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(54) Title: DISPLAY FOR BRAILLE TABLET

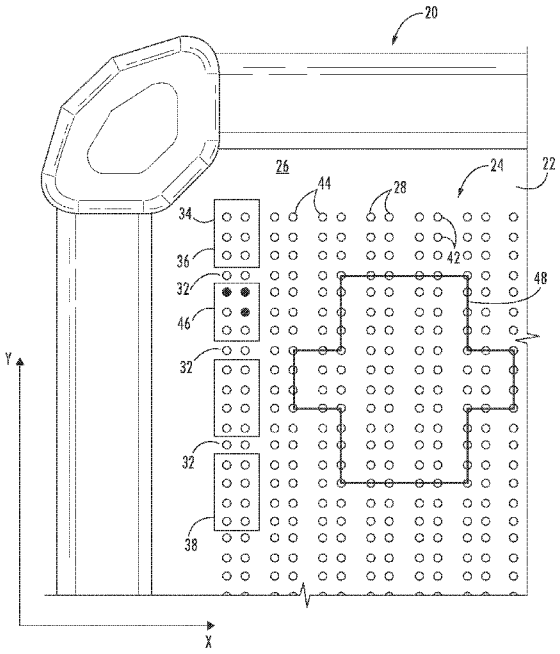


FIG. 1

(57) Abstract: Disclosed is a tablet with an improved Braille display. The Braille display employs a pin array that allows for the selective use of either six or eight pin cells. This is accomplished by turning off or on a pin pair adjacent to each cell. The spacing of the pins also allows capacitive sensors to be located adjacent to each Braille cell. These sensors are used to determine the location of the user's finger upon the display. The pin spacing further allows geometric shapes to be generated in additional to text.

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[Continued on next page]

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DISPLAY FOR BRAILLE TABLET

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Application Ser. No. 62/979,595, filed Feb. 21, 2020, and entitled "Display for Braille Tablet," the contents of which are fully incorporated herein for all purposes.

TECHNICAL FIELD

[0002] This disclosure relates to a display for a Braille tablet. More particularly, the present disclosure relates to various displays with an improved ability to locate the position of a user's finger upon the display.

BACKGROUND OF THE INVENTION

[0003] Braille displays are well known in the art. These devices allow the visually impaired to perceive individual Braille characters via tactile pins that can be selectively raised and lowered. These pins are arranged into an array consisting of a number of cells. Each cell, in turn, typically consists of six pins. Braille displays are adapted to be connected to a computer, or similar electronic device, to allow a visually impaired individual to perceive textual information. Often times, this information is present upon a screen. For this reason, Braille displays are refreshable and allow new rows of information to be continually presented to the user. Although Braille displays most often display textual characters, the pins can be used to generate geometric shapes. Braille displays may optionally include a keyboard to allow the user to input text. This may be a standard QWERTY keyboard or a dot type keyboard. Dot type keyboards feature keys that correspond to the individual dots of a Braille character. Regardless of the type utilized, the inputted text can be entered into a computer memory for subsequent retrieval. The inputted text can also be presented upon the display. Cursor router keys may be included within the keyboard to allow the user to insert text into a particular location upon the Braille display.

[0004] Braille displays frequently include individual cells featuring a six pin array, consisting of two columns of three pins each. Each of the pins forms a dot in the Braille character There are sixty four possible character combinations for an individual six pin array. An individual cell can be used to represent an individual letter, a digit, a punctuation

mark, or even a word. Some Braille displays alternatively employ an eight pin array in lieu of a six pin array. Eight pin arrays allow the encoding of a greater number of symbols. For example, the lowermost pins in an eight pin array can be used to differentiate between lower case and upper case characters. Eight pin arrays, for this reason, are often used to display more formal writing, such as academic texts.

[0005] Various efforts have been made throughout the years to improve the functionality of Braille displays. For example, U.S. Patent Pub. 2013/0321302 to Naccache discloses a device for keying in Braille data and a corresponding computer program. The device includes a touch sensitive surface and is configured to detect a plurality of pressures. The plurality of pressures serve to form different Braille characters. An image can be constructed from the points associated with the plurality of different pressures.

[0006] Additionally, U.S. Patent Pub. 2015/0125831 to Chandrashekhar discloses a handheld electronic device with a tactile pin array. The device comprises a set of cameras that can capture an image. The image is thereafter processed and used to output a three dimensional representation of the image on the pin array. This allows one to recognize objects and obstacles in the area in front of the device. It also allows for navigation capabilities, facial recognition, and various input/output means.

[0007] An additional tactile display is disclosed by U.S. Patent Pub. 2015/0379895 to Chari. The display of Chari provides a representation of a graph or other image generated by a graphic device for visually impaired users. The display includes a frame assembly with hollow shaft chambers that are perpendicular to a number of hollow actuator members. Drive shafts are received within the hollow shaft chambers. Each drive shaft can be moved up and down via cams.

[0008] Although the background art contains several examples of tactile display constructions, they all suffer from common drawbacks. Namely, the displays of the background art fail to allow users to selectively use either six or eight pin cells. Nor does the background art disclose a display that can effectively display both Braille characters and Braille graphics. Known Braille displays also lack a means for accurately and conveniently tracking the position of the user's finger over the display. The improved

Braille display of the present disclosure is aimed at overcoming these and other deficiencies present in the background art.

SUMMARY OF THE INVENTION

[0009] The present disclosure relates to the tablet with an improved Braille display.

[0010] One advantage of the present display is realized by providing a pin pitch that permits the selective use of either six or eight pin arrays.

[0011] A further advantage is realized by providing a pin arrangement that can display both individual Braille characters as well as Braille graphics.

[0012] The pins of the display are advantageously positioned to allow capacitive sensors to be placed immediately adjacent each Braille cell.

[0013] The positioning of capacitive sensors adjacent to the Braille cells allows the position of the user's finger to be detected and tracked.

[0014] Still yet an additional advantage is attainted by including a physical button that when depressed allows the user to move a cursor to a location adjacent to the user's finger on the display.

[0015] A further advantage is realized by creating a space between adjacent Braille cells to accommodate a number of capacitive touch sliders.

[0016] Various embodiments of the invention may have none, some, or all of these advantages. Other technical advantages of the present invention will be readily apparent to one skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] For a more complete understanding of the present disclosure and its advantages, reference is now made to the following descriptions, taken in conjunction with the accompanying drawings, in which:

[0018] FIG. 1 is a partial plan view of the outer surface of the present tactile display.

[0019] FIG. 2 is a detailed view of the inner surface of the display and illustrating the various capacitive surfaces.

[0020] FIG. 3 is detailed view of the capacitive surfaces with one of the associated resistors removed.

[0021] FIG. 4 is a view of an eight pin array with the details of the individual pins depicted.

[0022] FIG. 5 is a view of pin block being used to place a series of eight pin arrays.

[0023] FIGS. 6A-6E are a series of views depicting a user interacting with the present display.

[0024] Similar reference numerals refer to similar parts throughout the several views of the drawings.

Parts List	
20 Tablet	48 Braille graphic
22 Display	50 Apertures in PCB
24 Array of pins	52 Printed Circuit Board
26 Face of display	53 Inner Surface
28 Individual pin in array	54 Microprocessor
32 Pin pairs	55 Drive Lines
34 Cells	56 Metallic strips
36 Six pin cell	57 Resistors
38 Eight pin cell	58 Pin block
42 Spacing along Y-axis	62 Pin weights
44 Spacing along X-axis	64 Dot Keys
46 Braille character	66 Space Bar

DETAILED DESCRIPTION OF THE DRAWINGS

[0025] The present disclosure relates to a tablet with an improved Braille display. The Braille display employs a pin array that allows for the selective use of either six or eight pin cells. This is accomplished by turning off or on a pin pair adjacent to each cell. The spacing of the pins also allows capacitive sensors to be located adjacent to each Braille cell. These sensors are used to determine the location of the user's finger upon the display. The pin spacing further allows geometric shapes to be generated in addition to text. The various features of the present disclosure, and the manner in which they interrelate, are described in greater detail hereinafter.

Braille Tablet with Asymmetrical Pin Pitch

[0026] FIG. 1 illustrates a Braille tablet **20** with a refreshable display **22**. Display **22** is formed from an array of Braille pins **24** that are positioned across an outer face **26**. A number of individual pins **28** form part of a larger Braille cell **34** and can be selectively raised or lowered to generate a Braille character. This can be accomplished via any of a variety of known technologies; such as biomorph reeds, electromagnetic actuators, or piezo mechanisms. As illustrated, pins **28** are positioned along both X and Y axes. With continuing reference to FIG. 1, it can be seen that a series of pin pairs **32** are oriented along the Y axis. Each pin pair **32** is positioned adjacent to a Braille cell **34**. Pin pairs **32** preferably consist of two side-by-side pins **28**. In accordance with the disclosure, each pin pair **32** can either be added to or removed from an adjacent Braille cell **34** to thereby generate either a six or an eight pin cell (**36** or **38**).

[0027] As is known in the art, each cell **34**, is used to generate a corresponding Braille character. For example, cell **46** in FIG. 1 is displaying the letter "D." By refreshing display **22**, a user can successively read a series of characters, and thereby read text appearing on a computer screen. In accordance with the disclosure, display **32** can generate characters consisting of either a six pin array **36** or an eight pin array **38**. This is accomplished by the user selectively turning off or on an adjacent pin pair **32**. As used herein, a pin pair **32** is "off" when the pins are in a lowered orientation and are "on" when in a raised orientation. A six pin cell **36** can be generated by turning "off" an adjacent pin

pair **32**, and an eight pin cell **38** can be generated by turning 'on" an adjacent pin pair **32**. Whether the user wishes to generate information employing the six or eight pin array (**36**, **38**) will depend upon the particular application being employed. For example, six pin arrays can be used to convey information found on most websites, whereas academic literature often employs eight pin arrays.

[0028] In a further improvement to display **22**, the spacing of pins **28** across the face **26** is asymmetrical (i.e. non-uniform). In particular, the spacing between pins **28** along the Y axis (indicated at **42**) are generally uniform with all the vertically arranged pins **28** being equally spaced from one another. However, the spacing of the pins along the X axis (indicated at **44**) is not uniform. In particular, space **44** forms an alleyway between the adjacent cells **34** along the X axis (i.e. the horizontally arranged pins). This alleyway **44** has a spacing that is greater that the corresponding spacing **42** of the pins along the Y axis. s described below, alleyway **44** allows for capacitive sliders to be positioned upon display **22**. It has been found that this asymmetrical spacing is advantageous as it allows for both the display of six or eight pin cells (**36**, **38**) in addition to Braille graphics **48**. As illustrated in FIG. 1, Braille graphics **48** are images or shapes that are generated by a corresponding number of pins **28** within display **22**. The non-uniform nature of the pin pitch allows both characters and graphics to be generated in a single display. However, the asymmetry may require a conversion to maintain the proper aspect ratio for certain geometric shapes.

Braille Tablet with Capacitive Touch Sliders

[0029] The present disclosure also relates to a Braille tablet with capacitive based sensors formed within the face of display. These capacitive sensors can by employed by the user to conduct any of a variety of functions. In one embodiment, the capacitive sensors are placed immediately adjacent each of the Braille cells and function as cursor router keys. They can also be used to track a user's fingers across the face of the display and thereby monitor the user's progress in reading a document. Incorporating the sensors into the face of the display is beneficial as spacing is critical in tablet displays and room for physical keys is limited.

[0030] In the preferred embodiment, display **22** is formed, at least partially, from a double sided printed circuit board ("PCB") **52**. FIGS. 2 and 3 illustrate the underside of the PCB **52**. In the depicted embodiment, PCB **52** is formed from two layers of FR-4, which is a glass-reinforced epoxy laminate, that are bonded together. As depicted, the outer layer **52(a)** forms face **26** of the display and inner layer **52(b)** forms the inner surface **53**. Various electrical components can be soldered onto inner surface **53** of PCB **52**. Non-plated through holes **50** are also formed through the doubled sided PCB **52** to accommodate placement of individual pins **28** of display **22**. Notably, the outer surface of the PCB **52** is exposed to the user and forms a face of **26** the display. The use of the PCB **52** as the outer surface **26** avoids the need to register an outer cover with holes **50**. A microprocessor **54** is associated with tablet **20** and is in electrical communication with PCB **52**.

[0031] With continuing reference to FIGS. 2 and 3, a series of capacitive, metallic strips **56** are positioned across the an inner surface **53** of PCB **52**. In the preferred embodiment, each strip **56** is formed from a series of shorter sub-strips that are bridged together by a series of resistors **57**. Resistors **57** allow the sub-strips to function as one large capacitive sensor **56**. These elongated strips **56** span the length of display **22**. Each strip **56** is positioned immediately below a corresponding alleyway **44** in display **22**. This ensures that each strip **56** is located adjacent to an associated Braille cell **34**. In the preferred embodiment, each strip **56** is positioned to the left of an associated Braille cell **34**. Capacitive strips **56** react to the charge in user's finger as the user touches the exposed surface **26** of display **22**. More specifically, a circuit is completed as the user touches surface **26** immediately above an associated capacitive strip **56**. Each layer of the PCB (**56a** and **56b**) acts as a dielectric material to create this capacitive circuit. The thickness of the upper, exposed layer **56(a)** of the PCB **52** can be selected to optimize the touch sensitivity. Capacitive strips **56** will register a user's touch anywhere along their length and are therefore referred to a "touch sliders." Drive lines **55** are used to interconnect adjacent strips **56**.

[0032] Strips **56** allows the X-Y position of a user's finger to be detected when placed within the alleyway **44** adjacent a particular cell **34** (FIG. 1). As the circuit is completed, microprocessor **54** executes instructions to associate the X-Y finger position with a

particular cell **34** upon display **22**. Microprocessor **54** will make this determination while taking into account whether display **22** has been configured for a six or an eight pin array. In this regard, strips **56** can be used to monitor the progress of a user's fingers across display **22**, as would occur as the user is perceiving or "reading" the displayed Braille characters. FIG. 6B illustrates a user's fingers progressing along display **22**. The microprocessor **54** would be employed in determining both the direction and rate at which the user's hands were progressing across the display. The top area of display **22** could then be refreshed in time for the user to sense additional lines of text. This feature would essentially allow the "pages" of a Braille text to be automatically turned as the user progresses through the material.

[0033] Another application of the strips **56** would be to allow the user to indicate where in the display to move a cursor. This may be used if the user is employing the notetaker function of tablet **22**. As illustrated in FIG. 6A, tablet **20** may include a series dot-type keys **64** and a space bar **66** for the purpose of entering Braille characters into display **22**. FIG. 6E illustrates a user entering information via keys **64**. If the user wishes to place a cursor at a particular location within display **22**, the user would move the cursor by depressing space bar **66** along with touching an alleyway **44** adjacent a cell **34** of interest (FIG. 6D). This action signals microprocessor **54** that the user wishes to move the cursor to the identified location upon display **22**. Alternatively, it may signal that the user wishes to interact with the associated Braille cell **34** in some other manner. For example, this feature could allow users to perform tasks such as copying, pasting, selecting, and/or editing functions. Using the display based, capacitive sensors in this manner avoids the need for peripherally located cursor router keys that can be challenging for some users.

Pin Blocks and Weighted Pins

[0034] FIG. 5 illustrates a block **58** housing a series of eight pin cells **38**. A similar bock (not shown) could be utilized for a series of six pin cells. Block **58** is formed as one modular unit. This allows all the pins **28** to be removed, replaced, or serviced as a discrete unit. FIG. 4 illustrates a weight **62** that can be positioned about the stem of each pin **28**. These weights **62** lower center of gravity of each pin **28**. This, in turn, allows the pins **28** to be more easily installed via a conventional vibration table.

[0035] Although this disclosure has been described in terms of certain embodiments and generally associated methods, alterations and permutations of these embodiments and methods will be apparent to those skilled in the art. Accordingly, the above description of example embodiments does not define or constrain this disclosure. Other changes, substitutions, and alterations are also possible without departing from the spirit and scope of this disclosure.

WHAT IS CLAIMED IS:

1. A Braille tablet with an improved tactile display, the tactile display allowing a user to selectively generate both Braille characters and graphics, the tablet comprising:

an array of pins positioned across a face of the display, the pins being positioned along X and Y axes;

the array including a series of pin pairs oriented along the Y axis, each of the pin pairs being selectively turned off or on by the user of the tablet, wherein a pin pair is raised when on and lowered when off;

the pins of the array defining a series of cells, within an individual cell being used to generate a Braille character, the tactile display selectively displaying either six or eight pin cells, with a six pin cell being generated by turning off an adjacent pin pair and an eight pin cell being generated by turning on an adjacent pin pair;

the spacing between the pins along the Y axis being uniform with all of the pins being equally spaced from one another;

the spacing between the cells along the X axis being non-uniform, with the spacing between adjacent cells along the X axis being greater than the spacing of the pins along the Y axis;

the spacing of the pins across the face of the tactile display allowing the user to selectively display six pin cells, eight pin cells, and graphics.

2. A Braille tablet with an improved tactile display comprising:

an array of pins positioned across a face of the display, the pins being positioned along X and Y axes;

the array including a series of pin pairs oriented along the Y axis, each of the pin pairs being selectively turned off or on by the user of the tablet;

the pins of the array defining a series of cells, within an individual cell being used to generate a Braille character, the tactile display selectively displaying either six or eight pin cells, with a six pin cell being generated by turning off an adjacent pin pair and an eight pin cell being generated by turning on an adjacent pin pair.

3. The Braille tablet as described in Claim 2 wherein the spacing between the pins along the Y axis being uniform with all of the pins being equally spaced from one another.

4. The Braille tablet as described in Claim 2 wherein the spacing between the cells along the X axis is non-uniform.

5. The Braille tablet as described in Claim 2 wherein the spacing between adjacent cells along the X axis is greater than the spacing of the pins along the Y axis.

6. The Braille tablet as described in Claim 2 wherein the display can generate graphics in additional to six and eight pin arrays.

7. The Braille tablet as described in Claim 2 wherein the pins are actuated via electromagnets.

8. The Braille tablet as described in Claim 2 wherein the pins are actuated via bimorph reeds.

9. A Braille tablet with sensors for locating the position of a user's hands, the tablet comprising:

a display associated with the tablet, the display including a printed circuit board ("PCB"), the PCB including an exposed outer surface and an inner surface;

a pin array formed over the display, with the pin array defining a series of individual Braille cells, the pin array adapted to display individual Braille characters;

a microprocessor associated with the tablet and in electrical communication with the PCB;

a series of capacitive strips formed on the inner surface of the PCB, each capacitive strip being associated with a Braille cell;

whereby the user can touch the outer surface of the PCB at a location above a capacitive strip to thereby signal the microprocessor that the user wishes to interact with the associated Braille cell.

10. The tablet as described in Claim 9 wherein table further includes a physical button that the user can depress along with the outer surface of the display to route a cursor to the associated Braille cell.

11. The tablet as described in Claim 9 wherein the capacitive strips are used to monitor the progress of the user's hands across the display.

12. The tablet as described in Claim 11 wherein the microprocessor refreshes the display based upon the progress of the user's hands across the display.

13. The Braille tablet as described in Claim 9 wherein the pins are actuated via electromagnets.

14. The Braille tablet as described in Claim 9 wherein the pins are actuated via bimorph reeds.

15. The Braille tablet as described in Claim 9 wherein the pins are arrayed along an X-Y axis and wherein the spacing between the pins along the Y axis is uniform.

16. The Braille tablet as described in Claim 9 wherein the spacing between the cells along the X axis is non-uniform.

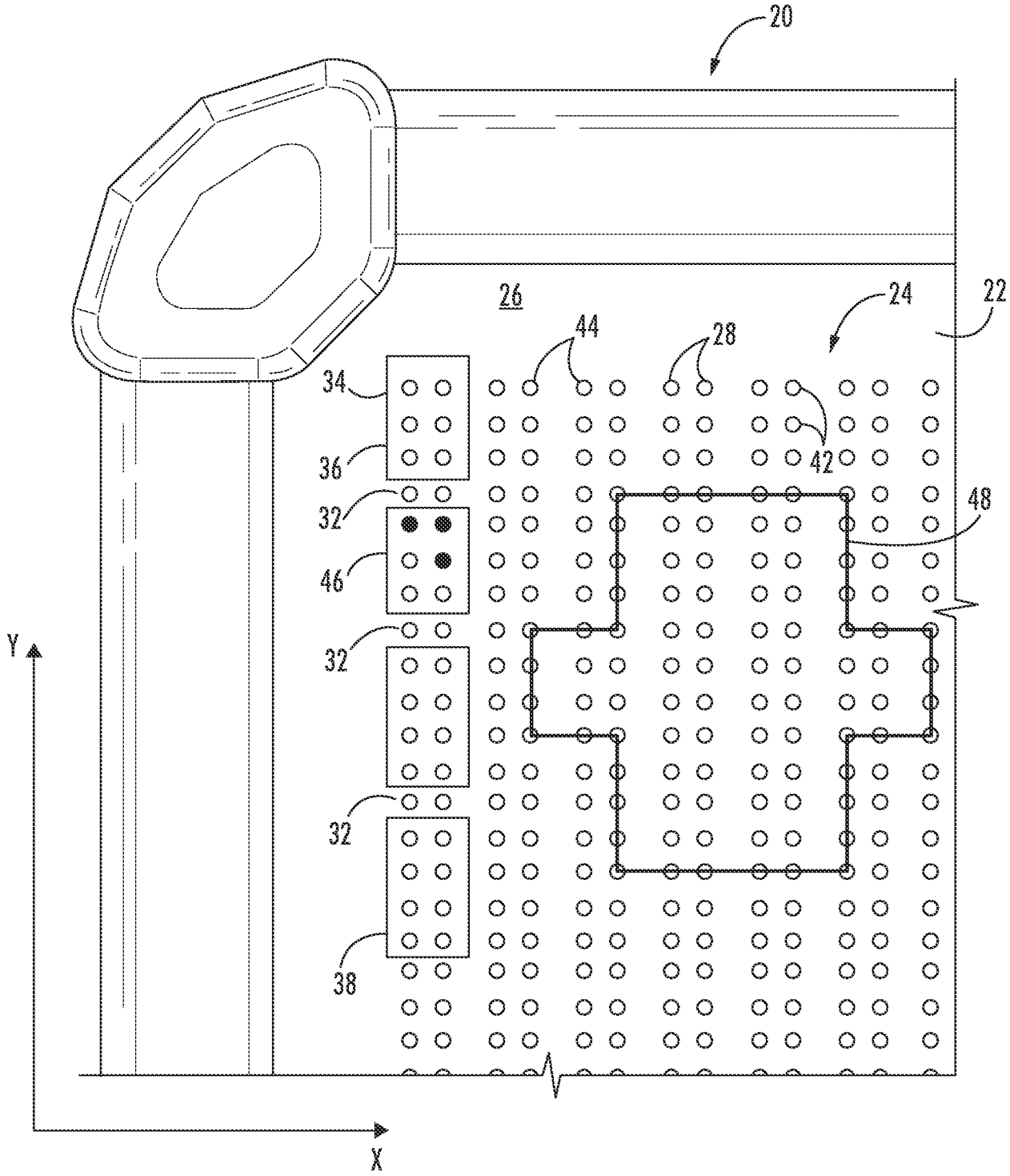


FIG. 1

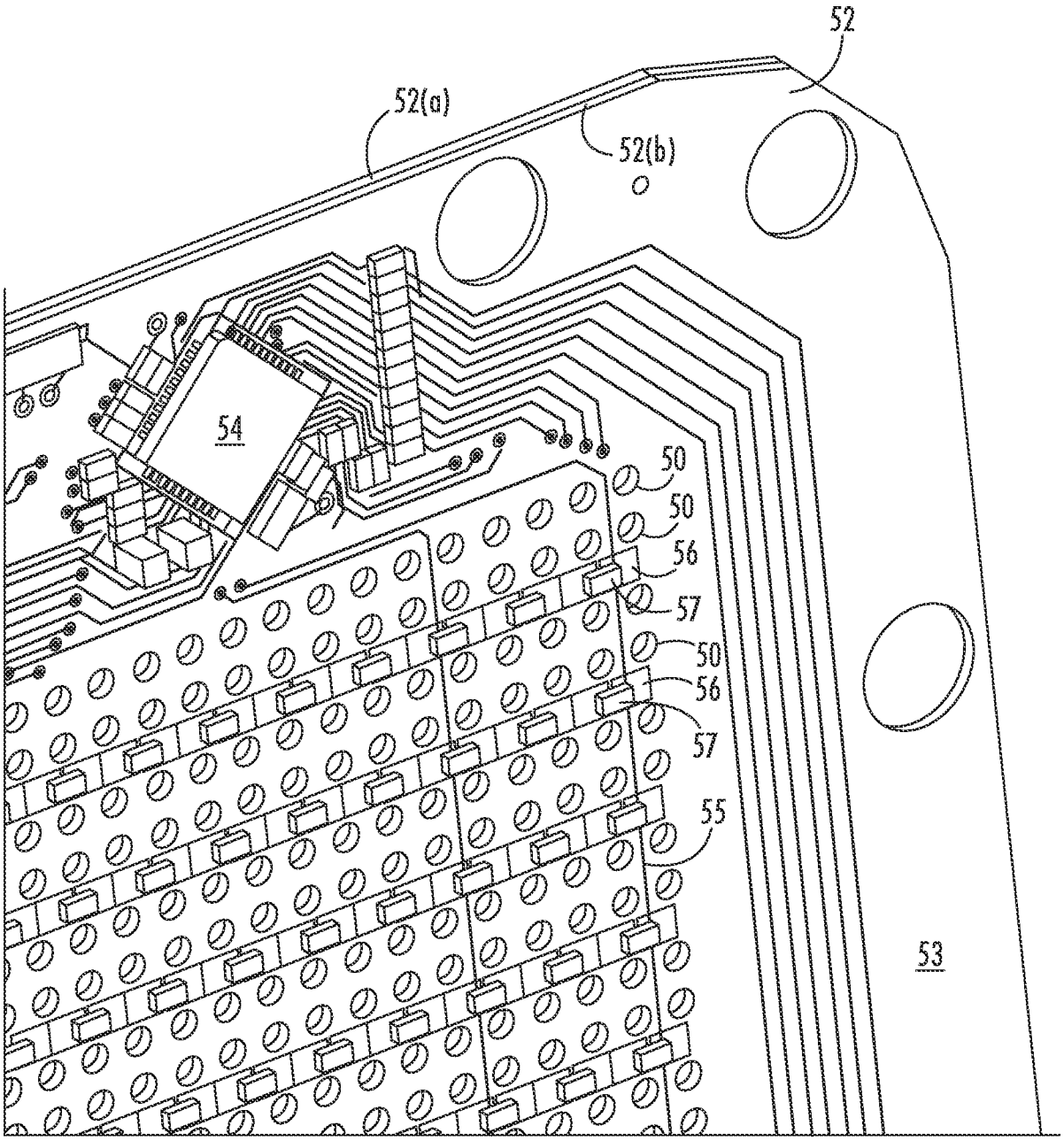


FIG. 2

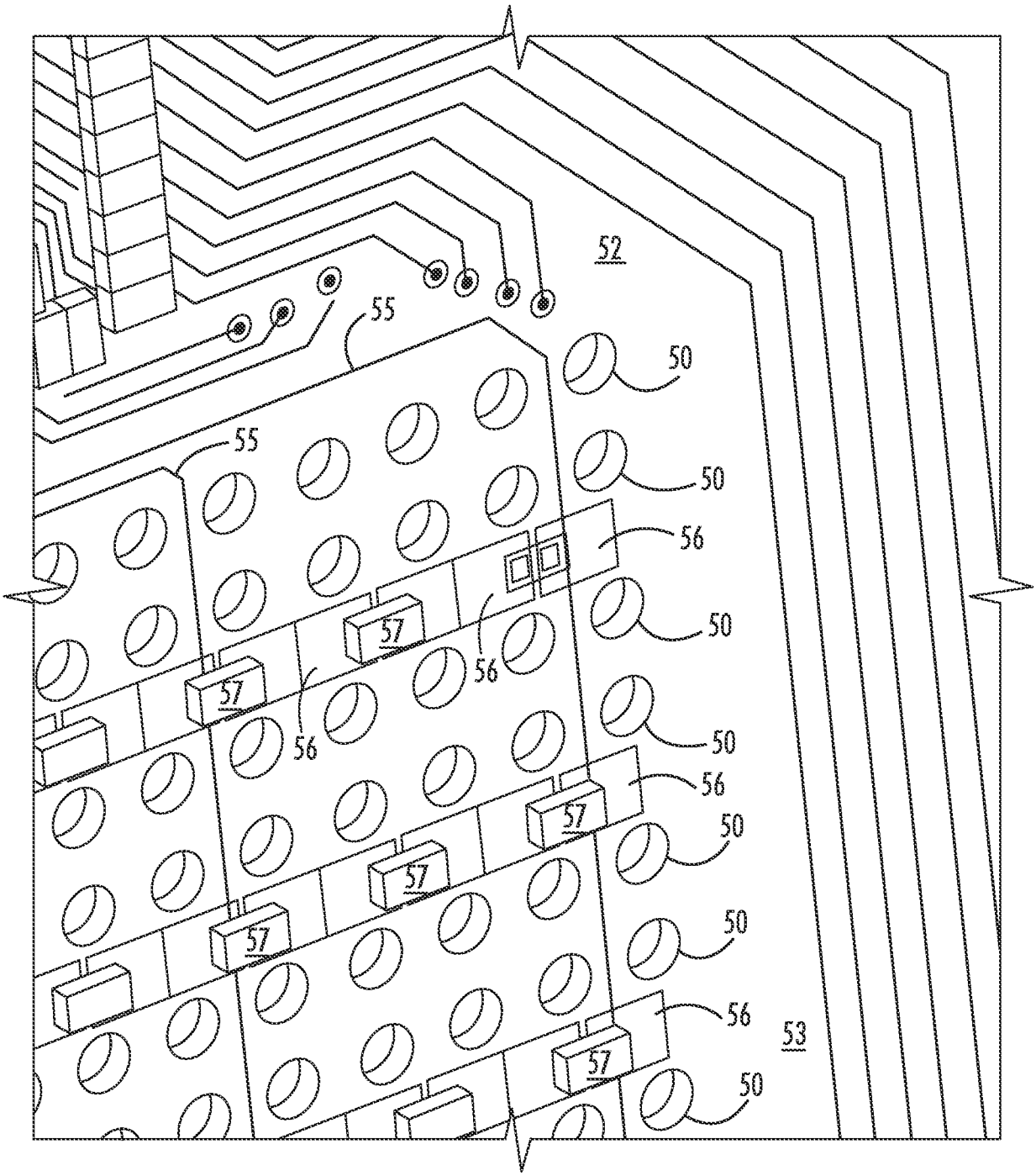


FIG. 3

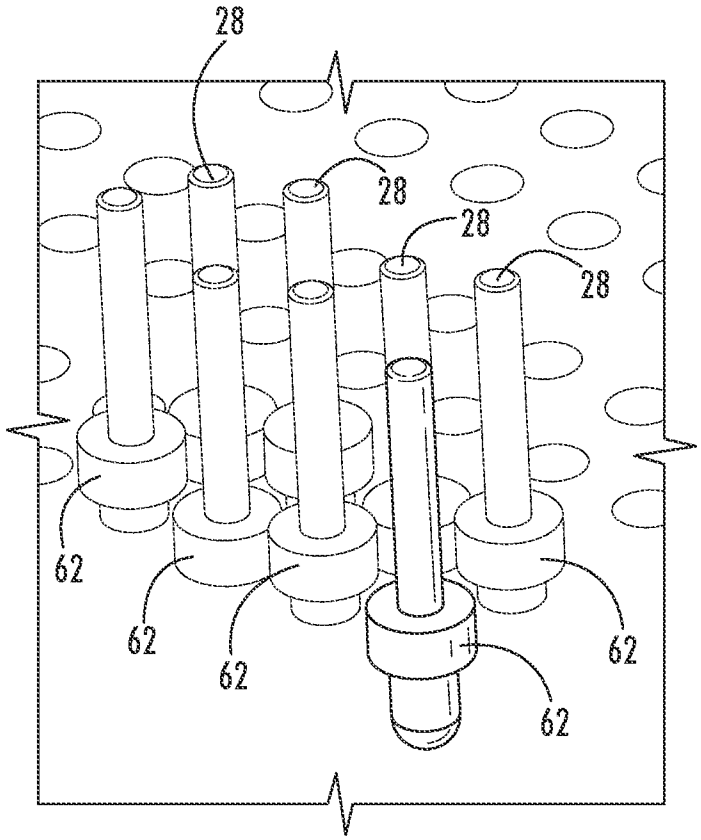


FIG. 4

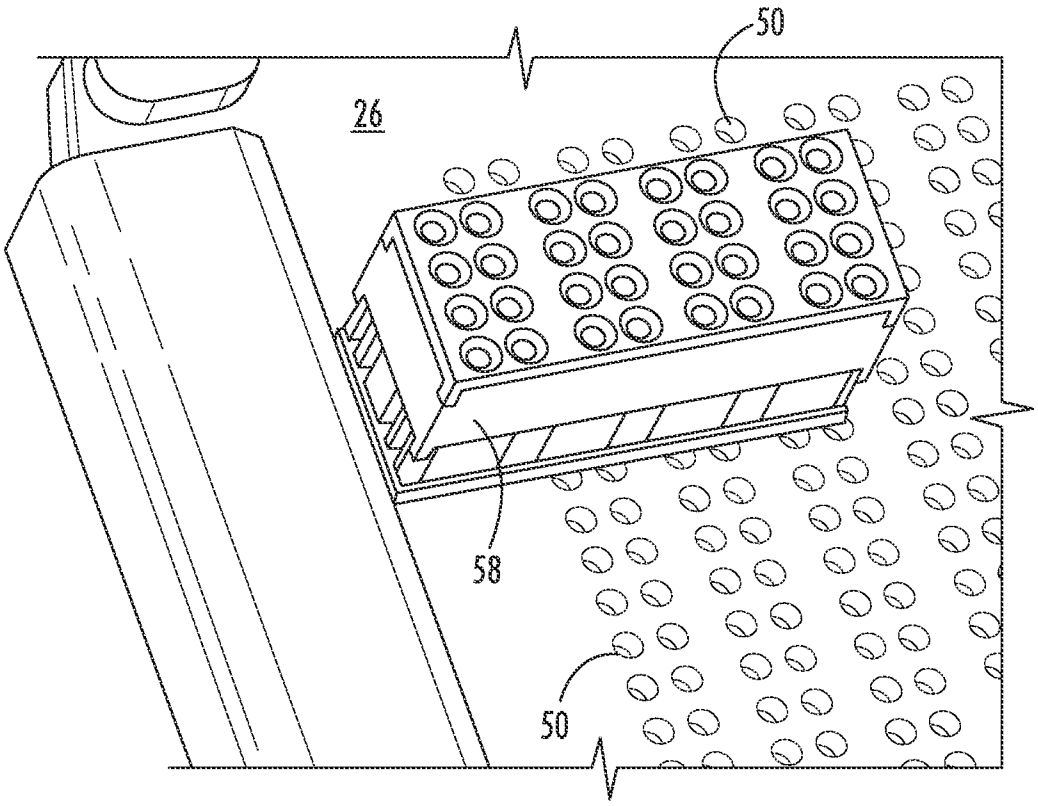


FIG. 5

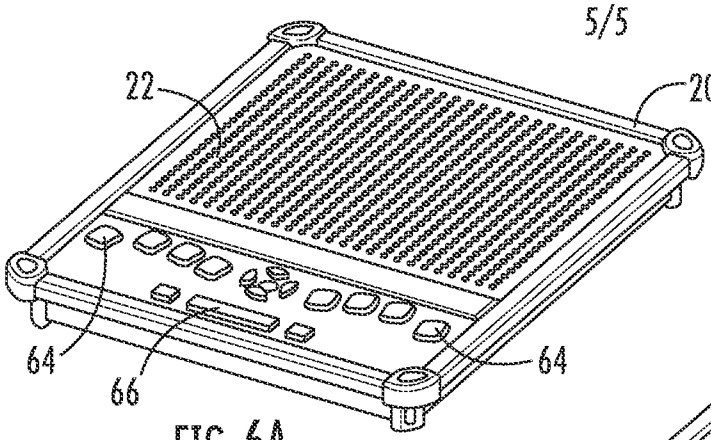


FIG. 6A

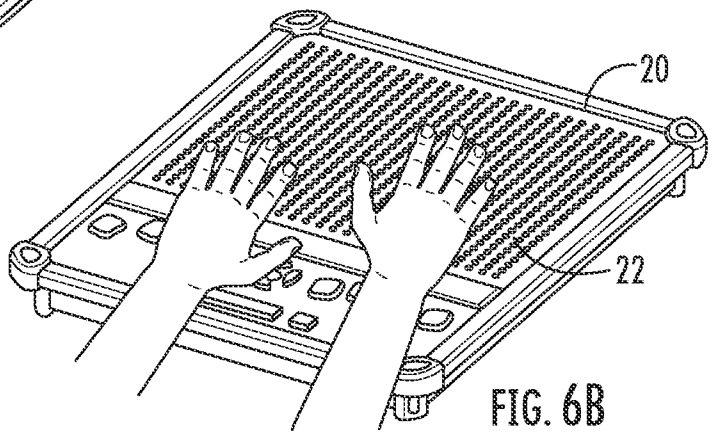


FIG. 6B

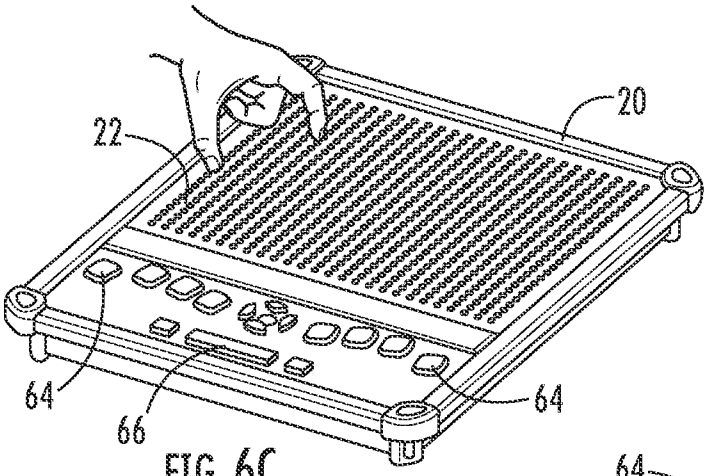


FIG. 6C

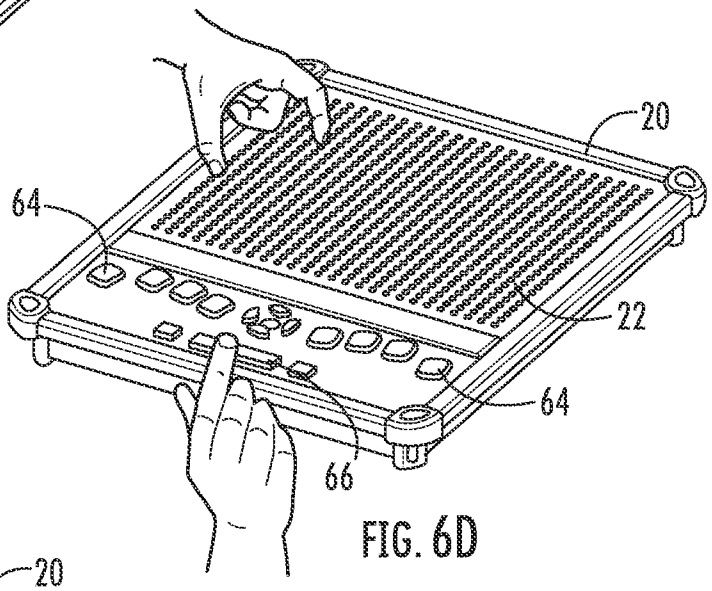


FIG. 6D

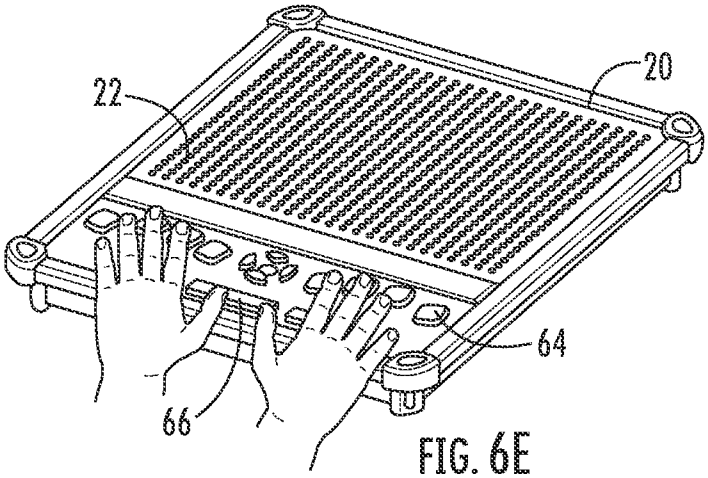


FIG. 6E

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US21/18887

A. CLASSIFICATION OF SUBJECT MATTER

IPC - G09B 21/00; G09B 21/02 (2020.01)

CPC - G09B 21/004; G09B 21/00; G09B 21/002; G09B 21/003; G09B 21/02; G09B 21/025

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)
See Search History document

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	AMERICAN PRINTING HOUSE FOR THE BLIND, INC. "Refreshabraille 18 Gen 3.0 User's Guide" 1-30. RB 18 Gen 2.0 User's Guide. [online]. 27 July 2015; [Retrieved on 13 April 2021]. Retrieved from the internet: <url:https://tech.aph.org/rbd_doc.htm>; pages 1-30.	1-6 --- 7-8
X --- Y	JP 2018013692 A (TOPPAN PRINTING CO LTD) 25 January 2018; see machine translation	9, 11-13, 15 --- 10, 14, 16
Y	US 5,466,154 A (THOMPSON JAMES M) 14 November 1995; figure 4; column 5, lines 4-27	7
Y	US 2018/0366031 A1 (FREEDOM SCIENTIFIC, INC.) 20 December 2018; paragraphs [0003], [0039]	8, 14, 16
Y	US 2014/0242555 A1 (FREEDOM SCIENTIFIC, INC.) 28 August 2014; paragraph [0035]	10
A	US 2009/0104587 A1 (FABRICK II RICHARD W) 23 April 2009; entire document	1-8
A	US 2009/0023116 A1 (SHAW KEITH N) 22 January 2009; entire document	1-8
A	US 6,542,623 B1 (KAHN SHMUEL) 01 April 2003; entire document	1-8
A	US 5,580,251 A (GILKES ALAN M) 03 December 1996; entire document	1-8

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"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 2021 (13.04.2021)	JUL 01 2021
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. 571-273-8300	Authorized officer Shane Thomas Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US21/18887

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
-***-Please See Supplemental Page-***-

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US21/18887

-***-Continued From Box No. III: Observations where unity of invention is lacking-***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-8 are directed toward a Braille tablet with an improved tactile display, the tactile display allowing a user to selectively generate both Braille characters and graphics, the tablet comprising: the tactile display selectively displaying either six or eight pin cells, with a six pin cell being generated by turning off an adjacent pin pair and an eight pin cell being generated by turning on an adjacent pin pair.

Group II: Claims 9-16 are directed toward a Braille tablet with sensors for locating the position of a user's hands, the tablet comprising: a series of capacitive strips formed on the inner surface of the PCB, each capacitive strip being associated with a Braille cell; whereby the user can touch the outer surface of the PCB at a location above a capacitive strip to thereby signal the microprocessor that the user wishes to interact with the associated Braille cell.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Group I include a Braille tablet with an improved tactile display, the tactile display allowing a user to selectively generate both Braille characters and graphics, the tablet comprising: the pins being positioned along X and Y axes; the array including a series of pin pairs oriented along the Y axis, each of the pin pairs being selectively turned off or on by the user of the tablet, wherein a pin pair is raised when on and lowered when off; the pins of the array defining a series of cells, within an individual cell being used to generate a Braille character, the tactile display selectively displaying either six or eight pin cells, with a six pin cell being generated by turning off an adjacent pin pair and an eight pin cell being generated by turning on an adjacent pin pair; the spacing between the pins along the Y axis being uniform with all of the pins being equally spaced from one another; the spacing between the cells along the X axis being non-uniform, with the spacing between adjacent cells along the X axis being greater than the spacing of the pins along the Y axis; the spacing of the pins across the face of the tactile display allowing the user to selectively display six pin cells, eight pin cells, and graphics, which are not present in Group II.

Group II include a Braille tablet with sensors for locating the position of a user's hands, the tablet comprising: the display including a printed circuit board ("PCB"), the PCB including an exposed outer surface and an inner surface; a microprocessor associated with the tablet and in electrical communication with the PCB; a series of capacitive strips formed on the inner surface of the PCB, each capacitive strip being associated with a Braille cell; whereby the user can touch the outer surface of the PCB at a location above a capacitive strip to thereby signal the microprocessor that the user wishes to interact with the associated Braille cell, which are not present in Group I.

The common technical features of Groups I and II are a Braille tablet, the tablet comprising: a display associated with the tablet; a pin array formed over the display, with the pin array defining a series of individual Braille cells, the pin array adapted to display individual Braille characters.

These common technical features are disclosed by US 2009/0023116 A1 (SHAW). Shaw discloses a Braille tablet (Braille pin apparatus; figure 1; paragraph [0041]), the tablet comprising: a display (10) associated with the tablet (as shown); a pin array (array of Braille pins 30; figure 1; paragraph [0042]) formed over the display (as shown), with the pin array defining a series of individual Braille cells (each cell represents a Braille character and includes a 2x3 sub-array of six Braille pins 30 as shown; figure 1; paragraph [0042]), the pin array adapted to display individual Braille characters (each cell for displaying a Braille character; figure 1; paragraph [0042]).

Since the common technical features are previously disclosed by the Shaw reference, the common features are not special and so Groups I and II lack unity.