とするデータ入力システム。

【請求項４２】

請求項２１記載のデータ入力システムであって、

前記少なくとも一つの圧力は、第１の圧力レベルと第２の圧力レベルからなること

を特徴とするデータ入力システム。

【請求項４３】

請求項２１記載のデータ入力システムであって、

前記第１の圧力は第１の応答に関連しており、前記第２の圧力は第２の応答に関連していること

を特徴とするデータ入力システム。

【請求項４４】

請求項２１記載のデータ入力システムであって、

前記応答はクリックであること

を特徴とするデータ入力システム。

【請求項４５】

データ入力システムであって、

複数のキーを定義（define）するキーパッドであって、該キーの少なくとも一つが少なくとも二つの記号を含むキーパッドと、

前記少なくとも一つのキーに結合した音声認識システムであって、ユーザが前記少なくとも一つのキーと相互作用するのを受けて、ユーザの第１又は第２の記号の発音を認識して該第１又は第２の記号を選択するように構成された音声認識システムと、を備えること

を特徴とするデータ入力システム。

【請求項４６】

請求項４５記載のデータ入力システムであって、

前記記号の一つは、前記少なくとも第１又は第２の記号を発音することなく、ユーザが前記キーと相互作用することで選択されるデフォルト記号であること

を特徴とするデータ入力システム。

【請求項４７】

請求項４５記載のデータ入力システムであって、

前記キーパッドは、３列４行に配列された１２個のキーを定義すること

を特徴とするデータ入力システム。

【請求項４８】

請求項４７記載のデータ入力システムであって、

前記１２個のキーのうち１０個が０から９までの数字に対応し、残りの２つのキーが文字「*」と「＃」の一方に対応すること

を特徴とするデータ入力システム。

【請求項４９】

請求項４８に記載のデータ入力システムであって、

前記１２個のキーのうち１０個がテキスト入力を可能にする英数文字に対応すること

を特徴とするデータ入力システム。

【請求項５０】

請求項４９記載のデータ入力システムであって、

前記英数文字が前記１２個のキーに分配されて、標準的な電話機キーパッドの英数配列を二重化してあること

を特徴とするデータ入力システム。

【請求項５１】

請求項４９記載のデータ入力システムであって、

各言語中の記号は、前記言語の標準的な電話機キーパッドの配列と同じ配列で前記１２個のキー上に分配させてあること

を特徴とするデータ入力システム。

【請求項５２】

複数セクション化された（multi-sectored）ディスプレイユニットであって、

複数セクション化されたディスプレイユニットが、閉位置と開位置との間を動く構成とされ、閉位置において前記複数セクション化されたディスプレイユニットはクレジットカードの大きさとされ、開位置では前記複数セクション化されたディスプレイユニットの前記複数のセクションが拡張されて、拡大された表示画面をもたらすこと

を特徴とする複数セクション化されたディスプレイユニット。

【請求項５３】

請求項５２記載の複数セクション化されたディスプレイユニットであって、

前記ディスプレイは、電子装置に接続されていること

を特徴とする複数セクション化されたディスプレイユニット。

【請求項５４】

請求項５２記載の複数セクション化されたディスプレイユニットであって、

前記開位置において、前記複数セクション化されたディスプレイの幅はＡ３／Ａ４の用紙に書かれる、標準的な余白を除く文字行の幅にほぼ等しいこと

を特徴とする複数セクション化されたディスプレイユニット。

【請求項５５】

請求項５３記載の複数セクション化されたディスプレイユニットであって、

前記電子装置および前記表示ユニットは、互いを接続する符号化システムを含むこと

を特徴とする複数セクション化されたディスプレイユニット。

【請求項５６】

請求項５２記載の複数セクション化されたディスプレイユニットであって、

前記ディスプレイユニットはさらに、一体化したキーパッドユニットを含むこと

を特徴とする複数セクション化されたディスプレイユニット。

【請求項５７】

請求項５６記載の複数セクション化されたディスプレイユニットであって、

前記キーパッドは、３列４行に配列された１２個のキーを備える標準的な電話機キーパッドを含むこと

を特徴とする複数セクション化されたディスプレイユニット。

【請求項５８】

請求項５２記載の複数セクション化されたディスプレイユニットであって、

前記ディスプレイユニットは、クレジットカードサイズの電子装置のディスプレイであること

を特徴とする複数セクション化されたディスプレイユニット。

【請求項５９】

請求項５３記載の複数セクション化されたディスプレイユニットであって、

前記電子装置は、コンピュータであること

を特徴とする複数セクション化されたディスプレイユニット。

【請求項６０】

請求項５３記載の複数セクション化されたディスプレイユニットであって、

前記電子装置は、通信装置であること

を特徴とする複数セクション化されたディスプレイユニット。

【請求項６１】

コンテンツの管理・配信システムであって、

テレコミュニケーション手段を介して情報を送信するよう構成された少なくとも一つのコンテンツ源と、

前記コンテンツ源からの送信情報を受信するよう構成された少なくとも一つの

受信局と、

少なくとも一つの受信局において複数のユーザに分配されるように利用可能な複数の電子パネルと、を有し、

該複数の電子パネルのそれぞれは、メモリユニットと少なくとも一つのディスプレイユニットを有し、ユーザが少なくとも一つの前記電子パネルを受け取って前記情報の選択を行なうと、前記選択された情報が前記少なくとも一つの受信局から前記メモリユニットへコピーされて、前記ユーザに対し表示されること

を特徴とするコンテンツの管理・配信システム。

【請求項６２】

請求項６１記載のコンテンツの管理・配信システムであって、

ユーザが受信局に対し前記パネルの授受を選択すること

を特徴とするコンテンツの管理・配信システム。

【請求項６３】

請求項６１記載のコンテンツの管理・配信システムであって、

ユーザによって各取引に用いるプレスカード（press card）が所持されること

を特徴とするコンテンツの管理・配信システム。

【請求項６４】

請求項６３記載のコンテンツの管理・配信システムであって、

前記プレスカードは、前記パネルがユーザに分配されたときに、コンテンツの管理・配信システムに対し通知すること

を特徴するコンテンツの管理・配信システム。

【請求項６５】

請求項６４記載のコンテンツの管理・配信システムであって、

前記コンテンツの管理・配信システムは、ユーザに対応する購入/支払いの勘定情報を維持するよう構成され、前記プレスカードは、ユーザのプレス（press）購入/支払い勘定情報を前記コンテンツの管理・配信システムへ通知すること

を特徴とするコンテンツの管理・配信システム。

【請求項６６】

請求項６５記載のコンテンツの管理・配信システムであって、

前記ユーザのパネル及び/又は前記ユーザの勘定書の状態は、中央組織（central organization）によって管理されること

を特徴とするコンテンツの管理・配信システム。

【請求項６７】

請求項６６記載のコンテンツの管理・配信システムであって、

前記中央組織は、クレジットカード運営組織であること

を特徴とするコンテンツの管理・配信システム。

【請求項６８】

請求項６３記載のコンテンツの管理・配信システムであって、

前記各コンテンツ源は、自身のプレスカードを有すること

を特徴とするコンテンツの管理・配信システム。

【請求項６９】

請求項６８記載のコンテンツの管理・配信システムであって、

前記ユーザのパネル及び/又は前記ユーザの勘定の状態は、前記コンテンツ源の少なくとも一つにより管理されること

を特徴とするコンテンツの管理・配信システム。

【請求項７０】

請求項６３記載のコンテンツの管理・配信システムであって、

前記プレスカードは、通常のクレジッカードであること

を特徴とするコンテンツの管理・配信システム。

【請求項７１】

請求項６１記載のコンテンツの管理・配信システムであって、

前記少なくとも一つのコンテンツ源は、前記受信局を新しい情報で連続的に更新すること

を特徴とするコンテンツの管理・配信システム。

【請求項７２】

請求項６１記載のコンテンツの管理・配信システムであって、

前記パネルは、ズーム機構を備えること

を特徴とするコンテンツの管理・配信システム。

【請求項７３】

請求項６１記載のコンテンツの管理・配信システムであって、

前記パネルは、少なくとも一つのキーパッドを備えること

を特徴とするコンテンツの管理・配信システム。

【請求項７４】

請求項６１記載のコンテンツの管理・配信システムであって、

前記ディスプレイユニットは、フレキシブル（flexible）であること

を特徴とするコンテンツの管理・配信システム。

【請求項７５】

請求項７３記載のコンテンツの管理・配信システムであって、

前記ユーザがキーを用いて頁から頁へスクロールし得ること

を特徴とするコンテンツの管理・配信システム。

【請求項７６】

請求項２１記載のデータ入力システムであって、

前記接触感応パッドは、前記ユーザの指の少なくとも一部を認識するように構成されていること

を特徴とするデータ入力システム。

【請求項７７】

請求項７６記載のコンテンツの管理・配信システムであって、

前記ユーザの指の前記少なくとも一部が前記記号の一つに割り当ててあること

を特徴とするコンテンツの管理・配信システム。

【請求項７８】

請求項７６記載のコンテンツの管理・配信システムであって、

前記ユーザの指の前記少なくとも一部が前記サブグループの一つに割り当ててあること

を特徴とするコンテンツの管理・配信システム。

【請求項７９】

行列配置された複数のキーを有する電話機型キーパッドを用いるデータ入力方法であり、複数の記号が前記各キーに割り当ててあり、該キーが第１と第２の異

なる圧力レベルに応答するデータ入力方法であって、

（ａ）前記複数のキーの少なくとも一つに対するユーザの接触を認識するステップと、

（ｂ）前記接触に応答して、接触された前記キーに割り当てられている記号グループを選択するステップと、

（ｃ）接触された前記キーに作用する圧力のレベルを認識するステップと、

（ｄ）前記圧力のレベルに反応してステップ（ｂ）で選択された前記記号グループのサブグループを選択するステップと、

（ｅ）認識システムを用い、前記ステップ（ｄ）で選択された前記記号グループの記号のうちの一つを選択するステップと、を含むこと

を特徴とするデータ入力方法。

【請求項８０】

請求項７９記載のデータ入力方法であって、

前記認識システムを用いるステップはさらに、ユーザの音声の有無を認識するステップを含むこと

を特徴とするデータ入力方法。

【請求項８１】

請求項８０記載のデータ入力方法であって、

前記音声の有無の認識ステップはさらに、前記ステップ（ｄ）で選択された前記サブグループの記号からデフォルト記号を割り当てるステップを含むこと

を特徴とするデータ入力方法。

【請求項８２】

請求項８０記載のデータ入力方法であって、

前記音声の有無を認識するステップは、

前記ユーザが発した話し言葉を判定するステップと、

前記ユーザが発した前記話し言葉の前記判定に応答し、前記ステップ（ｄ）で選択された前記サブグループから記号を選択するステップを含むこと

を特徴とするデータ入力方法。

【請求項８３】

請求項７９記載のデータ入力方法であって、

前記キーのうちの二つに同時に触れて前記キーのうちの一つに対応する記号を選択するステップをさらに含むこと

を特徴とするデータ入力方法。

【請求項８４】

請求項８３記載のデータ入力方法であって、

前記記号は、コンピュータのコマンドであること

を特徴とするデータ入力方法。

【請求項８５】

請求項７９記載のデータ入力方法であって、

前記ステップ（ｄ）で選択された前記サブグループは、英数記号に対応すること

を特徴とするデータ入力方法。

【請求項８６】

請求項８５記載のデータ入力方法であって、

前記ステップ（ｄ）で選択されたなかった記号の残りのサブグループは、数字記号に対応すること

を特徴とするデータ入力方法。

【請求項８７】

請求項８６記載のデータ入力方法であって、

前記残るサブグループはさらに、コンピュータのキーボードのコマンドに対応すること

を特徴とするデータ入力システム。

【請求項８８】

請求項７９記載のデータ入力方法であって、

複数の前記記号を英数文字として表わすステップをさらに備え、前記英数文字の少なくとも一部が前記キー中に割り当てられて、電話機キーパッドの英数構成を規定すること

を特徴とするデータ入力方法。

【請求項８９】

請求項８２記載のデータ入力方法であって、

前記キー上の他の記号に対する記号の位置に対応して発された話し言葉を認識するステップをさらに含むこと

を特徴とするデータ入力方法。

【請求項９０】

請求項８９記載のデータ入力方法であって、

前記位置の指定は、上か下又は左か右の単語の発声を含むこと

を特徴とするデータ入力方法。

【請求項９１】

請求項８２記載のデータ入力方法であって、

前記話し言葉が英数文字であること

を特徴とするデータ入力方法。

【請求項９２】

請求項８２記載のデータ入力方法であって、

前記話し言葉が前記ステップ（ｄ）で選択された記号の発音であること

を特徴とするデータ入力方法。

【請求項９３】

請求項７９記載のデータ入力方法であって、

前記認識システムは、前記キー上に配設された前記記号の任意の一つの位置へ向けてユーザの指がスライドする動きを認識するステップをさらに含むこと

を特徴とするデータ入力方法。

【請求項９４】

請求項７９記載のデータ入力方法であって、

前記認識システムはさらに、前記ユーザの所定の指を認識し、前記記号を前記所定の指に割り当てるステップをさらに含むこと

を特徴とするデータ入力方法。

【請求項９５】

請求項９４記載のデータ入力方法であって、

前記キー上の前記各記号間の位置関係をユーザの指に関連付け、前記キー上の異なる位置の各記号を前記ユーザの異なる指に対応させるステップをさらに含むことを特徴とするデータ入力方法。

【請求項９６】

行列配置された複数のキーを有する電話機型キーパッドを用いるデータ入力方法であり、複数の記号が前記各キーに割り当ててあり、該キーがユーザの接触に応答するデータ入力方法であって、

（ａ）前記複数のキーの少なくとも一つに対する前記ユーザの接触を認識するステップと、

（ｂ）前記接触に応答して、接触したキーに割り当てられている記号グループを選択するステップと、

（ｃ）認識システムを用い、前記ステップ（ｂ）で選択された前記記号グループのうちの前記記号の一つを選択するステップと、を含むこと

を特徴とするデータ入力方法。

【請求項９７】

請求項９６記載のデータ入力方法であって、

前記認識システムを用いるステップはさらに、ユーザの音声の有無を認識するステップを含むこと

を特徴とするデータ入力方法。

【請求項９８】

請求項９７記載のデータ入力方法であって、

前記音声の有無を認識する前記ステップはさらに、前記ステップ（ｂ）で選択された前記記号グループからデフォルト記号を割り当てるステップを含むこと

を特徴とするデータ入力方法。

【請求項９９】

請求項９７記載のデータ入力方法であって、

前記音声の有無を認識する前記ステップがさらに、

前記ユーザが発した話し言葉を判定するステップと、

前記ユーザが発した前記話し言葉の前記判定に応答し、前記ステップ（ｂ）で

選択された前記グループから記号を選択するステップと、を含むこと

を特徴とするデータ入力方法。

【請求項１００】

請求項９６記載のデータ入力方法であって、

前記キーの少なくとも二つを同時に触れて、前記キーの一つに対応する記号を選択するステップをさらに含むこと

を特徴とするデータ入力方法。

【請求項１０１】

請求項１００記載のデータ入力方法であって、

前記記号は、コンピュータのコマンドであること

を特徴とするデータ入力方法。

【請求項１０２】

請求項９６記載のデータ入力方法であって、

前記ステップ（ｂ）で選択された前記グループは、英数記号に対応すること

を特徴とするデータ入力方法。

【請求項１０３】

請求項９６記載のデータ入力方法であって、

複数の前記記号を英数文字で表現するステップをさらに含み、該英数文字の少なくとも一部が前記キー中に割り当ててあって、電話機キーパッドの英数構成を規定すること

を特徴とするデータ入力方法。

【請求項１０４】

請求項９７記載のデータ入力方法であって、

前記キー上の他の記号に対する記号の位置に対応して発された話し言葉を認識するステップをさらに含むこと

を特徴とするデータ入力方法。

【請求項１０５】

請求項１０４記載のデータ入力方法であって、

前記位置の指定は、上か下又は左か右の単語の発声を含むこと

を特徴とするデータ入力方法。

【請求項１０６】

請求項９６記載のデータ入力方法であって、

前記認識システムがさらに、前記キーに配設された前記記号の任意の一つの位置へ向けたユーザの指のスライド動きを認識するステップを含むこと

を特徴とするデータ入力方法。

【請求項１０７】

請求項９６記載のデータ入力方法であって、

前記認識システムはさらに、前記ユーザの所定の指を認識し、前記記号の一つを前記所定の指に割り当てるステップを含むこと

を特徴とするデータ入力方法。

【請求項１０８】

請求項１０７記載のデータ入力方法であって、

前記キー上の前記各記号間の位置関係をユーザの指へ関連付け、前記キー上の異なる位置の各記号を前記ユーザの異なる指に対応させるステップをさらに含むこと

を特徴とするデータ入力方法。

【請求項１０９】

請求項９７記載のデータ入力方法であって、

前記ユーザが発する前記話し言葉が前記ステップ（ｃ）で選択された前記記号の発音であること

を特徴とするデータ入力方法。

【請求項１１０】

折り畳み可能な複数セクション化された（multi-sectioned）コンピュータであって、

少なくとも複数のキーを有する一体型キーパッドを備える少なくとも第１及び第２のセクションと、

前記第２のセクションが、少なくともディスプレイユニットを備え、

前記一体型キーパッドがさらに、

前記キーの少なくとも一つへのユーザの接触を認識する手段と、

前記接触に応答して、接触されたキーに割り当てられた記号グループを選択する手段と、

接触されたキーに作用する圧力レベルを認識する手段と、

前記接触に応答して選択された前記記号グループのサブグループを選択する手段と、

前記選択された前記サブグループの前記記号の一つを選択する認識システムと、を含むこと

を特徴とする複数セクション化されたコンピュータ。

【請求項１１１】

請求項１１０記載の複数セクション化されたコンピュータであって、

閉位置において前記複数セクション化されたコンピュータは、その最大セクションに合わせた大きさとされること

を特徴とする複数セクション化されたコンピュータ。

【請求項１１２】

請求項１１１記載の複数セクション化されたコンピュータであって、

閉位置において、前記複数セクション化されたコンピュータはクレジットカードの大きさを有すること

を特徴とする複数セクション化されたコンピュータ。

【請求項１１３】

請求項１１０記載の複数セクション化されたコンピュータであって、

前記ディスプレイユニットは、少なくとも２つのセクションを有する複数セクション化されたディスプレイであり、

閉位置において前記複数セクション化されたディスプレイは、最大セクションと同じ大きさとされ、開位置において前記複数セクション化されたディスプレイは、拡張されて拡大表示ユニットをもたらすこと

を特徴とする複数セクション化されたコンピュータ。

【請求項１１４】

請求項１１３記載の複数セクション化されたコンピュータであって、

閉位置において、前記ディスプレイはクレジットカードの大きさを有すること
を特徴とする複数セクション化されたコンピュータ。

【請求項１１５】

請求項１１３記載の複数セクション化されたコンピュータであって、
開位置において、前記ディスプレイの幅はクレジットカードの２倍の大きさを有すること
を特徴とする複数セクション化されたコンピュータ。

【請求項１１６】

請求項９６記載のデータ入力方法であって、
前記ステップ（ａ）がさらに、前記少なくとも一つのキーのユーザによる２回叩きの認識ステップを含むこと
を特徴とするデータ入力方法。

【請求項１１７】

請求項１１６記載のデータ入力方法であって、
前記少なくとも一つのキーのユーザによる２回叩きを認識するステップはさらに、前記ステップ（ｂ）で選択された前記記号グループから記号を割り当てるステップを含むこと
を特徴とするデータ入力方法。

【国際調査報告】

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/29647

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) :H03K 17/94; G06K 9/00
US Cl. :341/22; 382/116, 124
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)
U.S. : 341/22; 382/116, 124

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST
search terms: finger recognition, keyboard, keypad

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,767,842 A (KORTH) 16 June 1998, col 2, line 65 to column 3 to col 4, line 3.	1-5

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

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search 03 JANUARY 2001	Date of mailing of the international search report 26 FEB 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer TIMOTHY EDWARDS Telephone No. (703) 305-4896

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(81)指定国 ＥＰ(ＡＴ，ＢＥ，ＣＨ，ＣＹ，ＤＥ，ＤＫ，ＥＳ，ＦＩ，ＦＲ，ＧＢ，ＧＲ，ＩＥ，ＩＴ，ＬＵ，ＭＣ，ＮＬ，ＰＴ，ＳＥ)，ＯＡ(ＢＦ，ＢＪ，ＣＦ，ＣＧ，ＣＩ，ＣＭ，ＧＡ，ＧＮ，ＧＷ，ＭＬ，ＭＲ，ＮＥ，ＳＮ，ＴＤ，ＴＧ)，ＡＰ(ＧＨ，ＧＭ，ＫＥ，ＬＳ，ＭＷ，ＭＺ，ＳＤ，ＳＬ，ＳＺ，ＴＺ，ＵＧ，ＺＷ)，ＥＡ(ＡＭ，ＡＺ，ＢＹ，ＫＧ，ＫＺ，ＭＤ，ＲＵ，ＴＪ，ＴＭ)，ＡＥ，ＡＬ，ＡＭ，ＡＴ，ＡＵ，ＡＺ，ＢＡ，ＢＢ，ＢＧ，ＢＲ，ＢＹ，ＣＡ，ＣＨ，ＣＮ，ＣＲ，ＣＵ，ＣＺ，ＤＥ，ＤＫ，ＤＭ，ＥＥ，ＥＳ，ＦＩ，ＧＢ，ＧＤ，ＧＥ，ＧＨ，ＧＭ，ＨＲ，ＨＵ，ＩＤ，ＩＬ，ＩＮ，ＩＳ，ＪＰ，ＫＥ，ＫＧ，ＫＰ，ＫＲ，ＫＺ，ＬＣ，ＬＫ，ＬＲ，ＬＳ，ＬＴ，ＬＵ，ＬＶ，ＭＡ，ＭＤ，ＭＧ，ＭＫ，ＭＮ，ＭＷ，ＭＸ，ＮＯ，ＮＺ，ＰＬ，ＰＴ，ＲＯ，ＲＵ，ＳＤ，ＳＥ，ＳＧ，ＳＩ，ＳＫ，ＳＬ，ＴＪ，ＴＭ，ＴＲ，ＴＴ，ＴＺ，ＵＡ，ＵＧ，ＵＳ，ＵＺ，ＶＮ，ＹＵ，ＺＡ，ＺＷ

Espacenet

Bibliographic data: KR20100003572 (A) — 2010-01-11

MULTIPLE INPUT PROCESSING DEVICE

Inventor(s): SOHN SUNG GON [KR] ± (SOHN, SUNG GON)

Applicant(s): IREVO INC [KR] ± (IREVO, INC)

Classification: - international: *G06F3/02; G06F3/041; H01H13/70*
- cooperative: G06F3/02 (KR); G06F3/0354 (KR); G06F3/041 (KR); H01H13/70 (KR)

Application number: KR20080063533 20080701 Global Dossier

Priority number (s): KR20080063533 20080701

Abstract of KR20100003572 (A)

PURPOSE: A multiple input processing device is provided to perform various inputs by one time touch action and prevent a password from being exposed even tough a number input action is exposed, thereby improving security. CONSTITUTION: A user contact unit(100) comprises a plurality of contact areas. If the contact pressure of a user about a contact area reaches the first critical amount, a contact detector(200) outputs the first output value. If the contact pressure of the user about the contact area reaches the second critical amount, the contact detector outputs the second output value. A signal processing unit(300) processes a predefined signal using the first and second output values. The first critical amount shows the contact of a finger. The second critical amount shows the press by the finger.

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

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(74) 대리인
특허법인세신

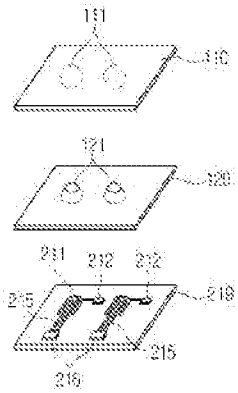
전체 청구항 수 : 총 12 항

(54) 복수 입력 처리 장치

(57) 요 약

본 발명은 한 번의 접촉 동작으로 다양한 입력을 할 수 있는 입력 장치를 실현하기 위하여, 복수의 접촉 영역이 형성되어 있는 사용자 접촉부와, 상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 접촉 감지부와, 상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함하는 복수 입력 처리 장치를 제공한다.

대 표 도 - 도2



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특허청구의 범위

청구항 1

복수의 접촉 영역이 형성되어 있는 사용자 접촉부와,

상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 접촉 감지부와,

상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함하는 복수 입력 처리 장치.

청구항 2

제1항에 있어서,

상기 제1의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락에 의한 누름을 나타내는 것을 특징으로 하는 복수 입력 처리 장치.

청구항 3

제2항에 있어서,

상기 접촉 감지부는,

상기 접촉을 감지하면 상기 제1 출력값을 출력하는 제1 감지수단과, 상기 누름을 감지하면 상기 제2 출력값을 출력하는 제2 감지수단을 구비하는 것을 특징으로 하는 복수 입력 처리 장치.

청구항 4

제3항에 있어서,

상기 제1 감지수단은 사용자 손가락의 상기 접촉에 의해 변화하는 정전용량을 감지하는 정전용량 센서이고, 상기 제2 감지수단은 사용자 손가락의 상기 누름에 의해 동작하는 기계적인 스위치인 것을 특징으로 하는 복수 입력 처리 장치.

청구항 5

제4항에 있어서,

상기 기계적인 스위치는 적어도 두 개의 접점을 구비하고 상기 누름에 의해 상기 접점간의 접속이 단속되는 동 스위치인 것을 특징으로 하는 복수 입력 처리 장치.

청구항 6

제5항에 있어서,

상기 정전용량 센서의 정전용량 감지용 단자와 상기 기계적인 스위치의 접점은, PCB층에, 상기 복수의 접촉 영역마다 동심에 배치되어 있는 것을 특징으로 하는 복수 입력 처리 장치.

청구항 7

제5항 또는 제6항에 있어서,

상기 사용자 접촉부는, 사용자 손가락이 접촉하는 보호층과 상기 복수의 접촉 영역마다 대응하는 위치에 돔 스위치를 형성하기 위한 탄성 돔이 형성된 실리콘층을 포함하여 이루어진 것을 특징으로 하는 복수 입력 처리 장치.

청구항 8

복수의 접촉 영역이 형성되어 있는 사용자 접촉부와,

상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉에 의해 변화한 정전용량 또는 접촉

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시간이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 정전 용량 센서;

상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함하는 복수 입력 처리 장치.

청구항 9

제1항 내지 제6항, 제8항 중 어느 한 항에 있어서,

상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 음향을 발생하고, 상기 신호 처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 음향을 발생하는 음향 발생 수단을 더 포함하는 것을 특징으로 하는 복수 입력 장치.

청구항 10

제1항 내지 제6항, 제8항 중 어느 한 항에 있어서,

상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 진동을 발생하고, 상기 신호 처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 진동을 발생하는 진동 발생 수단을 더 포함하는 것을 특징으로 하는 복수 입력 장치.

청구항 11

사용자 손가락에 의한 복수의 입력을 처리하기 위한 방법으로서,

복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 단계;

상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 단계를 포함하는 복수 입력 처리 방법.

청구항 12

제9항에 있어서,

상기 제1의 임계량은 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 사용자 손가락에 의한 누름을 나타내는 것을 특징으로 하는 복수 입력 처리 방법.

명 세 서

발명의 상세한 설명

기 술 분 야

<1> 본 발명은 복수 입력 처리 장치에 관한 것으로서, 더욱 상세하게는, 사용자의 터치와 누름을 동시에 감지할 수 있는 복수 입력 처리 장치에 관한 것이다.

배 경 기 술

<2> 최근, 전자 기기에서 사용자 입력을 위한 버튼을 대신하여, 디자인 및 조작의 편리성 때문에 터치 패드가 많이 적용되고 있다. 그러나 사용되고 있는 버튼 또는 터치 패드는, 하나의 버튼 또는 손가락 접촉 영역에 대해서 하나의 입력만을 받을 수 있도록 되어 있다.

<3> 그래서 다양한 기호 또는 숫자등을 입력하기 위해서는 그 기호 또는 숫자의 각각의 개수에 대응하는 버튼 또는 접촉 영역이 구비되어야 했다. 한편, 이러한 문제점을 해결하기 위해서, 하나의 버튼 또는 접촉 영역을 여러번 누름 또는 접촉함으로써 입력되는 기호 또는 숫자를 변경시키는 방법, 별도의 전환 키 등을 설치하고 이 전환 키와 동시에 누름 또는 접촉하는 방법이 사용되고 있다.

<4> 하지만, 이러한 입력 방법들은 원하는 입력을 행하기 위해서 2회 이상의 누름 또는 접촉을 행해야 하기 때문에 복잡하고 불편하였다.

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<5> 또한, ATM 장치나 디지털 도어락 등과 같이 보안성이 요구되는 비밀번호를 입력하고자 하는 경우에는, 번호를 입력하기 위하여 버튼 또는 터치 패드를 사용하는 동작을 누군가 보게 된다면, 비밀번호가 노출될 수 있다는 치명적인 단점을 갖는다.

발명의 내용

해결 하고자하는 과제

<6> 따라서, 본 발명은 한 번의 접촉 동작으로 다양한 입력을 할 수 있는 입력 장치를 실현하고자 하는 것을 목적으로 한다.

<7> 또한, 본 발명은 비밀번호 입력 등에 있어서 번호 입력 동작이 노출되더라도 비밀번호가 노출되지 않도록 하여, 보안성을 향상시킬 수 있는 입력 장치를 제공하고자 한다.

과제 해결수단

<8> 상기 목적을 달성하기 위한 본 발명에 따른 복수 입력 처리 장치는, 복수의 접촉 영역이 형성되어 있는 사용자 접촉부와, 상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 접촉 감지부와, 상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 신호 처리부를 포함한다.

<9> 여기에서, 상기 제1의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 상기 사용자 접촉부에 대한 사용자 손가락에 의한 누름을 나타낸다.

<10> 또한, 상기 접촉 감지부는, 상기 접촉을 감지하면 상기 제1 출력값을 출력하는 제1 감지수단과, 상기 누름을 감지하면 상기 제2 출력값을 출력하는 제2 감지수단을 구비한다.

<11> 또한, 상기 제1 감지수단은 사용자 손가락의 상기 접촉에 의해 변화하는 정전용량을 감지하는 정전용량 센서이고, 상기 제2 감지수단은 사용자 손가락의 상기 누름에 의해 동작하는 기계적인 스위치인 것을 특징으로 한다.

<12> 한편, 상기 기계적인 스위치는 적어도 두 개의 접점을 구비하고 상기 누름에 의해 상기 접점간의 접속이 단속되는 등 스위치인 것을 특징으로 한다.

<13> 또한, 상기 정전용량 센서의 정전용량 감지용 단자와 상기 기계적인 스위치의 접점은, PCB층에, 상기 복수의 접촉 영역마다 동시에 배치된다.

<14> 또한, 상기 사용자 접촉부는, 사용자 손가락이 접촉하는 보호층과 상기 복수의 접촉 영역마다 대응하는 위치에 돔 스위치를 형성하기 위한 탄성 돔이 형성된 실리콘층을 포함하여 이루어진다.

<15> 또한, 본 발명에 따른 복수 입력 처리 장치는, 복수의 접촉 영역이 형성되어 있는 사용자 접촉부와, 상기 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉에 의해 변화한 정전용량 또는 접촉 시간이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 정전용량 센서를 포함한다.

<16> 또한, 본 발명은, 상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 음향을 발생하고, 상기 신호처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 음향을 발생하는 음향 발생 수단을 더 포함할 수도 있으며, 상기 신호 처리부에서 상기 제1 출력값을 출력하는 경우에 제1 진동을 발생하고, 상기 신호 처리부에서 상기 제2 출력값을 출력하는 경우에는 제2 진동을 발생하는 진동 발생 수단을 더 포함할 수도 있다.

<17> 또한, 본 발명은 사용자 손가락에 의한 복수의 입력을 처리하기 위한 방법으로서, 복수의 접촉 영역 중 적어도 하나의 접촉 영역에 대한 사용자의 접촉 압력이 제1의 임계량에 도달하면 제1 출력값을 출력하고 제2의 임계량에 도달하면 제2 출력값을 출력하는 단계; 상기 제1 출력값 및 제2 출력값을 이용하여 미리 정의된 신호처리를 행하는 단계를 포함하는 복수 입력 처리 방법을 제공한다.

<18> 여기에서, 상기 제1의 임계량은 사용자 손가락의 접촉을 나타내고, 상기 제2의 임계량은 사용자 손가락에 의한 누름을 나타낸다.

효 과

<19> 상술한 바와 같은 본 발명에 의하면, 터치패드 형태의 사용자 입력이 가능한 전자 장치에 있어서, 하나의 접촉

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영역에 대한 한 번의 접촉 동작으로도 복수의 입력이 가능하게 되어 사용자 입력이 간편해진다.

<20> 또한, 비밀 번호의 입력과 같이 보안성을 요구하는 경우에도, 안전한 입력이 가능하게 된다.

발명의 실시를 위한 구체적인 내용

<21> 상술한 바와 같은 본 발명을, 이하에서 도면을 참조하여 설명한다.

<22> 먼저, 본 발명의 일 실시예에 따른 복수 입력 처리 장치는, 도 1에 개략적으로 도시된 바와 같이, 사용자 접촉부(100)와 접촉 감지부(200)와 신호 처리부(300)를 포함하여 이루어진다.

<23> 사용자 접촉부(100)는, 일반적으로 평평한 패널로 이루어지며, 표면에는 사용자가 손가락을 접촉할 위치가 되는 접촉 영역(111)이 인쇄 등에 의해 표시된다. 또한, 사용자 접촉부(100)는 약간의 탄성을 가져 사용자가 손가락으로 누를 때 약간의 변형 및 복원이 가능하도록 한다.

<24> 접촉 감지부(200)는, 사용자 접촉부(100)와 접하지도록 배치되며, 접촉된 상태에서 복수의 접촉 영역에 대응하는 위치마다에 사용자 손가락의 접촉 등을 감지하여 미리 지정된 신호를 출력하는 감지 수단(210)이 배치된 PCB 기판(219)을 포함한다.

<25> 신호 처리부(300)는, 사용자 접촉부(100)에 사용자 손가락의 접촉 또는 접근 여부를 감지하여 그에 대응하여 감지 수단에서 출력한 신호를 수신하고, 이 신호를 추후 마이크로프로세서 등에서 이용할 수 있는 신호 형태로 변환하여 출력한다.

<26> 여기, 접촉 감지부(200)의 감지 수단(210)은, 사용자 손가락이 사용자 접촉부에 접촉하거나 누름에 의해 발생하는 압력 또는 접촉 시간 등을 측정하고, 그 측정 결과가 적어도 하나의 기준치를 경계로 하는 제1의 임계값 영역 및 제2의 임계값 영역 중 어느 영역에 포함되는 지를 판정한다. 그리고 각 영역에 해당하는 서로 다른 값을 갖는 신호를 출력하게 된다. 이후 신호 처리부(300)에서 각각의 신호를, 본 발명의 복수 입력 처리 장치의 출력값을 이용하는 전자 장치의 마이크로프로세서에서 사용하는 디지털 또는 아날로그 신호 형태를 갖도록 변환하게 된다.

<27> 이러한 동작에 의하면 하나의 접촉 영역에 대하여 복수의 입력을 받아들이는 것이 가능하게 된다.

<28> 한편, 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 감지 수단은, 제1의 임계값을 감지하기 위한 제1 감지수단과 제2의 임계값을 감지하기 위한 제2 감지수단을 구비한다. 그리고 제1 감지수단으로는 제1의 임계값 영역에 해당하는 접촉 압력을 감지하기 위한 정전용량 감지 센서를 이용하고, 제2 감지수단으로는 제2의 임계값 영역에 해당하는 접촉 압력을 감지하기 위한 기계적인 스위치를 이용한다.

<29> 이러한 구성에서는, 사용자가 손가락을 제1의 임계값 영역에 해당하는 수준으로 접촉 영역(111)을 접촉하면 제1의 임계값 영역에 대응하는 신호로서 접촉 신호가 출력된다. 한편, 사용자가 제2의 임계값 영역에 해당하는 수준의 접촉 압력으로 접촉 영역(111)을 누르는 경우에는, 제1 감지 수단에서 접촉 신호가 출력될 뿐만 아니라 기계적인 스위치까지 눌려짐으로써 제2의 임계값 영역에 대응하는 신호인 누름 신호도 동시에 출력된다. 이렇게 접촉 신호 및 누름 신호가 동시에 출력되는 경우, 신호 처리부(300)는 사용자가 제2의 임계값 영역에 해당하는 누름을 입력하고자 하는 것으로 판단하고 누름 신호를 출력하게 된다.

<30> 다음으로, 도 2를 참조하여, 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 구성을 더욱 상세하게 설명한다. 도 2에 따르면, 복수 입력 처리 장치는 사용자 접촉부(100)를 구성하는 돔(121)과 원터콘층(120), 및 접촉 감지부(200)를 구성하는 PCB층(210)을 도시하고 있다. 신호 처리부(300)는 생략하였다.

<31> 먼저, PCB층(210)은 사용자 손가락의 접촉을 감지하는 감지 수단을 형성하기 위한 전극들 및 회로 소자들이 배치되며, 복수 입력 처리 장치의 최하층이 된다. 본 발명의 일 실시예에서는, 사용자 손가락의 접촉을 감지하기 위한 제1 감지수단으로 인체의 접근 또는 접촉에 의해 발생하는 정전용량의 변화를 적어도 하나의 전극을 이용하여 감지하고 접촉 신호를 출력하는 정전용량 감지 센서를 이용하고, 사용자의 누름을 감지하기 위한 제2 감지수단으로 적어도 두 개의 접점이 배치되고 사용자의 누름에 의해 이 접점들이 서로 접촉하거나 분리되는 단속에 의해 누름 신호를 출력하는 기계적인 스위치를 이용한다.

<32> 이러한 정전용량 감지 센서와 기계적인 스위치는 동일한 접촉 영역에 동시에 배치된다. 이를 위하여, PCB층(210)의 표면에서 접촉 영역(111)의 각각에 대응하는 위치에는, 정전용량을 감지하기 위한 전극인 정전용량 감지 전극(211)의 패턴과 기계적인 스위칭 동작을 행하기 위한 스위칭 접점(215)의 패턴이 동시에 형성되어 있다. 그리고 이 패턴들 상에 기계적인 스위치 구조와 사용자 손가락의 터치를 감지하기 위한 구조가 동시에 배치됨으로

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로써, 본 발명이 성립된다.

<33> 그리고 각각의 접점(215) 및 전극(211)에는, 이 접점(215)을 및 전극(211)에서 감지한 접촉을 전기적인 신호로서 출력하기 위한 스위칭 회로(216) 및 정전용량 감지 회로(212)가 배치된다. 이 회로들의 출력은 이후 신호 처리부(300)를 거쳐 출력된다.

<34> 도 2를 참조하면, PCB층(210)의 각각의 접촉 영역(111)에 두 개의 스위칭 접점(215) 패턴이 나란하게 형성되어 있으며, 또한, 이 접점(215)에 인접하게 정전용량 감지 전극(211)의 패턴이 형성된 것을 확인할 수 있다. 한편, 각 접점(215) 및 전극(211)을 동시에 형성하기 위한 패턴의 형태는 이에 한정되는 것이 아님은 당연하다.

<35> 다음, 돔(121)은, 복수 입력 처리 장치의 최상층으로서 사용자가 손가락으로 접촉하는 부분인 복수의 접촉 영역(111)이 형성되어 있으며, 적어도 돔(121) 표면의 접촉 영역(111)에는 접촉에 의해 입력할 숫자나 문자 또는 기호가 인쇄 등에 의해 표시되어 있다.

<36> 한편, 돔(121)에서 적어도 접촉 영역(111)은 인체에 의한 정전용량의 변화를 감지할 수 있도록 인체의 전자기적 에너지가 통과할 수 있는 재질로 이루어진다. 일반적인 플라스틱 필름 등은 인체의 에너지가 투과될 수 있다. 하지만 이러한 투과 특성에 의해, 손가락이 어느 하나의 접촉 영역(111)에 접촉하거나 접근하는 경우에 이 접촉 영역 이외의 부분(접촉에 의한 입력을 원하지 않는 부분)의 접촉 영역(111)에서도 정전 용량의 변화를 동시에 감지하게 될 수 있다. 따라서, 에너지 투과성의 플라스틱 필름을 사용하는 경우, 접촉 영역(111) 이외의 부분에는 인체 에너지를 차단하는 효과가 있는 물질을 도포하는 것이 바람직하다.

<37> 실리콘층(120)은, PCB층(210)에 형성된 스위칭 접점(215)을 단속하기 위한 접촉돌기(122)가 형성된 돔(121)이 형성된다. 돔(121)은 외부로부터 눌려지면 접촉돌기(122)를 하강시켜 두 개의 스위칭 접점(215)에 동시에 접촉시키고, 눌려짐이 해제되면 실리콘 재질의 탄성에 의해 원래의 돔 형태로 복원되어 접촉돌기(122)가 상승한다. 한편, 접촉돌기(122) 중 스위칭 접점과 접촉하게 되는 부분에는 전도성 물질이 도포되어 스위칭 접점(215)간의 전기적인 연결을 가능하게 한다.

<38> 도 3은 도 2에 도시된 보호층, 실리콘층 및 PCB층이 결합된 형태에 대한 측단면도이다. 도 3을 참조하면, 돔(121)의 하부에 실리콘층(120)이 접촉 배치되며, 또한 PCB층(210)도 실리콘층(120)에 접촉 배치된 구조를 볼 수 있다.

<39> 여기에서 실리콘층(120)의 돔(121)의 내부에는 아래쪽을 향하는 접촉돌기(122)가 형성되어 있고, 접촉돌기(122)의 아래쪽에 있는 PCB층(210)에는 두 개의 스위칭 접점(215)이 배치되어 있다. 또한, 스위칭 접점(215)의 양측에 정전용량 감지 전극(211)이 배치되어 있다. 또한, 적어도 돔(121)의 바깥쪽에는 PCB층(210)과 돔(121)을 일정한 간격을 유지하도록 하기 위한 거치부(123)가 형성되어 있다.

<40> 이러한 구조에서, 사용자가 손가락을 돔(121)의 접촉 영역(111)에 단지 접촉하는 경우에는 정전용량 감지 전극(211)에서 정전용량의 변화를 감지하게 되고, 정전용량 감지 회로(212)에서는 접촉 신호를 출력하게 된다. 또한, 사용자가 접촉 영역(111)에 손가락을 접촉한 후 더욱 압력하여 누르게 되면, 돔(121)과 실리콘층(120)의 돔(121)의 눌려짐에 의해 접촉돌기(122)가 스위칭 접점(215)에 접촉하게 되고 스위칭 접점(215)이 서로 도통되어 스위칭 회로(216)에서 누름 신호를 출력하게 된다.

<41> 즉, 사용자 손가락이 접촉만을 행하는 경우에는 단지 정전용량 감지 회로(212)에서만 접촉신호를 출력하게 되지만, 사용자가 접촉 후 돔 스위치까지 누르는 경우에는 접촉신호뿐만 아니라 스위칭 회로(216)에서도 누름 신호를 출력하게 된다. 신호 처리부(300)는 접촉 신호만 입력되는 경우에는 접촉에 대응하는 신호를 출력하게 되고, 접촉신호와 누름 신호가 동시에 입력되는 경우에는 누름에 대응하는 신호를 출력하게 된다.

<42> 이에 의해, 본 발명의 일 실시예에 따른 복수 입력 처리 장치는, 접촉 영역(111)에 대하여 사용자가 손가락의 접촉만을 행한 경우에는 접촉에 대응하는 제1의 신호처리를 행하게 되고, 접촉 영역(111)에 대하여 사용자가 손가락으로 누르는 경우에는 누름에 대응하는 제2의 신호처리를 행하게 된다.

<43> 다음으로, 도 4를 참조하여, 접촉 감지부(200)의 형태에 대한 또다른 실시예를 설명한다. 본 실시예에서는 스위칭 접점(215)과 정전용량 감지 전극(211)의 형태를 더욱 개선하고자 한다. 즉, 도 4를 참조하면, 두 개의 스위칭 접점(215) 중의 적어도 어느 하나를 정전용량 감지 전극(211)으로 겸용하도록 하는 구성을 나타내고 있다. 이러한 구성에 의하면 별도의 정전용량 감지 전극(211)을 형성하지 않아도 되기 때문에 제조 및 설계의 단순함을 도모하고, 제조 비용의 절감을 실현할 수 있게 된다.

<44> 한편, 본 발명의 또다른 실시예에 따른 복수 입력 처리 장치는, 사용자 손가락의 접촉에 의한 정전용량의 변화

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를 감지하는 정전용량 감지 센서만을 구비하고, 본 발명에 따른 접촉 및 누름 압력에 따른 서로 다른 신호 처리를 가능하게 한다. 즉, 손가락이 접촉 영역(111)에 접촉하는 경우의 정전용량의 변화량과, 손가락으로 누르는 경우의 정전용량의 변화량을 각각 제1의 임계값 영역과 제2의 임계값 영역으로 하고, 정전용량의 변화가 각각의 영역에 해당하는 경우 제1 출력값 및 제2 출력값을 구분하여 출력하도록 하는 구성도 가능하다.

<45> 즉, 도 5를 참조하면, 사용자 손가락이 접촉 영역에 접촉하는 압력과 측정되는 정전용량의 크기의 관계를 개략적으로 확인할 수 있다. 즉, 손가락과 정전용량 감지 전극(211)과의 사이에서의 정전용량은, 손가락의 압력에 따라 감소하는 양상을 나타낸다. 이때, 정전용량의 크기를 제1의 임계값과 제2의 임계값을 기준으로 분할하고, 각 영역의 값으로 정전용량이 측정될 때, 각각 다른 신호를 출력하게 된다.

<46> 즉, 사용자가 손가락으로 접촉 영역에 접촉한 후 떼었을 때, 측정된 정전용량의 최소값이 제1의 임계값보다 큰 경우에는 접촉 신호를 출력하도록 하고 제2의 임계값보다 작은 경우에는 누름 신호를 출력하도록 할 수 있다. 물론 기준이 되는 임계값은 하나 또는 복수일 수 있다.

<47> 이러한 구성에 의하면 별도의 기계적인 스위치를 배치할 필요가 없어지므로, 설계의 용이함 및 제조 비용의 절감 효과를 도모할 수 있게 된다.

<48> 본 발명의 또다른 실시예에 따른 복수 입력 처리 장치는, 도 6에 도시된 바와 같이, 사용자가 터치 또는 누름에 의한 입력을 행하는 경우, 각 입력의 완료를 표시하기 위한 입력 표시 수단(400)을 더 포함할 수도 있다.

<49> 이와 같은 입력 표시 수단(400)에 의해, 사용자가 접촉기점(210)에 단지 접촉함으로써 입력을 행하면 제1 음향을 발생하거나 제1 진동을 발생하도록 하고, 사용자가 접촉기점(210)을 누름으로써 입력을 행하면 제2 음향이나 제2 진동을 발생하도록 한다.

<50> 이러한 구성에 의하면, 사용자가 자신이 행한 입력을 정확히 구분 및 확인할 수 있게 되어, 더욱 편리하게 입력 동작을 행할 수 있게 된다.

<51> 다음으로, 본 발명의 일 실시예에 따른 복수 입력 처리 장치를 이용하는 방법에 대하여 설명한다. 여기에서는 디지털 도어락의 비밀번호 입력용 장치에 적용되는 것을 예를 들어 설명한다.

<52> 디지털 도어락에 적용되는 본 발명에 따른 복수 입력 처리 장치는 하나의 접촉 영역에서 복수의 입력이 가능하다는 특징에 의해, 비밀 번호의 규격을 변형시킬 수 있게 된다. 즉, 일반적인 비밀 번호는 터치 패드나 키패드에 표시된 숫자 또는 기호만으로 이루어진 "1, 2, 3, 4" 등의 단순한 기호들로 이루어진다. 그러나 본 발명에 의하면, 각 기호마다 터치와 누름의 적어도 두 가지 입력 방식이 적용될 수 있으며, 비밀 번호를 구성하는 기호 중 적어도 하나에 대하여 적용시킬 수 있다. 즉, 비밀 번호를 "터치 입력에 의한 1", "누름 입력에 의한 2", "터치 입력에 의한 3", "누름 입력에 의한 4"와 같이 구성할 수 있게 된다.

<53> 그리고 사용자는 디지털 도어락의 비밀 번호 입력시 각각의 기호에 대한 터치와 누름을 정확히 조작함으로써 사용자 인증을 행할 수 있게 된다.

<54> 이와 같이 구성되는 비밀 번호에 의하면, 비밀 번호를 구성하는 숫자 또는 기호가 주변으로 노출된 경우에 있어서도, 입력 동작이 터치인지 누름인지에 대해서는 쉽게 노출되지 않으므로, 터치 패드를 이용하여 비밀 번호를 입력하는 장치에 대한 보안성을 향상시킬 수 있게 된다.

도면의 간단한 설명

<55> 도 1은 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 구성을 개략적으로 나타낸 도면.

<56> 도 2는 본 발명의 일 실시예에 따른 복수 입력 처리 장치의 구성을 나타낸 도면.

<57> 도 3은 도 3은 도 2에 도시된 보호층, 절리콘층 및 PCB층이 결합된 형태에 대한 측단면도.

<58> 도 4는 접촉 감지부의 접점 및 전극 패턴에 대한 또다른 실시예를 나타낸 도면.

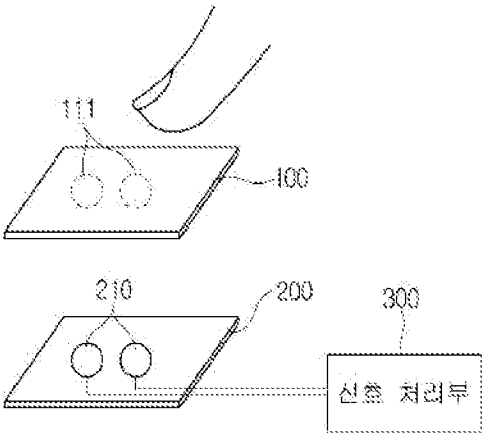
<59> 도 5는 접촉 압력과 정전용량과의 관계를 나타낸 그래프.

<60> 도 6은 본 발명의 또다른 실시예에 따른 복수 입력 장치의 구성을 개략적으로 나타낸 도면.

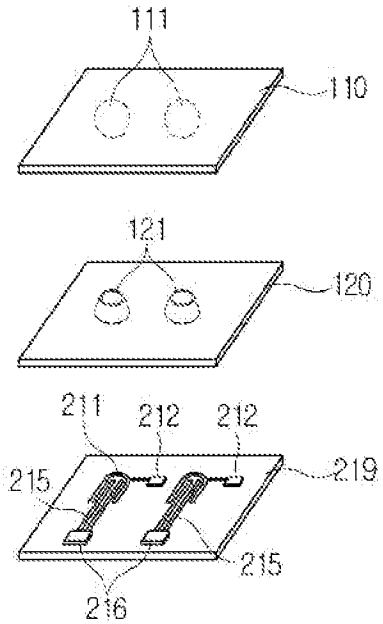
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도면

도면1

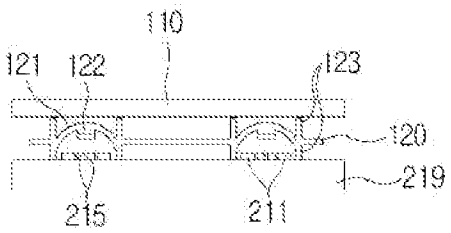


도면2

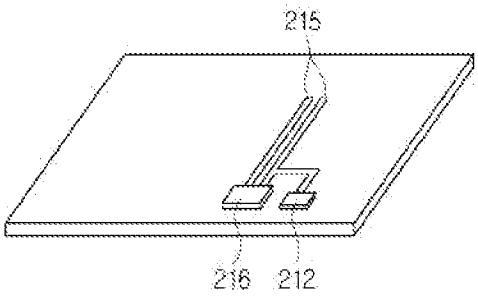


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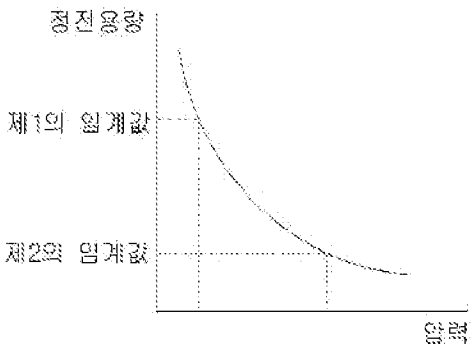
도면3



도면4

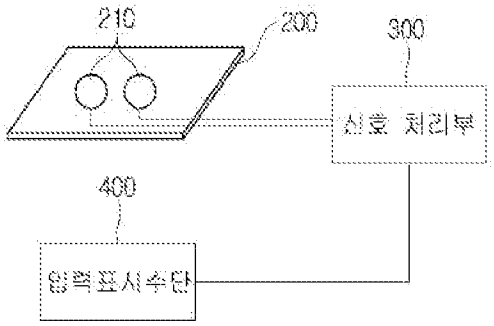


도면5



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도면6



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[Continued on next page]

(54) **Title**: SYSTEM FOR OPERATING A KEYBOARD WITH MULTI FUNCTIONAL KEYS, USING FINGERPRINT RECOGNITION

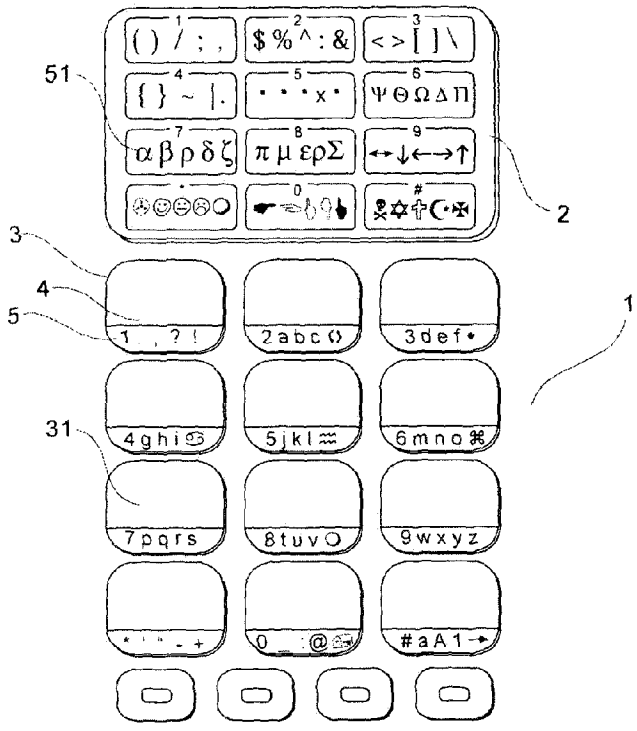


FIG 5

(57) **Abstract**: An appliance with a keyboard equipped with sensors that can recognize each of the user's fingerprints. Several symbols are engraved on or below each key such that every time the key is pressed by a specific finger, it corresponds to a specific symbol from among the symbols associated with that key, such that the right-most finger activates the right-most symbol, the second from right finger activates the second from right symbol, and so on. The appliance can be switched to a work mode that displays additional series of symbols on the display panel of the appliance, such that every time the key is pressed by a specific finger, it corresponds to a specific symbol from among the symbols displayed on the display panel.

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SYSTEM FOR OPERATING A KEYBOARD WITH MULTI FUNCTIONAL KEYS, USING FINGERPRINT RECOGNITION

Description

TECHNICAL FIELD

The present invention refers to a method and system for operating keyboards with multi-functional keys on digital, electronic and other appliances whereby a specific function of the keys is activated by identifying the user's fingerprints and selecting the specific key function according to the finger pressing the key (the required action is selected one of several associated functions with the key that is pressed).

BACKGROUND ART

Digital, electronic and other appliances, such as computer keyboards, tabletop telephones, cellular phones, hand-held computers, hand-held terminals, control systems of digital, electronic or electric instrumentation such as operation panels in airplanes, weapon activation systems, testing equipment and so on, are all equipped with pushbuttons (keys) or keyboards.

The recent dramatic minimization of such systems and the physical constraints that sometimes exist, have led to a situation in which several different functions (i.e. the selection of a specific numeral or letter or symbol) are associated with a single key, since there are more functions than there are keys. One existing solution that enables a user to select a specific function associated with a specific key is the rapid, repeated pressing of the said key, whereby the desired function is selected by the number of times the user rapidly presses the key. For example, Drawing No. 1 depicts a schematic keyboard of a standard cellular phone that is in message writing mode. Pressing the "2" key once will select the letter "a"; pressing the "2" key twice in rapid succession will select the letter "b"; three consecutive presses will select the letter "c"; and the result of four consecutive presses will be the numeral "2". This solution is cumbersome and inconvenient and any error in pressing the key (which is a very common occurrence) leads to the need to repeat the entire sequence so as to reach the desired function.

In order to increase the efficiency of pressing of keys on appliances, as mentioned, a technology was developed that is based on a keyboard key that includes a sensor that recognizes the print of the user's specific finger that was used to press the key or button. The appliance is programmed so that when the user presses the said key using his or her third finger, for instance, a specific, pre-defined function is selected (or a group of characters pre-defined for the finger and key), and when the user presses the same key with his or her little finger or ring finger, other pre-defined functions are selected that correspond to the specific finger that pressed the said key. So far this is all existing knowledge.

Nevertheless, the currently existing knowledge in the said field has several drawbacks: First, it is still necessary to press the key several times in order to select the desired function (for instance, when a group of characters was associated with a specific key/finger during the initialization process). Second, the system's initialization process (i.e. the enrollment of the fingerprints and their association with specific, pre-defined keys, or characters, or groups of characters) is very cumbersome and is not user-friendly.

In addition, this method (of associating/pre-defining a specific finger to a key and/or a character and/or a group of characters) requires the user to remember these pre-defined associations during the regular operation of the appliance (when he or she must sometimes work fast). In addition, some of the knowledge pertains to keys on appliances, as mentioned, that refer to four fingers of only one hand.

The present invention refers to a method and system that enhance the efficiency of the currently existing knowledge in the field.

THE INVENTION

The present invention refers to a method and system that include one or more keys, or even an entire keyboard on digital, electronic or other appliances (hereinafter referred to as the "appliances"), whereby each key (which is equipped with a fingerprint recognition sensor) recognizes (using fingerprint recognition technology) the user's specific finger (one of five fingers on one

hand, or one of ten when using two hands), and according to the finger that is pressing the key, selects the function of the key, all according to a simple and full visual correlation between the order of the fingers of the hand and the order of functions associated with the keys.

The appliance on which the invention, subject of the application, is implemented has one or more keys that are equipped with a fingerprint recognition sensor (hereinafter referred to as the "sensor"). Not all keys on the appliance must be equipped with sensors and the invention may be implemented on one or more keys on each appliance. For the sake of fluency of the explanation, pushbuttons or keys that are equipped with fingerprint sensors will be referred to as the "keys" (or the "key").

Initialization of the system: In order for the appliance's sensors to recognize the user's fingerprints and specifically identify the specific finger that pressed the key, the appliance must first be initialized. The initialization is a one-time action (and is not performed every time the appliance is turned on).

Initialization can be performed in several ways. For instance, a special key may be designated for initialization and fingerprint enrollment. The user must cause the sensors to recognize all ten of his or her fingers. To that end, the user places each of his or her ten fingers, one at a time, on the specific key designated for appliance initialization (alternately, initialization may be performed by pressing the key) so that the appliance recognizes each finger according to its unique fingerprint. Initialization can also be performed using a key that is not specifically designated for system initialization. This kind of initialization is very simple and does not require any pre-set associations between specific fingers and specific characters or keys or groups of characters, but rather the enroll of the user's fingerprints and saving thereof in the appliance to enable recognition during its regular operation.

Fingerprint recognition (during regular operation): During regular operation, pressing once on each key can lead to the selection of one of ten different functions (if the appliance is operated using both hands). The function selected is determined by the finger that pressed the key, according to the order of functions associated with the said key.

The present invention can be also implemented on keys that have only five options (five fingers on one hand only). For the convenience of explanation, the drawings and illustrations of the invention, subject of the present application, will refer to an appliance that is designed to recognize five fingers on one hand only, except for Drawing No. 6 which describes a key designated for use with ten fingers of two hands.

The invention can also be implemented on keys that have sensors over an area that is smaller than the full finger pad area of an average user. In this case, although system initialization includes the full enrollment of the finger pad on a designated sensor, when the user presses a key with a sensor using his or her finger pad, recognition is accomplished based on part of the full area of the finger pad that is saved in the appliance's memory. The invention can be implemented not only on keyboards that represent text writing functions, with which symbols and characters are associated from the common set of symbols and characters, but also on keys from control systems, for instance, with which various functions are associated, such as the release of bombs (in weapon systems), activation of sprinklers (in irrigation control systems) and so on.

In such cases, the symbol engraved next to the key will be an icon that identifies the desired function (a trigger icon, for instance, in the case of a weapon system or a sprinkler icon in case of an irrigation system).

After initialization, each key on the appliance recognizes the user's fingerprints and can also identify the specific finger that pressed the key. In other words, the sensor identifies which of the user's fingers [thumb, index finger, third finger, ring finger or little finger (of the user's right hand, for instance)] was used to press the key and according to the specific finger, which corresponds to the order of functions associated with the key, the key's function is selected.

Drawing No. 2 describes one of many possibilities for implementing the method and system, subject of the invention. Drawing No. 2 describes the appliance (1) which includes a display panel (2) and twelve keys (3). A sensor (4) is located on the top surface of each of the keys (3). Symbols (5) are engraved on the key (3) or beside it or beneath it or above it in a horizontal line (in Drawing No. 2 the symbols appear beneath the key).

In the case described in Drawing No. 2, most keys (3) have five symbols (5) beneath them in a horizontal line (although the invention can refer to ten symbols that correspond to ten fingers of two hands, as described for instance in Drawing No. 6).

A main and principle innovation presented by the method and system, subject of the present invention, is the spatial arrangement of the symbols (5) in relation to each key (3). For example and illustration we will refer to the third key from the top in the left-hand column, which is denoted (31) in Drawing No. 2.

As illustrated in Drawing No. 3, pressing the key (31) with the thumb (of the right hand) selects the numeral "7"; pressing the key (31) with the forefinger (of the right hand) selects the letter "p"; pressing the key (31) with the third finger (of the right hand) selects the letter "q"; pressing the key (31) with the ring finger (of the right hand) selects the letter "r"; and pressing the key (31) with the little finger (of the right hand) selects the letter "s".

The method and system, subject of the invention, include, as described above, the spatial correspondence whereby using the left-most finger leads to the selection of the left-most symbol in the line of symbols (5) beneath the key (3) (or in the line of symbols above or beside the key), and so on. This innovation enables the user to control the appliance in a fast and efficient manner. In addition, the key (3) needs to be pressed only once in order to select the desired character/symbol/function from among the five symbols (5) engraved under the key (3). If the key has only four (or less) functions/symbols/characters associated with it, the correlation between the fingers and the functions/characters begins from the left (for example) and proceeds to the right, and ends when all members of the group of functions/characters are associated with fingers.

The method and system can also be implemented using East Asian languages, such as Japanese and Chinese. In such cases, the symbols (5) are arranged adjacent to the key (3) in a vertical line, as appears for instance in Drawing No. 4, and the symbol is selected by matching the order of fingers to the order in which the symbols are specified in a vertical manner (e.g. from top to bottom), as shown in Drawing No. 4.

Implementation of the invention will enable, for instance, to manufacture a telephone (fixed or mobile) with only one numeral key, assuming the user uses both hands, or with two numeral keys (if only one hand is used to dial).

Drawing No. 5 describes additional possibilities for implementing the method and system, subject of the invention. Drawing No. 5 shows an appliance (1) that includes a display panel (2) and twelve keys (3). A sensor (4) is located on the top surface of each of the keys (3). Symbols (5) are engraved in a horizontal line beneath the key (3) Up to this point, the description is similar to that given above for Drawing No. 2. In addition, however, the appliance (1) can be turned to a work mode in which additional symbols are displayed on the display panel (2) in such a way that they are arranged in full compatibility with the order of the appliance's keys (3). Thus, for instance, the key (31) operates in this work mode, the group of symbols (51) that appears on the display panel (2) of the appliance (1). For the purpose of example and illustration we refer to the third key from the top in the left-hand row, denoted 31 in Drawing No. 5.

Pressing the key (31) with the thumb (of the right hand) selects the symbol α; pressing it with the forefinger (of the right hand) selects the symbol β; pressing it with the third finger (of the right hand) selects the symbol (here is missing the symbol for Gamma which also on the drawing it appears like a "p" – please correct!), and so on.

By transitioning to another work mode (or to other character sets), other and additional series of symbols (51) can be displayed on the display panel (2), arranged according to the order and arrangement of the keyboard (3). This method is referred to as "soft keys" and it enables a large and wide variety of options for the operation of the keys, depending on the selected work mode the system is in at a specific moment.

The appliance (1) includes a processor in which the user's fingerprints are saved as enrolled during the initialization of the system. The processor also includes software that identifies the fingerprints of the fingers pressing the sensors (known as a "one-to-few" function).

The appliance does not have to be re-initialized every time it is used by the same user since the fingerprints are saved in the processor's memory. The processor can store fingerprint data for a large number of users without re-initialization or identification of the user during regular operation, except for the first time. The invention will prevent people who are not recognized by the system (i.e. whose fingerprints have not been enrolled into the system) from using this fingerprint recognition work mode, an option that adds a security dimension to the system.

While the present invention has been described in connection with what is considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

DESCRIPTION OF THE DRAWINGS

Drawing No. 1 schematically depicts a keyboard and display of a standard cellular phone.

Drawing No. 2 depicts an appliance (1) with twelve keys (3), each of which has a sensor (4), and five symbols (5) arranged beneath each of the keys in a horizontal row.

Drawing No. 3 depicts the key (3) with a sensor (4) and five symbols (5) arranged beneath the key in a horizontal row.

Drawing No. 4 depicts the key (3) with a sensor (4) and five symbols (5) arranged to the left of the key in a vertical row.

Drawing No. 5 depicts an appliance (1) with twelve keys (3) each of which has a sensor (4) and twelve series of symbols (5) arranged on the display panel in spatial correlation with the keyboard.

Drawing No. 6 depicts a key (3) with a sensor (4) and ten symbols (5) arranged in two vertical groups of five on either side of the key, that correlate with the user's ten fingers (of both hands).

Claims

What is claimed is:

1. An appliance with the following components: (a) A device that enables to input the user's fingerprints into a CPU located in the said appliance; (b) one or more keys with a sensor that can recognize each of the user's fingerprints; (c) several symbols engraved on or next to the said key, arranged in a horizontal row or in a vertical row or on a diagonal; (d) the said processor, programmed so that it associates the pressing of a certain finger of the said user on the said key with a specific symbol from among the said symbols, whereby the left-most finger from among the fingers that were input into the appliance activates the left-most symbol from among the row or column of said symbols that are engraved on or next to the said key, and such that the second from left finger activates the second from left symbol, and so on.

2. The appliance mentioned in Claim No. 1, which also includes a work mode (operated as a routine part of operating the appliance) that enables to display another series of several symbols on the display panel of the said appliance, in a horizontal row or vertical row or on a diagonal; whereby the said processor is programmed so that it associates the pressing of the said user's specific finger on the said key with a specific symbol from among the said symbols; and whereby the left-most finger from among the fingers input into the appliance activates the left-most symbol from among the row or column of said symbols that are displayed on the said display panel, and whereby the second from left finger activates the second from left symbol, and so on.

3. The appliance mentioned in Claim No. 2 whereby the activation of a specific work mode displays several series of additional symbols on the display panel, which correlate spatially with the sensor keys as described for the said appliance.

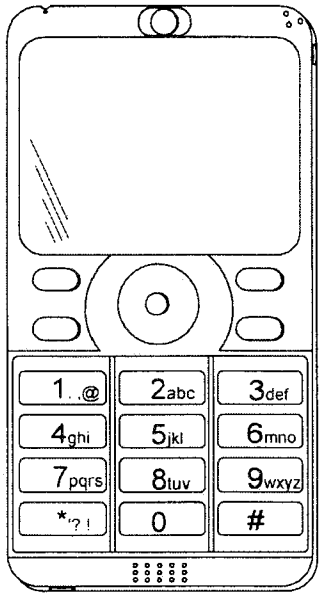


FIG 1

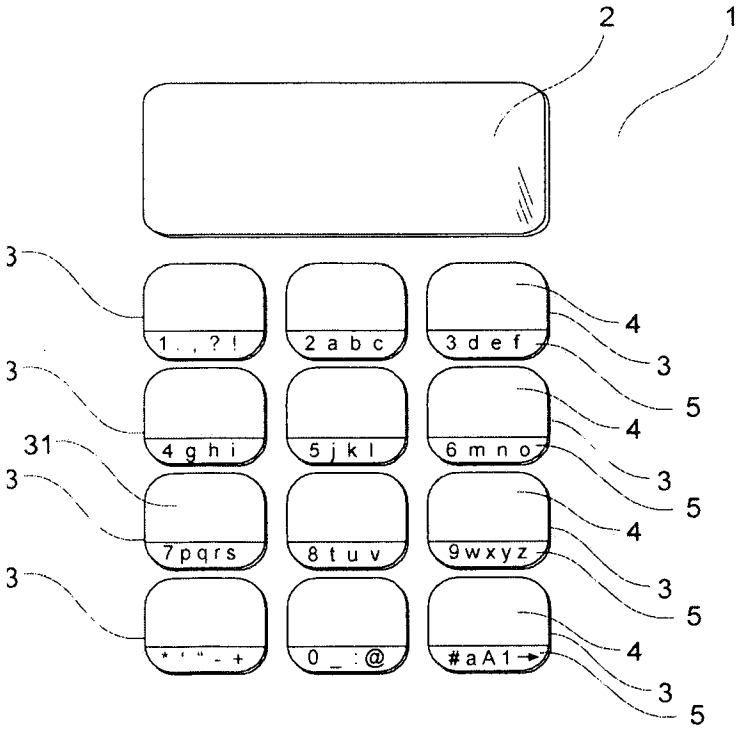


FIG 2

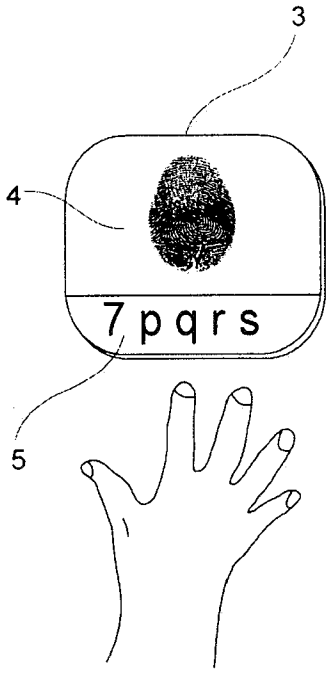


FIG 3

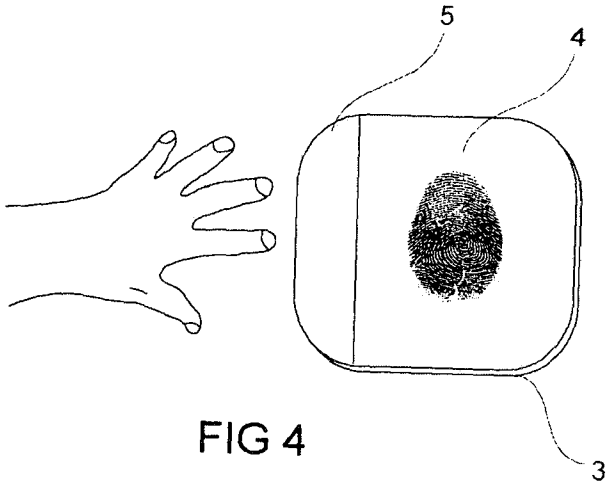


FIG 4

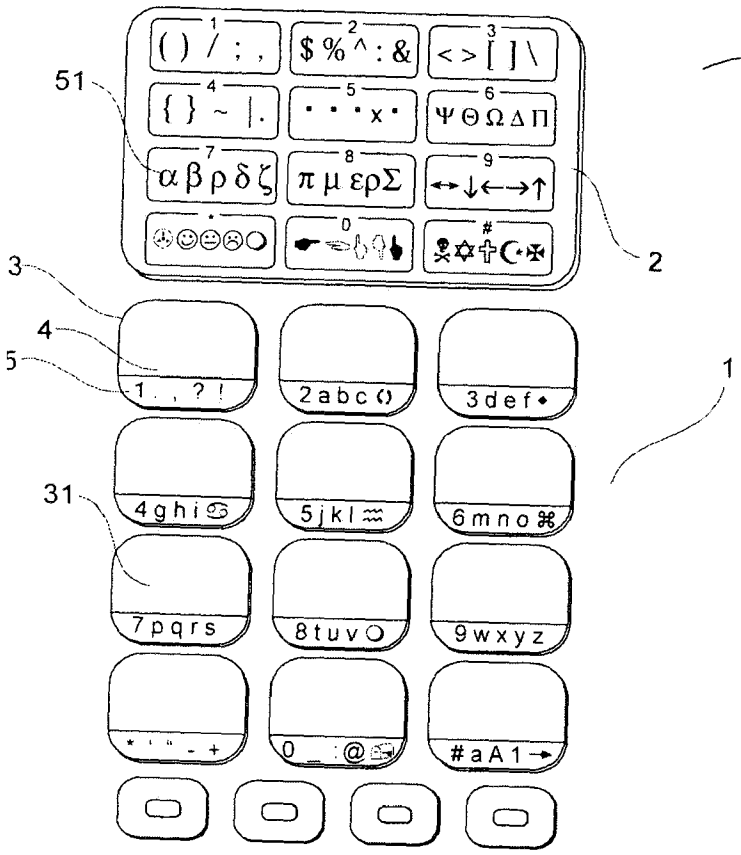


FIG 5

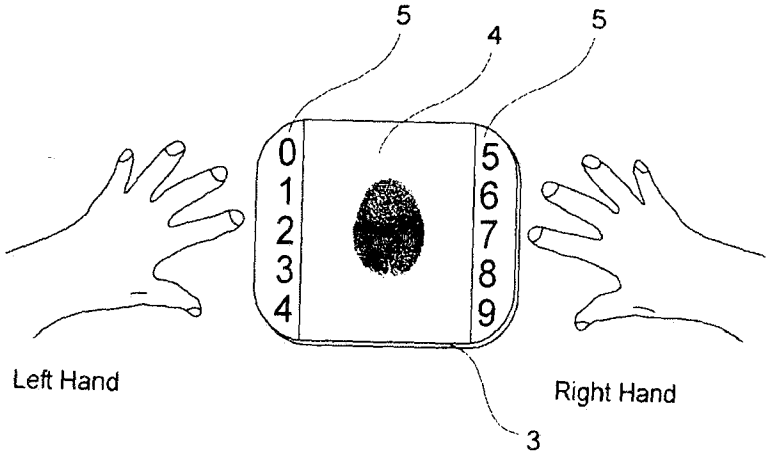


FIG 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL 09/01202

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06K 7/00 (2010.01)
USPC - 382/312
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: G06K 7/00 (2010.01)
USPC: 382/312

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 382/312,124,115; 345/169,168 (keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
pubWEST(USPT,PGPB,EPAB,JPAB,USOCR); Google(Web); Search terms used: fingerprint sensor engraved raised embossed impression braille bump keyboard keypad button key input device lateral side vertical naturally ergonomic left right both hand finger display guide corresponding actual pressed location reference position character symbol

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2006/0020216 A1 (Oishi et al.) 26 January 2006 (26.01.2006), Fig. 30; para [0047], [0188], [0264], [0265]	1-3
Y	US 2008/0145127 A1 (Liu) 19 June 2008 (19.06.2008), Fig. 7; para [0017]-[0025]	1-3
Y	US 2008/0243624 A1 (Perry et al.) 02 October 2008 (02.10.2008), para [0035]	1-3
A	US 6,057,788 A (Cummings) 02 May 2000 (02.05.2000), entire document	1-3
A	US 6,084,576 A (Leu et al.) 04 July 2000 (04.07.2000), entire document	1-3

☐ Further documents are listed in the continuation of Box C. ☐

* 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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 April 2010 (13.04.2010)	28 APR 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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Date Lodged: 28.11.2003

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(continued on next page)

(51) INT CL[7]:
H04M 1/02

(52) UK CL (Edition W):
H4J JK J36Q

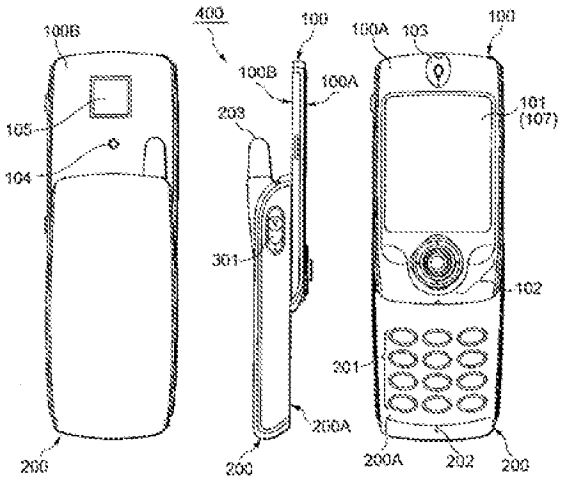
(56) Documents Cited:
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JP 2000332871 A
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US 6064734 A

(58) Field of Search:
UK CL (Edition W) H4J
INT CL[7] H04M
Other: WPI, EPODOC, JAPIO

(54) Abstract Title: **Camera and/or fingerprint recognition device located on sliding portion of portable communication device**

(57) A portable communication device (mobile phone) has a first unit with a display 101 and a second unit 200 with a keypad 201. The first and second units are slidably coupled and can slide between an extended and a retracted state (fig 1A, 1B). An optical device in the form of a camera 104 and/or a fingerprint sensor 105 is provided on a surface 100B of one of the two slidable units which is concealed when the device is in the retracted state. Thus the optical device is protected from dirt and damage when the device is retracted, but made operable when the device is extended.

FIG. 2A FIG. 2B FIG. 2C



GB 2 393 066

GB 2393066 A continuation

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United Kingdom

FIG. 1A

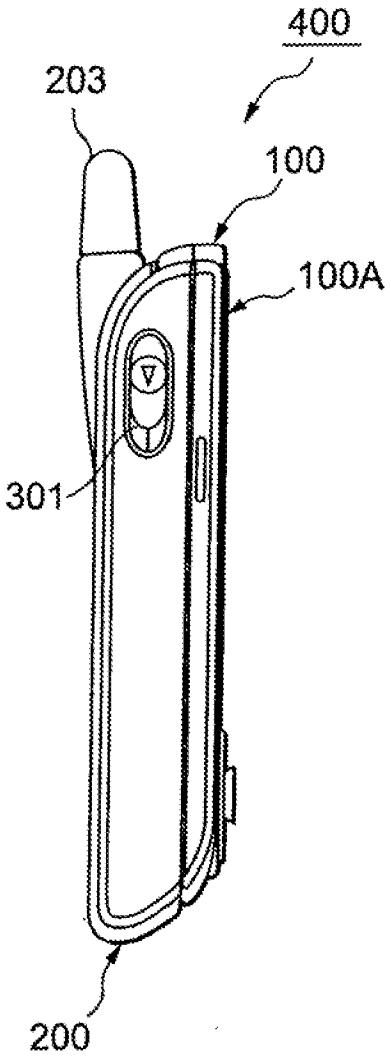


FIG. 1B

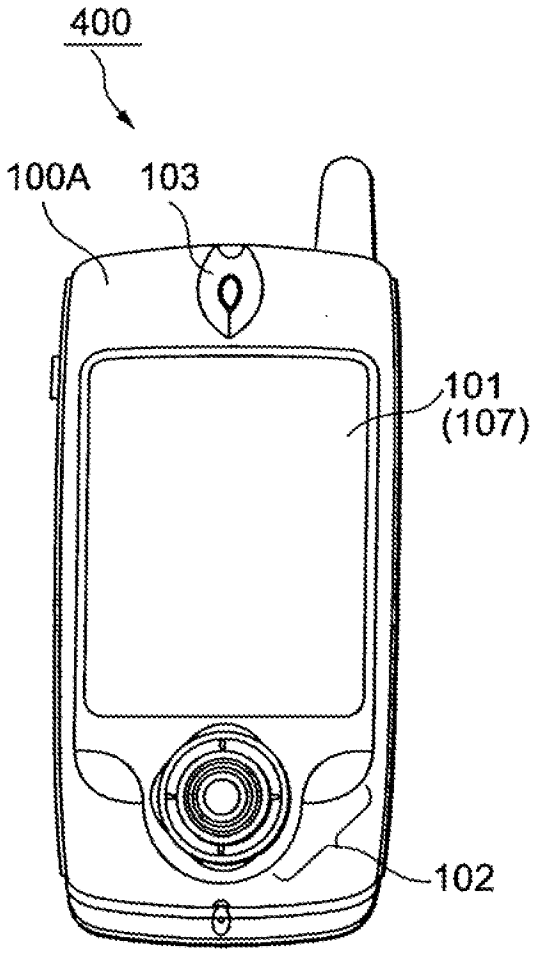


FIG. 2A FIG. 2B FIG. 2C

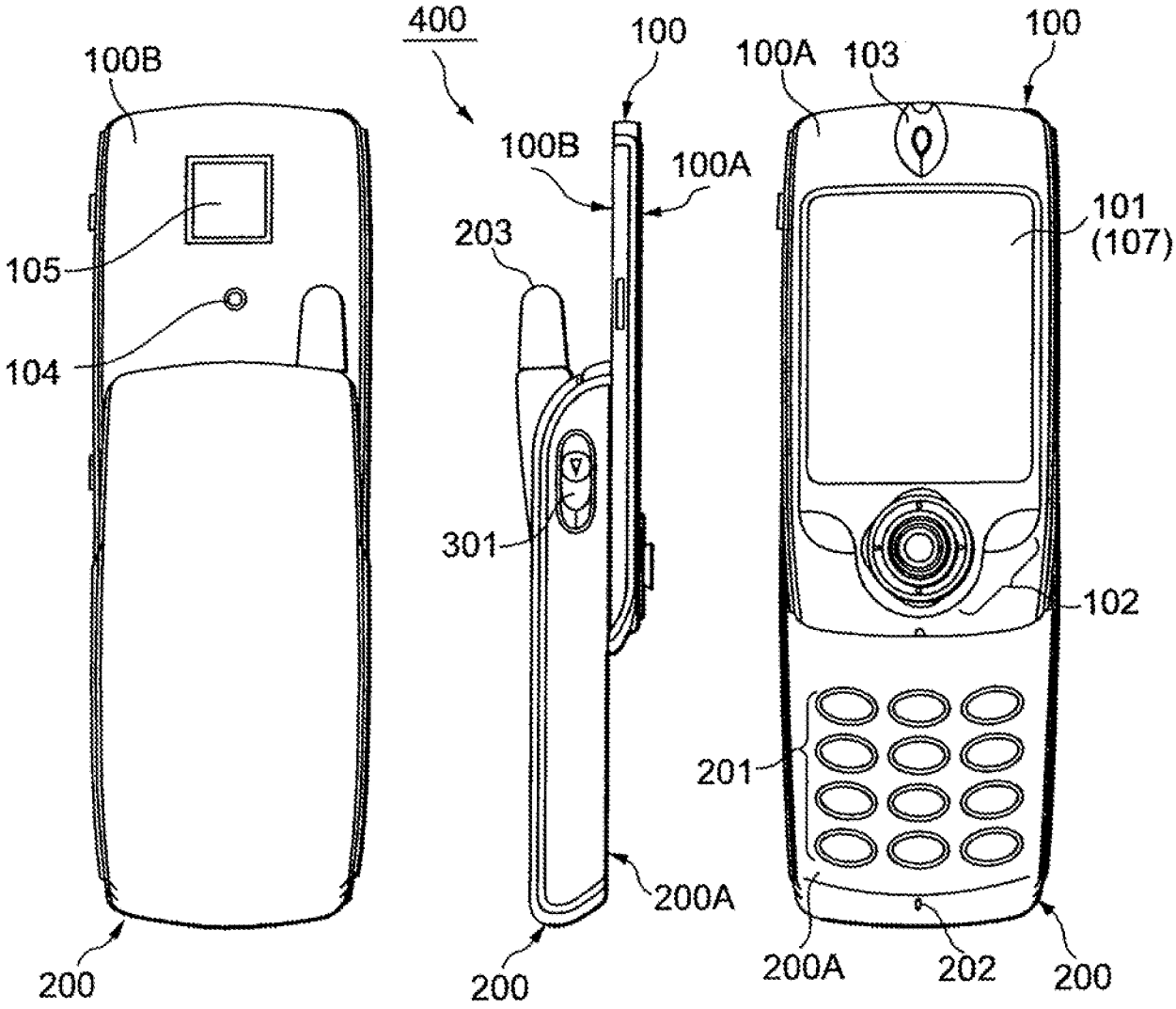


FIG. 3

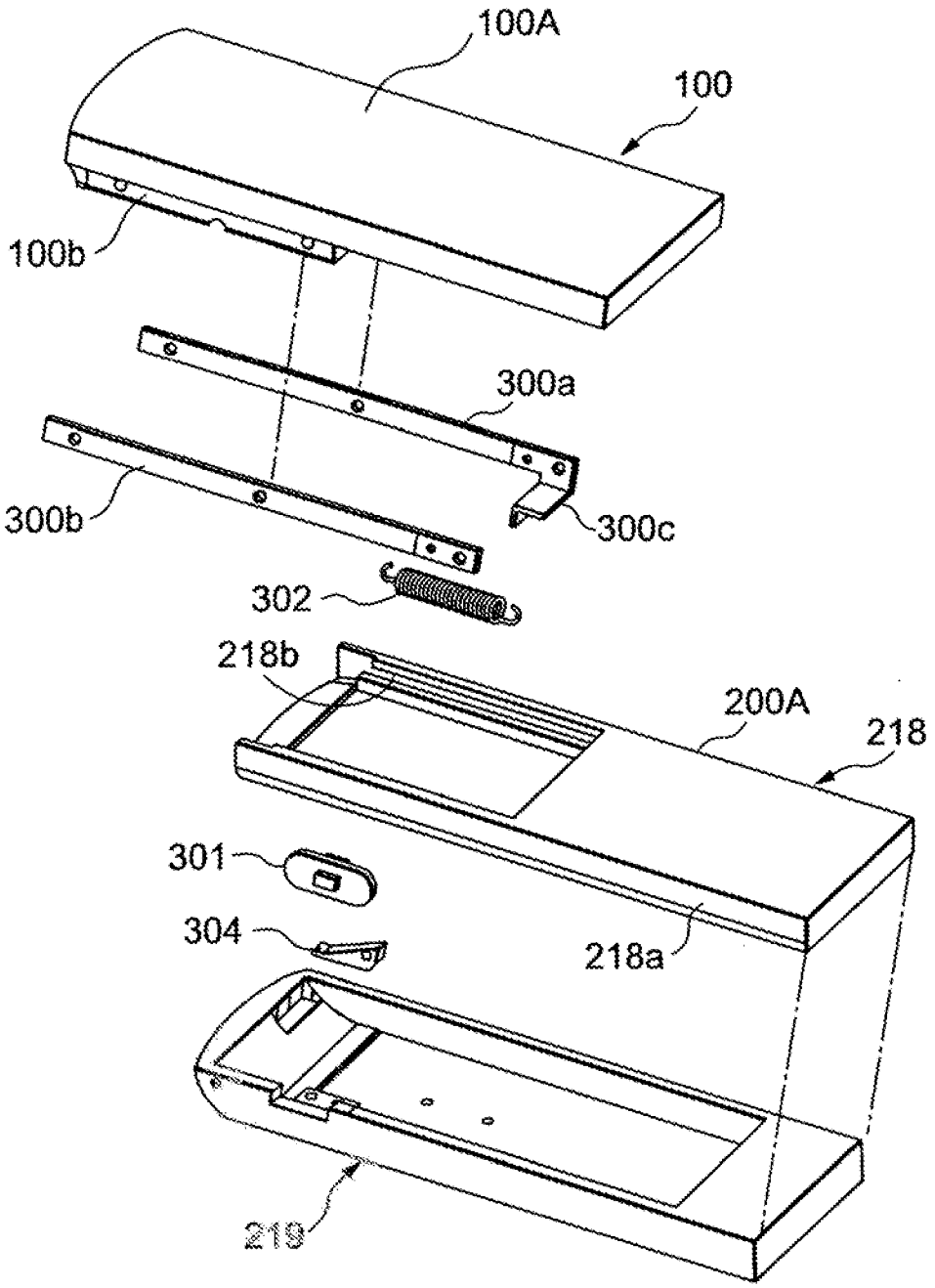

100A
100
100b
300a
300b
300c
302
218b
200A
218
301
304
218a
219

FIG. 4

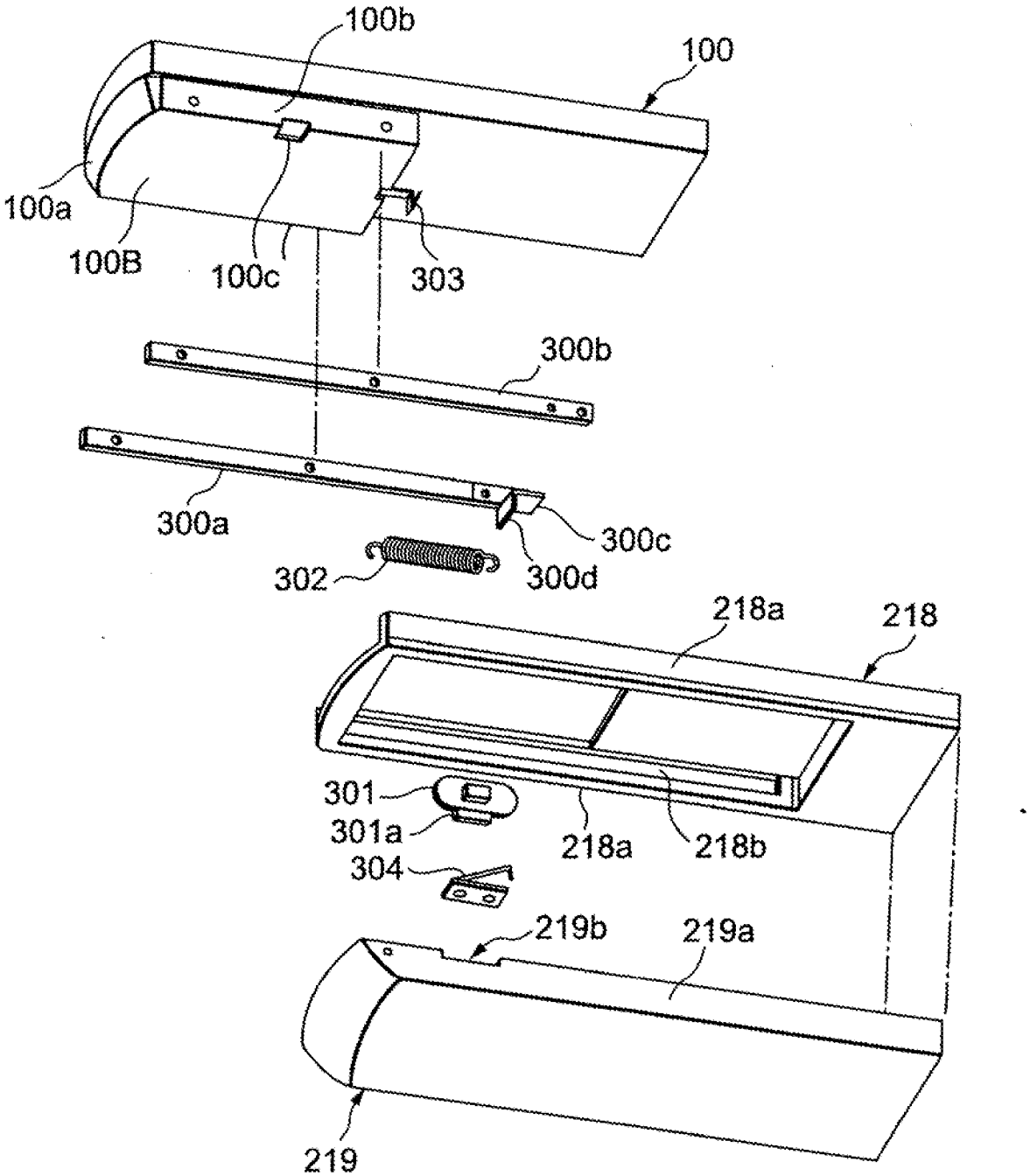

100b
100
100a
100B
100c
303
300b
300a
300c
302
300d
218a
218
301
301a
304
218a
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219b
219a
219

FIG. 5

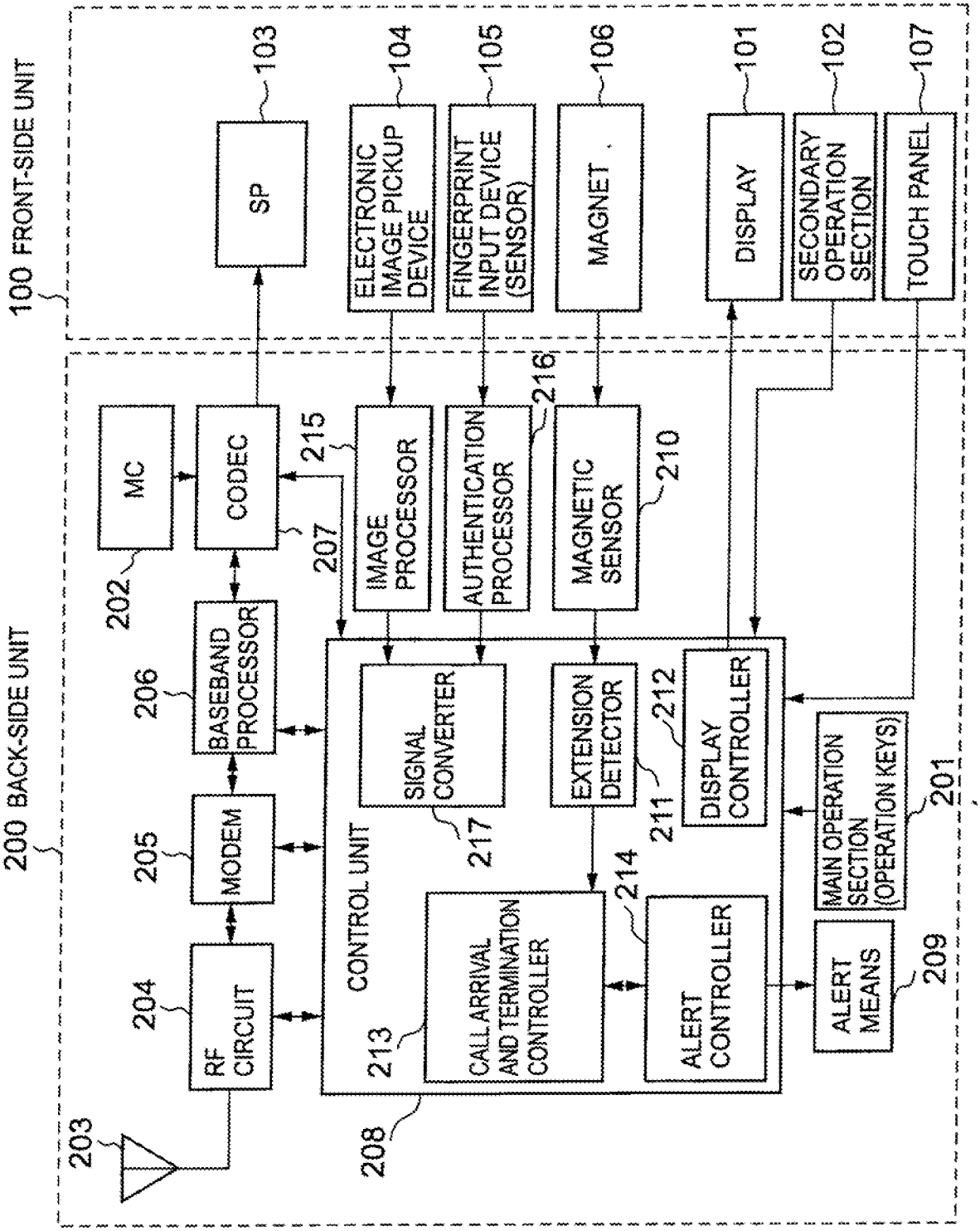

100 FRONT-SIDE UNIT
200 BACK-SIDE UNIT
SP
103
ELECTRONIC IMAGE PICKUP DEVICE
104
FINGERPRINT INPUT DEVICE (SENSOR)
105
MAGNET
106
DISPLAY
101
SECONDARY OPERATION SECTION
102
TOUCH PANEL
107
MC
202
CODEC
207
215
IMAGE PROCESSOR
AUTHENTICATION PROCESSOR
216
MAGNETIC SENSOR
210
BASEBAND PROCESSOR
206
MODEM
205
RF CIRCUIT
204
203
CONTROL UNIT
208
SIGNAL CONVERTER
217
EXTENSION DETECTOR
212
211
DISPLAY CONTROLLER
CALL ARRIVAL AND TERMINATION CONTROLLER
213
214
ALERT CONTROLLER
MAIN OPERATION SECTION (OPERATION KEYS)
201
ALERT MEANS
209

FIG. 6

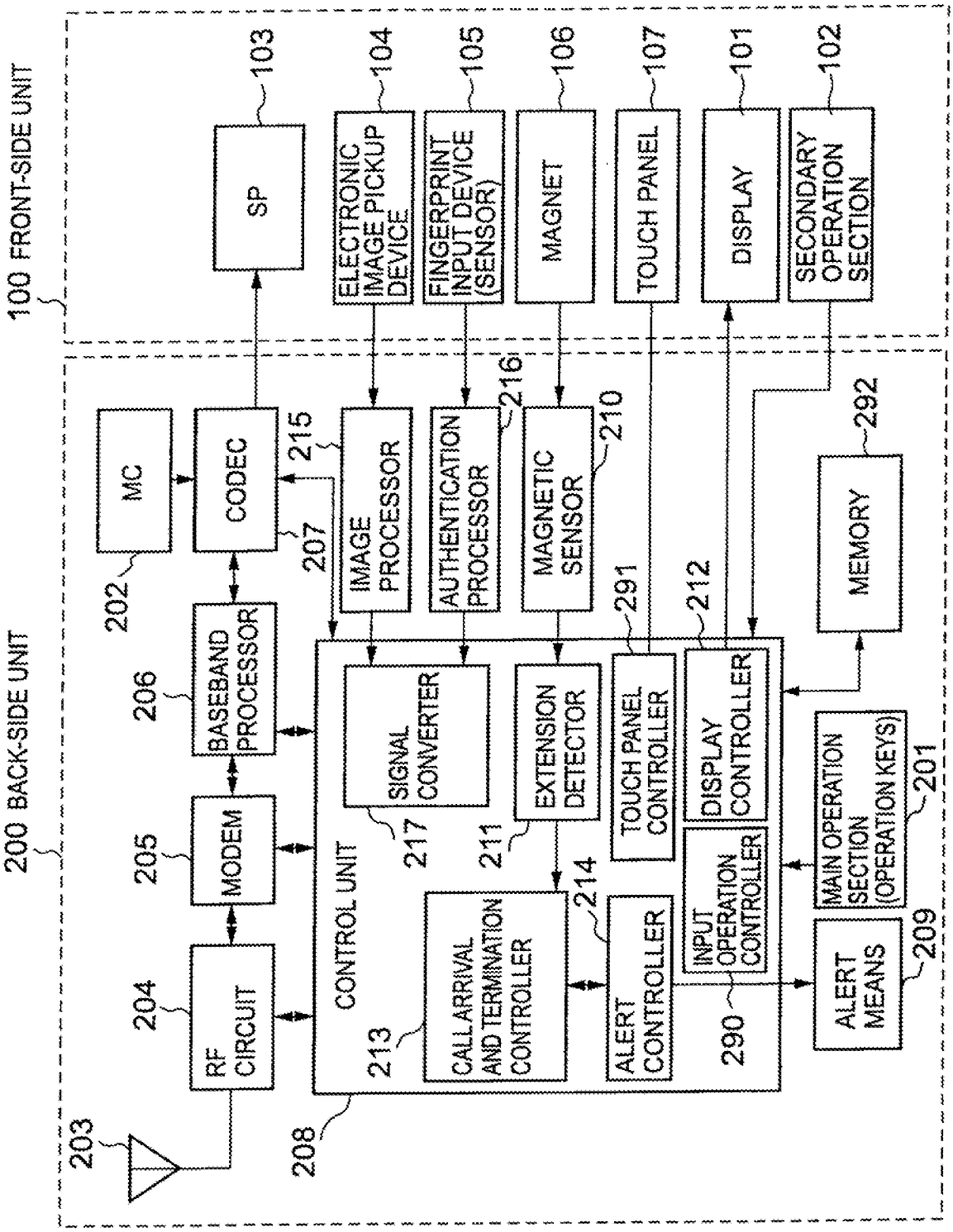

100 FRONT-SIDE UNIT
200 BACK-SIDE UNIT
SP
103
ELECTRONIC IMAGE PICKUP DEVICE
104
FINGERPRINT INPUT DEVICE (SENSOR)
105
MAGNET
106
TOUCH PANEL
107
DISPLAY
101
SECONDARY OPERATION SECTION
102
MC
202
CODEC
207
215
IMAGE PROCESSOR
AUTHENTICATION PROCESSOR
216
MAGNETIC SENSOR
210
MEMORY
292
BASEBAND PROCESSOR
206
MODEM
205
RF CIRCUIT
204
203
208
CONTROL UNIT
SIGNAL CONVERTER
217
EXTENSION DETECTOR
211
TOUCH PANEL CONTROLLER
291
DISPLAY CONTROLLER
212
CALL ARRIVAL AND TERMINATION CONTROLLER
213
214
ALERT CONTROLLER
INPUT OPERATION CONTROLLER
290
MAIN OPERATION SECTION (OPERATION KEYS)
201
ALERT MEANS
209

FIG. 7A

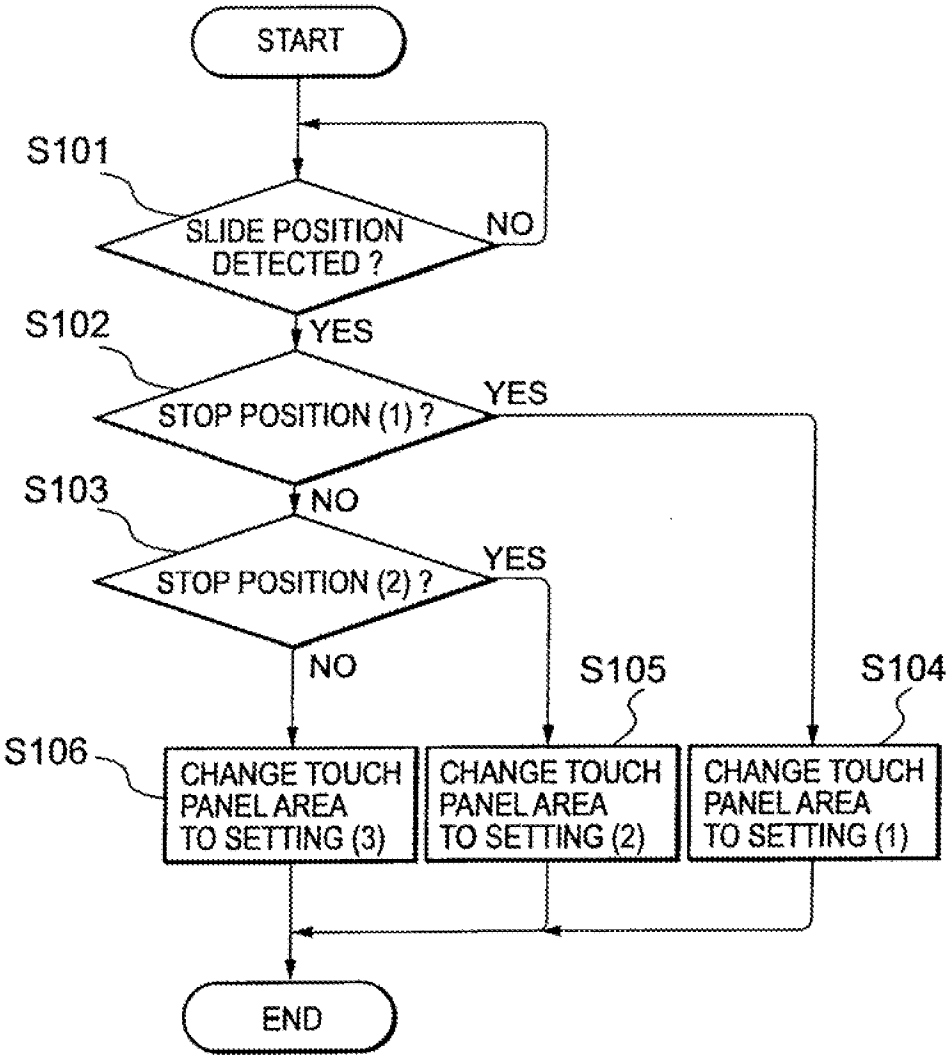


FIG. 7B

	FRONT-SIDE/ BACK-SIDE UNIT STOP POSITION	TOUCH PANEL ENABLED AREA ON DISPLAY
(1)	CLOSED STATE (RETRACTED)	FULL SCREEN
(2)	HALF-OPEN	1/3
(3)	OPEN (EXTENDED)	1/5

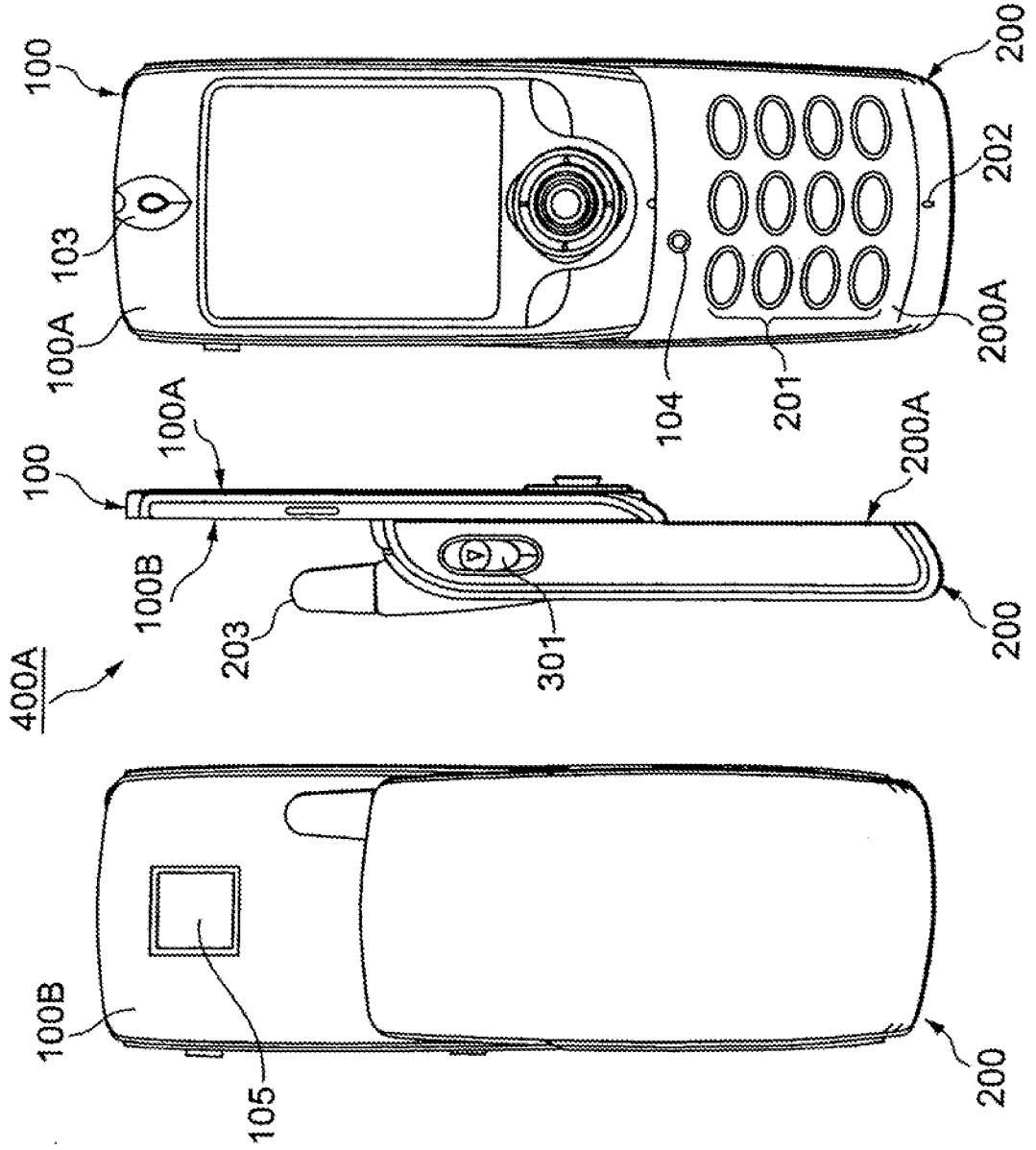


FIG. 8A FIG. 8B FIG. 8C

FIG. 9A

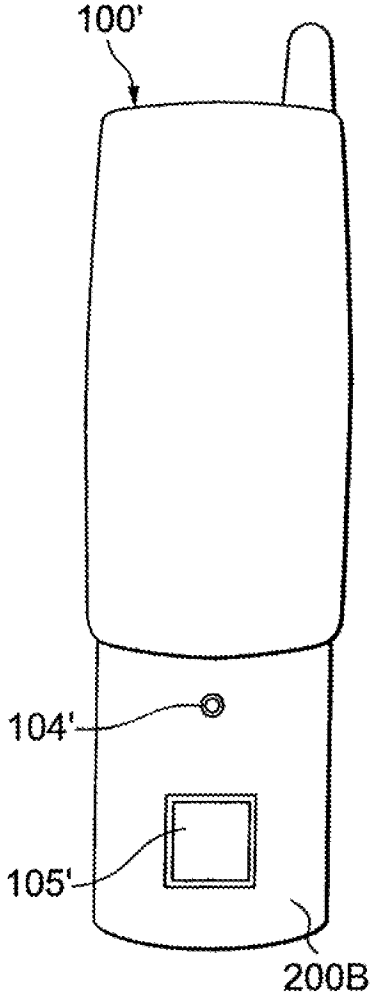


FIG. 9B

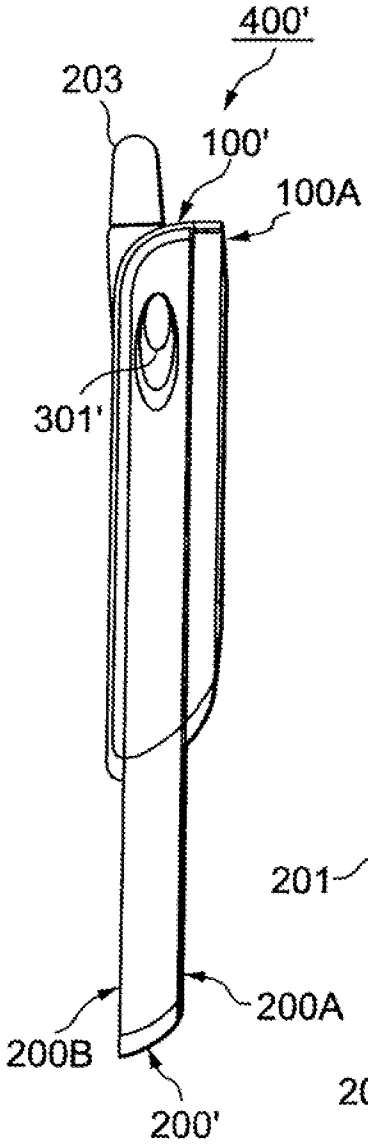


FIG. 9C

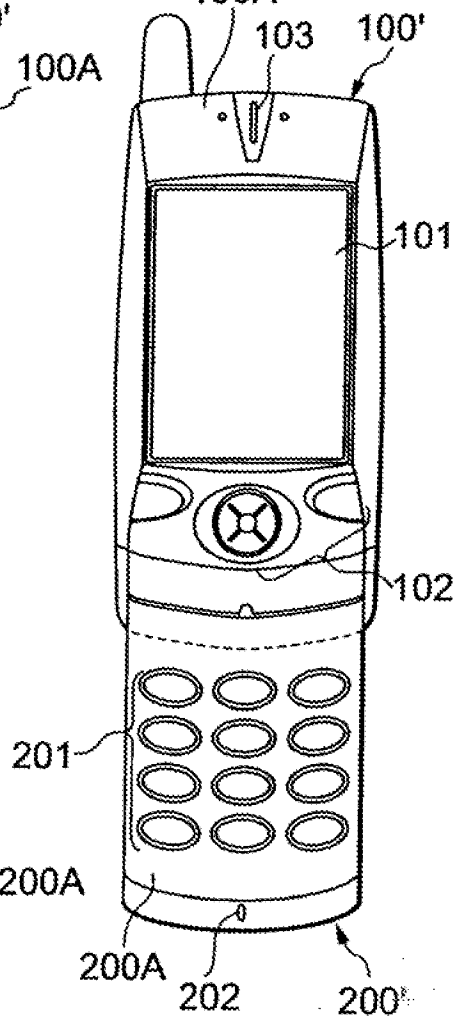


FIG. 10A

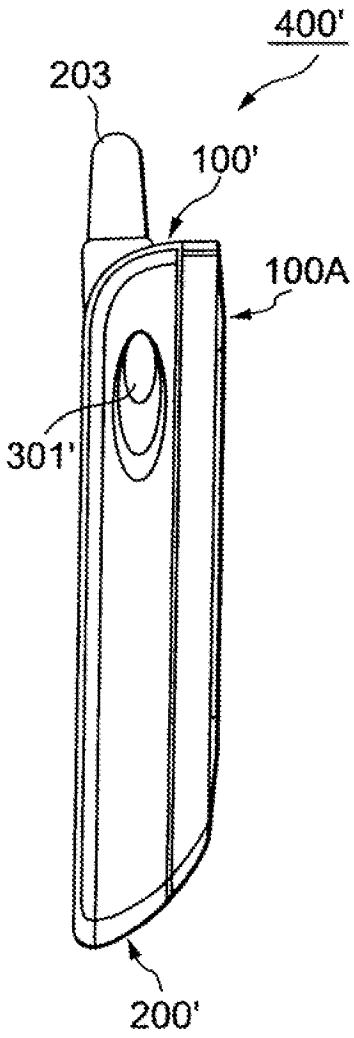


FIG. 10B

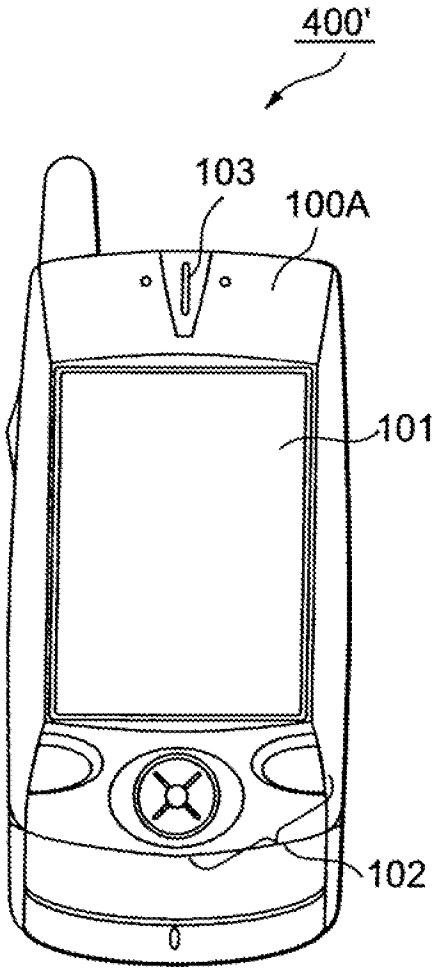


FIG. 11A

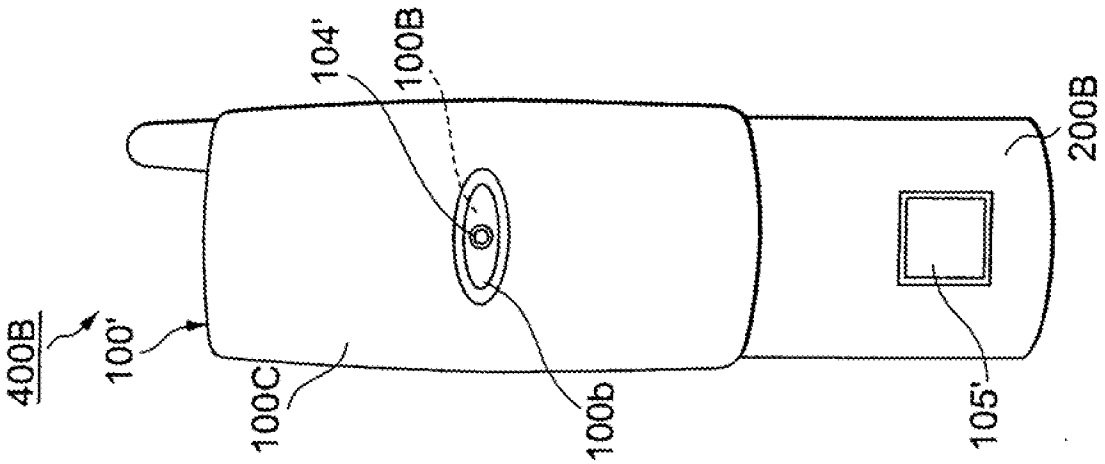


FIG. 11B

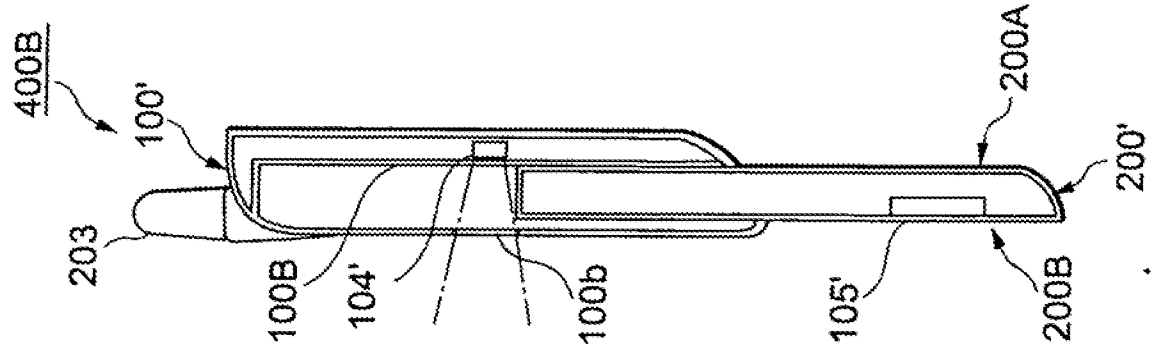


FIG. 11C

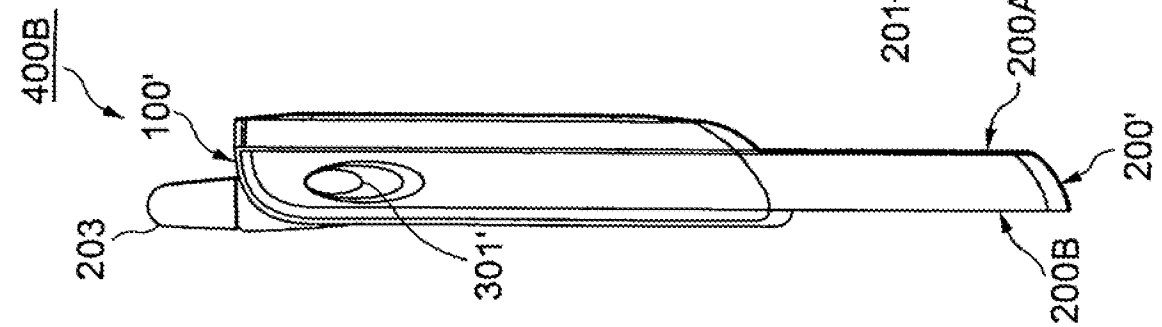


FIG. 11D

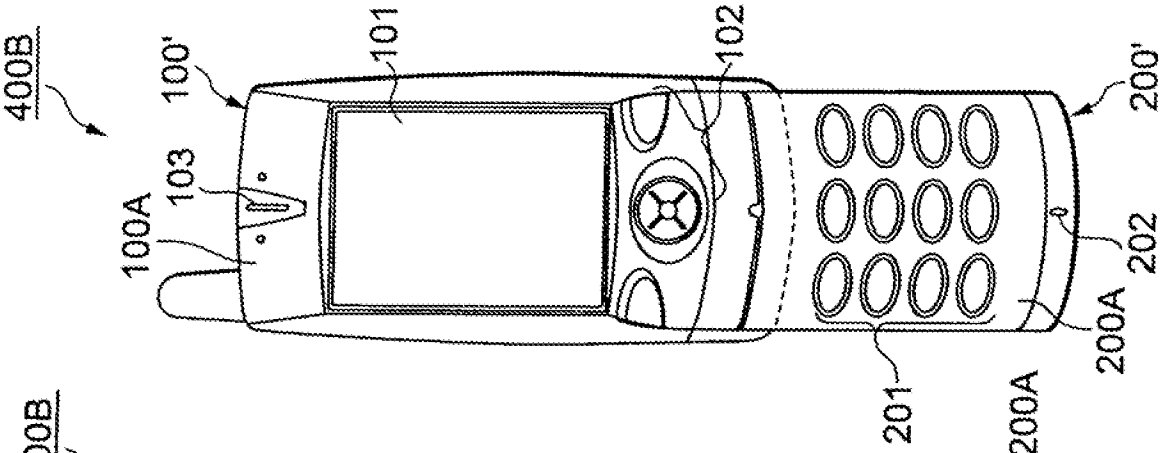


FIG. 12A

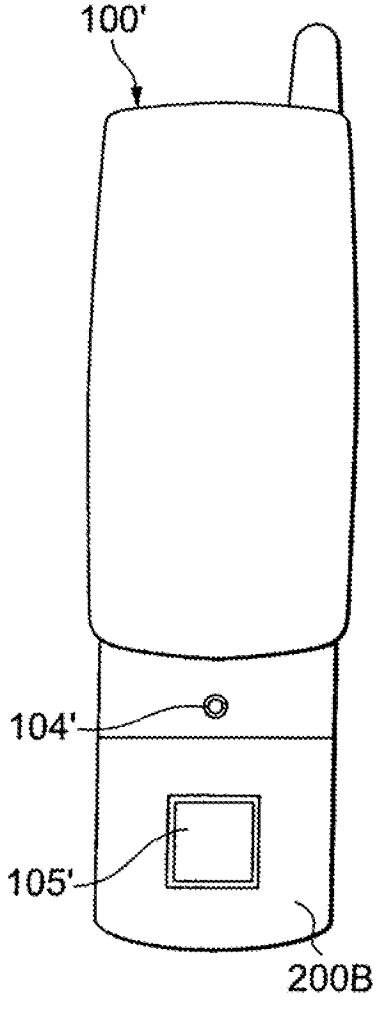


FIG. 12B

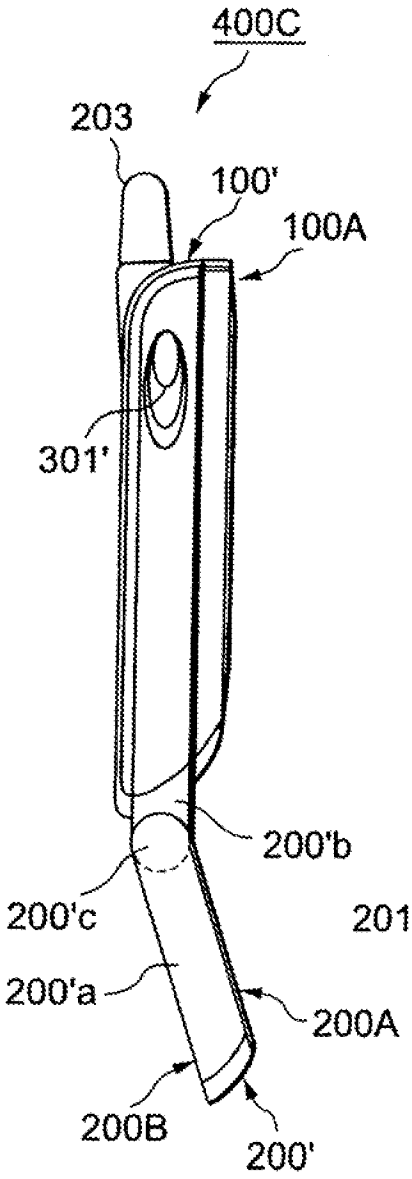


FIG. 12C

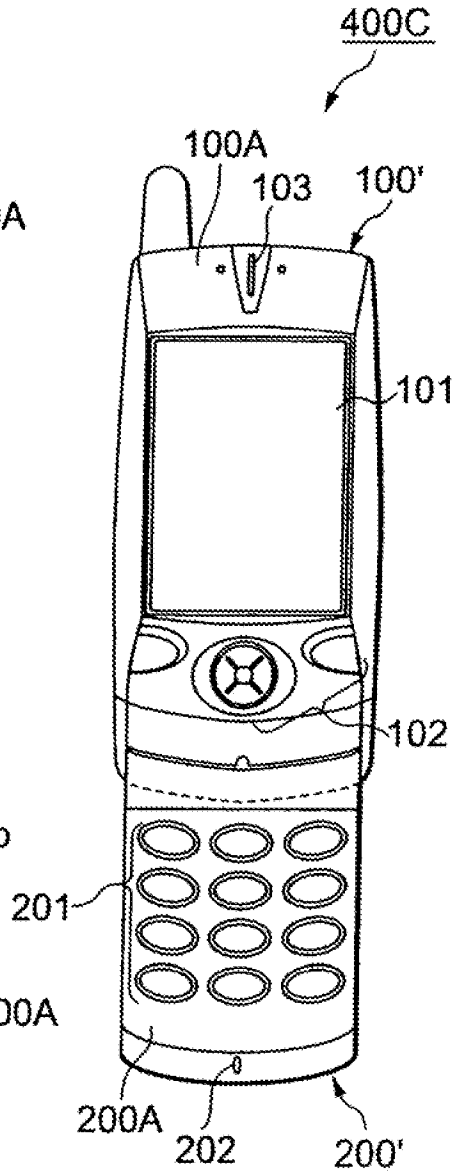
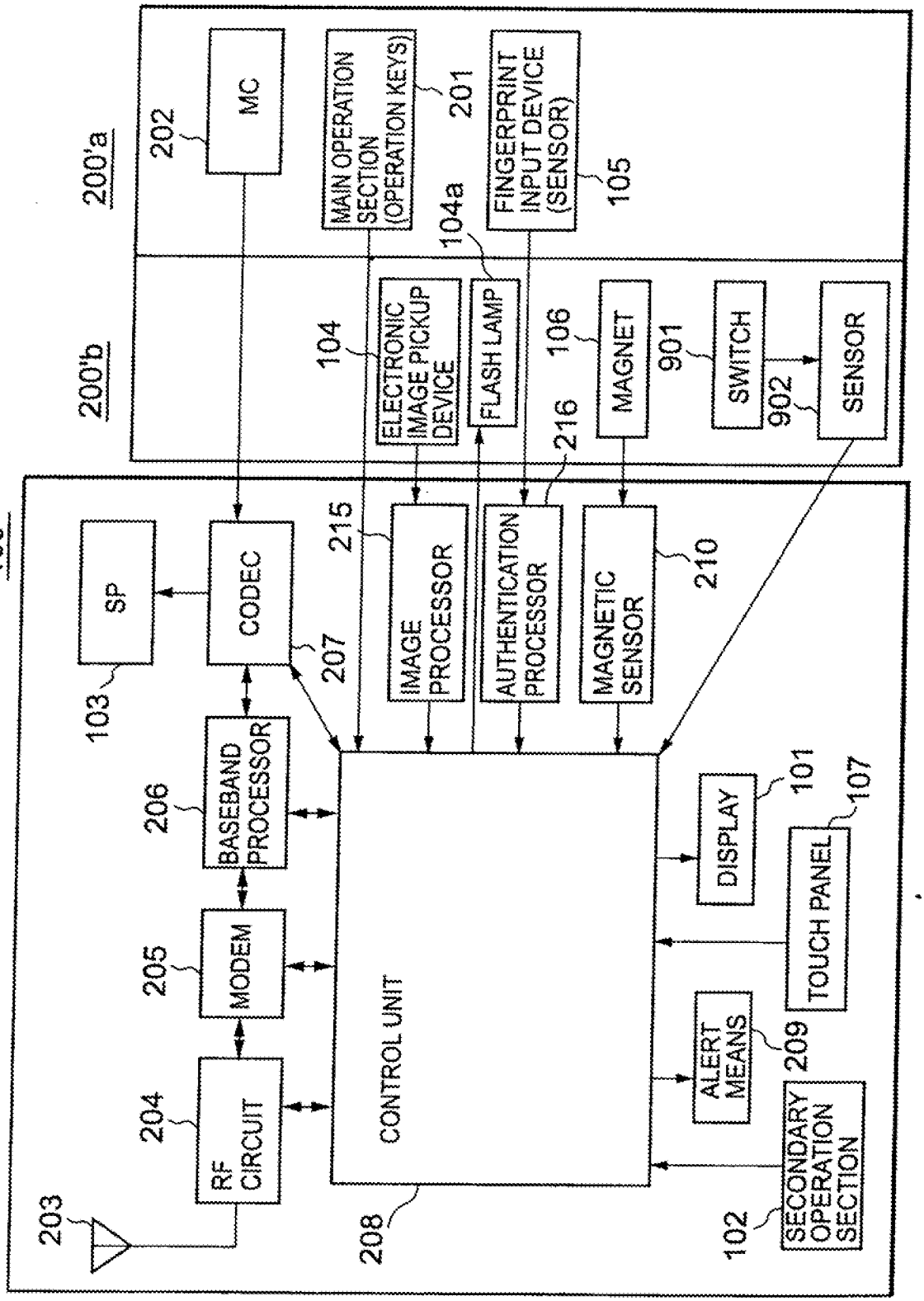


FIG. 13


100'
200'a
200'b
MC
202
MAIN OPERATION SECTION (OPERATION KEYS)
201
FINGERPRINT INPUT DEVICE (SENSOR)
105
104a
104
ELECTRONIC IMAGE PICKUP DEVICE
FLASH LAMP
106
MAGNET
901
SWITCH
902
SENSOR
216
SP
103
CODEC
207
215
IMAGE PROCESSOR
AUTHENTICATION PROCESSOR
MAGNETIC SENSOR
210
BASEBAND PROCESSOR
206
MODEM
205
RF CIRCUIT
204
203
CONTROL UNIT
208
DISPLAY
101
TOUCH PANEL
107
ALERT MEANS
209
SECONDARY OPERATION SECTION
102

SLIDE-TYPE PORTABLE COMMUNICATION APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a portable communication apparatus, such as a portable telephone, and more particularly, to a portable communication apparatus having a slide-type structure.

2. Description of the Related Art

In addition to a straight-type portable telephone apparatus, foldable or slidable structures have been employed to meet the needs for miniaturization. The foldable structure allows two units of a main body to be folded by a connecting member rotatably connecting the two units. The slidable structure is provided with a main housing (first unit) and a movable housing (second unit), which is mounted with a part of functions and is coupled with the main housing so as to be slidable in the longitudinal direction. Such a structure allows the two units to be retracted with overlapping one another when carried and to be extended by sliding them in the longitudinal direction when communicating or the like.

For example, Japanese Unexamined Patent Application Publication No. 5-91015 discloses a small-size portable radio apparatus, which comprises a housing that has a transmitter, a key operation section and a display section and has a recess portion formed extending in the longitudinal direction, and a movable housing that is equipped with a receiver and incorporated into the recess portion so as to be freely slidable. When being out of use, the movable housing can be inserted into the recess portion to compact the whole; and the movable housing can be pulled out to a desired length to be used.

Also, Japanese Unexamined Patent Application Publication No.7-312631 discloses a portable radio apparatus, which comprises a first housing having at least a receiver and a display section, and a second housing, which is accommodated within the first housing so as to be freely slidable and rotatable with respect to the first housing and is provided with an operation section and a transmitter on the front surface thereof. By sliding and rotating the second housing to be accommodated into the first housing, two states are realized: a state that operation and speech communication are available; and a state that the operation face is protected with facing in.

Further, in Japanese Unexamined Patent Application Publication No.2001-24762, a portable telephone apparatus is composed of a main body thereof having a display section provided on one side thereof, and a keypad having operation buttons provided on its surface, which is slidable to cover the display section of the main body therewith. When the main body accommodates the keypad, a part of the display section is exposed from the keypad. When the keypad is slid downward, the entire screen of the display section is exposed. The keypad slides up and down along guide rails provided at both right and left sides of the main body. In the portable telephone apparatus, it is possible to enlarge the displayable screen without injuring the portability and the operability to achieve the displaying of a large amount of information such as mail and data. In the accommodation state, information necessary for audio communication is displayed, and by exposing the entire screen, it is possible to read character information such as mail.

In addition, many slide-type structures, which are adapted so that a movable housing is accommodated within a main housing, have been known. For example, in Japanese Unexamined Patent Application Publication No. 10-271192, a portable phone terminal has been disclosed, in which an operation panel portion having a microphone and a group of dial operation keys can slide into the main body having a

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speaker and a display. In this portable phone terminal, when being accommodated in the main body, the operation panel section is covered with the main body and therefore cannot be used, preventing it from operating. Also, in a slide-type portable terminal of Japanese Unexamined Patent Application Publication No. 9-205476, a main body can be accommodated into the inside of a slidable housing.

Further, a portable telephone having an optical function has been also provided according to the trend of multi-function and high performance. For example, it may be mounted with an electronic camera for capturing image data. Furthermore, a portable telephone mounted with a fingerprint recognition system has been provided so that only authorized users can operate the portable telephone itself or identification of a caller can be verified. Such an optical function has an optical aperture section exposed to the outside and any dirt or flaw may prevent it from functioning normally.

SUMMARY OF THE INVENTION

The invention is defined in claim 1 below, to which reference should now be made. Advantageous features are set forth in the appendant claims.

A preferred portable communication apparatus embodying the present invention, described in more detail below, includes a first unit having at least a display section and a second unit having at least a main operation section. The first unit and the second unit are coupled by a slide coupling and are freely slidable in a longitudinal direction between a retracted state and an extended state. An optical aperture for optical function is provided in one of surfaces of the first and second units that face one another in the retracted state. The optical function section is made operable when the first and second units are positioned in the extended state. The optical function may be e.g. a camera or a fingerprint sensor.

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BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example, with reference to the drawings, in which:

Fig. 1A is a side view of a portable telephone apparatus in a retracted state where a front-side unit and a back-side unit overlap one another, according to a first embodiment of the present invention;

Fig. 1B is a plan view of the portable telephone apparatus of Fig. 1A;

Fig. 2A is a rear view of the portable telephone apparatus in an extended state where the front-side unit and the back-side unit extendedly slide in a longitudinal direction, according to the first embodiment of the present invention;

Fig. 2B is a side view of the portable telephone apparatus of Fig. 2A;

Fig. 2C is a plan view of the portable telephone apparatus of Fig. 2A;

Fig. 3 is an exploded perspective view of a slide mechanism in the first embodiment when viewed from above;

Fig. 4 is an exploded perspective view of the slide mechanism in the first embodiment when viewed from below;

Fig. 5 is a schematic block diagram showing an electric circuit of the portable telephone apparatus according to the first embodiment;

Fig. 6 is a schematic block diagram showing an electric circuit of the portable telephone apparatus according to a second embodiment of the present invention;

Fig. 7A is a flowchart showing a control operation of a touch panel in the second embodiment;

Fig. 7B is a diagram showing an example of a correspondence table between stop positions of the front-side and back-side units and the touch panel enabled area on the display in the second embodiment;

Fig. 8A is a rear view of the portable telephone apparatus in an extended state where the front-side unit and

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the back-side unit extendedly slide in a longitudinal direction, according to a third embodiment of the present invention;

Fig. 8B is a side view of the portable telephone apparatus of Fig. 8A;

Fig. 8C is a plan view of the portable telephone apparatus of Fig. 8A;

Fig. 9A is a rear view of the portable telephone apparatus in an extended state where the front-side unit and the back-side unit extendedly slide in a longitudinal direction, according to a fourth embodiment of the present invention;

Fig. 9B is a side view of the portable telephone apparatus of Fig. 9A;

Fig. 9C is a plan view of the portable telephone apparatus of Fig. 9A;

Fig. 10A is a side view of the portable telephone apparatus in a retracted state where a front-side unit and a back-side unit overlap one another, according to the fourth embodiment of the present invention;

Fig. 10B is a plan view of the portable telephone apparatus of Fig. 10A;

Fig. 11A is a rear view of a portable telephone apparatus in an extended state where the front-side unit and the back-side unit extendedly slide in a longitudinal direction, according to a fifth embodiment of the present invention;

Fig. 11B is a side sectional view of the portable telephone apparatus of Fig. 9A for explanation of the placement of an optical function section provided in the fifth embodiment;

Fig. 11C is a side view of the portable telephone apparatus of Fig. 11A;

Fig. 11D is a plan view of the portable telephone apparatus of Fig. 11A;

Fig. 12A is a rear view of the portable telephone apparatus in an extended state where the front-side unit and

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the back-side unit extendedly slide in a longitudinal direction, according to a sixth embodiment of the present invention;

Fig. 12B is a side view of the portable telephone apparatus of Fig. 12A;

Fig. 12C is a plan view of the portable telephone apparatus of Fig. 12A; and

Fig. 13 is a schematic block diagram showing an electric circuit of the portable telephone apparatus according to the sixth embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

As shown in Figs. 1A, 1B, and 2A-2C, a portable telephone set according to a first embodiment of the present invention is composed mainly of a front-side unit (first unit) 100 and a back-side unit (second unit) 200, which are connected by a slide mechanism so that they are able to freely slide in a longitudinal direction. Figs. 1A and 1B show a retracted state and Figs. 2A-2C show an extended state. The slide mechanism will be described in Figs. 3 and 4.

The front-side unit 100 is flat and roughly rectangular in form having a predetermined thickness, and has a first main surface 100A that is a front surface of the front-side unit 100 and a first sub-surface 100B that is a back surface thereof. The front-side unit 100 has a large-size display section (LCD device) 101, a secondary operation section 102 and a receiver section (speaker) 103 provided on the first main surface 100A. On the first sub-surface 100B, the front-side unit 100 has an optical function section provided, for example, with an optical aperture section (sensor section) of an electronic image pick-up device (e.g. CCD camera) 104 and a fingerprint recognition section 105 as shown in Figs. 2A-2C. Further, a magnet 106 (Fig 5; not shown on Figs. 1A-2C) is disposed at an appropriate position

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on the first sub-surface 100B. In the display section 101, a touch panel mechanism 107 may be incorporated.

The back-side unit 200 is flat in form, which has the approximately same shape as the front-side unit 100, and is mounted to the rear side of the front-side unit 100 so as to be freely slidable. A second main surface 200A that is a front surface of the back-side unit 200 has a main operation section 201 and a transmitter section (microphone) 202 provided on the lower portion thereof. A stop-release operation member (one-touch slide button) 301 is provided on one side surface of the back-side unit 200. Within the back-side unit 200, other electronic circuits are accommodated, which will be described later.

Both units 100 and 200 are urged in an extending direction by an urging means 302 disposed within the portable telephone set so as to keep the extended state as shown in Figs. 2A-2C. In addition, a stop means (locking mechanism) is provided to lock the units 100 and 200 so as to keep the retracted state of the units against the urging means 302. The locking of the stop means can be released by operating the stop-release operation member 301 disposed on one of the side surfaces of the back-side unit 200.

In this embodiment, when the stop-release operation member 301 slides, the lock mechanism of the front-side unit 100 and back-side unit 200 is released to cause the front-side unit 100 to automatically slide upward with respect to the back-side unit 200 by the urging means 302 to set the telephone set in a usable state that the front-side unit 100 and the back-side unit 200 are opened. Instead of sliding the stop-release operation member 301, the stop-release operation member 301 may be depressed to release the lock mechanism.

As shown in Fig. 3 and Fig. 4, the upper portion of the front-side unit 100 (left side in the figure) is formed in a swelling shape toward the back-side, and this swelling portion 100a has guide rails 300a and 300b mounted to respective ones of both side surfaces 100b so that the lower

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portions the guide rails extend from the swelling portion 100a downwardly (to right direction in the figure). The end of the lower portion of the guide rail 300a has a roughly L-shaped bracket 300c fixed thereto. At the centre of the bracket in the axial direction, the edge of the bracket 300c is bent downward in the figure to form an engagement piece 300d. At the central portion of the lower end of the swelling portion 100a, a stop protrusion piece 303 is provided as a stopper in the extension direction. At the centre of the one side edge of the swelling portion, a stop recess portion 100c is formed. One end of a coil spring 302 is fixed to the engagement piece 300d, and the other end is fixed to the bottom surface of the back case 219 such that the coil spring 302 is disposed in parallel with the guide rail 300a.

The back-side unit 200 is composed of an intermediate frame 218 and the back case 219 coupled with the intermediate frame 218. Guide grooves 218b for guiding respective ones of the guide rails 300a and 300b are formed in the inner sides of the respective side walls 218a, of the intermediate frame 218. The lower portion of the front surface of the intermediate frame 218 is provided for the second main surface 200A where the main operation section 201 is formed. The back case 219 has a stop spring 304 of roughly "<"-like shape fixed at the position corresponding to the stop recess portion 100c and, when the units 100 and 200 are retracted, the free end of the stop spring 304 enters into the stop recess portion 100c to restrain the front-side unit 100 from moving in the extension direction. A notch portion 219b is formed in the sidewall 219a of the back case 219 at a position corresponding to the mounting position of the stop spring 304. The stop-release operation member 301 is engaged with this notch portion 219b so as to be slidable by a minute distance in the axial direction. The inwardly protruding piece 301a of the stop-release operation member 301 is adapted so as to come in contact with the upper slope of the stop spring 304, and tension by the stop

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spring 304 urges the stop-release operation member 301 toward the upper end of the portable telephone set.

The front-side unit 100 and back-side unit 200 are urged in the extension direction by the coil spring 302 at all times. When both units are slid in the retraction direction against the tension of the coil spring 302, the front edge of the free end of the stop spring 304 is inserted into the stop recess portion 100c to restrain both units from moving toward the extension direction, thereby keeping the retracted state. It is more preferable that an appropriate braking means is provided to act in parallel with the coil spring 302, or an appropriate braking element is incorporated into the urging means itself so that the units slide slowly.

When downwardly sliding the stop-release operation member 301 in the retracted state, the inwardly protruding piece 301a moves while keeping the contact with the upper slope of the stop spring 304 to lower the front edge of the free end of the stop spring 304. When the front edge of the free end of the stop spring 304 is disengaged from the stop recess portion 100c, the tension of the coil spring 302 causes the both units to slide in the extension direction. In this manner, the portable telephone set is automatically extended from the retraction state to the extension state by only sliding the stop-release operation member 301.

In the present embodiment, a magnet 106 (Fig. 5; not shown in Figs. 1A-2C) is disposed at an appropriate portion in the front-side unit 100 in order to determine whether the two units are in the retracted state or in the extended state. On the other hand, a magnetic sensor 210 such as a Hall element or the like is disposed in the back-side unit 200, for example, at the position facing the magnet 106 in the retracted state. Since a predetermined output of the magnetic sensor 210 is obtained by the magnetic field of the magnet 106, the retracted state can be detected.

As described above, when the stop-release operation member is simply slid in the retracted state in which the

front-side and back-side units overlap one another as shown in Figs. 1A and 1B, the front-side unit slides upwardly from the back-side unit into the extended state in which the main operation section is exposed and the space between the microphone and the receiver becomes appropriate as shown in Figs. 2A-2C, allowing various operation and audio communication.

Next, an electric circuit of the portable telephone according to the present embodiment will be described.

As shown in FIG. 5, the portable telephone according to the present embodiment is structured to include a display section (LCD) 101, a secondary operation section (secondary operation keys) 102, a receiver (speaker) 103, an electronic image pickup device (CCD camera) 104, a fingerprint input device (sensor) 105, a magnet 106 used to detect a relative position of the front-side unit and the back-side unit, and a touch panel 107 incorporated in the display section 101, which are mounted in the front-side unit 100.

In addition, the portable telephone according to the present embodiment is structured to include an antenna 203, an RF circuit 204, a modem 205, a baseband processing circuit 206, a codec circuit 207, a control unit 208, a microphone 202, operation keys 201, a alert means 209, image processor 215, authentication processor 216, and magnetic sensor (Hall element) 210 corresponding to the magnet 106, which are mounted in the back-side unit 200.

The control unit 208 includes a extension detector 211 that detects the retracted/extended state of the units 100 and 200 based on the output of the magnetic sensor 210, a display controller 212 that controls the displaying of the display section 101, a call arrival and termination controller 213 that can carry out a call arrival control operation corresponding to the retracted/extended state of the units 100 and 200, an alert controller 214 that can control a call arrival notification corresponding to the retracted/extended state of the units 100 and 200, and a signal converter 217 that performs conversion of signals

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from the image processor 215 and the authentication processor 216.

The RF circuit 204 has a receiving circuit, a transmitting circuit, and a frequency synthesizer, which are not shown. The operation keys 201 includes a transmission key, conversion keys for alphabet/Kana/Kanji/numeral, a power source on/off key, a cross key for cursor operation, and an end key. These functional sections are mounted within the back-side unit 200 or on the surface thereof. Each circuit block as shown in Fig. 5 may use a known one and therefore the detailed descriptions will be omitted.

An optical aperture section of the electronic image pickup device 104 disposed on the first sub-surface 100B of the front-side unit 100, an optical aperture section of the fingerprint input device 105 and the operation section 201 of the back-side unit 200 are exposed and operable only when the front-side unit 100 and the back-side unit 200 are extended. Accordingly, only when the front-side unit 100 and the back-side unit 200 are extended, the image capturing and fingerprint input functions can be available and speech communication is further allowed because the microphone and the receiver are appropriately separated from one another.

On the other hand, in the retracted state, the first sub-surface of the front-side unit 100 and the main operation section 201 of the back-side unit 200 faces each other and therefore they are covered with each other. Accordingly, the optical aperture sections of the image pickup device and the fingerprint input device of the main face side unit are protected and the main operation section of the back-side unit 200 is prevented from operating.

In this embodiment, the sub-operation section 102 is provided on the first main surface 100A of the front-side unit 100, allow various operations including mail operation, image operation and call arrival operation while confirming visually the displayed contents on the display section in the retracted state.

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An operation of the portable telephone according to the embodiment will be described hereinafter.

First, in the case where the portable telephone acts as a telephone, an operation of transmitting and receiving a speech signal will be explained. The antenna 203 receives a radio signal from a base station, and transmits a radio signal. A radio signal received by the antenna 203 is output to a receiving circuit of the RF circuit 204. The receiving circuit selects a signal of a frequency indicated by a frequency synthesizer, and determines whether the selected signal includes a signal notifying of an incoming call to its own terminal (standby reception).

When the receiving circuit has detected a signal that notifies a call arrival to the own terminal, the receiving circuit notifies the call arrival to the control unit 208. The control unit 208 receives the notification from the receiving circuit that there is a call arrival to the own terminal, and drives the alert means 209 such as a beeper, a vibrator and/or a light-emitting diode to notify the user by sound, vibration and/or light blinking of the occurrence of an incoming call to the own terminal.

A user can set the portable telephone to a mode such that, when an incoming call occurs in the retracted state and then the extension detector 211 detects that the front-side unit 100 and the back-side unit 200 are extended in a normal communication position, the call arrival and termination controller 213 automatically sets the operation to an off-hook state to connect the telephone line. In this setting, the reception signal transmitted from a call originating terminal is output to the modem 205 via the RF circuit 204. At the same time, the call arrival and termination controller 213 instructs the alert controller 214 to stop the alert operation.

Then, the modem 205 demodulates the reception signal to produce a baseband reception signal and output it to the baseband processing circuit 206. The baseband processing circuit 206 processes the baseband reception signal and

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outputs it to the codec circuit 207. The codec circuit 207 decodes the baseband reception signal to output a sound signal to the speaker (telephone receiver) 103, which outputs sound waves. The codec circuit 207 also encodes a sound signal received by the microphone 202 to output a transmission signal to the baseband processing circuit 206 and the transmission signal is transmitted to the destination through the modem 205 and the RF circuit 204. With this arrangement, the user can carry out communications immediately after the front-side 100 and back-side 200 units have been extended.

This portable telephone is capable of transmitting and receiving character data or graphics data. The portable telephone monitors whether the selected signal includes a signal indicating transmission of character data to its own terminal (standby reception). When character data or graphics data has been received, the control unit 208 automatically receives the transmitted character data without waiting for the off-hook operation, and displays information in the display section 101 based on the received data.

In other words, a signal carrying character data received from the call originating terminal is output to the modem 205 via the RF circuit 204, and is demodulated by the modem 205. The demodulated signal enters the baseband processing circuit 206, which extracts character data from the demodulated signal, to output it to the control unit 208. The display controller 212 of the control unit 208 forms character information or graphic information to be displayed on the display section 101 based on data received from the baseband processing circuit 107. At the same time, the alert controller 214 drives the alert means 209 such as a beeper or a vibrator in a predetermined fashion different from that at the occurrence of an incoming call to notify the user that character data or graphics data has been received.

The control unit 208 includes a CPU, a ROM storing programs, data necessary to perform various kinds of processing, and character font data, a RAM used as a work area, a Video RAM to display information on the display section 101, and the display controller 212 that controls the display section 101.

In this portable telephone, the display section 101 is always exposed and therefore the user can look at character data and graphic data on the display section 101 in the retracted state. Since the secondary operation section 102 is also exposed, character data and graphic data can be seen immediately after they have been received, which allows simple response operations in a compact state where the units 100 and 200 are retracted.

Further, the portable telephone can create message data and transmit it to a destination. In other words, alphabet letters and Katakana characters are allocated to dial operation keys such as 0 to 9, *, and # that are provided on the operation section 201, and these keys include a conversion key for alphabet/Kana/Kanji/numeral conversion. It is possible to input message data and transmit it to a destination designated by the user operating these dial operation keys and the conversion key.

Particularly, in this portable telephone, when character data or graphics data is transmitted or received, it is possible to use the display section 101 as a horizontally oriented display unit if the user wishes. At this time, the display controller 212 displays the display contents on the display section 101 by converting the contents so as to match the direction of the horizontally oriented screen. Further, the processing instructed by a predetermined operation key is appropriately changed so as to match the direction of the horizontally oriented screen.

When the above setting has not been done or when the front-side 100 and back-side 200 units have already been extended at the call arrival time, the telephone line is

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connected upon the off-hook operation of the user with a communication start key to allow communication.

When the user retracts the front-side 100 and back-side 200 units to the retracted state after termination of the conversation, the extension detector 211 detects this position change, and the call arrival and termination controller 213 automatically sets the operation state to the on-hook state (communication termination processing). Of course, the same communication termination can be made by the user operating a predetermined termination key for off-hook in the normal communication position.

As described above, the portable telephone according to the present embodiment can provide the following advantages. Since the front-side unit 100 having the display section 101 and the back-side 200 unit having the operation section 201 overlap one another in the retracted state, both a large-size display and a reduction in size can be achieved. When retracted such that the operation section 200 is covered with the front-side unit 100, the display section 101 and the secondary operation section 102 are always exposed and therefore it is possible to carry it in a compact form while looking at a map or the like on the display section 101. Furthermore, prompt operations of a map, a game or the like are allowed without extending the portable telephone.

When the portable telephone is retracted, it is possible to carry the portable telephone while protecting the operation section and preventing it from operating. Further, the optical function sections of the CCD camera and the fingerprint input device can be also protected.

As described before, a one-touch sliding operation of the stop-release operation member allows the portable telephone to be changed from the retracted state to the extended state. Accordingly, the normal use state can be obtained by operating a single button without using both hands every time, resulting in enhanced convenience in use.

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Furthermore, it is possible to change display contents or switch the function of an operation key (soft-key) so as to meet the detected extended/retracted state of both units. When a call arrives in the retracted state, the extended state is obtained by only a slide operation of the stop-release operation member, and at the same time, the off-hook operation is automatically performed, resulting in prompt response operations to the call arrival and increased convenience in use. When the portable telephone is retracted after completing communication, call termination is automatically performed. This also allows increased convenience in use.

In the present embodiment, although the stop-release operation member is provided to the back-side unit 100, it may be provided to the front-side unit 200. In this case, by operating the stop-release operation member, the back-side unit 100 having the operation section 201 slides downward with respect to the front-side unit 200 having the display section 101 and the main operation section 201 is exposed to the outside, allowing operations by operation keys. In addition, the distance between the microphone 202 and the receiver 103 is suitable for speech communication.

Second Embodiment

A portable telephone according to a second embodiment of the present invention has substantially the same structure as the first embodiment as shown in Figs. 1A, 1B, and 2A-2C. Since the shape and the retraction/extension operation of the portable telephone are the same as those of the first embodiment, their descriptions will be omitted.

As shown in Fig. 6, the second embodiment is characterized by an input operation controller 290 and a touch panel controller 291. The input operation controller 290 enables or disables the input operation with the operation section. The touch panel controller 291 enables or disables the touch panel function of the touch panel 107. A memory (RAM) 292 is further provided to store setting data.

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The other blocks are similar to those of the first embodiment. Accordingly, the other blocks similar to those described in Fig. 5 are denoted by the same reference numerals and the descriptions of the other blocks and the slide mechanism will be omitted.

In the present embodiment, when a slide operation between the front-side unit 100 and the back-side unit 200 is detected by a combination of the magnet 106, the magnetic sensor 210 and the extension detector 211, the input operation controller 290 switches the input operation of the main operation section 201 and/or the secondary operation section 102 between the disabled state and the enabled state. In other words, the function control state is changed depending on a slide stop position. When a slide operation between the front-side unit 100 and the back-side unit 200 is detected, the touch panel controller 291 switches the touch panel function of the display section 101 and the touch panel 107 between the disabled state and the enabled state.

As for the control of the touch panel function, the entire panel face may simply switch between enabled and disabled states. In the present embodiment, a plurality of slide stop positions of the front-side unit 100 and the foregoing back-side unit 200 are previously provided, and the touch panel controller 291 may increase/decrease the enabled area of the touch panel function on the display section 101 depending on a slide stop position of the front-side unit 100 and the foregoing back-side unit 200. More specifically, the touch panel function on the full screen of the display section 101 is enabled or disabled on the basis of a predetermined area. An example of the control of the touch panel controller 291 will be described with reference to Figs. 7A and 7B.

As shown in Fig. 7B, the memory (RAM) 292 previously stores the settings of a touch panel function enabled area on the display section 202, the settings each corresponding to a closed (retracted) state, a half-open state, and an

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open (extended) state of the stop position between the front-side unit 100 and the back-side unit 200. For example, depending on which is set: the closed state; half-open state; or open state, full-screen, one-third, or one-fifth of the lower portion of the display section is, respectively, set to a touch panel function enabled area.

As shown in Fig. 7A, the control unit 208 monitors sensor output of the magnetic sensor to detect a current slide position of the front-side and back-side units (step S101). When the current position has been detected (YES at step S101), it is determined whether the detected position is a stop position (1) (step S102). When it is the stop position (1) (YES at step S102), a touch panel enabled area is changed to the setting (1) indicating the full screen (step S104). When it is not the stop position (1) (NO at step S102), it is determined whether the detected position is a stop position (2) (step S103). When it is the stop position (2) (YES at step S103), a touch panel enabled area is changed to the setting (2) indicating one-third of the lower portion of the display section (step S105). When it is not the stop position (2) (NO at step S103), a touch panel enabled area is set to the setting (3) indicating one-fifth of the lower portion of the display section (step S106).

In this manner, the touch panel enabled area of the display section 101 is set to a selected one of full-screen, one-third, or one-fifth of the lower portion of the display section depending on which one of the plurality of stop positions is detected. The enabled area may be expressed as a number of rows in a predetermined character size display, instead of a zone (area) of the display section 101. The settings stored in the memory (RAM) 292 may be arbitrarily determined by a user. According to the present embodiment, a slide operation of the front-side and back-side units allows control of the touch panel function, key locking function, and other functions, resulting in enhanced convenience in use.

Third Embodiment

As shown in Figs. 8A-8C, a portable telephone set 400A according to a third embodiment of the present invention has almost same structure as the above described first embodiment, except that an electronic image pick-up device (CCD camera) 104 is mounted as an optical function section on a back-side unit 200 and its optical aperture section is formed in the front surface (second main surface) 200A of the back-side unit 200, and a video telephone function is added to the electric circuit.

The other members are the same as those of the first embodiment. Therefore, in the retracted state in which the front-side unit 100 and the back-side unit 200 overlap one another, the external appearance is the same as that previously shown in Figs. 1A and 1B. Description of the structure of each unit, the slide mechanism, the electric circuit and the like will be omitted to avoid repetition.

In the third embodiment, the optical aperture section of the electronic image pick-up device (CCD camera) 104 is formed in the front surface (second main surface) 200A of the back-side unit 200. When extended (in use state), the main operation section 201 on the second main surface 200A and the display section 101 provided to the first main surface 100A of the front-side unit 100 are all disposed in the front-side. Therefore, all of the electronic image pick-up device (CCD camera) 104, the main operation section 201 and the display section 101 face to the front-side (user-side). This results in a further advantage of allowing a video telephone communication or video telephone conference using the present portable telephone.

Fourth embodiment

A fourth embodiment of the present invention will be described with reference to Figs. 9A-9C and Figs. 10A and 10B.

A portable telephone set 400' according to the present embodiment is composed of two units, a first unit 100',

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shaped like a hollow sheath having an opening directed downward and is provided with a display section and the like on its surface; and a second unit 200' provided with a main operation section and the like, which can be accommodated within the hollow space of the first unit 100'. These units 100' and 200' are coupled via an appropriate slide mechanism so as to be freely slidable in the longitudinal direction.

The first unit 100' is flat and roughly rectangular in form having a predetermined thickness, and has a first main surface 100A that is a front surface of the first unit 100' and a first sub-surface 100B that is a back surface thereof. The first unit 100' has a display section (LCD device) 101, a secondary operation section 102 and a receiver section (speaker) 103 provided on the first main surface 100A. A stop-release operation member (one-touch slide button) 301' is provided on one side surface of the first unit 100'. Further, a magnet 106 (not shown on these Figures) is disposed at an appropriate position on the first sub-surface 100B. In the display section 101, a touch panel mechanism 107 may be incorporated as necessary.

The second unit 200' allowed to be accommodated into the first unit 100' is shaped like a flat box corresponding to an inner space of the first unit 100' and is mounted so as to be slidable into the inner space of the first unit 100'. A second main surface 200A that is a front surface of the second unit 200' has a main operation section 201 and a transmitter section (microphone) 202 provided on the lower portion thereof. On a second sub-surface 200B opposite to the second main surface 200A, the second unit 200' has an optical function section provided, for example, for optical aperture sections (sensor sections) of an electronic image pick-up device (e.g. CCD camera) 104' and a fingerprint input device 105' as shown in Fig. 9A.

Both units 100' and 200' are urged in an extending direction by an urging means (not shown) disposed within the portable telephone set so as to keep the extended state as shown in Figs. 9A-9C. In addition, a stop means (locking

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mechanism) is provided to lock the units 100' and 200' so as to keep the retracted state of the units against the urging means. The locking of the stop means can be released by operating the stop-release operation member 301' disposed on one of the side surfaces of the first unit 100'.

In this embodiment, when the stop-release operation member 301' slides, the lock mechanism of the first unit 100 and second unit 200 is released to cause the first unit 100 to automatically slide upward with respect to the second unit 200 by the urging means to set the telephone set in a usable state that the first unit 100 and the second unit 200 are opened. Instead of sliding the stop-release operation member 301', the stop-release operation member 301' may be depressed to release the lock mechanism.

The portable telephone according to the present embodiment has the same function sections as those of the electric circuit as shown in FIG. 5. The first unit 100' includes the display section (LCD) 101, the touch panel 107, the secondary operation section 102, the receiver (speaker) 103, the inner magnet 106 and further includes an antenna 203, an RF circuit 204, a modem 205, a baseband processing circuit 206, a codec circuit 207, a control unit 208, an alert means 209 and the like. The second unit 200' includes the main operation section 201 and the microphone 202 on the second main surface 200A and the electronic image pickup device (CCD camera) 104' and the fingerprint input device (sensor) 105' on the second sub-surface 200B.

The units 100' and 200' are coupled with each other so as to be freely slidable in the axial direction by the slide mechanism. Operating the main operation section 201 and speech communication can be carried out in the extended state that the second unit 200' is pulled out from the first unit 100'. When the second unit 200' slides into the first unit 100' (in the retracted state), the main operation section 201 and the optical aperture sections of the electronic image pick-up device 104' and the fingerprint recognition section 105' are covered with the back surface

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of the first unit 100' and thereby protected. As described above, the portable telephone set according to the present embodiment has the same advantages as those of the first embodiment.

In the portable telephone set according to the present embodiment, it may be adapted so that the optical aperture section of the electronic image pick-up device (CCD camera) 104' is mounted on the front surface (second main surface) 200A of the second unit 200' and a video telephone function is implemented in the electric circuit as in the case of the third embodiment.

Fifth embodiment

Referring to Figs. 11A-11D, a portable telephone set 400B according to a fifth embodiment of the present invention has a structure similar to that of the above-described fourth embodiment, and only the following two points are different. First, an electronic image pick-up device (CCD camera) 104, which is the optical function section, is provided in an inside surface (first sub-surface) 100B that faces the inner space and is opposite to the first main surface 100A of the first unit 100'. Second, a light transmission section 100b is formed in a back surface section 100C of the sheath-like unit 100' at a position corresponding to the electronic image pick-up device (CCD camera) 104.

The other portions are the same as those of the fourth embodiment. Accordingly, in the retracted state in which the first unit 100' and the second unit 200' overlap one another, the external appearance is the same as shown in Figs. 10A and 10B. Description of each unit, the slide mechanism, the electric circuit and the like will be omitted to avoid repetition.

The light transmission section 100b of the portable telephone set 400B is a through hole that is formed at a predetermined position of the back-face section 100C and is slightly larger than the aperture section 104' of the CCD

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camera 104. In the present embodiment, as shown in Fig. 11B, in the extended state (usable state) the second unit 200' has popped out from the first unit 100', light from outside transmitted through the light transmission section 100b and enters into the aperture section 109' of the CCD camera 104 and therefore the CCD camera 104 captures an image, which can be utilized. On the other hand, when both units are slid into a retracted state, the second unit 200' is accommodated within the first unit 100', the aperture section of the CCD camera 104 is covered and protected by the second unit 200'.

As for the light transmission section 100b, at least the relevant portion of the back-face section 100C may be formed using a transparent material, or may be realized by providing a transparent protection plate to the relevant portion. Such a structure further increases the air tightness and thereby the entry of any foreign matter such as dust into the inside space is prevented, which is further preferred. As for the light transmission section 100b, if light from outside can be transmitted through it, any structure may be adopted.

The fifth embodiment also has various advantages as above mentioned. For example, a single action of operating the stop-release operation member 301' while holding the portable telephone set by one hand can extend the portable telephone set into the usable state. In particular, the protection performance of the CCD camera 104 becomes higher.

Sixth Embodiment

A sixth embodiment of the present invention will be described with reference to Figs. 12A-12C and Fig. 13.

As shown in Figs. 12A-12C, a portable telephone set according to the sixth embodiment of the present invention has a similar structure to the above fourth and fifth embodiments. It is composed mainly of a first unit 100' having a display device 101 and a speaker 103, a second unit 200' that has a microphone 202 and is engaged with the first unit 100', and a slide engagement means for engaging the

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first unit 100' with the second unit 200' so as to be freely slidable in the longitudinal direction. In particular, the second unit 200' is provided with an upper first housing 200'b and a second housing 200'a that has a microphone 202 and is rotatably coupled to the first housing 200'b. A rotation structure 200'c, which rotatably couples the first housing 200'b and the second housing 200'a, can employ any known structure. As shown in Fig. 12B, the second housing 200'a can rotate around the rotation structure 200'c to make the second unit 200' bend at a predetermined angle.

As shown in Fig. 13, the portable telephone set according to the present embodiment includes an electric circuit within the first unit 100' and the second unit 200' composed of the second housing 200'a and the first housing 200'b. The control unit 208 includes an extension detector (not shown) for detecting that the first unit 100' and the second unit 200' are in the extended state by using a magnet 106 and a magnetic sensor 210, a rotation detector (not shown) for detecting that the first housing 200'b and the second housing 200'a of the second unit 200' are in the rotated state by using a switch 901 and a sensor 902, and a function controller (not shown). In the control unit 208, when the extension detector detects the extended state between the first unit 100' and the second unit 200', a predetermined function is enabled or disabled. When the rotation detector detects the rotated state between the first housing 200'b and the second housing 200'a of the second unit 200', a predetermined function can be enabled or disabled. Further, the control unit 208 is also provided with other functions similar to those previously described in the other embodiments. The function controller acts as the above-described input operation controller as well and, based on the extended state between the first unit 100' and the second unit 200', determines whether the input operation via the main operation section and/or the sub-operation section is enabled.

A desired function control of the function controller can be set depending on the setting. For example, the rotation detector may perform an off-hook operation when detecting a shift from the straight state to the rotated state (see Fig. 12B) between the first housing 200'b and the second housing 200'a of the second unit 200' at call arrival; and perform call termination when detecting a shift from the rotated state to the straight state between the first housing 200'b and the second housing 200'a of the second unit 200 after completing the communication. In addition, it is possible to make an alert reduction/mute function or a response holding function operate at the call arrival as a first function in the extended state, and make the off-hook or response hold-release function operate as a second function in the rotated state. Furthermore, it is possible to set the camera image pickup function as a first function, or the flash function at picking-up as a second function. As described above, the portable telephone set according to the present embodiment has, in addition to the previously described advantages, another advantage such that the touch panel function, the key locking function and other functions can be controlled depending on a state made by a slide operation between the first unit and the second unit and/or a bent state made by rotation between the first housing and the second housing, resulting in increased convenience in use.

The above-described embodiments have been described taking as an example the case where both of the electronic image pick-up device and the fingerprint input device are provided as the optical function section. Needless to say, the portable telephone may be provided with either the electronic image pick-up device or the fingerprint input device. In the present invention, the other components are not limited to the above-described embodiments. Various modifications may be possible within the scope of the present invention; for example, an EL display device is utilized for the display device in place of the LCD.

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According to the present invention, the following advantages are obtained. Since the first unit, having the display section, and the second unit, having the main operation section, overlap one another when retracted, increasing the size of the display screen and decreasing the size of the telephone set are possible. In the retracted state the main operation section is concealed. However, the display section and the secondary operation section are always exposed allowing easy operation thereof. Accordingly, it is possible to carry around the portable telephone set compactly while watching the display section, and thereby referring to a map or operating a game or the like can be carried out easily.

In the retracted state, the main operation section is protected and prevented from operating. Also, in the case where optical function sections such as a camera and a fingerprint input device are provided, these sections are also accommodated and protected as described before.

Only a sliding operation of the stop-release operation member causes the portable telephone set to slide from the retracted state to the extended state. In other words, the usable state can be obtained by a simple operation of a single button (by one-touch), without extending the portable telephone set by using both hands every time, resulting in increased convenience in use.

It is possible to detect the extended/retracted state of both units and display content or function of an operation key (soft-key) can change depending on the detected state. When a call arrives in the retracted state, the extended state is obtained by a sliding operation only of the stop-release operation member and, at the same time, an off-hook operation is carried out automatically, resulting in prompt response to an incoming call and therefore increased convenience in use. When detecting a shift from the extended state to the retracted state after completing communication, call termination is carried out automatically, resulting in increased convenience in use.

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Attention is drawn to the parent of this divisional application, namely our application No. 0222957.3.

Claims:

1. A portable communication apparatus comprising:

a first unit having at least a display section;

a second unit having at least a main operation section;

a slide coupling for coupling said first unit with said second unit such that they are freely slidable in a longitudinal direction between a retracted state and an extended state; and

at least one optical function section, the or each of which has an optical aperture provided in one of the surfaces of said first unit and said second unit that face one another in the retracted state, wherein said at least one optical function section is made operable when said first unit and said second unit are positioned in the extended state.

2. The portable communication apparatus according to claim 1, wherein said at least one optical function section is at least one of a fingerprint authentication device and an electronic image pickup device.

3. The portable communication apparatus according to claim 1 or 2, wherein said first unit has an inner space into which said second unit is allowed to slide.

4. The portable communication apparatus according to claim 1, 2 or 3, wherein an optical aperture of an electronic image pickup device is provided on an inner surface of said first unit facing an opposite inner surface thereof, wherein a portion of said opposite inner surface corresponding to said optical aperture of said electronic image pickup device is made of transparent material to allow image pickup operation of said electronic image pickup device.

5. The portable communication apparatus according to any preceding claim, further comprising:

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an urging member for urging said first unit and said second unit in an extension direction; and

a releasable lock mechanism for releasably locking said first unit and said second unit in the retracted state, wherein the locking is released by a predetermined operation.

6. Portable communication apparatus substantially as any of the embodiments herein described with reference to the drawings.

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Application No: GB 0327746.4 30 **Examiner:** Stephen Jennings
Claims searched: 1-6 **Date of search:** 9 January 2004

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
Y	1-3,5	DE 297 22 657 U1	(Jeßberger) See figure
Y	1-3,5	US 6249672 B1	(Castiel) See figures 1A and 1B
Y	1-3,5	US 6064734 A	(Hasewaga et al) See figures 1 and 2
Y	1-3,5	JP 10-271192	(Sony Corp) See figures
A		JP 2000-332871	(Fujitsu General Ltd)
A		EP 1143686 A1	(Matsushita Electric Industrial Co Ltd)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO, & US patent documents classified in the following areas of the UKC[W]:

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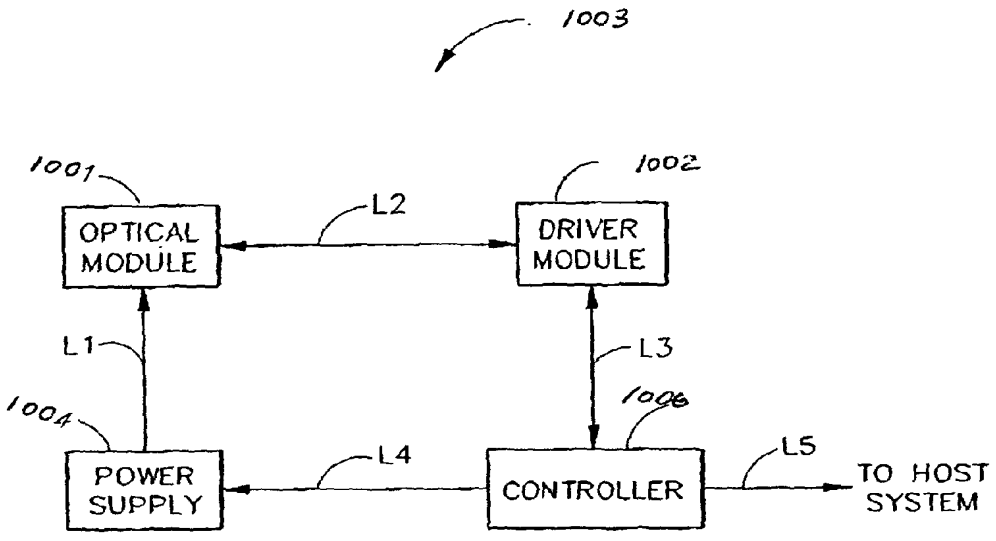
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[Continued on next page]

(54) Title: BIOMETRIC SENSOR



(57) Abstract: A system and methods for sensing and imaging a fingerprint surface using an optical sensing device. The fingerprint system utilizes an optical detector to capture light selectively reflected by the relief features of the fingerprint surface. A number of different methods for lighting and positioning the sensor are described to desirably enhance the contrast and clarity of the rendered image and to improve accuracy in discriminating between fingerprints. A color filter system is also described that is integrated into fingerprint sensor and improves the quality of the resultant fingerprint image. Furthermore, a live finger sensing apparatus is shown to prevent the use of non-living or artifice finger substitutes with the sensor.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

BIOMETRIC SENSOR

Background of the Invention

Field of the Invention

The invention relates to an biometric sensor system. More particularly, the invention relates to an optical sensor system and method for detecting and rendering a relief object such as a fingerprint.

Description of the Related Art

Fingerprint sensors, which provide fingerprint imaging and recognition capabilities, have found increasing utility in a variety of applications, including building access security systems, computer access security systems, and other personal identity verification systems. Fingerprint sensors in these applications are typically employed to verify that a person attempting to gain access to a protected system is in fact an authorized user of that system. This process is referred to as authentication. Fingerprints are statistically unique to each individual and difficult to replicate. Fingerprints are further advantageous as authentication means as they cannot be misplaced or forgotten as is the case with tokens, such as pass keys or cards, or passwords and combinations.

The accuracy and resolution of the electronic image developed by a fingerprint sensor is important to the dependability of the sensor system. Fingerprint discrimination relies on indexing distinguishing features in the ridge and valley patterns of the fingerprint and comparing them to known patterns. Inadequate resolution or imaging errors can result in inaccuracies in the authentication process. In particular, authorized users should be granted access without rejection or extended delay. A denial of access to an authorized user is referred to as a false rejection. The fingerprint sensor system should also not grant access to other than authorized users. Doing so is referred to as a false acception.

Certain types of optical fingerprint sensors take advantage of the phenomenon of total internal reflection due to the differing indices of refraction of air and tissue. When a fingertip is placed onto a substrate, the protruding ridges of the fingerprint are in contact with the substrate while the valleys between the ridges form air-filled regions. By illuminating the finger and placing photodetectors within the substrate, which has an index of refraction close to that of the finger, light is able to pass between the finger and the substrate through the ridges, but is reflected from the air-filled valleys. In this way, the ridges can be optically distinguished from the valleys to form an electronic image of the fingerprint pattern.

An important factor in determining the quality of a fingerprint image resolved by an optical fingerprint sensor is the amount of, and the angle at which, light illuminates the ridges and valleys of the finger. Ambient light entering the fingerprint sensor while the sensor is attempting to resolve the fingerprint image may be of such a nature as to reduce the contrast of the ridges and valleys of the fingerprint image and degrade the image quality. This problem is particularly troublesome in that the reduced image quality may further result in reduced accuracy in discriminating between fingerprints. Ambient light entering the fingerprint sensor may also degrade the performance of the fingerprint sensor system as a result of undesirable reflection and refraction within the sensor which degrades the quality of the rendered fingerprint surface.

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The use of a light-blocking enclosure or shield to reduce the influence of ambient light in the detection of the fingerprint has been proposed to address the aforementioned resolution problem. However, the use of a shield is often impractical as it necessitates the formation of a relatively bulky structure around the fingerprint sensor region. Additionally, in some applications the fingerprint sensor may be positioned in such a way as to make it difficult or impossible to create an enclosure which reduces or eliminates the ambient light effects. For example, if the fingerprint sensor is integrated into a touchscreen, monitor, or other display apparatus, the use of a light blocking enclosure may not be possible as it would block or impede a user's ability to view the portion of the display apparatus covered by the enclosure.

Another problem arises when providing illumination for detection of the fingerprint and, in particular, results from the placement of the light source used to illuminate the ridges and valleys of the fingertip. In some situations, conventional backlighting of the fingerprint sensor may not be the most efficient method by which the fingerprint can be illuminated. This problem may be exacerbated by the structure of the fingerprint sensor or accompanying electronics which occlude light from the back surface of the device. In this circumstance, backlighting cannot be readily used to illuminate the surface of the finger.

However, fingerprint detection systems that use photo-detection as a method for identifying the fingerprint typically do require some source of lighting which illuminates the underside of the fingerprint surface. A problem encountered when illuminating the fingerprint surface is ensuring that the entire region of the fingerprint is uniformly illuminated. Non-uniform illumination leads to reduced fingerprint resolution and reduced accuracy in distinguishing between similar fingerprint patterns.

Another problem related to the requisite need for illumination of conventional photodetector fingerprint systems relates to the source of light used to illuminate the fingerprint surface. In some applications, the use of an externally positioned or integrated light source is impractical, as it would interfere with the operation of the device. Furthermore, the spectral characteristics of the light produced by certain light sources may be unsuitable for illumination of the fingerprint surface and may result in decreased contrast and resolution of the rendered fingerprint image.

Additionally, there are applications where a fingerprint sensor is desired to be integrated into another electronic device which cannot be illuminated in a practical manner using conventional methods. For example, if the surfaces of the fingerprint sensor are necessarily formed from an opaque material, externally generated light-dependent fingerprint detection is precluded due to the inability to transmit and reflect light through the surfaces of the fingerprint detector.

Conventional fingerprint sensors for electronic devices, such as personal computers, laptop computers, or workstations, typically operate as stand-alone or externally connected devices. These fingerprint sensors are commonly connected to the electronic device through an expansion port or peripheral port such as a serial port, a parallel port, a USB port, a PC card slot, a PCMCIA expansion port or the like. However, the number of peripheral connection ports that are available for other externally connected peripheral devices is limited. As a consequence, it

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may be necessary to continually exchange port connections for multiple peripheral devices, including the fingerprint sensor, and may prevent the user from enjoying the convenience of having multiple devices simultaneously connected at one time.

In addition, stand-alone fingerprint sensors can be cumbersome in that they require a portion of the workspace near the host device to be dedicated to their presence and may require a cord or connector to extend between the fingerprint sensor and the host electronic device. This can result in an increase in the amount of "clutter" or workspace disorganization near the electronic device, whereby the creation of an undesirable or unmanageable workspace environment may manifest where a space saving situation is of greater importance.

Another problem may arise when the fingerprint sensor is used in conjunction with portable devices, such as notebook computers, handheld personal digital assistant (PDA) devices, and memory storage devices. These host devices may not have the necessary expansion ports available to connect an externally connected fingerprint sensor, and, furthermore, if such a sensor can be connected, then its use undesirably adds additional weight and bulk to the computing device.

As fingerprint sensors are often employed in battery powered devices such as, PDAs, laptop computers, cell phones, etc., it can be appreciated that minimizing idle current draw is a desirable feature. In particular, a fingerprint sensor typically includes a light source and a sensing array. Both of these devices require electrical power to operate. As the fingerprint sensor is being employed to verify an identity, once that task is accomplished, the sensor no longer needs to remain active. Additionally, the sensor need not be active unless it is actually in the process of verifying an identity. Continuously operating the fingerprint sensor when a verification process is not being performed needlessly drains the limited battery power.

The sensors are typically used to limit access to sensitive information, such as personal, classified, or financial information; valuable devices, such as computers, PDAs, or cell phones; and restricted areas such as clean rooms, hazardous areas, treasuries, or restricted access areas. Thus, an additional requirement for an effective sensor employed as a security device is to not only authenticate the fingerprint pattern but also discriminate fraud attempts. It is known to use disembodied fingers or fingertip skin removed from an authorized person to attempt to compromise a fingerprint sensor. It is also known to replicate an authorized fingerprint pattern on an artificial finger made of rubber, for example. Therefore, a more dependable system must be able to recognize and reject fake, altered, and dead fingers.

A living finger has certain characteristics that might be employed to discriminate a living finger from an artifice. A living skin surface, such as a fingertip, has an inherent electrical resistance and capacitance that is distinct from those of dead tissue or artificial materials. A particular resistance in combination with a particular capacitance, i.e. a particular impedance, is difficult to accurately replicate and is thus a fairly reliable indicator of authenticity. A living skin surface will also have a temperature and heat emission in a narrow range different from readily fabricated artificial appendages. A living finger will also exhibit a varying surface pressure and interior concentrations of oxygenated blood due to the underlying blood pulse that is also difficult to duplicate with an artifice. However, known

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methods and devices for measuring temperature, heat emission, pressure, and pulse oxidation are either excessively expensive or impractical to integrate with an optical fingerprint sensor.

A design consideration that affects most electronic device applications, including fingerprint sensors, is protection against electrostatic discharge (ESD). Electrostatic discharge occurs when a built-up static charge of electricity is suddenly discharged from one body to another. Charge accumulates as bodies with different electrical properties are repeatedly brought into and away from contact. Common examples are the movement of a device through a manufacturing process and the movement of a person through walking and handling objects. The build-up of the static electricity in people is facilitated by the fact that typical footwear is electrically insulative, thus inhibiting the shunting of built-up charge within the body and clothing to earth. Accumulation of static electricity is also facilitated by dry and windy atmospheric conditions. Such conditions inhibit conduction and support free ions in the air that can transfer charge to a person.

The dangers of ESD stem from the high voltages that arise, which can often be on the order of tens of thousands of volts. The current available and, thus, the overall energy is relatively low; however, the high voltages can be extremely damaging to small electronic devices. Typical operating voltages for electronic devices are less than ten volts. If the devices are exposed to a potential of tens of thousands of volts, the localized current and voltage can quite readily breakdown dielectric layers and p-n junctions. The ESD can also temporarily melt conductive traces and sever their interconnection of other devices. Such damage is typically permanent and irreversible and renders the device useless. Also, since electronic devices and interconnects are small in scale and are generally encapsulated in finished products, ESD damage is not visible and is only apparent upon use or testing of the product.

Glass and silicon dioxide (SiO_2), typical materials in fingerprint sensors, tend to accumulate positive electric charge whereas, rubber and polyester, common clothing materials, tend to accumulate negative charge. Thus, the electrical potential between a person and a typical fingerprint sensor is even more pronounced because of the opposite charge types accumulated.

A particular aspect of fingerprint sensors of concern with respect to ESD is that even very small levels of ESD through the sensor can corrupt the image read by the sensor. A typical sensor comprises an array of discrete optical detectors that read incident light from a finger surface so as to infer a two-dimensional electronic representation of the fingerprint. Even relatively low amounts of electricity discharged between the finger surface and the sensor can create false signals read by the sensor array. This can result in "overexposure" of regions of the array due to saturation of the detectors so that the sensor is not able or its ability is degraded to distinguish between ridge and valley features.

Unintentional ESD can also create false images indicating the presence of fingerprint features where nonesuch actually exist. This phenomenon is visualized as "grainy" or more pixilated images of the surface image. Verification of fingerprints hinges upon accurately distinguishing small surface features and it can be appreciated that any corruption of the base data lowers the accuracy and reliability of a fingerprint sensor system.

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In a manufacturing environment, it is relatively easy to take preventive measures against damage to electronic devices by electrostatic discharge. The typical safeguards include modifications to moving equipment to continuously maintain a uniform electrical potential among the various component parts. The issue of accumulating charges on personnel is typically handled by providing workers with grounding straps that shunt any accumulated charge to earth. As the workers are typically relatively stationary at a fixed workstation, this method of minimizing the effects of ESD is acceptably inconvenient.

However, with a consumer application such as the fingerprint sensors of concern here, it is much more difficult to deal with the ESD problem through the users. The fingerprint sensors are intended to increase convenience for users, whereas, known methods and systems for dealing with ESD decrease convenience. Requiring a user to employ a grounding strap prior to use of a fingerprint sensor is unacceptably inconvenient. It is known to have a separate conductive pad or protrusion that users can touch to equalize electrical potential, however, this method adds an additional step to the procedure of using the device and is inconvenient for that reason. In addition, having a separate ESD discharge assembly increases the overall size of the device and reduces its utility and economy.

Summary of the Invention

In one aspect, the invention comprises a fingerprint sensor wherein a finger placed on the sensor is illuminated by both a light source and by ambient light, the fingerprint sensor having a color filter that filters out a portion of the ambient light, the fingerprint sensor comprising: a contact surface which receives a fingertip of a user; at least one light source which generates at least green light that is reflected by the fingertip; a color filter which is substantially transparent to the green light and substantially opaque to a portion of ambient light that is substantially transmitted through the fingertip; and a plurality of optical detectors disposed from the contact surface with at least a portion of the color filter disposed between the optical detectors and the contact surface, the optical detectors positioned to receive the green light reflected by the fingertip, the optical detectors generating electrical signals in response to the received light, thereby providing an electronic representation of a fingerprint corresponding to the fingertip.

In another aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; a color filter which is substantially transparent to green light and substantially opaque to non-green light; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the green light reflected by the fingertip.

In yet another aspect, the invention comprises a fingerprint sensor comprising: a contact surface which receives a fingertip of a user, the fingertip comprising a pattern of ridges and valleys, the contact surface in contact with the ridges of the fingertip; at least one light source which generates light that is reflected from the contact surface; a color filter which is substantially transparent to green light and substantially opaque to non-green light; and at least one optical detector disposed from the contact surface with at least a portion of the color filter disposed

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between the optical detector and the contact surface, the optical detector positioned to receive the green light reflected from the contact surface.

In still yet another aspect, the invention comprises a fingerprint sensor comprising: a substrate which is substantially transparent to green light; at least one light source coupled to the substrate, the light source generating light that propagates through the substrate and is reflected by a fingertip; a color filter which is substantially transparent to green light and substantially opaque to non-green light; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the green light reflected by the fingertip.

In a further aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; a color filter which is substantially transparent to green light and substantially opaque to non-green light; and an optical detector layer disposed from the fingertip with at least a portion of the color filter disposed between the optical detector layer and the fingertip, the optical detector layer positioned to receive the green light reflected by the fingertip.

In a still further aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; a color filter which is substantially transparent to non-red light and substantially opaque to red light; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the non-red light reflected by the fingertip.

In an additional aspect, the invention comprises a fingerprint sensor comprising: a contact surface which receives a fingertip of a user, the fingertip comprising a pattern of ridges and valleys, the contact surface in contact with the ridges of the fingertip; at least one light source which generates light that is reflected from the contact surface; a color filter which is substantially transparent to non-red light and substantially opaque to red light; and at least one optical detector disposed from the contact surface with at least a portion of the color filter disposed between the optical detector and the contact surface, the optical detector positioned to receive the non-red light reflected from the contact surface.

In yet an additional aspect, the invention comprises a fingerprint sensor comprising: a substrate which is substantially transparent to non-red light; at least one light source coupled to the substrate, the light source generating light that propagates through the substrate and is reflected by a fingertip; a color filter which is substantially transparent to non-red light and substantially opaque to red light; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the non-red light reflected by the fingertip.

In another aspect the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; a color filter which is substantially transparent to non-red light and substantially opaque to red light; and an optical detector layer disposed from the fingertip with at least a portion of

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the color filter disposed between the optical detector layer and the fingertip, the optical detector layer positioned to receive the non-red light reflected by the fingertip.

In yet another aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; a color filter which is substantially opaque to a portion of ambient light that passes through the fingertip; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive a portion of the light that reflects from the fingertip and passes through the color filter.

In a further aspect, the invention comprises a fingerprint sensor comprising: a contact surface which receives a fingertip of a user, the fingertip comprising a pattern of ridges and valleys, the contact surface in contact with the ridges of the fingertip; at least one light source which generates light that is reflected from the contact surface; a color filter which is substantially opaque to a portion of ambient light that passes through the fingertip; and at least one optical detector disposed from the contact surface with at least a portion of the color filter disposed between the optical detector and the contact surface, the optical detector positioned to receive a portion of the light that reflects from the contact surface and passes through the color filter.

In a still further aspect, the invention comprises a fingerprint sensor comprising: at least one light source coupled to a substrate, the light source generating light that propagates through the substrate and is reflected by a fingertip, the substrate being substantially transparent to the light generated by the light source; a color filter which is substantially opaque to a portion of ambient light that passes through the fingertip; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive a portion of the light that reflects from the fingertip.

In an additional aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; a color filter which is substantially opaque to a portion of ambient light that passes through the fingertip; and an optical detector layer disposed from the fingertip with at least a portion of the color filter disposed between the optical detector layer and the fingertip, the optical detector layer positioned to receive a portion of the light that reflects from the fingertip.

In still yet another aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; and at least one optical detector disposed from the fingertip, the optical detector positioned to receive the light generated by the light source and reflected by the fingertip, the optical detector comprising a color filter which is substantially transparent to the light that is generated by the light source and reflected by the fingertip and substantially opaque to a portion of ambient light substantially transmitted through the fingertip, whereby the optical detector is substantially responsive to the light that is generated by the light source and reflected by the fingertip and is not substantially responsive to the portion of ambient light substantially transmitted through the fingertip.

In a further aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip; and a plurality of optical detectors disposed from the fingertip, the

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optical detectors positioned to receive the light generated by the light source and reflected by the fingertip, the optical detectors each comprising: a switching diode; a photodiode comprising a photoactive p-layer, an intrinsic layer, and an n-layer; and a color filter layer covering the photoactive p-layer, the color filter layer substantially transparent to the light generated by the light source and reflected by the fingertip and substantially opaque to a portion of ambient light substantially transmitted through the fingertip, whereby the optical detectors are substantially responsive to light that is generated by the light source and not substantially responsive to the portion of ambient light substantially transmitted through the fingertip.

In a still further aspect, the invention comprises a fingerprint sensor wherein a finger placed on the sensor is illuminated by both a light source and by ambient light, the fingerprint sensor having a color filter that filters a portion of the ambient light, the fingerprint sensor comprising: a substrate comprising a first material which is substantially transparent to light with wavelengths within a first range of wavelengths; a contact surface which receives a fingertip of a user; a color filter layer comprising a second material which is substantially transparent to light with wavelengths within the first range of wavelengths and substantially opaque to a portion of ambient light with wavelengths within a second range of wavelengths, the portion of ambient light propagating through the fingertip; at least one light source coupled to the substrate, the light source generating light with at least one wavelength within the first range of wavelengths, the light propagating through the substrate to the fingertip; and a plurality of optical detectors disposed from the contact surface with at least a portion of the second material disposed between the optical detectors and the contact surface, the optical detectors positioned to receive light generated by the light source and reflected by the fingertip, the optical detectors generating electrical signals in response to the received light, thereby providing an electronic representation of a fingerprint corresponding to the fingertip.

In another aspect, the invention comprises a method of sensing a fingerprint comprising a pattern of ridges and valleys of a fingertip of a user, the method comprising: receiving the fingertip on a fingerprint sensor; receiving a first light substantially transmitted through the fingertip to a contact surface, whereby the first light is generated by ambient light sources; generating a second light and substantially transmitting the second light to the fingertip from the contact surface; reflecting a portion of the second light from the fingertip; filtering the first light substantially transmitted through the contact surface from the second light reflected from the fingertip; and detecting the second light reflected from the fingertip, thereby imaging the fingerprint of the fingertip.

In yet another aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates green light that is reflected by a fingertip; a color filter which is substantially transparent to the green light generated by the light source and reflected by the fingertip, and which is substantially opaque to non-green light; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the green light generated by the light source and reflected by the fingertip.

In an additional aspect, the invention comprises a fingerprint sensor comprising: at least one light source comprising a green light-emitting diode which generates green light that is reflected by a fingertip; a color filter which

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is substantially transparent to the green light generated by the green light-emitting diode and reflected by the fingertip, and which is substantially opaque to non-green light; and at least one optical detector comprising an active matrix sensor array disposed from the fingertip with at least a portion of the color filter disposed between the active matrix sensor array and the fingertip, the active matrix sensor array positioned to receive the green light generated by the green light-emitting diode and reflected by the fingertip.

In yet an additional aspect, the invention comprises a fingerprint sensor comprising: at least one light source comprising a microlens array and a green light-emitting diode which generates green light that is reflected by a fingertip; a color filter which is substantially transparent to the green light generated by the light source and reflected by the fingertip, and which is substantially opaque to non-green light; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the green light generated by the light source and reflected by the fingertip.

In a further aspect the invention comprises a fingerprint sensor comprising: at least one light source comprising a microlens array and a green light-emitting diode which generates green light that is reflected by a fingertip; a color filter which is substantially transparent to the green light generated by the light source and reflected by the fingertip, and which is substantially opaque to non-green light; and at least one optical detector comprising an active matrix sensor array disposed from the fingertip with at least a portion of the color filter disposed between the active matrix sensor array and the fingertip, the active matrix sensor array positioned to receive the green light generated by the green light-emitting diode and reflected by the fingertip.

In a still further aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates non-red light that is reflected by a fingertip; a color filter which is substantially transparent to the non-red light generated by the light source and reflected by the fingertip, and which is substantially opaque to red light; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the non-red light generated by the light source and reflected by the fingertip.

In another aspect, the invention comprises a fingerprint sensor comprising: at least one light source which generates light that is reflected by a fingertip, the light having a wavelength which is not substantially transmitted through the fingertip; a color filter which is substantially opaque to a portion of ambient light that passes through the fingertip, and which is substantially transparent to the light generated by the light source and reflected by the fingertip; and at least one optical detector disposed from the fingertip with at least a portion of the color filter disposed between the optical detector and the fingertip, the optical detector positioned to receive the light generated by the light source and reflected by the fingertip.

In yet another aspect, the invention comprises personal electronic device comprising: an input device; a display for displaying information to a user, wherein the display includes a light source; a controller that receives signals from the input device and provides signals to the display; a fingerprint sensor positioned so as to receive light from the display, the fingerprint sensor having a surface upon which a user's finger is positioned and also having a

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plurality of detectors that detect light from the display that is reflected off of the finger when the user's finger is positioned on the sensor wherein the plurality of detectors produce a signal indicative of the reflected light that is provided to the controller so that the controller can thereby determine whether the user is an authorized user of the personal electronic device.

In a further aspect, the invention comprises an LCD display incorporating a fingerprint sensor, the display comprising: a light source that produces light; an LCD element that has a first and a second surface, wherein the LCD element is positioned to receive the light via the first surface and selectively transmit the light therethrough to the second surface so as to selectively produce images; a top coat member formed on the second surface of the LCD element wherein the top coat member is formed of a light transmissive material wherein the top coat material defines an outer surface where a user's finger is positioned to obtain a representation of the user's fingerprint; and a plurality of detectors mounted so as to be interposed between the LCD display and the outer surface such that light from the light source is reflected off of the user's fingerprint when the user's fingerprint is positioned on the outer surface and is then detected by the plurality of detectors so that the plurality of detectors generate a signal representative of the user's fingerprint.

In a still further aspect, the invention comprises a personal electronic device comprising: a housing having a first, second and third apertures; an input device positioned within the first aperture of the housing; a display positioned within the second aperture, for displaying information to a user, wherein the display includes a light source that provides light to the second aperture and also provides light to the third aperture; a controller positioned within the housing that receives signals from the input device and provides signals to the display; a fingerprint sensor positioned within the third aperture so as to receive light from the display, wherein the fingerprint sensor has a surface upon which a user's finger is positioned and also has a plurality of detectors that receive light from the display that is reflected off of the finger when the user's finger is positioned on the surface, wherein the plurality of detectors provides an signal indicative of the reflected light, wherein the signal is provided to the controller so that the controller can thereby determine whether the user is an authorized user of the personal electronic device.

In an additional aspect, the invention comprises a touch screen assembly for a personal electronic device, the touch screen comprising: a light source; a touch screen surface that receives light from the light source; and a plurality of detectors wherein the plurality of detectors detect changes in the ambient light so as to determine the presence and location of a stylus on the touch screen and wherein the plurality of detectors further detect light that is reflected off of a user's finger that is positioned on the touch screen so as to produce a signal indicative of the user's fingerprint for identification purposes.

In yet another aspect, the invention comprises a touch screen for a personal electronic device, the touch screen comprising: a light source; a touch screen surface that is light transmissive and receives light from the light source; and a first plurality of detectors wherein the first plurality of detectors detect changes in the ambient light so as to determine the presence and location of a stylus on the touch screen; a finger print surface that is formed of a light transmissive material so as to transmit light from the light source therethrough; a second plurality of detectors of

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detectors that detect light from the light source that is reflected off of a user's finger that is positioned on the fingerprint surface so as to produce a signal indicative of the user's fingerprint for identification purposes.

In still yet another aspect, the invention comprises a fingerprint detector comprising: a substrate having a first surface; a plurality of contacts that are geographically distributed about a region of the first surface wherein each of the plurality of contacts extend upward from the first surface a first height to an upper surface that has a first linear dimension wherein the first height and the first linear dimension is selected so that when a user's finger is placed on the first surface of the substrate in a first orientation, the ridges of the user's finger positioned adjacent a first set of the upper surfaces of the plurality of contacts physically contact the first set of the plurality of contacts and the grooves of the user's finger positioned adjacent the upper surfaces of a second set of the plurality of contacts are spaced from the upper surfaces of the second set of the plurality of contacts; a distributed light emitting element positioned adjacent the plurality of contacts so as to be electrically connected to each of the plurality of contacts such that when the user's finger is positioned on the region of the first surface in the first orientation, light is emitted from regions of the light emitting element positioned adjacent the first set of the plurality of contacts; a plurality of light detectors positioned within the substrate at locations corresponding to the locations of the plurality of contacts such that a first set of the plurality of light detectors produce electrical signals that correspond to the first set of the plurality of contacts such that an electrical signal indicative of the user's fingerprint is produced.

In a further aspect, the invention comprises a fingerprint detector comprising: a substrate having a first surface; a plurality of contacts that are geographically distributed about a region of the first surface wherein each of the plurality of contacts extend upward from the first surface a first height to an upper surface that has a first linear dimension wherein the first height and the first linear dimension is selected so that when a user's finger is placed on the first surface of the substrate in a first orientation, the ridges of the user's finger positioned adjacent a first set of the upper surfaces of the plurality of contacts physically contact the first set of the plurality of contacts and the grooves of the user's finger positioned adjacent the upper surfaces of a second set of the plurality of contacts are spaced from the upper surfaces of the second set of the plurality of contacts; an organic light emitting diode layer positioned adjacent the plurality of contacts so as to be electrically connected to each of the plurality of contacts such that when the user's finger is positioned on the region of the first surface in the first orientation, light is emitted from regions of the light emitting element positioned adjacent the first set of the plurality of contacts; a plurality of light detectors positioned within the substrate at locations corresponding to the locations of the plurality of contacts such that a first set of the plurality of light detectors produce electrical signals that correspond to the first set of the plurality of contacts such that an electrical signal indicative of the user's fingerprint is produced.

In a still further aspect, the invention comprises fingerprint sensor comprising: a substrate defining a first surface that is adapted to receive a user's finger wherein the substrate is formed at least partially of a light transmitting material; a light source positioned with respect to the substrate so as to permit light to travel therethrough; a plurality of detectors positioned with respect to the substrate so as to receive a reflected light pattern emanating through the substrate when the user's finger is positioned on the first surface and wherein the plurality of

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detectors produce an electrical signal indicative of the reflected light pattern; and a grounding mechanism coupled to the first surface of the substrate such that electrical potential arising from electrostatic charge differences between the first surface and the user as a result of the user's finger being positioned on the first surface is reduced to thereby reduce the influence of the electrostatic charge on the plurality of detectors.

In an additional aspect, the invention comprises a fingerprint sensor coupled to a system such that the fingerprint sensor permits access to the system to authorized users, the fingerprint sensor comprising: a substrate defining a first surface that is adapted to receive a user's finger wherein the substrate is at least partially formed of a light transmitting material; a light source positioned with respect to the substrate so as to permit light to travel therethrough; a plurality of detectors positioned with respect to the substrate so as to receive a reflected light pattern emanating through the substrate when the user's finger is positioned on the first surface and wherein the plurality of detectors produce an electrical signal indicative of the reflected light pattern; and a finger characteristic detector that is engaged with the first surface of the substrate that obtains at least one characteristic of the user's finger when the user's finger is positioned on the first surface and compares the at least one characteristic to a pre-determined criteria to thereby determine whether the user's finger is a live finger to thereby hinder fraudulent access to the system.

In yet an additional aspect, the invention comprises a fingerprint sensor coupled to a system such that the fingerprint sensor permits access to the system to authorized users, the fingerprint sensor comprising: a substrate defining a first surface that is adapted to receive a user's finger wherein the substrate is at least partially formed of a light transmitting material; a light source positioned with respect to the substrate so as to permit light to travel therethrough; a plurality of detectors positioned with respect to the substrate so as to receive a reflected light pattern emanating through the substrate when the user's finger is positioned on the first surface and wherein the plurality of detectors produce an electrical signal indicative of the reflected light pattern; an impedance measurement circuit coupled to the first surface such that when the user positions their finger on the first surface, the impedance of the finger is measured and a signal indicative thereof is produced; an evaluation device that receives the impedance measurement signal from the impedance measurement circuit wherein the evaluation device determines whether the impedance measurement signal is indicative of a live finger and provides an evaluation signal indicative thereof such that the system can use the evaluation signal to limit access to inhibit unauthorized access to the system.

In another aspect, the invention comprises a fingerprint sensor comprising: a substrate defining a first surface that is adapted to receive a user's finger wherein the substrate is formed at least partially of a light transmitting material; a light source positioned with respect to the substrate so as to permit light to travel therethrough; a plurality of detectors positioned with respect to the substrate so as to receive a reflected light pattern emanating through the substrate when the user's finger is positioned on the first surface and wherein the plurality of detectors produce an electrical signal indicative of the reflected light pattern; and a grounding mechanism coupled to the first surface of the substrate such that electrical potential arising from electrostatic charge differences between the first surface and the user as a result of the user's finger being positioned on the first surface is reduced to thereby reduce the influence of the electrostatic charge on the plurality of detectors.

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In yet another aspect, the invention comprises a fingerprint sensor coupled to a system such that the fingerprint sensor permits access to the system to authorized users, the fingerprint sensor comprising: a substrate defining a first surface that is adapted to receive a user's finger wherein the substrate is at least partially formed of a light transmitting material; a light source positioned with respect to the substrate so as to permit light to travel therethrough; a plurality of detectors positioned with respect to the substrate so as to receive a reflected light pattern emanating through the substrate when the user's finger is positioned on the first surface and wherein the plurality of detectors produce an electrical signal indicative of the reflected light pattern; and a finger characteristic detector that is engaged with the first surface of the substrate that obtains at least one characteristic of the user's finger when the user's finger is positioned on the first surface and compares the at least one characteristic to a pre-determined criteria to thereby determine whether the user's finger is a live finger to thereby hinder fraudulent access to the system.

In still yet another aspect, the invention comprises a fingerprint sensor coupled to a system such that the fingerprint sensor permits access to the system to authorized users, the fingerprint sensor comprising: a substrate defining a first surface that is adapted to receive a user's finger wherein the substrate is at least partially formed of a light transmitting material; a light source positioned with respect to the substrate so as to permit light to travel therethrough; a plurality of detectors positioned with respect to the substrate so as to receive a reflected light pattern emanating through the substrate when the user's finger is positioned on the first surface and wherein the plurality of detectors produce an electrical signal indicative of the reflected light pattern; an impedance measurement circuit coupled to the first surface such that when the user positions their finger on the first surface, the impedance of the finger is measured and a signal indicative thereof is produced; an evaluation device that receives the impedance measurement signal from the impedance measurement circuit wherein the evaluation device determines whether the impedance measurement signal is indicative of a live finger and provides an evaluation signal indicative thereof such that the system can use the evaluation signal to limit access to inhibit unauthorized access to the system.

Brief Description of the Drawings

These and other aspects, advantages, and novel features of the invention will become apparent upon reading the following detailed description and upon reference to the accompanying drawings. In the drawings, same elements have the same reference numerals in which:

Figure 1 shows an overview of an optical image sensor system;

Figure 2 shows an embodiment of an optical module;

Figure 3A shows a side view of a first embodiment of an optical module;

Figure 3B shows a side view of a second embodiment of an optical module;

Figure 4 shows a side view of a third embodiment of an optical module;

Figure 5 shows upper layers of an optical module with a fingertip placed on a top surface;

Figure 6 shows a section of the upper layers shown in Figure 5 with a ridge of a fingertip covering a photosensitive pixel;

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Figure 7 shows a section of the upper layers shown in Figure 5 with a valley of a fingertip located above a photosensitive pixel;

Figure 8 shows a schematic circuit diagram of a matrix of photosensitive pixels comprising diodes;

Figures 8A and 8B show timing diagrams of address and detector voltages;

Figure 9 shows a schematic circuit diagram of a matrix of photosensitive pixels comprising transistors;

Figures 10A-10D show timing diagrams illustrating operation of the circuit shown in Figure 9;

Figure 11 shows an embodiment of fingerprint sensing system;

Figure 12 shows a flow chart of a read-out procedure;

Figure 13 shows a block diagram of a driver module;

Figure 14 shows an embodiment of an optical module having photodetectors and light sources located within one layer;

Figure 15 shows a first embodiment of a photodetector of a pixel;

Figure 15A shows a second embodiment of a photodetector of a pixel;

Figure 16 shows an exemplary topography of a pixel layout;

Figure 17 shows an embodiment of an optical module that comprises an optical lens;

Figure 17A shows an embodiment of a light source of a pixel;

Figure 18 shows a first embodiment of a light source;

Figure 19 shows a second embodiment of a light source;

Figure 20 shows an embodiment of an optical module that comprises a reflector and an optical lens;

Figure 21 shows a further embodiment of an optical module;

Figure 22 shows an embodiment of an optical module that comprises a fiber optic bundle;

Figure 23 illustrates a fingerprint sensor in accordance with one aspect of the present invention;

Figure 24 is a perspective view of a fingerprint sensor showing the contact surface on which a finger is placed;

Figure 25 illustrates an exemplary transmittance spectrum for color-filters in red, green, and blue;

Figure 26 illustrates an exemplary emission spectrum for a sensor backlight panel;

Figure 27 is a perspective view of an optical detector comprising an optical array of pixels;

Figure 28 illustrates a cross-sectional view of an optical sensor in accordance with one aspect of the present invention;

Figure 29 illustrates an exemplary optical responsivity of an amorphous-silicon p-i-n photodiode;

Figure 30 is a flowchart detailing a method for sensing a fingerprint;

Figure 31A-C illustrate additional embodiments of the fingerprint sensor;

Figure 32A-C illustrate additional embodiments of the fingerprint sensor;

Figure 33A-B illustrate a fingerprint sensor attached to a printed circuit board;

Figure 34A-B illustrate the illumination of a fingerprint surface using exemplary modes of lighting;

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Figure 35 illustrates an exemplary sensor that uses selective reflection to render the fingerprint surface;

Figure 36A-C illustrate a side injected lighting apparatus for the fingerprint sensor;

Figure 37A-B illustrate a bottom injected lighting apparatus for the fingerprint sensor;

Figure 38A-C illustrate a tactile fingerprint sensor in accordance with one aspect of the present invention;

Figure 39 illustrates another tactile fingerprint sensor in accordance with one aspect of the present invention;

Figure 40A-B illustrate a fingerprint sensor used in conjunction with a multifunction OLED screen;

Figure 41 illustrates another embodiment of fingerprint sensor 930 integrated into the multifunction OLED screen;

Figure 42A-B illustrate an OLED fingerprint sensor with an integrated color filter;

Figure 43A-B illustrate fingerprint sensor with an OLED backlight;

Figure 44A-B illustrate an exemplary application of the fingerprint sensor integrated into an identification card;

Figure 45 illustrates a laptop-computing device with integrated fingerprint sensor;

Figure 46 illustrates a Personal Digital Assistant (PDA) device with integrated fingerprint sensor;

Figure 47 illustrates a passive matrix liquid crystal display with integrated fingerprint sensor;

Figure 48 illustrates an active matrix liquid crystal display device with integrated fingerprint sensor;

Figure 49 is a cross-sectional representation of a liquid crystal display apparatus with integrated fingerprint sensor;

Figure 50 is a flow chart showing the operation of one embodiment of the present invention;

Figure 51 is a block diagram illustrating one embodiment of a fingerprint sensor;

Figure 52 is a top view of a fingerprint sensor with an optically transparent protective layer for shunting ESD;

Figure 53 is a top view of a finger print sensor with an optically transparent protective layer with secondary conductive metal foil for shunting ESD;

Figure 54A illustrates a sample fingerprint image sensed by a sensor without an optically transparent conductive layer;

Figure 54B illustrates a sample fingerprint image sensed by a fingerprint sensor with an optically transparent conductive protective layer;

Figure 55 is a circuit diagram of one embodiment of a live finger detection system;

Figure 56 is a circuit diagram of another embodiment of a live finger detection system;

Figure 57 is a top view of one embodiment of a finger contact;

Figure 58A is a side section view of another embodiment of a finger contact;

Figure 58B is a side section view of the finger contact of Figure 57;

Figure 59 is a flow chart showing the operation of one embodiment of the present invention.

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Detailed Description of the Preferred Embodiment

Figure 1 shows an exemplary embodiment of an optical image sensor system 1003. The optical image sensor system 1003 generates an electronic signal in response to an object that is placed on an optical module 1001. The electronic signal may indicate the presence of the object or correspond to an electronic representation of a surface of the object. In one embodiment, the object is a pencil-like pointer used, for example, to select an icon on a touch pad or "write" on the touch pad. In another embodiment, the object is a relief object such as a tip of a person's finger. As is well known, a human fingertip has a surface that forms a unique pattern of ridges and valleys. The structure of the fingertip, or a print caused when the fingertip is placed on a surface is often referred to as a "fingerprint." Hereinafter, this term is generally used to refer to the print caused by the fingertip.

Embodiments of the invention are described with reference, but not limited, to a fingertip as the object placed upon the optical module 1001. In response to the presence of the fingerprint, the optical module 1001 generates in one embodiment the electronic representation ("electronic image" or "digital image") of the fingerprint. The fingerprint resulting from the sensing of the physical fingerprint of the user is referred to as the "sensed" fingerprint to distinguish it from a "stored" fingerprint of an authorized user. As described below in greater detail, if the sensed fingerprint matches the stored fingerprint, the present user is identified as the authorized user.

The illustrated optical image sensor system 1003 further includes a power supply 4, a driver module 1002 and a controller 1006. A connection L1 connects the power supply 1004 to the optical module 1001, and a connection L2 connects the driver module 1002 to the optical module 1001. The controller 1006 is connected to the driver module 1002 and the power supply 1004 through connections L3, L4, respectively. A connection L5 connects the controller 1006, for example, to a processor unit of a host system (not shown).

The host system may be a personal computer (PC), a laptop computer, a cellular phone, a security system, or other equipment installed, for example, in an access-restricted location where high-level security is needed. The host system processes the sensed fingerprint of the present user and matches it with the stored fingerprint of the authorized user. The host system allows full operation of the host system itself, or access to the restricted areas only if the electronic representation of the sensed fingerprint matches the stored fingerprint of the authorized user.

In one embodiment, the optical image sensor system 1003 is an external apparatus that is connectable to a computer (e.g., a desktop computer or a laptop). The computer includes a software program that operates the computer and the optical image sensor system 1003 and performs a matching procedure. In other embodiments, the optical image sensor system 1003 may be implemented, for example, within a computer or a cellular phone. In these embodiments, the optical module 1001 is located so that a user may place a finger on an exposed surface of the optical module 1001. For instance, the optical module may be integrated into a keyboard of a computer or next to the keypad of a cellular phone. Remaining components of the optical image sensor system 1003 are then located within the computer or the cellular phone.

In alternative embodiments the optical image sensor system 1003 may be implemented as a portable, autonomous identification and/or authentication apparatus that includes the components and software to perform the

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matching procedure and to output the result of the matching procedure. For example, the optical image sensor system 1003 may be implemented within a smart or chip card, or a communications module designed in accordance with a specification defined by the Personal Computer Memory Card International Association (PCMCIA). The communications module is, thus, often referred to as a PCMCIA card.

Focusing on an exemplary embodiment of the optical module 1, Figure 2 shows a perspective view of the optical module 1001 to illustrate a general structure of the optical module 1001. In one embodiment, the optical module 1001 includes multiple layers and has a flat, generally rectangular shape with a planar top surface 1015. The optical module 1001 may have a thickness of about 1-2 mm, a length of about 3 cm, and a width of about 2 cm. The top surface 1015 forms an exposed contact area onto which the user places a finger. The contact area is, for example, about 6 cm^2. In other embodiments, the top surface 1015 may have a circular-, oval-, square-like, or any other shape of sufficient size to contact a sufficiently large part of the finger.

Figure 2, as well as the other figures, illustrates the optical module 1001 so that the top surface 1015 and the contact area are horizontal. Terms, such as "top," "bottom," "above," "below," "underneath," or the like, to describe the orientation of an element or a layer of the optical module 1001 are, thus, used with reference to the horizontal orientation of the optical module 1001. Those skilled in the art will appreciate that the optical module 1001 may have another orientation and that the terms then apply correspondingly.

From top to bottom, the optical module 1001 has a detector layer 1010, a substrate layer 1008, and a light source layer 1012. It is contemplated that, in another embodiment, the optical module 1001 may include additional layers (e.g., a surface coating) as shown in Figure 3. The detector layer 1010 includes a plurality of individual, spaced-apart photosensitive areas. Each photosensitive area is a pixel 1014 of an optical array with the pixels 1014 being arranged in M rows and N columns. In one embodiment, the pixel 1014 has M = 315 rows and N = 240 columns. As described below with reference to Figure 5, each pixel 1014 includes in one embodiment a photodetector 1024 and a charge-storing mechanism, for example, an inherent (parasitic) capacitance or a capacitor 1026 electrically coupled to the photodetector 1024 . Each pixel 1014, hence, each photodetector 1024 , can be selected through an address line L_M (row) and a data line L_N (column). To illustrate the array structure of the detector layer 1010, the address lines L_M and the data lines L_N are indicated in the detector layer 1010, but it is contemplated that these lines are for illustrative purposes only and typically not visible. The address lines L_M and the data lines L_N are connected to the connection L2 that connects the optical module 1001 to the driver module 2.

The photosensitive areas are implemented on top of the substrate layer 1008 which is transparent for light emitted by the light source layer 1012. For instance, the photosensitive areas may be deposited directly on the substrate layer 1008. In one embodiment, a rigid substrate such as glass forms the substrate layer 1008. The glass substrate may have a thickness of about 1.1 mm. Other suitable, transparent materials include plastic-like materials.

In the illustrated embodiment, the light source layer 1012 is in direct contact with the substrate layer 8, and connected to the power supply 1004 which provides electrical power for the light source layer 1012. The light source layer 1012 includes a single light source that extends across the glass substrate and illuminates the glass substrate

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evenly. In other embodiments, the light source layer 1012 may include multiple individual light sources located to evenly cover and illuminate the glass substrate, an array emitter including pixelized light sources, or a light source panel such as an electroluminescent panel. The term "light source" is therefore intended to encompass single or multiple light sources or light source panels which may have a variety of configurations. When the light source is activated, light propagates in upward direction through the transparent substrate layer 1008 and the detector layer 1010 to illuminate the top surface 1015. The light source, therefore, functions as a backlight for the top surface 1015 of the optical module 1001.

The light source layer 1012, and thus the light source, may therefore be implemented in a variety of different ways. The light source may be an electroluminescent device, one or more light emitting diodes (LED's), an electroluminescent device, a backlight device, for example, as used for a liquid crystal displays (LCD), or any other light source suitable to illuminate the substrate layer 1008 of the optical module 1001. Generally, the light source is selected to emit light that passes with minimal attenuation through the substrate layer 1008 and the detector layer 1010 to illuminate the top surface 1015 and the fingertip placed onto the top surface 1015 as explained below. In one embodiment, the light is visible and, for example, emitted by an electroluminescent light source.

The electroluminescent light source may be based on inorganic or organic materials. An organic electroluminescent material includes, for example, thin sublimed molecular films such as tris(8-quinolinolato) aluminum (III) commonly known as Alq or light emitting polymers having specialized structures which provide positive and negative charge carriers having high mobilities. The light-emitting polymers include polyphenylene vinylene (PPV), soluble polythiophene derivatives, and polyanilene which may be applied by known coating techniques such as spin or doctor-blade coating. Further details about organic electroluminescent materials are described in J.C. Sturm et al., "INTEGRATED ORGANIC LIGHT EMITTING DIODE STRUCTURES USING DOPED POLYMERS," Proceedings of SID, 1997, pages F-11-F18.

An inorganic electroluminescent material includes a phosphor material in combination with materials such as zinc sulfide:manganese (ZnS:Mn), zinc silicate (Zn_2SiO_4) or zinc gallate ($ZnGaO_4$). In one embodiment, the phosphor, ZnS:Mn material may be dispersed in an insulating dielectric material such as barium titanate ($BaTiO_3$). Other dielectric materials include yttrium oxide, silicon nitride, and silicon oxy-nitride.

In another embodiment, the light source layer 1012 includes an electroluminescent (EL) panel. Such an EL panel is, for example, manufactured by Durel Corporation of Chandler, Arizona, and designated as part number DB5-615B.

Depending on what kind of light source the light source layer 1012 includes, the power supply 1004 provides either a predetermined voltage or a predetermined current to the light source. For instance, EL panels are voltage-controlled devices. A typical operating voltage for an EL panel ranges approximately between 100 volts and 300 volts. Organic LED's, however, are current-controlled devices. A typical operating current density for an organic LED is in the order of milliamperes per cm^2. Further, the kind of light source determines if the power supply 1004 provides an alternating current (AC) or a direct current (DC), or an AC voltage or a DC voltage.

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The light source layer 1012 includes electrodes that are connected to the power supply 1004. In one embodiment, the light source layer 1012 has a transparent electrode that faces the substrate layer 1008, and a bottom electrode. The transparent electrode is, for example, a transparent polymeric material coated with a transparent electrode composition such as indium tin oxide (ITO) or aluminum doped zinc oxide (ZnO:Al). In another embodiment, the transparent electrode composition may include transparent aluminum doped zinc oxide (AZO).

Figure 3A shows an embodiment of the optical module 1001 in greater detail. In addition, Figure 3A shows a portion of a fingertip 1025 placed on top of the surface 1015 and having ridges and valleys. The ridges are separated by the valleys and touch the surface 1015. The illustrated embodiment of the optical module 1001 has the same general structure as the embodiment shown in Figure 2 but shows additional layers. Same elements (layers) have, thus, same reference numerals.

Referring to layers between the top surface 1015 and the detector layer 10, a planarization layer 1020 covers the detector layer 1010 and provides for a planar surface. A planar surface reduces the possibility that undesired residuals remain on the surface of the optical module 1001 and allows easy cleaning of the surface. The planarization layer 1020 is a transparent dielectric insulator and has a thickness of about 1-2 μm. In one embodiment, the dielectric insulator is a non-conducting, transparent polymer such as benzocyclobutene (BCB). Other materials for the planarization layer 1020 (dielectric insulator) include acrylic, epoxy, or polyimide.

Following the planarization layer 1020 , a top layer 1022 covers the planarization layer 1020 . The top layer 1022 is an electrically conducting material and is in one embodiment connected to ground. As the fingertip 1025 is illuminated from within the optical module 1001, the top layer 1022 is also transparent. In one embodiment, the top layer 1022 includes as transparent and conducting material ITO. The top layer 1022 has a thickness of about 1000Å. Although the top layer 1022 completely covers the planarization layer 1020 in one embodiment, it is contemplated that the top layer 1022 may be implemented as a plurality of parallel ITO stripes or as a grid of ITO stripes. An advantage of the conducting top layer 1022 is that any static charge the fingertip 1025 may carry is discharged from the top surface 1015 to ground thereby avoiding electrostatic discharge (ESD) problems.

In another embodiment, the transparent and conducting stripes may be implemented so that a finger detection circuit may be fabricated on top of the planarization layer 1020 . For example, the finger detection circuit may comprise two ITO electrodes spaced apart from each other. When a fingertip is placed over the these ITO electrodes, a current flows between the ITO electrodes via the fingertip. Further details of detecting the finger are described below with reference to Figure 11.

Referring to layers underneath the light source layer 1012, a reflector layer 1016 covers a bottom surface of the light source layer 1012. In one embodiment, the reflector layer 1016 is a thin layer of aluminum which reflects light from the light source layer 1012 back into the light source layer 1012. Because the reflector layer 1016 reflects light back into the light source layer 1012, the efficiency of the light source layer 1012 is improved and a higher light intensity reaches the top layer 1015 and the fingertip 1025 . The layer of aluminum is conductive and, hence, may serve as an electrode for the light source layer 1012. Those skilled in the art will appreciate that other materials that

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have conductive and reflective properties may be used to form the reflector layer 1016. These materials include metals such chromium (Cr), molybdenum (Mo), gold (Au), silver (Ag) and copper (Cu) or alloys including these and other metals.

An insulation layer 1018 covers the reflector layer 1016 and forms in the illustrated embodiment a bottom surface of the optical module 1001. The insulation layer 1018 covers the exposed surface of the reflector layer 1016 and enhances the mirror effect of the reflector layer 1016. In one embodiment, the insulation layer 1018 includes a polymer such as polyester. It is contemplated that other insulating materials such as polyethylene may be used.

Figure 3B shows a further embodiment of an optical module 1001 which comprises layers and elements already introduced in Figure 3A, same layers and elements have, thus, the same reference numerals. Compared to the embodiment of Figure 3A, the order of the detector layer 1010, the light source layer 1012, and the substrate layer 1008 is changed. That is, in Figure 3B, the light source layer 1012 is positioned between the detector layer 1010 and the substrate layer 1008, whereas in Figure 3A the substrate layer 1008 is between the detector layer 1010 and the light source layer 1012. On top of the detector layer 1010, the planarization layer 1020 and the top layer 1022 are implemented which perform the same functions as described above.

In one embodiment, the light source layer 1012 includes a thin-film EL panel and the substrate layer 1008 is a glass substrate. Alternatively, the substrate layer 1008 may be formed by a layer of plastic-like material. With the substrate layer 1008 positioned underneath the light source layer 1012, the substrate layer 1008 may be transparent or opaque. In addition, the material for the substrate layer 1008 may be a rigid or a flexible material.

Figure 4 shows another embodiment of an optical module 1001. From the substrate layer 1008 upward, the structure of the optical module 1001 is as shown in Figure 3A and same elements have the same reference numerals. The illustrated embodiment differs from the embodiment shown in Figure 3A in that a gap 1021 exists between the substrate layer 1008 and the light source layer 1012. The gap 1021 may have a width within a wide range, for example, a few microns or several centimeters. In one embodiment, the gap 1021 includes a transparent medium (e.g., air, plastic).

The light source layer 1012 may be permanently connected to the substrate layer 1008 during manufacturing and is an integral part of the optical module 1001. In another embodiment, however, the light source layer 1012 may be an element separate and independent from the substrate layer 1008 and the remaining layers. As a separate element, the user has an additional degree of freedom and may select a particular kind of light source and position it underneath the substrate layer 1008. Criteria for selecting the light source include, to name a few, size, thickness, light intensity, power consumption and wavelength spectrum of the emitted light. For instance, if the optical module is implemented within a portable, battery-operated device, the optical module 1001 must be as small (thin) as possible and consume as little power as possible. In the same application, however, the light intensity should be as high as possible to sufficiently illuminate the fingertip 1025 .

The term "optical module 1001" as used in this specification is intended to encompass the various embodiments described herein, for example, the embodiments shown in Figures 3A, 3B and the embodiment shown in

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Figure 4 in which the light source layer 1012 may be a separate element. It is contemplated that the optical module 1001 may include only the substrate layer 1008 and the upper layers 1010, 1020 , 1022 , without a light source.

Figure 5 illustrates one embodiment of the detector layer 1010. The detector layer 1010 is implemented on the surface of the substrate layer 1008 and covered by the planarization layer 1020 and the top layer 1022 . For illustrative purposes, the fingertip 1025 is placed on the surface 1015 and two ridges and two valleys are shown. It is contemplated that the Figure 5 is a magnified illustration of the upper layers 1010, 1020 , 1022 of the optical module 1001 and that the size of the fingertip 1025 and the thicknesses of the layers 1010, 1020 , 1022 are not to scale.

The detector layer 1010 includes spaced-apart photosensitive areas 1027 which are distributed over the contact area of the optical module 1001. Each photosensitive area 1027 is part of a pixel 1014 and includes a photodetector 1024 . The bottom portion (or electrode) of the photosensitive areas 1027 are opaque for light originating from the substrate layer 1008. In the illustrated embodiment, a single pixel 1014 includes the photodetector 1024 and a mechanism that stores electrical charge. The pixels 1014 are separated by light barriers 1028 that extend essentially perpendicular with respect to the substrate layer 1008. Between adjacent light barriers 1028 a transparent area 1019 exists. A light barrier 1028 may be formed by a non-conducting opaque material such as a black-matrix material used in liquid-crystal displays (LCDs). In one embodiment, the charge-storing mechanism may be an inherent (parasitic) capacitance of the photodetector 1024 . In another embodiment, the charge-storing mechanism may be a capacitor 1026 . For illustrative purposes, the charge-storing mechanism is hereinafter indicated through a conventional symbol for a capacitor (1026) and the photodetector 1024 is indicated through a conventional symbol for a photodiode. To indicate that the photodetectors 1024 and the charge-storing mechanisms 1026 function in principle as individual elements, the photodetectors 1024 and the charge-storing mechanisms 1026 are illustrated as neighboring elements. It is contemplated that each photodetector 1024 is electrically associated with one charge-storing mechanism 1026 .

The photodetectors 1024 are in one embodiment pin photodiodes. In another embodiment, the photodetectors 1024 are thin film transistors (TFT) each having terminals referred to as gate, drain and source, wherein the gates are photosensitive areas. The pin photodiodes and the TFT photodetectors, respectively, are manufactured through conventional process technologies typically used to manufacture such photosensitive elements. In case the charge-storing mechanism 1026 includes a capacitor, the capacitors (1026) are often manufactured during essentially the same manufacturing process as the photodetectors 1024 . As known in the art, photodetectors are sensitive to incident light. When the intensity of the incident light changes, an internally generated current changes. The current that flows when no light is incident is commonly referred to as a "darkcurrent" and the current that flows when light is incident is referred to as a "photocurrent."

Figure 6 illustrates a magnified section of the detector layer 1010 shown in Figure 5. To illustrate the operation of the optical module 1001, the detector layer 1010 includes photodiodes or phototransistors as photodetectors 1024 and capacitors as charge-storing mechanisms 1026 . A ridge of the fingertip 1025 is shown

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covering one pixel 1014. It is contemplated that a ridge of a typical finger may cover about five pixels. Light originating from the light source layer 1012 is indicated through dashed lines. Referring to the covered pixel 1014, the photodetector 1024 and the light barrier 1028 are opaque for the light used and light does not pass through the photodetector 1024 and the light barrier 1028 . Light originating from the light source layer 1012 passes through the transparent areas 1019 between the light barriers 1028 and illuminates the fingertip 1025 . As illustrated, the light illuminates the ridge which is located immediately above the area 1019 . However, as the ridge covers the photodetector 1024 and the area 1019 most of the photons are blocked by the ridge and do not reach the photodetector 1024 . Consequently, only a very small or no photocurrent is generated and the area above the photodetector 1024 is represented as a dark pixel. If a digital signal processing is used, the states "no photocurrent" and "dark pixel" may be represented through a logic state "LOW."

Figure 7 illustrates a magnified section of the detector layer 1010 with a valley located above the pixel 1014. The detector layer 1010 includes also photodiodes or phototransistors as photodetectors 1024 and capacitors as charge-storing mechanisms 1026 . As illustrated, light does not pass through the capacitor 1026 and the photodetector 1024 , but passes through the transparent areas 1019 and enters into a cavity formed between the valley and the top surface 1015. Light that enters the cavity is randomly reflected at the surface of the cavity. Some of the reflected light is incident upon the photodetector 1024 and generates a photocurrent. In this case, the area above the photodetector 1024 is represented as a bright pixel. The states "photocurrent" and "bright pixel" may be represented through a logic state "HIGH."

The light source layer 1012 functions as a backlight that illuminates the fingertip 1025 from within the optical module 1001. The backlight illumination allows that the optical module 1001 and, hence, the optical sensor system 1003 reliably generate a digital image of the fingerprint regardless if the user has a wet, oily or dirty finger. These surface characteristics of the user's finger are usually transparent for the used light and do not influence the path of the light. Light, therefore, enters the cavity and is reflected from the valleys back into the optical module 1001.

Figure 8 shows a schematic circuit diagram of a matrix of the photosensitive pixels 1014. For ease of illustration, only circuit diagrams of four pixels 1014 are shown in greater detail. Each pixel 1014 includes one photodetector 1024 and one switching element 1023 and is connected to a data line L_N, L_{N-1} and an address line L_M, L_{M-1}. It is contemplated that N and M are positive integers. In the illustrated embodiment, the photodetector 1024 is a photodiode, for example, a pin photodiode, and the switching element 1023 is a switching diode, each having an anode and a cathode. The photodetector 1024 is hereinafter referred to as the photodiode 1024 .

As each pixel 1014 has the same structure, one embodiment of the pixel array is described hereinafter with reference to the pixel 1014 that is connected to the address line L_M and the data line L_N. The photodiode 1024 and the switching diode 1023 are connected in series with the cathode of the switching diode 1023 connected to the address line L_M and the cathode of the photodiode 1024 connected to the data line L_N. The anodes of the diodes 1023 , 1024 are thus connected.

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The address lines L_M, L_{M-1} are connected to a power supply 1038. The power supply 1038 receives a control signal CTRL1 from a central processor (not shown) which controls the operation of the power supply 1038. As a function of the control signal CTRL1, the power supply 1038 selectively provides an address voltage V_A having predetermined voltage levels of predetermined durations to the address lines L_M, L_{M-1} and, thus, to the cathodes of the individual switching diodes 1023 .

The data lines L_N, L_{N-1} are connected to amplifiers 1032 and convey in operation data voltages V_D to the amplifiers 1032 . The amplifiers 1032 are in one embodiment charge-sensitive amplifiers. Outputs of the amplifiers 1032 are connected to a multiplexer 1037 having an output 1035 . The output 1035 is connected to a signal processing unit, for example, an analog-to-digital (A/D) converter if the subsequent signal processing is in digital form. The central processor may control the one or more multiplexers.

Figures 8A and 8B show timing diagrams, i.e., DC voltages as a function of the time t, illustrating the operation of the circuit shown in Figure 8. In operation, as shown in Figure 8A, the power supply 1038 addresses the address lines L_M periodically with an address voltage V_A. At t = T1, the address voltage V_A changes from a low-voltage level L0, for example, about 0 volts, to a higher-voltage level L1, for example, about 4-5 volts, and returns to the level L0 at t = T2. The period between t = T1 and t = T2 is referred to as "pulse duration." At t = T3, the address voltage V_A changes again from the low-voltage level L0 to the higher-voltage level L1, and returns to the low-voltage level L0 at t = T4.

During the pulse duration, the switching diode 1023 is forward biased and a forward-bias current flows through the switching diode 1023 . The forward-bias current charges an inherent (parasitic) capacitance of the photodiode 1024 . Following t = T2, i.e., following the falling edge of the address voltage V_A the switching diode 1023 and the photodiode 1024 are reverse biased.

Between two consecutive pulses, i.e., between t = T2 and t = T3, when the pixel 1014 is illuminated, the capacitance of the photodiode 1024 is discharged by the photocurrent generated in the photodiode 1024 . This amount of charge is detected during the following pulse when the photodiode 1024 is charged back to its original value, as explained with reference to Figure 8B.

Figure 8B shows the data voltage V_D between t = T1 and t = T4 for two different illuminations I1, I2, with $I1 < I2$. The higher illumination I2 generates a higher photocurrent than the lower illumination I1. A high photocurrent discharges the capacitance of the photodiode 1024 faster than a relative low photocurrent. Hence, at the illumination I2, the data voltage V_D is lower at t = T1 and t = T3 than at the illumination I1. As illustrated, at these instances t = T1 and t = T3 the data voltage V_D is at a level L0, e.g., zero volt, at the illumination I2, and at a level L2, e.g., about 1 volt, at the illumination I1. The amplifiers 1032 detect the amount of charge that is necessary to re-charge the capacitance of the photodiode 1024 .

As the data voltage V_D for the illumination I2 is lower than the data voltage V_D for the illumination I1 at the beginning of the rising edge of the address voltage V_A, a higher amount of charge is necessary to re-charge the capacitance of the photodiode 1024 at the illumination I2. The amount necessary for the re-charging is, thus, an

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indication if a pixel 1014 was exposed to light reflected from the valley of the finger 1009. As illustrated, the voltage V_D increases within the pulse duration from the level L0 or the level L2, respectively, to a level L3. The level L3 may be at a voltage of about 5 volts.

Figure 9 shows a schematic circuit diagram of a further embodiment of a matrix of the photosensitive pixels 1014. For ease of illustration, only circuit diagrams of three pixels 1014 are shown in greater detail. Each pixel 1014 includes one photodetector 1024 , a switching transistor 1030 , and one capacitor 1026 . As in Figure 8, each pixel 1014 is connected to a data line L_N, L_{N-1} and an address line L_M, L_{M-1}. It is contemplated that N and M are positive integers. In the illustrated embodiment, the photodetector 1024 and the switching transistor 1030 are thin film field effect transistors having terminals referred to as drain D, gate G and source S. The photodetector 1024 (hereinafter referred to as the phototransistor 1024) has a photosensitive area that generally exists in an area defined by the gate G.

As each pixel 1014 has the same structure, one embodiment of the pixel array is described hereinafter with reference to the pixel 1014 that is connected to the address line L_M and the data line L_N. Referring to the phototransistor 1024 , the drain D and the gate G are both connected to a power line 1041 which connects the phototransistor 1024 to a voltage supply 1043 . The source S of the phototransistor 1024 is connected to the source S of the switching transistor 1030 and a terminal of the capacitor 1026 which has a further terminal that is grounded. The drain D of the switching transistor 1030 is connected to the data line L_N and the gate G of the switching transistor 1030 is connected to the address line L_M.

In use, the voltage supply 1043 provides a voltage of about -5 volts to the phototransistor 1024 . In one embodiment, the voltage supply 1043 provides the voltage only during the period the light source 1012 is active. In another embodiment, the voltage supply 1043 provides the voltage continuously. When the pixel 1014 is exposed to light, the (powered) phototransistor 1024 generates a photocurrent that charges the capacitor 1026 as a function of time and light incident on the phototransistor 1024 causes a voltage V_C across the capacitor 1026 . While the phototransistor 1024 is exposed to light, the switching transistor 1030 is not conducting and the photocurrent charges the capacitor 1026 .

The address lines L_M, L_{M-1} are connected to a power supply 1038a. The power supply 1038a receives a control signal CTRL3 from a central processor (not shown) which controls the operation of the power supply 1038a. As a function of the control signal CTRL3, the power supply 1038a selectively provides predetermined voltage levels of a predetermined duration to the address lines L_M, L_{M-1} and, thus, to the gates G of the individual switching transistors 1030 .

The data lines L_N, L_{N-1} are connected to switches 1036. In the illustrated embodiment, each switch 1036 has two positions A, B, and receives a control signal CTRL2 that sets the switch 1036 to one of the positions A, B. In position A the data line L_N is connected to ground, and in position B the data line L_N is connected to an electrical circuit including an amplifier 1145 and a grounded capacitor 1034 . The circuit has an output 1146 for a voltage V_R.

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It is contemplated that the switch 1036 assigned to the data line L_{N-1} has also two positions A, B and is likewise connected to an electrical circuit and ground.

It is contemplated that instead of having one electrical circuit for each data line L_N, L_{N-1}, a multiplexer may be interposed to reduce the number of amplifier circuits. For instance, a multiplexer may be assigned to several data lines L_N, L_{N-1} with an output of the multiplexer connected to the electrical circuit. The central processor may control the one or more multiplexers.

The operation of the circuit is explained with reference to the timing diagrams shown in Figures 10A-10D. Figure 10A shows the address voltage V_A output by the power supply 1038a and applied to the address line L_M and the gate G of the switching transistor 1030 . Figure 10B shows a voltage V_L operating the light source layer 1012 of the optical module 1. The voltage V_L indicates periods during which the light source layer 1012 emits light and during which the light source layer 1012 is dark. Figure 10C shows the voltage V_C across the capacitor 1026 , and Figure 10D shows the voltage V_R across the capacitor 1034 .

Referring to Figure 10A, at t = T1, the address voltage V_A changes from a level L0 to a level L1 and returns to the level L0 at t = T2. The period between t = T1 and t = T2 is referred to as "reset cycle." At t = T1, the switch 1036 is in the position A connecting the data line L_N to ground. In one embodiment, the address voltage V_A is approximately between 10 volts and 15 volts. The address voltage V_A which is applied to the gate G turns the switching transistor 1030 on and any charge stored on the capacitor 1026 flows from the capacitor 1026 through the switching transistor 1030 (drain-source path), the data line L_N and the switch 1036 (position A) to ground. During the reset cycle, the capacitor 1034 is also connected so that any charge is discharged to ground.

As shown in Figure 10B, the voltage V_L changes from the level L0 to the level L1 at t = T1 and activates the light source layer 12. At t = T3 (with T3 > T2), the voltage V_L returns to the level L0 deactivating the light source layer 12. Hence, in one embodiment, the light source layer 1012 emits light during the reset cycle.

Referring to Figures 10A and 10B, with the electrical circuit and the pixel 1014 being reset, the pixel 1014 is enabled to detect light. The period between T2 and T3 is referred to as a "detect cycle" and a corresponding operational state of the optical module 1001 is referred to as "detect mode." During the detect cycle, the light source layer 1012 is active and the switching transistor 1030 is turned off. The phototransistor 1024 is reverse biased and sensitive to incident light. If no light is incident, the conductivity of a channel existing between the drain D and source S is low and the channel conducts only a minimum current which is commonly referred to as the "dark current."

Assuming light is incident to the gate area of the phototransistor 1024 , for example, because a valley of the fingerprint is above the pixel 1014 (see Figure 7), charge carriers are generated and the conductivity of the channel increases. The generated charge carriers superimpose with the dark current forming a current commonly known as a the "photo current." If a ridge of the fingerprint covers the gate area of the transistor 1024 , no light is incident and only the dark current flows.

If light is incident, the photocurrent charges the capacitor 1026 during the detect cycle and the voltage V_C across the capacitor 1026 changes as a function of time as shown in Figure 10C. As the capacitor 1026 has been

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discharged during the reset cycle, the voltage V_C is approximately zero before the charging of the capacitor 1026 begins at t = T2. The voltage V_C increases in accordance with a conventional charge function of a capacitor until the light source layer 1012 is turned off at t = T3. The capacitor 1026 stores the charge and the voltage V_C remains essentially unchanged after the light source layer 1012 has been turned off.

After the detect cycle, the pixel 1014 stores information which indicates if a ridge or a valley is present above the pixel 1014. It is contemplated that every pixel 1014 of the optical module 1001 stores information after a detect cycle and the information together represent the relief structure of the fingerprint. In order to make the information available for a subsequent electronic processing, the information needs to be read during a "read cycle" and a corresponding operational state of the optical module 1001 is referred to as "read mode."

The read cycle is initiated through applying a positive pulse to the gate G of the switching transistor 1030 . As shown in Figure 10A, the address voltage V_A changes from level L0 to level L1 at t = T4 and returns to level L0 at t = T5. During the read cycle the switch 1036 is in position B connecting the data line L_N to the amplifier 1045 . Further, the light source layer 1012 is deactivated (V_L = 0 in Figure 10B) during the read cycle.

The positive address voltage V_A activates the switching transistor 1024 as during the reset cycle described above. The activated switching transistor 1024 closes a path from the capacitor 1026 to the amplifier 1045 and a read-out current flows discharging the capacitor 1026 . The amplifier 1045 and the capacitor 1034 are connected to form an integrator. The read-out current charges the capacitor 1034 causing the voltage V_R. Figure 10D illustrates the voltage V_R as a function of time. The voltage V_R increases during the read cycle, i.e., between t = T4 and t = T5, up to the level L1 and remains essentially constant at this level L1 thereafter. In the illustrated embodiment, the capacitor 1034 is discharged at t = T6 and the voltage V_R drops to the level L0.

In one embodiment, the amplifier 1045 and the capacitor 1034 are part of the driver module 1002 (Figure 1). The amplifier 1045 and the capacitor 1034 are controllable by the controller 1006. At the end of the read cycle, the controller 1006 "polls" the capacitor 1034 at regular polling instances to determine the voltage V_R at these polling instances. If the voltage V_R has the level L1, the controller 1006 interprets this as "valley above pixel 1014." If the voltage V_R has the level L0 at a polling instance, the controller 1006 interprets this as "ridge above pixel 1014." By polling all pixels 1014 of the optical module 1001 in the same manner, the controller 1006 creates the electronic representation of the fingerprint.

Figure 11 shows a further embodiment of an optical image sensor system 1003'. The system 1003' generally corresponds to the system 1003 shown in Figure 1. Same components have therefore the same reference numerals. The optical module 1001 is illustrated in a perspective view with a finger 1009 placed on the surface 1015 of the optical module 1001. The optical module 1001 includes a contact pad 1011 at the surface 1015, and a sensor module 1007 is connected to the contact pad 1011. Like the driver module 1002 and the power supply 1004, the sensor module 1007 is connected to the controller 1006.

The sensor module 1007 and the contact pad 1011 are configured to detect if the finger 1009 is placed on the optical module 1001. When placed on the optical module 1, the finger 1009 closes an electrical loop and a current

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flows across the finger surface. In one embodiment, the sensor module 1007 is a current sensor that detects if the finger 1009 is present. In other embodiments, the sensor module 1007 may be a voltage sensor that determines a voltage across a resistor, or a sensor that determines the conductivity of the loop.

The contact pad 1011 may be implemented in various ways. For instance, the contact pad 1011 may be a circular contact element (contact ring) that surrounds the area where the finger 1009 is placed, or the contact pad 1011 may include several independent pads located in the plane of the surface 1015. When the finger 1009 is placed, a current flows, for example, between the contact ring, the finger surface, and the grounded surface of the optical module 1001. In another embodiment, the contact pad 1011 may have several first electrodes and several second electrodes connected to the sensor module 1007, wherein the first and second electrodes are interdigited. The finger 1009 connects the first and second electrodes and, hence, closes the loop.

Figure 12 is a flow chart illustrating a procedure of operating the optical module 1001 of the optical image sensor system 1003' shown in Figure 11. The procedure is described with reference to the detector array that includes the switching transistors 1030 and the phototransistors 1024 . It is contemplated that a similar procedure is executed when the detector array includes the switching diodes 1023 and the photodiodes 1024 . The procedure is initialized in step 1100 in which the controller 1006 may conduct a self-test to determine, among others, if the driver module 1002, the power supply 1004 and the optical module 1001 are properly connected and operable.

Proceeding to steps 1104 and 108, the controller 1006 determines if the sensor module 1007 detects a current that flows between the contact pad 1011 and the surface 1015 of the optical module 1001. In step 1108, if the sensor module 1007 does not detect a current, the procedure returns along the NO branch to step 1104 . As long as the sensor module 1007 does not detect a current, the controller 1006 disables a further execution of the procedure because the finger 1009 is not present. However, if the sensor module 1007 detects a current, the controller 1006 determines that the finger 1009 is present and the procedure proceeds along the YES branch to step 1112 . It is contemplated that the steps 1104 and 1108 are optional and are omitted in systems, like the optical image sensor system 1003 shown in Figure 1, that do not include a sensor module 1007.

Proceeding to step 1112 , the controller 1006 resets the optical module 1001 to prepare capturing of the fingerprint caused by the finger 1009. For instance, the controller 1006 applies the positive voltage V_A to the gates G of the switching transistors 1030 to reset the capacitors 1026 during the reset cycle. It is contemplated that in step 1112 and the following steps, the controller 1006 operates the switches 1036 as described with reference to Figures 10A-10D and no specific reference to the positions A, B of the switches 1036 is made hereinafter.

Proceeding to step 1116 , the controller 1006 controls the power supply 1004 to activate the light source layer 1012. The activated light source layer 1012 illuminates the surface 1015 of the optical module 1001. As shown in Figures 10A, 10B, the light source layer 1012 is activated at the beginning of the reset cycle (t = T1).

Proceeding to step 1120, the controller 1006 operates the driver module 1002 to apply a positive voltage V_D (level L1) to the data lines L_N, L_{N-1} and thus to the drains D of the switching transistors 1030 . During this detect cycle, the phototransistors 1024 which are covered by ridges do not generate photocurrents and the capacitors 1026

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are not charged. However, those phototransistors 1024 , which are not covered by ridges, generate photocurrents that charge the capacitors 1026 . Figure 10D illustrates the charging of the capacitors 1026 as a function of time.

Proceeding to step 1124 , the controller 1006 operates the driver module 1002 to read the information stored on the capacitors 1026 . With the voltages V_A and V_L and switches 1036 properly set, conductive paths exist between the capacitors 1026 and the amplifiers 1032 and the capacitors 1034 . Those capacitors 1026 , which have been charged by the photocurrents, are sources for discharge currents that the amplifiers 1032 and the capacitors 1034 integrate. If the voltage V_R of a capacitor 1034 is at the level L1, a valley was placed over the pixel 1014 and, correspondingly, if the voltage V_R is at the level L0, a ridge covered the pixel 1014.

During the read cycle, the controller 1006 determines the values of the voltages V_R of the capacitors 1034 . In their entirety, these values represent a digital representation of the fingerprint. The controller 1006 can evaluate the representation and determine the quality of the representation, for example, if the fingerprint image is too bright or too dark, or if the exposure time needs to be increased or decreased. In any case, the controller 1006 may adjust the intensity of the light emitted by the light source layer 1012 by controlling the voltage and/or the duration of the voltage supplied to the light source layer 1012.

Because of this adjustment process, the steps 1112 -1124 may be repeated as indicated in step 1128 . In one embodiment, the procedure returns along the YES branch to step 1112 three times in order to generate four representations of the fingerprint images. For instance, the representations are generated at a rate of four representations per second. When the fourth representation is generated the procedure proceeds along the NO branch to step 1132.

In step 1132 , the final representation of the fingerprint image is captured and stored in a storage device. The storage device may be accessed by a matching unit, which compares the captured representation of the present fingerprint with a stored fingerprint of the owner. The matching unit may be located within the controller 1006 or within the host system. The procedure ends at step 1136 .

Figure 13 shows a block diagram of a driver module 1002 which may be configured for use with the electrical circuits shown in Figure 8 and Figure 9. The driver module 1002 is associated with the N address lines L_N, L_{N-1} (rows) and M data lines L_M, L_{M-1} (columns) of the optical module 1. In the illustrated embodiment, the driver module 1002 includes components which are already shown in Figure 8 and Figure 9. That is, for example, a multiplexer 1008 corresponds to the multiplexer 1037 of Figure 8, and an input amplifier module 1140 includes the amplifiers 1032 shown in Figure 8.

The input amplifier module 1140 has N inputs and N amplifiers to connect to the data lines L_N, L_{N-1}. The N amplifiers of the input amplifier module 1140 operate as charge sense amplifiers to determine the charge necessary to re-charge the capacitance of the photodiode 1024 (Figure 8B). The input amplifier module 1140 has N outputs which are connected to inputs of the multiplexer 1142 . The multiplexer 1142 has an output 1143 which is connected to an input of an analog-to-digital (A/D) converter 1144 . An output of the A/D converter 1144 is connected to a control logic 1146 .

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The control logic 1146 is connected to an interface 1148 which has an output 1149 for a signal DATA and which is connected to the controller 1006. The control logic 1146 is further directly connected to the controller 1006 to receive a control signal CTRL that the control logic 1146 uses to generate individual control signals. Control lines 1154, 1156, 1158 connect the control logic 1146 to the input amplifier module 1140 , the multiplexer 1142 , and the A/D converter 1144 , respectively. For instance, the individual control signals include a control signal to set an amplification factor of the input amplifier module 1140, and timing control signals to clock the multiplexer 1142 and the A/D converter 1144 .

The driver module 1002 further includes a column driver 1150 and a row driver 1152. The column driver 1150 may be disabled when used in combination with the circuit of Figure 8. A control line 1160 connects the column driver 1150 and the control logic 1146, and a control line 1162 connects the row driver 1152 and the control logic 1146 . In one embodiment, the column driver 1150 has N outputs connected to the switches 1036, and generates N control signals CTRL2, one for each switch 1036, to operate the switches 1036 between the positions A, B.

In the illustrated embodiment, the row driver 1152 has an output which is connected to the power supply 1038, 1038a. The output provides the control signal CTRL1, CTRL2 which controls the power supply 1038, 1038a to drive the address lines L_M with the voltage V_A. It is contemplated that in another embodiment the row driver 1152 may have M outputs to directly drive each address line L_M. In this case, the row driver 1152 includes a power supply corresponding to the power supply 1038, 1038a.

The driver module 1002 is in one embodiment implemented as an application specific integrated circuit (ASIC), for example, in CMOS technology. Those skilled in the art will appreciate that the driver module 1002 may also be implemented, for example, in hybrid technology using discrete components. Further, those skilled in the art will appreciate that in other embodiments the structure of the illustrated driver module 1002 may be modified although the general function of the driver module 1002 is maintained.

Figure 14 shows another embodiment of an optical module 1001'. The fingertip 1025 is placed on the surface 1015, wherein a ridge covers a pixel 1014a and a valley is located above a neighboring pixel 1014b. The pixels 1014a, 1014b are representatives of the pixels 1014 of the optical module 1001', which have the same structure as the pixels 1014a, 1014b. The general structure of the pixels 1014 is described with reference to the pixel 1014a.

The optical module 1001' has a multiple layer structure. In the illustrated embodiment, four layers 1008', 1010', 1020 , 1022 are shown, wherein the layers 1020 , 1022 are the planarization layer 1020 and top layer 1022 , respectively, described with reference to Figure 3. The planarization layer 1020 covers an active layer 1010', which is implemented on a substrate layer 1008'. Within the active layer 1010', the pixels 1014, 1014a, 1014b are implemented. The active layer 1010' also includes conductor lines (not shown) to electrically connect the pixels 1014, 1014a, 14b, for example, to the driver module 1002.

The pixel 14a includes a light source 1050 and a photodetector 1024 ' which are both implemented in the active layer 1010'. The photodetector 1024 ' is in one embodiment a pin photodiode, and the light source 1050 is a

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light emitting diode (LED). The photodetector 1024' and the light source 1050 are indicated through conventional symbols, respectively. In another embodiment, the photodetector 1024 is a photodiode or a phototransistor (e.g., a TFT). A light barrier 1052 separates the photodetector 1024' and the light source 1050 to avoid that light is directly incident on the photodetector 1024 '. The light barrier 1052 is indicated through a dashed line between the symbols for the photodetector 1024 ' and the light source 1050. Those skilled in the art will appreciate that each pixel 1014 is optically isolated from neighboring pixels 1014 to avoid that light from the light source 1050 is directly incident on the photodetector 1024 ' of a neighboring pixel 1014.

It is contemplated that the light barrier 1052 may be implemented in various ways. For instance, in one embodiment, the light barrier 1052 may be an opaque, wall-like barrier that may extend in vertical direction beyond the planes of the photodetector 1024 ' and the light source 1050. In another embodiment, the light source 1050 or the photodetector 1024 ' may be positioned within cavities that have openings facing the planarization layer 1020 . In yet another embodiment, both the photodetector 1024 ' and the light source 1050 may be positioned within cavities.

The substrate layer 1008' includes a material selected to allow the implementation of the active layer 1010' through conventional high temperature, chemical deposition processes, and may be a transparent or opaque material. In one embodiment, the substrate layer 1008' is a glass substrate onto which the active layer 1010' is grown. In other embodiments, the substrate layer 1008' may be a semiconductor substrate such as a silicon or gallium arsenide substrate, or a temperature resistant polymer material.

In Figure 14, the valley of the fingertip 1025 is above the pixel 1014b and the ridge covers the pixel 1014a. In operation, the light source 1050 of the pixel 1014b emits light that passes through the layers 1020 , 1022 and is reflected on the inclined surfaces of the valley. The reflected light is incident on the photodetector 1024 ' which generates a photocurrent, as described above. The photocurrent indicates that a valley was located above the pixel 1014b. The light source 1050 of the pixel 1014a also emits light that passes through the layers 1020 , 1022 , but substantially no light is incident on the photodetector 1024 ' because the pixel 1014a is covered by the ridge. As a consequence, the photodetector 1024 ' does not generate a photocurrent. The substantially unchanged dark current indicates that a ridge covered the pixel 1014a.

Focusing on a particular embodiment of the detector layer 1010, Figure 15 shows an enlarged view of a section of the pixel 1014. As in the previous embodiments, the pixel 1014 includes, from top to bottom, the top layer 1022 , the planarization layer 1020 , the detector layer 1010, the substrate layer 1008, the light source layer 1012, the reflector layer 1016, and the insulation layer 1018. As in Figure 4, the gap 1021 separates the light source layer 1012 and the substrate layer 1008. In another embodiment, the light source layer 1012 and the substrate layer 1008 are in direct contact, for example, as shown in Figure 3.

The detector layer 1010 includes a photodetector 1024 ' which is in the illustrated embodiment a photodiode. It is contemplated that the pixel 1014 further includes the switching diode 1023 which is not shown in the illustrated section of the pixel 1014. The photodiode 1024 ' is a pin photodiode which comprises a photoactive p-

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layer 1024 a, an intrinsic (i)-layer 1024 b and an n-layer 1024 c. The photodiode 1024 ' is implemented above an electrode 1027 through a conventional process for pin photodiodes. The n-layer 1024 c is formed by a layer of amorphous silicon (a-Si:H) doped to be of n-type silicon, and the p-layer 1024 a is formed by a layer of amorphous silicon doped to be of p-type silicon. Between the p- and n-layers 1024 a, 1024 c, a layer of undoped amorphous silicon forms the i-layer 1024 b. The p-layer 1024 a can be covered by a layer of transparent and conducting ITO (not shown) which is in contact with an electrode 1029 indicated on top of the p-layer 1024 a.

The electrodes 1027 , 1029 and bus lines 1031 a, 1031 b are, for example, thin layers of chromium. It is contemplated that other conducting materials, such as molybdenum (Mo) or tungsten (W), may be used to form the electrodes 1027 , 1029 and the bus lines 1031 a, 1031 b. In one embodiment, the bus lines 1031 a are part of the lines L_N, L_{N-1} and the bus lines 1031 b are part of the lines L_M, L_{M-1}. The bus lines 1031 b are implemented on top of the bus lines 1031 a and separated through a passivation layer 1035 . The passivation layer 1035 , thus, covers the bus lines 1031 a and the pin diode 1024 '.

The p-layer 1024 a faces the top surface 1015 through which light re-enters the optical module 1001 when the walls of a valley reflect the light. The photodiode 1024 ' ideally does not receive light reflected from a ridge located above the pixel 1014. The pixel 1014 includes a light barrier 1033 that surrounds the photodiode 1024 ' avoiding that extraneous light is incident onto the photodiode 1024 ' covered by the area of the ridge. Without the light barrier 1033, sidewalls of the photodiode 1024 ' would be exposed to backlight illumination. Therefore, photocurrent would be generated by absorbing light incident via the sidewall. The increase in the photocurrent would increase the noise level and hence reduce the contrast ratio of the fingerprint image. In one embodiment, the light barrier 1033 has a hollow, elongate body of an opaque material. The opaque material may be an organic resin or any nonconducting material.

The light barrier 1033 is formed through a multiple-step process. When the photodiode 1024 ' has been implemented, in a first step, the opaque material is applied through, for example, spin coating so that the opaque material covers the photodiode 1024 ', the bus lines 1031 , and the remaining areas of the pixel 1014. In a second step, a mask is applied and the shape and location of the light barrier 1033 is defined by means of a photo-lithography process. A third step is a dry-etching process which removes undesired opaque material thereby forming the light barrier 1033. The third step may be simplified without using a dry-etching process if a photo-definable opaque material is used.

After the photodiode 1024 ' and the light barrier 1033 are implemented, the transparent planarization layer 1020 is applied. The planarization layer 1020 may completely cover a top surface of the light barrier 1033 as illustrated. In another embodiment, however, the top surface of the light barrier 1033 may be in the same plane as the top surface of the planarization layer 1020 and covered by the top layer 1022 .

The light barrier 1033 prohibits that scattered light is incident on the photodiode 1024 ' and, thus, allows only reflected light to enter the photodiode 1024 '. The pixel 1014 provides for an improved contrast because the difference in intensities between "dark" and "bright" is greater. "Dark" refers to a situation in which the pixel 1014 is

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covered by a ridge, and "bright" refers to a situation in which a valley is located above the pixel and the walls of the valley reflect light.

Those skilled in the art will appreciate that in another embodiment the light barrier 1033 and a TFT transistor may be combined. As in the above example, the light barrier 1033 protects the TFT transistor from scattered or lateral incident light. Further, those skilled in the art will appreciate that the light barrier 1033 may also be combined with the embodiment shown in Figure 14 in which the photodetector 1024 ' and the light source 1050 of a pixel 1014 lay in the same plane.

Figure 15A shows a further enlarged view of a section of the pixel 1014. As in the previous embodiments, the pixel 1014 includes, from top to bottom, the top layer 1022 , the planarization layer 1020 , the detector layer 1010, the substrate layer 1008, and the light source layer 1012. In another embodiment, the light source layer 1012 and the substrate layer 1008 may be separated through a gap, for example, as shown in Figure 4.

The detector layer 1010 includes a photodetector 1024 " which is a pin photodiode which comprises a photoactive p-layer 1024 d, an intrinsic (i)-layer 1024 e and an n-layer 1024 f. The photodiode 1024 " is implemented above a chromium (Cr) electrode 1027 a through a conventional process for pin photodiodes. The n-layer 1024 f is formed by a layer of amorphous silicon (a-Si:H) doped to be of n-type silicon, and the p-layer 1024 d is formed by a layer of amorphous silicon doped to be of p-type silicon. Between the p- and n-layers 1024 a, 1024 c, a layer of undoped amorphous silicon forms the i-layer 1024 e. The p-layer 1024 d is covered by a layer 1027 b of transparent conducting ITO which is in contact with an electrode 1029 a indicated on top of the p-layer 1024 d.

The electrodes 1027 a, 1029 a and bus lines 1031 c, 1031 d are, for example, thin layers of chromium or a combination of chromium and aluminum. It is contemplated that other conducting materials, such as Mo or W, may be used to form the electrodes 1027 a, 1029 a and the bus lines 1031 c, 1031 d. In one embodiment, the bus lines 1031 c are part of the data lines L_N, L_{N-1} and the bus lines 1031 d are part of the address lines L_M, L_{M-1}. The bus lines 1031 d and the bus lines 1031 c are separated through a passivation layer 1035 a.

In the illustrated embodiment, the switching diode 1023 is also a pin photodetector and has generally the same structure as the pin photodiode 1024 ' of Figure 15. The light barrier 1033 is implemented as described above. In addition, the light barrier 1033 covers the switching diode 1023 .

Figure 16 shows a top view of the section of the pixel 1014 shown in Figure 15A, including the switching diode 1023 , to illustrate a layout of the pixel 1014. As illustrated, the photodetector 1024 ' has a rectangular shape and is connected to the bus lines 1031 a (columns/data) and the bus lines 1031 b (rows/address). The elongate light barrier 1033 has a rectangular cross-section and covers the switching diode 1023 and a part of the photodetector 1024 '. The light barrier 1033 has a quadratic area 1039 which does not cover the photodetector 1024 ' and, thus, allows light to be incident on the photodetector 1024 '.

In the illustrated embodiment, the cross-section of the area 1039 corresponds to the cross-section of the light barrier 1033. However, in other embodiment, the cross-section of the area 1039 may be different from the cross-section of the light barrier 1033, for example, circular.

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Figure 17 shows an embodiment of an optical module 1200 with the finger 1009 placed onto a contact surface 1201. As in the previous embodiments, the optical module 1200 is configured so that the valleys of the finger 1009 reflect light, which originates from within the optical module 1200, back into the optical module 1200.

The optical module 1200 comprises a substrate 1210 and a light emitting layer 1202. In the illustrated embodiment, the light emitting layer 1202 includes a plurality of discrete light sources 1204. The substrate 1210 is transparent for light emitted by the light sources 1204. A surface 1212 of the substrate 1210 faces the finger 1009 and receives the light sources 1204. The layer 1202 covers the light sources 1204 as a protective coating and provides that the contact surface 1201 is planar. In one embodiment, the substrate 1210 has a thickness of about 0.5-1.5 mm, and the layer 1202 has a thickness of about 1 μm.

The optical module 1200 comprises further an optical lens 1206 and an opto-electronic (O/E) converter 1208. The optical lens 1206 is located between the substrate 1210 and the O/E converter 1208 along an axis 1221 that is perpendicular to a surface 1214 that faces the optical lens 1206. In Figure 17, rays 1218 illustrate light which is reflected by the valleys and incident on the optical lens 1206, rays 1220 illustrate light which is passed through the lens 1206 and incident on the O/E converter 1208.

In one embodiment, the light sources 1204 are arranged in spread relationships as a pixelized array of individual light emitting diodes (LED). Each LED is connected to a power supply via a pair of electrodes. In operation, each LED emits a cone-shaped beam of light having a predetermined aperture. The cone-shaped beam of light illuminates an area of the finger 1009. The area directly underneath the LED, or the substrate of the LED itself, is opaque so that no light is emitted directly into the substrate 1210. The electrodes of the LED's are transparent for light emitted by the LED's. In one embodiment, the electrodes are formed by ITO. Figure 17A shows an embodiment of a light source 1204 for a pixel for the optical module 1200.

In another embodiment, the light emitting layer 1202 includes a single sheet of thin film electroluminescent (EL) material that forms a patterned EL light source. Figures 18 and 19 show embodiments of EL light sources. The EL light source is connected to a power supply via a first electrode that faces the finger 1009 and a second electrode on top of the substrate 1210. The first electrode is transparent for light emitted by the EL light source to allow undisturbed illumination of the finger 1009. The area between the EL light source and the substrate 1210 has an opaque pattern that prevents light emitted by the EL light source from directly illuminating the lens 1206, while allowing light reflected from the finger 1009 reach the lens 1206. The opaqueness may be achieved by an opaque second electrode or an opaque coating.

In one embodiment, the optical lens 1206 has a distance from the light sources 1204 of about 40 mm, and a distance of about 8 mm from the O/E detector 1208. In operation, the light sources 1204 illuminate the finger 1009. The combination of covered ridges and light reflected by the valleys form an image of the fingerprint. The lens 1206 projects the image onto the O/E detector 1208 which converts the reduced image of the fingerprint into an electronic representation of the fingerprint.

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The O/E detector 1208 has an output 1216 for a signal that corresponds to the electronic representation and that is available for a subsequent signal processing. The O/E detector 1208 may be a CMOS imager, an array of photodiodes, a device that includes an array of charge coupled devices (CCD), or any other device that converts the image of the fingerprint into an electronic representation.

Figure 17A shows an embodiment of a light source 1204 of a pixel of the optical module 1200. The pixel includes, from top to bottom, a top layer 1240, the layer 1202 that includes a planarization layer 1254 and the light source 1204, and the substrate 1210. In the illustrated embodiment, the light source 1204 and the subsequent layers 1254, 1240 are implemented on top of the substrate 1210 which may be a glass substrate.

The light source 1204 includes, from the substrate 1210 upwards, the following layers: an electrode layer 1244 which may include a chromium or aluminum, a semiconductor layer 1246 which may include a-SiN_xO_y or a-SiN_x, a light emitting phosphor layer 1248, a semiconductor layer 1250 which may include a-SiN_xO_y or a-SiN_x, so that the phosphor layer 1248 is embedded between the semiconductor layers 1246 and 1250 within an light emitting area, and on top of the semiconductor layer 1250 an electrode layer 1252 which may include indium tin oxide (ITO).

The pixel includes a light barrier 1242 that surrounds the light source 1204. The light barrier 1242 prohibits that emitted light propagates in horizontal direction. In one embodiment, the light barrier 1242 has a hollow, elongate body of an opaque material. The opaque material may be an organic resin or any nonconducting material. In Figure 17A, the light barrier 1242 is shown as extending left and right of the light source 1204 between the substrate 1210 and the top layer 1240. The light barrier 1242 is formed through a multiple-step process as described above.

Figure 18 shows a section of a first embodiment of an EL light source within the layer 1202. The EL light source includes a light emitting area 1224 and isolated areas 1226 which do not emit light. In the illustrated embodiment, the areas 1226 are squares through which the reflected light from the finger can pass through. For instance, neighboring areas 1226 have a distance of about 50 μm, center to center. It is contemplated that in other embodiments, the areas 1226 may have, for example, oval or circular shapes.

Figure 19 shows a section of a second embodiment of an EL light source 1202' which forms the layer 1202. The EL light source 1202' includes isolated light emitting areas 1230 and an area 1228 that does not emit light. In the illustrated embodiment, the light emitting areas 1230 are squares. The EL light source 1202' may be implemented similar to the EL light source 1202, however, with a complementary structure. That is, the area 1228, which is similarly shaped as the area 1224 in Figure 18, does not emit light, whereas the area 1224 emits light.

Figure 20 shows an embodiment of an optical module 1300 which is a modified version of the optical module 1200 shown in Figure 17. In Figures 17 and 20 same elements have, thus, the same reference numerals. An axis 1304 is perpendicular to the surface 1214 and an axis 1306 is perpendicular to a convex surface 1308 of the lens 1206. The axis 1304, 1306 are perpendicular to each other. The optical module 1300 includes a reflector 1302, which is positioned in a plane between the substrate 1210 and the lens 1206 where the axis 1304, 1306 intersect.

The reflector 1302 is in one embodiment a planar mirror that diverts the light reflected by the valleys of the finger 1009 by about 90 degrees so that the light is incident on the lens 1206. The reflector 1302 has a rectangular

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reflector surface which is sized to project the complete image of the fingerprint onto the lens 1206. In one embodiment, the area of the reflector surface is about half the size of the surface 1214. Because the reflector 1302 diverts the light, the optical module 1300 is thinner than the optical module 1200. In one embodiment, the optical module 1300 is approximately half as thick as the optical module 1200.

Figure 21 shows a further embodiment of an optical module 1500 onto which the finger 1009 is placed. The optical module 1500 includes a detector layer 1502 and the layer 1202 that includes the light sources 1204 as explained above. Between the layer 1202 and the detector layer 1502, the optical module 1500 includes a planarization/isolation layer 1504 which has a thickness of a few microns, for example, about 4 μm. As in the previous embodiments, the valleys of the finger 1009 reflect light emitted from within the layer 1202 back into the optical module 1500 where the detector layer 1502 receives the reflected light. In one embodiment, the detector layer 1502 is an array of pin photodiodes, for example, as shown in Figure 9 and explained above.

Figure 22 shows an embodiment of an optical module 1400 that comprises a fiber optic bundle 1402. The fiber optic bundle 1402 has a surface 1404 onto which the finger 1009 is placed, an input branch 1408 with an input surface 1410, and an output branch 1406 with an output surface 1412. The input surface 1410 receives light which the input branch 1408 guides to the surface 1404 in order to illuminate the finger 1009. As in the previous embodiments, the valleys of the finger 1009 reflect light back into the fiber optic bundle 1402. Within the fiber optic bundle 1402 the output branch 1406 guides the reflected light to the output surface 1412 where the light is incident on a O/E detector 1414 which is connectable to a signal processing device.

The fiber optic bundle 1402 includes a plurality of individual optical fibers. In one embodiment, about half of the optical fibers form the input branch 1408 and the remainder of the optical fibers form the output branch 1406. The optical fibers of the input branch 1408 are referred to as "transmitter fibers" and the optical fibers of the output branch 1406 are referred to as "receiver fibers." In proximity of the surface 1404, the optical fibers are densely packed and arranged in a rectangular array of pixels having m rows and n columns and forming a planar contact area. In one embodiment, the contact area has a size of about 2.5 cm x 2.5 cm (1 inch x 1 inch) to receive the finger 1009. A typical outer diameter (without protective plastic coating) of an optical fiber is about 100 μm with a light guiding core of about 10 μm. Furthrmore each pixel may occupy an area of approximately 63 square microns.

In one embodiment, each pixel includes an end section of a transmitter fiber and an end section of a receiver fiber. For instance, the optical fibers may be arranged so that in each row and each column the transmitter fibers alternate with the receiver fibers. Further, the arrangement may be that a transmitter fiber directly neighbors only a receiver fiber, but not a transmitter fiber.

Figure 19 shows four array locations $R_{1,1}$, $R_{1,n}$, $R_{m,1}$, $R_{m,n}$, each including a receiver fiber. The array locations $R_{1,1}$, $R_{1,n}$, $R_{m,1}$, $R_{m,n}$ are shown at the surface 1404 and at the surface 1412 to indicate that the arrangement of the receiver fibers does not change between the surfaces 1404 and 1412. That is, the receiver fibers that are exposed at the surfaces 1404, 1412 have a fixed, coherent relationship, and thus comprise a coherent fiber bundle. The coherent

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relationship ensures that light exiting, for example, at the array location $R_{1,1}$ of the output surface 1412 was input at the array location $R_{1,1}$ of the surface 1404.

In operation, a light source 1416 emits light which may be monochromatic or "white" light. The light source 1416, thus, may be selected from a variety of different light sources, for example, halogen lamps, incandescent light bulbs, neon tubes, or even sunlight to name a few. The light illuminates the finger 1009 via the transmitter fibers and, with respect to the finger 1009, every transmitter fiber is a miniature light source (within a pixel) that illuminates a small area of the finger 1009. If a valley is above a miniature light source, the valley reflects light back to the surface 1404 where the reflected light may enter at least one receiving fiber. However, if a ridge covers a pixel, no light is reflected from the transmitter fiber to the receiving fiber and the receiving fiber remains "dark." As explained above, the entirety of the illuminated and dark receiving fibers forms the image of the fingerprint which is detected by the O/E converter 1414.

The optical image system 1003 shown in Figure 1 and the various embodiments of the optical module 1001, 1200, 1300, 1400 may be adapted to a variety of applications. For instance, when implemented to function as a touch screen, the optical image system 1003 may detect, which area, i.e., what symbol, the user touched. Further, the optical image system 1003 may trace the movement of the user's finger or pen when the user "writes" onto the surface. During the movement, subsequent pixels 1014 are covered, the finger or pen reflect light, and the pixels 1014 subsequently output photocurrents that allow tracing the movement. In addition, the optical image system 1003 may be configured to determine the shape of an object placed on top of the optical module 1001. A processor may match the determined shape with a number of stored shapes. In another embodiment, the processor may "measure" the area of the object, for example by counting the number of covered pixels 1014 when the area of an individual pixel 1014 is known.

It will be appreciated that one of skill in the art may combine the features of the sensor 1003 with the features of any of the optical modules 1001, 1200, 1300, 1400, or 1500 as herein described without detracting from the spirit of the present invention. It will further be appreciated that the features of the optical modules 1001, 1200, 1300, 1400, or 1500 may be combined by one of skill in the art with the features of other sensors 10, 200, 300, 330, 370, 420, 450, 468, or 500 to be described in greater detail below without detracting from the spirit of the present invention. Additional embodiments of the aforementioned optical image system 1003 will now be discussed. It should be appreciated by those of skill in the art that the features and methods presented herein can be combined and arranged so as to yield many possible combinations of functionalities. It is therefore conceived that the various features of the biometric sensor system can be desirably used to render an electronic fingerprint image in a number of different ways based on the teachings provided herein such that each combination and arrangement corresponds to an additional embodiment of the present invention as will be discussed in greater detail hereinbelow..

Figure 23 schematically illustrates one embodiment of a fingerprint sensor 10 compatible with the present invention. The fingerprint sensor 10 comprises a substrate 20 comprising a first material 22 which is substantially transparent to light with wavelengths within a first range of wavelengths. The fingerprint sensor 10 further

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comprises a color filter layer 30 and a contact surface 32 which receives a fingertip 40 of a user. The color filter layer 30 comprises a second material 34 which is substantially transparent to light with wavelengths within the first range of wavelengths and substantially opaque to a portion of ambient light propagating through the fingertip with wavelengths within a second range of wavelengths. The fingerprint sensor 10 further comprises at least one light source 50 coupled to the substrate 20. The light source 50 generates light with at least one wavelength within the first range of wavelengths, and the light propagates through the substrate 20 to the fingertip 40. A finger placed on the fingerprint sensor is illuminated by both the light source 50 and by ambient light. The fingerprint sensor 10 further comprises a plurality of optical detectors 60 disposed from the contact surface 32 with at least a portion of the second material 34 disposed between the optical detectors 60 and the contact surface 32. The optical detectors 60 are positioned to receive light generated by the light source 50 and reflected by the fingertip 40. The optical detectors 60 generate electrical signals in response to the received light, thereby providing an electronic representation of a fingerprint corresponding to the fingertip 40.

The surface of a person's fingertip 40 has a unique pattern of ridges 42 and valleys 44 which can be used to uniquely identify the person. The structure of the fingertip 40, or a print caused when the fingertip 40 is placed on a surface is often referred to as a "fingerprint." Hereinafter, this term is generally used to refer to the print caused by the fingertip 40. By placing the surface of a fingertip 40 of a user onto contact surface 32 of the fingerprint sensor 10, the fingerprint sensor 10 in one embodiment generates an electronic representation ("electronic image" or "digital image") of the fingerprint, which can be used to determine if the present user is an authorized user. The fingerprint resulting from the sensing of the physical fingerprint of the present user is referred to as the "sensed" fingerprint to distinguish it from a "stored" fingerprint of an authorized user. As described in U.S. Patent Application No. 09/477,943, entitled "Planar Optical Image Sensor and System for Generating an Electronic Image of a Relief Object for Fingerprint Reading," filed January 5, 2000, and incorporated by reference herein, if a sensed fingerprint of a present user matches the stored fingerprint of an authorized user, the present user is identified as an authorized user.

The fingerprint sensor 10 is typically connected to a host system, which may be a personal computer (PC), a laptop computer, a cellular phone, a PDA, a security system, or other equipment installed, for example, in an access-restricted location where high-level security is needed. The host system processes the sensed fingerprint of the present user and matches it with the stored fingerprint of the authorized user. The host system allows full operation of the host system itself, or access to the restricted areas only if the electronic representation of the sensed fingerprint matches the stored fingerprint of the authorized user.

In one embodiment, the fingerprint sensor 10 is an external apparatus that is connectable to a computer (e.g., a desktop computer or a laptop). The computer includes a software program that operates the computer and the fingerprint sensor 10 and performs a matching procedure. In other embodiments, the fingerprint sensor 10 may be implemented, for example, within a computer, a PDA, or a cellular phone. In these embodiments, the fingerprint sensor 10 is located so that a user may place a finger on an exposed surface of the fingerprint sensor 10. For instance, the fingerprint sensor 10 may be integrated into a keyboard of a computer, a PDA, a computer or next to the

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