(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 February 2017 (16.02.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/024732 A1

(51) International Patent Classification:
H04M 1/247 (2006.01)

(21) International Application Number:
PCT/CN2015/099154

(22) International Filing Date:
28 December 2015 (28.12.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
201510487902.7 10 August 2015 (10.08.2015) CN

(71) Applicants: **BOE TECHNOLOGY GROUP CO., LTD.** [CN/CN]; No.10 Jiuxianqiao Rd., Chaoyang District, Beijing 100015 (CN). **BEIJING BOE OPTOELECTRONICS TECHNOLOGY CO., LTD.** [CN/CN]; No.8 Xihuanzhonglu, BDA, Beijing 100176 (CN).

(72) Inventors: **YANG, Shengji**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **DONG, Xue**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **WANG, Haisheng**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **CHEN, Xiaochuan**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **ZHAO, Weijie**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **LIU, Yingming**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **XU, Rui**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **LIU, Jiantao**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **LI, Jing**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **XU, Jingbo**; No.9 Dize Rd., BDA, Beijing 100176 (CN). **WANG, Yingzi**; No.9 Dize Rd., BDA, Beijing 100176 (CN).

(74) Agent: **TEE&HOWE INTELLECTUAL PROPERTY ATTORNEYS**; CHEN, Yuan, 10th Floor, Tower D, Minsheng Financial Center, 28 Jianguomennei Avenue, Dongcheng District, Beijing 100005 (CN).

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

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

Published:

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

(54) Title: BRAILLE DISPLAY TERMINAL, SYSTEM AND METHOD

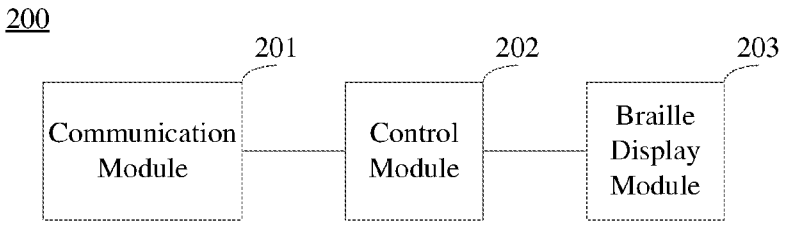

FIG. 2

(57) Abstract: The present invention provides a braille display module, terminal and system. The braille display terminal may include a communication module, a control module, and a braille display module. In operation, the communication module may receive to-be-displayed information and send it to the control module. The control module may generate control signals corresponding to the to-be-displayed information and send it to the braille display module. The braille display module may display the information in braille based on the control signals. Therefore, the visually impaired users may automatically acquire desired information.

WO 2017/024732 A1

BRAILLE DISPLAY TERMINAL, SYSTEM AND METHOD

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the priority of Chinese Patent Application No. 201510487902.7, entitled "Braille Display Terminal, System and Method," filed on August 10, 2015, the entire content of which is incorporated herein by reference.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to the field of display technologies and, more particularly, relates to a braille display terminal, system, and method.

BACKGROUND

[0003] Blind people have inherent visual impairments and may only obtain outside information by sound or touch. A braille display terminal is an electro-mechanical device that outputs braille characters. The braille characters are specially designed for visually impaired users and may be sensed by tactile perception. With the help of braille display terminals, blind people can read texts. However, the texts displayed by braille terminals are often entered manually. Blind people may still need help from others to obtain required information, which is not convenient.

[0004] The disclosed method and system are directed to solve one or more problems set forth above and other problems.

BRIEF SUMMARY OF THE DISCLOSURE

[0005] One aspect of the present disclosure provides a braille display module, including a display panel, a plurality of pins and a plurality of pin-driving assemblies. Each pin-driving assembly corresponds with at least one pin and is for driving the at least one pin. The plurality of pins may be arranged at the display panel in an array form. A pin is driven by a corresponding pin-driving assembly to raise above the display panel to present information based on a control signal.

[0006] In some embodiments, the plurality of pin-driving assemblies may be a plurality of piezoelectric units. When a voltage is applied to a piezo unit based on the control signal, the piezo unit expands in volume, and drives a pin corresponding to the piezo unit to raise above the display panel.

[0007] In some embodiments, each of the plurality of pin-driving assemblies may include one or more rotating shafts and a motor.

[0008] In one embodiment, the pin-driving assembly may include one rotating shaft and the motor. The rotating shaft may have a protrusion on a circumferential surface. The rotating shaft may be coaxially installed on a driving shaft of the motor. A lower end of one pin contacting the rotating shaft so that the one pin is driven by the pin-driving assembly.

[0009] In another embodiment, the pin-driving assembly may include two rotating shafts and the motor. Each rotating shaft may have a first protrusion and a second protrusion on a circumferential surface. Each of two pins corresponding with one of the two rotating shafts. The first protrusions of the two rotating shafts may be at different locations on the circumferential surfaces of the two rotating shafts. The second protrusions of the two rotating shafts may be at a same location on the circumferential surfaces of the two rotating shafts. The two rotating shafts are coaxially installed on a driving shaft of the motor. The lower end of each of the two pins are respectively pushed by one of the two rotating shafts such that the two pins are driven by the pin-driving assembly.

[0010] Further, the pin-driving assembly may include one or more elastic members, each elastic member corresponding to one rotating shaft. An upper end of each elastic member are connected with a corresponding pin, and a lower end of the elastic member being in contact with the corresponding rotating shaft.

[0011] Another aspect of the present disclosure provides a braille display terminal, including: a communication module for receiving to-be-displayed information; a control module for generating control signals corresponding to the to-be-displayed information; and a braille display module for displaying information based on the control signals.

[0012] The braille display module may include a display panel, a plurality of pins, and a plurality of pin-driving assemblies. Each pin-driving assembly corresponds with at least one pin and is for driving the at least one pin. The plurality of pins may be arranged at the display panel in an array form. A pin is driven by a corresponding pin-driving assembly to raise above the display panel to present information based on a control signal.

[0013] In some embodiments, the plurality of pin-driving assemblies may be a plurality of piezoelectric units. When a voltage is applied to a piezo unit based on the control signal, the piezo unit expands in volume, and drives a pin corresponding to the piezo unit to raise above the display panel.

[0014] In some embodiments, each of the plurality of pin-driving assemblies may include one or more rotating shafts and a motor.

[0015] In one embodiment, the pin-driving assembly may include one rotating shaft and the motor. The rotating shaft may have a protrusion on a circumferential surface. The rotating shaft may be coaxially installed on a driving shaft of the motor. A lower end of one pin contacting the rotating shaft so that the one pin is driven by the pin-driving assembly.

[0016] In another embodiment, the pin-driving assembly may include two rotating shafts and the motor. Each rotating shaft may have a first protrusion and a second protrusion on a circumferential surface. Each of two pins corresponding with one of the two rotating shafts. The first protrusions of the two rotating shafts may be at different locations on the circumferential surfaces of the two rotating shafts. The second protrusions of the two rotating shafts may be at a same location on the circumferential surfaces of the two rotating shafts. The two rotating shafts are coaxially installed on a driving shaft of the motor. The lower end of each of the two pins are respectively pushed by one of the two rotating shafts such that the two pins are driven by the pin-driving assembly.

[0017] Further, the pin-driving assembly may include one or more elastic members, each elastic member corresponding to one rotating shaft. An upper end of each elastic member are connected with a corresponding pin, and a lower end of the elastic member being in contact with the corresponding rotating shaft.

[0018] Further, a pin may have stopping-blocks on a side wall of the pin.

[0019] The control module may further include: a braille conversion unit for converting the to-be-displayed information into braille information; and a control signal conversion unit for converting the braille information to the control signals.

[0020] The communication module may further include one of an infrared communication module, a Bluetooth communication module, and a wireless fidelity (WiFi) module.

[0021] The braille display terminal may further include an audio module for broadcasting displayed information.

[0022] Another aspect of the present disclosure provides a braille display system, including a wearable device for collecting data and generating to-be-displayed information based on the collected data; and a braille display terminal. The braille display terminal may include a communication module for receiving the to-be-displayed information from the wearable device; a control module for generating control signals corresponding to the to-be-displayed information; and a braille display module for displaying information based on the control signals.

[0023] The braille display module may include a display panel, a plurality of pins, and a plurality of pin-driving assemblies. Each pin-driving assembly corresponds with at least one pin and is for driving the at least one pin. The plurality of pins may be arranged at the display panel in an array form. A pin is driven by a corresponding pin-driving assembly to raise above the display panel to present information based on a control signal.

[0024] In some embodiments, the plurality of pin-driving assemblies may be a plurality of piezoelectric units. When a voltage is applied to a piezo unit based on the control signal, the piezo unit expands in volume, and drives a pin corresponding to the piezo unit to raise above the display panel.

[0025] In some embodiments, each of the plurality of pin-driving assemblies may include one or more rotating shafts and a motor.

[0026] In one embodiment, the pin-driving assembly may include one rotating shaft and the motor. The rotating shaft may have a protrusion on a circumferential surface. The rotating shaft may be coaxially installed on a driving shaft of the motor. A lower end of one pin contacting the rotating shaft so that the one pin is driven by the pin-driving assembly.

[0027] In another embodiment, the pin-driving assembly may include two rotating shafts and the motor. Each rotating shaft may have a first protrusion and a second protrusion on a circumferential surface. Each of two pins corresponding with one of the two rotating shafts. The first protrusions of the two rotating shafts may be at different locations on the circumferential surfaces of the two rotating shafts. The second protrusions of the two rotating shafts may be at a same location on the circumferential surfaces of the two rotating shafts. The two rotating shafts are coaxially installed on a driving shaft of the motor. The

lower end of each of the two pins are respectively pushed by one of the two rotating shafts such that the two pins are driven by the pin-driving assembly.

[0028] Further, the pin-driving assembly may include one or more elastic members, each elastic member corresponding to one rotating shaft. An upper end of each elastic member are connected with a corresponding pin, and a lower end of the elastic member being in contact with the corresponding rotating shaft.

[0029] Further, a pin may have stopping-blocks on a side wall of the pin.

[0030] The control module may further include: a braille conversion unit for converting the to-be-displayed information into braille information; and a control signal conversion unit for converting the braille information to the control signals.

[0031] The communication module may further include one of an infrared communication module, a Bluetooth communication module, and a wireless fidelity (WiFi) module.

[0032] The braille display terminal may further include an audio module for broadcasting displayed information.

[0033] The wearable device may include at least one of a smart collar, a smart headset, smart glasses, a smart ring, and a smart watch.

[0034] The to-be-displayed information may include at least one of a position information, a navigation information, a road information, an environmental information, and a weather information.

[0035] The braille display may further include a voice recognition apparatus for receiving audio information from a user and generating a data retrieving instruction based on the received audio information. The wearable device may further generate the to-be-displayed information based on the data retrieving instruction.

[0036] Further, the voice recognition apparatus may be fully integrated with the wearable device.

[0037] The wearable device may collect data, generate to-be-displayed information based on the collected data, and send the to-be-displayed information to a braille display terminal. The braille display terminal generates control signals corresponding to the to-be-displayed information, and presents information based on the control signals.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] The following drawings are merely examples for illustrative purposes according to various disclosed embodiments and are not intended to limit the scope of the present disclosure.

[0039] Figure 1 illustrates an exemplary computing system according to various embodiments of the present disclosure;

[0040] Figure 2 illustrates a structure diagram of an exemplary braille display terminal according to various embodiments of the present disclosure;

[0041] Figure 3 illustrates a structure diagram of another exemplary braille display terminal according to various embodiments of the present disclosure;

[0042] Figure 4 illustrates a structure diagram of an exemplary braille display module according to various embodiments of the present disclosure;

[0043] Figure 5a and Figure 5b illustrate structure diagrams of exemplary pin-driving assemblies according to various embodiments of the present disclosure;

[0044] Figure 6 illustrates a structure diagram of an exemplary braille display system according to various embodiments of the present disclosure;

[0045] Figure 7 illustrates a structure diagram of another exemplary braille display system according to various embodiments of the present disclosure; and

[0046] Figure 8 illustrates a structure diagram of an exemplary braille display process according to various embodiments of the present disclosure.

DETAILED DESCRIPTION

[0047] Reference will now be made in detail to exemplary embodiments of the invention, which are illustrated in the accompanying drawings. Hereinafter, embodiments according to the disclosure will be described with reference to the drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. It is apparent that the described embodiments are some but not all of the embodiments of the present invention. Based on the disclosed embodiments, persons of ordinary skill in the art may derive other embodiments according to the present disclosure, all of which are within the scope of the present invention.

[0048] The present disclosure provides a braille display terminal, system and method. The braille display terminal, braille display system and braille display method may be implemented on any appropriate computing circuitry platform. Figure 1 illustrates a block diagram of an exemplary computing system according to various embodiments of the present disclosure.

[0049] Computing system 100 may include any appropriate type of computing systems, such as a personal computer (PC), a tablet or mobile computer, or a smart phone, etc. In addition, computing system 100 may be any appropriate content-presentation device capable of converting contents to signals corresponding to braille characters. Further, computing system 100 may be any appropriate device capable of collecting and transmitting data, such as a wearable device with sensors.

[0050] As shown in Figure 1, computing system 100 may include a processor 102, a storage medium 104, a display 106, a communication module 108, a database 110 and peripherals 112. Certain devices may be omitted and other devices may be included to better describe the relevant embodiments.

[0051] Processor 102 may include any appropriate processor or processors. Further, processor 102 can include multiple cores for multi-thread or parallel processing. Processor 102 may execute sequences of computer program instructions to perform various processes, such as voice recognition, signal processing, converting information into braille characters, etc. Storage medium 104 may include memory modules, such as ROM, RAM, flash memory modules, and mass storages, such as CD-ROM and hard disk, etc. Storage medium 104 may store computer programs for implementing various processes when the computer programs are executed by processor 102, such as computer programs for implementing a signal processing algorithm.

[0052] Further, communication module 108 may include certain network interface devices and hardware components for establishing connections through communication networks, such as cable network, wireless network (e.g., infrared, Bluetooth, WiFi), internet, etc. For example, communication module 108 may include an adapter and an antenna for sending and receiving signals from the communication networks. Database 110 may include one or more databases for storing certain data and for performing certain operations on the stored data, such as database searching. For example, database 110 may store a look-up table containing corresponding relationships between texts and braille representations of the texts.

[0053] Display 106 may provide information to users. Display 106 may include any appropriate type of computer display device or electronic device display such as LCD or OLED based devices. Display 106 may further include a braille display panel that provides information for visually impaired users. Peripherals 112 may include various sensors and other I/O devices, such as a GPS, a microphone, a speaker, a thermometer, etc.

[0054] In one embodiment, computing system 100 may receive data retrieving instructions to collect data from a peripheral 112. Processor 102 may process the collected data and transmit the data to another device through communication module 108. For example, computing system 100 may receive instructions to detect a distance to an obstacle on the road and send the detection result to a braille display terminal. In another example, computing system 100 may recognize a voice command and perform corresponding tasks based on the voice command, such as identifying a current location and sending it to a braille display terminal.

[0055] In another embodiment, computing system 100 may receive to-be-displayed information for further processing. The to-be-displayed information may be from locally stored data, data received from other sources over the network, or data inputted from peripherals 112, etc. Processor 102 may perform certain signal processing techniques to output the to-be-displayed information on a braille display terminal. For example, computing system 100 may receive and process a geographic location to be displayed by a braille display terminal.

[0056] Figure 2 illustrates a structure diagram of an exemplary braille display terminal according to various embodiments of the present disclosure. As shown in Figure 2, the braille display terminal 200 may include a communication module 201, a control module 202, and a braille display module 203.

[0057] The communication module 201 may be configured to receive to-be-displayed information. The communication module 201 may be, for example, implemented by communication module 108. The control module 202 may be configured to generate control signals corresponding to the to-be-displayed information. The control module 202 may be, for example, implemented by processor 102. The braille display module 203 may be configured to display the to-be-displayed information based on the control signals.

[0058] In operation, the communication module 201 may receive to-be-displayed information and send it to the control module 202. The control module 202 may generate

control signals corresponding to the to-be-displayed information and send them to the braille display module 203. The braille display module 203 may display the information in braille based on the control signals. Therefore, visually impaired users may automatically acquire desired information, which may be widely adopted because of the improved convenience to the users.

[0059] Figure 3 illustrates a structure diagram of another exemplary braille display terminal according to various embodiments of the present disclosure. As shown in Figure 3, the braille display terminal 300 may include a communication module 301, a control module 302, a braille display module 303 and an audio module 304.

[0060] The communication module 301 may be configured to receive to-be-displayed information. The communication module 201 may be, for example, implemented by communication module 108. The control module 302 may be configured to generate control signals corresponding to the to-be-displayed information. The control module 202 may be, for example, implemented by processor 102.

[0061] The braille display module 303 may be configured to display the information in braille based on the control signals. Figure 4 illustrates a structure diagram of an exemplary braille display module according to various embodiments of the present disclosure. The braille display module may be configured to display braille characters which are small rectangular blocks containing small palpable bumps (i.e., raised dots). The number and arrangement of these dots distinguish one character from another. For example, a braille character may be presented in a 6-dot block or an 8-dot block.

[0062] As shown in Figure 4, the braille display module may include a housing 1, pins 2 and pin-driving assemblies (not shown). The housing 1 may be a box with a depth for containing a plurality of pins 2 and a plurality of pin-driving assemblies (not shown). The housing 1 may include a display panel 11 configured on a top surface of the housing 1. The display panel 11 may be configured to include a plurality of through-holes 11a arranged in an array form.

[0063] A pin may be any properly shaped slender piece configured to fit the through-hole 11a and stand in the housing 1, such as a cuboid or a cylinder. Each pin corresponds to one through-hole 11a of the display panel 11 and may be pushed across and above the through-hole 11a to present a raised dot in a braille character. The cross section of a pin 2 may have a size compatible with the cross section of the through-hole 11a. In other words, a

plurality of pins may be arranged at the display panel in an array form for presenting braille information.

[0064] A pin 2 may be driven by a corresponding pin-driving assembly to switch between two states: a raised state and a flat state. At the raised state, the pin 2 may pop out of the through-hole 11a and raise above the display panel 11 to represent a raised dot in a braille character. At the flat state, the top surface of the pin 2 may stay at a same or lower level as the display panel 11 to represent a flat dot in a braille character.

[0065] Pins 2 at the raised state (i.e., partially above the display panel 11) and pins 2 at the flat state (i.e., at a same or lower level as the display panel 11) may form arrays with alternating raised and flat dots on the display panel 11, which may display braille information. Visually impaired users may touch the display panel 11 and read the displayed information. For example, the display panel 11 may be divided into a plurality of blocks, each block including six pins 2 to represent a braille character. Further, the display panel 11 may be divided into multiple rows and columns of the character blocks. Thus, the display panel 11 may present a considerable amount of context at one time.

[0066] A pin-driving assembly may be configured to drive at least one pin 2. The pin-driving assemblies may be configured inside the housing 1 and below the display panel 11.

[0067] In one embodiment, each pin-driving assembly may drive one pin 2. Figure 5a illustrate a structure diagram of an exemplary pin-driving assembly according to this embodiment. As shown in Figure 5a, the pin-driving assembly on the left illustrates the situation when the pin 2 is at the raised state. The pin-driving assembly on the right illustrates the situation when a pin 2 is at the flat state.

[0068] The pin-driving assembly may include a spring 31, a rotating shaft 32 and a motor 33. The rotating shaft 32 may be a cylinder having a protrusion 32a on its circumferential surface. The motor 33 may include a driving shaft. The rotating shaft 32 is coaxially installed on the driving shaft of the motor 33. One end (i.e., the upper end) of the spring 31 is connected with the pin 2, and the other end (i.e., the lower end) of the spring 31 is in contact with the rotating shaft 32.

[0069] The control signals from the control module 202 may control the motor 33 to rotate, which may drive the rotating shaft 32 to rotate. As shown in Figure 5a, along with the rotation of the rotating shaft 32, the spring 31 may switch between directly contacting the

circumferential surface of the rotating shaft 32 and indirectly contacting the circumferential surface of the rotating shaft 32 through the protrusion 32a. When the spring 31 directly contacts the circumferential surface of the rotating shaft 32, the pin 2 may move downward under the force of gravity and the pin 2 is at the flat state, as shown on the right of Figure 5a. When the spring 31 contacts the rotating shaft 32 through the protrusion 32a, the pin 2 may move upward under an elastic force of the spring 31, and the pin 2 may switch to the raised state, as shown on the left of Figure 5a.

[0070] It should be noted that in other embodiments, the spring 31 may be substituted by other types of elastic member or connector. The elastic member or the connector may be configured between the pin and the rotating shaft. An upper end of the elastic member or the connector is connected with the pin 2, and a lower end of the elastic member or the connector is in contact with the rotating shaft 32. Thus, the pin 2 may switch between the raised state and the flat state as the rotating shaft 32 rotates and contacts the elastic member or the connector with its different part.

[0071] Further, in some embodiments, the pin-driving assembly may not include the spring 31. In other words, the pin-driving assembly may be comprised of the rotating shaft 32 and the motor 33. The lower end of the pin 2 may directly contact the rotating shaft 32. When the lower end of the pin 2 contacts the protrusion 32a on the circumferential surface of the rotating shaft 32, the pin 2 is raised above the display panel 11. When the lower end of the pin 2 directly contacts the circumferential surface of the rotating shaft 32, the pin 2 is at the flat state. Thus, the pin 2 is driven by the pin-driving assembly to switch between the flat state and the raised state as the rotating shaft 32 rotates.

[0072] It is understood that the braille display module 203 may be implemented by common components such as pins, springs, rotating shafts and motors, which may reduce the cost of making the braille display module.

[0073] Further, a solid plate 31a may be configured at the lower end of the spring 31. The spring 31 may contact the rotating shaft 32 through the plate 31a, which may avoid the spring 31 bypassing the protrusion 32a and directly contacting the circumferential surface of the rotating shaft 32 when the spring 31 are facing the protrusion 32a.

[0074] In addition, the protrusion 32a may be wedge-shaped, which may facilitate the spring 31 to switch from directly contacting the circumferential surface of the rotating shaft 32 to contacting the protrusion 32a during the rotation.

[0075] In another embodiment, one pin-driving assembly may drive two pins 2. Figure 5b illustrate a structure diagram of an exemplary pin-driving assembly according to this embodiment. As shown in Figure 5b, the pin-driving assembly may include two springs 31, a motor 33 and two rotating shafts 32 which are a first rotating shaft and a second rotating shaft. Each of the two pins 2 may have one-to-one correspondence with a spring 31 and a rotating shaft 32. Each of the rotating shafts 32 may be a cylinder having two protrusions on its circumferential surface: a first protrusion 32a and a second protrusion 32b. The motor 33 may include a driving shaft. Both rotating shafts 32 are coaxially installed on the driving shaft of the motor 33. The upper end of each spring 31 is connected with its corresponding pin 2, and the lower end of each spring 31 is in contact with its corresponding rotating shaft 32.

[0076] The control signal may control the motor 33 to rotate, which may drive the rotating shafts 32 to rotate. The first protrusion 32a of the first rotating shaft 32 and the first protrusion 32a of the second rotating shaft 32 may be configured at different locations on the circumferential surfaces of the two rotating shafts 32. That is, along with the rotation of the rotating shafts 32, the two first protrusions 32a may contact their corresponding springs 31 at different times and separate with their corresponding springs 31 at the different times. Further, the second protrusion 32b of the first rotating shaft 32 and the second protrusion 32b of the second rotating shaft 32 may be configured at same locations on the circumferential surfaces of the two rotating shafts 32. That is, along with the rotation of the rotating shafts 32, the two second protrusions 32b may contact their corresponding springs 31 at the same time and separate with their corresponding springs 31 at the same time.

[0077] As shown in Figure 5b, along with the rotation of the rotating shaft 32, each spring 31 may switch between directly contacting the circumferential surface of the rotating shaft 32 and indirectly contacting the circumferential surface of the rotating shaft 32 through the first protrusion 32a or the second protrusion 32b. When the spring 31 directly contacts the circumferential surface of its corresponding rotating shaft 32, the corresponding pin 2 may move downward under gravity and the pin 2 is not projected outside the display panel 11, as shown on the right of Figure 5b. When the spring 31 indirectly contacts the circumferential surface of the rotating shaft 32 through the protrusion 32a, its corresponding pin 2 may move upward under an elastic force of the spring 31, and the pin 2 may raise above the display panel 11, as shown on the left of Figure 5b.

[0078] Further, as shown in Figure 5b, the rotation of the motor 33 may drive the rotating shafts 32 to rotate, which brings the protrusions 32b configured at same locations to contact the springs 31 at the same time, and the two pins 2 may raise above the display panel 11 together. Moreover, the rotation of the motor 33 may drive the rotating shafts 32 to rotate, which brings the first protrusion 32a on the first rotating shaft 32 to contact the corresponding spring 31, while the first protrusion 32a and the second protrusion 32b on the second rotating shaft 32 do not contact the corresponding spring 31. Thus, a first pin 2 (i.e., pin 2 on the left in Figure 5b) raise above the display panel 11, and the second pin 2 (i.e., pin 2 on the right in Figure 5b) stays below the surface of the display panel 11. When the motor 33 rotates and two springs 31 are both directly contacting the circumferential surface of the rotating shafts 32, two pins 2 are both below the surface of the display panel 11.

[0079] It should be noted that in other embodiments, the two springs 31 may be substituted by other types of elastic member or connector. The elastic member or the connector may be configured between the pin 2 and its corresponding rotating shaft 32. An upper end of the elastic member or the connector is connected with the pin 2, and a lower end of the elastic member or the connector is in contact with the rotating shaft 32. Thus, the pin 2 may switch between the raised state and the flat state as its corresponding rotating shaft 32 rotates.

[0080] Further, in some embodiments, the pin-driving assembly may not include the two springs 31. In other words, the pin-driving assembly may be comprised of the two rotating shafts 32 and the motor 33. The lower end of the pin 2 may directly contact its corresponding rotating shaft 32. When the lower end of the pin 2 contacts the first protrusion 32a or the second protrusions 32b on the circumferential surface of its corresponding rotating shaft 32, the pin 2 is raised above the display panel 11. When the lower end of the pin 2 directly contacts the circumferential surface of its corresponding rotating shaft 32, the pin 2 is at the flat state. Thus, two pins 2 may be driven by the pin-driving assembly to switch between the flat state and the raised state as the two rotating shafts 32 rotate.

[0081] It should be noted that, the same principle may be applied to a pin-driving assembly for driving three or more pins with similar structures.

[0082] In some embodiments, as shown in Figures 5a and 5b, a pin 2 may further include two or more stopping-blocks 21 configured on its side wall. The stopping-block 21 may prevent the pin 2 from completely popping out of the display panel 11 under the elastic

force of the spring 31. Further, the stopping blocks 21 may be configured at a same height on the side wall of each pin 2. Thus, the pins 2 above the display panel 11 may have a uniform raised height.

[0083] Returning to Figure 4, pins 2 above the display panel 11 and pins 2 below the display panel may form arrays with alternating raised and lowered cells on the display panel 11, which may present braille information. Visually impaired users may touch the display panel 11 and obtain the displayed information.

[0084] It is understood that the braille display module may be implemented by common components such as pins, springs, rotating shafts and motors, the cost of the braille display module may be reduced. In addition, one motor may control a plurality of neighboring pins, which may further reduce production cost.

[0085] In some embodiments, the braille display module 203 may include a raised dot array formed by a plurality of piezoelectric units. Using the piezo effect, when a voltage is applied to a piezo unit based on the control signal, the piezo unit may expand in volume, and display effects as a raised dot.

[0086] Returning to Figure 2, the control module 202 may further include a braille conversion unit and a control signal conversion unit. The braille conversion unit may be configured to convert the to-be-displayed information into braille information. The control signal conversion unit may be configured to convert the braille information to control signals.

[0087] In some embodiments, the braille conversion unit may further be configured to store mapping relationships between text information and braille information, and convert the to-be-displayed information to braille information based on the stored mapping relationships. For example, the mapping relationships between text information and braille information may be stored in a table. The table may support multiple languages. That is, an English alphabet may have mapping relationships with braille characters according to English braille customs; a Chinese character may have mapping relationships with braille characters according to Chinese braille customs.

[0088] The control signal conversion unit may further be configured to store correspondence relationships between braille information and control signals, and convert the braille information to corresponding control signals based on the stored correspondence relationships. The control signals may control the motors of the pin-driving assemblies to

rotate certain degrees to raise some pins or lower some pins for presenting the displayed information.

[0089] Further, when the information cannot be completely shown in one setting on the display panel 11, the control module 202 may be configured to convert the information into multiple batches of control signals, each batch of control signals corresponding to one setting of the braille display module 203.

[0090] In one embodiment, the control module 202 may send one batch of control signals at a set time interval. Thus the braille display module 203 may refresh the setting and display the information at a set speed. For example, the display panel 11 may be configured to show 140 characters at one setting. The information may include 200 characters. The control module 302 may convert the information into 2 batches of control signals and send each batch of control signals at every 30 seconds. The braille display module 303 may receive the first batch of control signals to display the first 140 characters at a first setting, and after 30 seconds, to display the remaining 60 characters at a second setting.

[0091] In another embodiment, the control module 302 may further include one or more control buttons, such as a "previous page" button and a "next page" button. For example, the user may select to turn to a next page. The control module 202 may send a next batch of control signals when receiving the instruction.

[0092] The communication module 201 may include at least one of an infrared communication module, a Bluetooth communication module, and a wireless fidelity (WiFi) module. It is understood that, the components of the communication module 201 (such as the infrared communication module, the Bluetooth communication module, and the WiFi module) are commonly used, thus the implementation cost may be low.

[0093] The audio module 204 may be configured to broadcast the displayed information through audio. Compared to the braille display, audio broadcasting may be simpler, more convenient and faster, and may enhance efficiency and convenience for visually impaired users to obtain information in a quiet environment. Meanwhile, the braille display may ensure visually impaired users to obtain desired information in a noisy environment. The audio module 204 may be implemented by an audio chip and a speaker, which is simple, convenient, and economic.

[0094] Figure 6 illustrates a structure diagram of an exemplary braille display system according to various embodiments of the present disclosure. As shown in Figure 6, the

braille display system 600 may include a wearable device 601 and a braille display terminal 602.

[0095] The wearable device 601 may be configured to collect data and generate to-be-displayed information based on the collected data. The braille display terminal 602 may be the braille display terminal 200 or the braille display terminal 300 illustrated in Figure 2 or Figure 3 according to previously described embodiments.

[0096] In operation, the wearable device 601 may collect data, generate to-be-displayed information based on the collected data, and send the to-be-displayed information to the braille display terminal 602. The braille display terminal 602 may receive the to-be-displayed information, and present the information in braille characters. Therefore, information may be automatically presented to the visually impaired users. The braille display system may allow the visually impaired users to acquire desired information without help from others, and is thus convenient to use. Further, data collection is implemented by the wearable device, which is convenient to carry around.

[0097] Figure 7 illustrates a structure diagram of another exemplary braille display system according to various embodiments of the present disclosure. As shown in Figure 7, the braille display system 700 may include a wearable device 701, a braille display terminal 702, and a voice recognition apparatus 703.

[0098] The wearable device 701 may be configured to collect data and generate to-be-displayed information based on the collected data. The braille display terminal 702 may be the braille display terminal 200 or the braille display terminal 300 illustrated in Figure 2 or Figure 3 according to previously described embodiments.

[0099] In operation, the wearable device 701 may collect data, generate to-be-displayed information based on the collected data, and send the to-be-displayed information to the braille display terminal. The braille display terminal 702 may receive the to-be-displayed information, and present the information in braille. Therefore, information may be automatically presented to the visually impaired users. The braille display system may allow the visually impaired users to acquire desired information without help from others, and is thus convenient to use. Further, data collection is implemented by the wearable device, which is convenient to carry around.

[00100] Further, the wearable device 701 may include, but not limited to, at least one of a smart collar, a smart headset, smart glasses, a smart ring, and a smart watch. The

wearable device 701 may be any appropriate wearable device that collects and transmits data. By directly using a wearable device to collect data, the implementation cost may be reduced.

[00101] The to-be-displayed or the displayed information may include, but not limited to, at least one of position information, navigation information, road information, environmental information, and weather information. The information may be any information collected by the wearable device. It is understood that, such information may include various types of information, to meet various needs of the visually impaired population.

[00102] For example, the smart glasses may be configured to include a camera to obtain image information of the road surface and the surrounding environment. The smart watch may be configured with a global positioning system (GPS) to obtain the location of the visually impaired users. The smart ring may be configured with range finder to obtain information about nearby obstacles. The smart collar may be configured with sensors to obtain weather information.

[00103] The voice recognition apparatus 703 may be configured to receive audio information from a user and generate data retrieving instructions based on the received audio information. The wearable device 701 may be further configured to generate to-be-displayed information based on the data retrieving instruction.

[00104] In operation, the wearable device 701 may directly collect data based on the data retrieving instruction and generate to-be-displayed information based on the data retrieving instruction. Alternatively, the wearable device 701 may store collected data and generate to-be-displayed information according to the stored data when receiving the data retrieving instruction.

[00105] The voice recognition apparatus 703 may be implemented by an audio chip and a microphone, which is simple, convenient and economic. The voice recognition apparatus 703 may allow visually impaired users to express their desired information conveniently, and may enhance efficiency and convenience for visually impaired users to obtain information.

[00106] The voice recognition apparatus 703 may be a separate apparatus, or may be integrated into the braille display terminal 702 or the wearable device 701 such as a smart headset. For example, the voice recognition apparatus 703 may be integrated with the audio module 304 in the braille display terminal. A user may use voice commands to refresh the

information on the braille display module 303, or to display a next page of information on the braille display module 303.

[00107] Figure 8 illustrates a structure diagram of an exemplary braille display process according to various embodiments of the present disclosure. The process may be used in the braille display system shown in Figure 6 or 7. The process may include the following steps.

[00108] A wearable device may collect data and generate to-be-displayed information based on the collected data (S801). The wearable device may send the to-be-displayed information to the braille display terminal (S802). The braille display terminal may generate control signals corresponding to the to-be-displayed information, and present the information in braille based on the control signals (S803).

[00109] In operation, the wearable device may collect data, generate to-be-displayed information based on the collected data, and send the to-be-displayed information to the braille display terminal. The braille display terminal may receive the to-be-displayed information, and present the information in braille. Therefore, the visually impaired users may acquire desired information automatically generated by the braille display system, which is very convenient to use. Further, data collection is implemented by the wearable device, which is convenience to carry around.

[00110] The wearable device and the voice recognition apparatus may be integrated with the braille display terminal. In some embodiments, the wearable device, the voice recognition apparatus, and the braille display terminal may be implemented as a one-piece system. For example, the wearable device may be a pair of glasses. The voice recognition system may be a microphone piece fully attached to or integrated with the glasses (e.g., one leg of the glasses). The braille display terminal may be a touch terminal fully attached to or integrated with the glasses (e.g., one leg of the glasses).

[00111] In some embodiments, a user can set up the wearable device, the voice recognition apparatus, and the braille display terminal to be configured either as a one-piece system or a multi-piece system. For example, the wearable device, the voice recognition apparatus, and the braille display terminal may include adaptors that would allow one piece to be plugged into another. A user may plug in the voice recognition apparatus into a wearable device, such as a pair of glasses. The user may choose to not plug in the braille display terminal with the wearable device. The separate pieces may then communicate

wirelessly to each other. In another example, the user may plug in the voice recognition apparatus and the braille display terminal together with the wearable device.

[00112] In various embodiments, the disclosed modules for the exemplary system as depicted above can be configured in one device or configured in multiple devices as desired. The modules disclosed herein can be integrated in one module or in multiple modules for processing messages. Each of the modules disclosed herein can be divided into one or more sub-modules, which can be recombined in any manners.

[00113] The disclosed embodiments are examples only. One of ordinary skill in the art would appreciate that suitable software and/or hardware (e.g., a universal hardware platform) may be included and used to perform the disclosed methods. For example, the disclosed embodiments can be implemented by hardware only, which alternatively can be implemented by software only or a combination of hardware and software. The software can be stored in a storage medium. The software can include suitable commands to enable any client device (e.g., including a digital camera, a smart terminal, a server, or a network device, etc.) to implement the disclosed embodiments.

[00114] Other embodiments of the disclosure will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the claims.

WHAT IS CLAIMED IS:

1. A braille display module, comprising:

a display panel;

a plurality of pins; and

a plurality of pin-driving assemblies;

wherein:

each pin-driving assembly corresponds with at least one pin and is for driving the at least one pin;

the plurality of pins are arranged at the display panel in an array form; and

a pin is driven by a corresponding pin-driving assembly to raise above the display panel to present information based on a control signal.

2. The braille display module according to claim 1, wherein each of the plurality of pin-driving assemblies comprises one or more rotating shafts and a motor.

3. The braille display module according to claim 1, wherein the plurality of pin-driving assemblies are a plurality of piezoelectric units; and

when a voltage is applied to a piezo unit based on the control signal, the piezo unit expands in volume, and drives a pin corresponding to the piezo unit to raise above the display panel.

4. The braille display module according to claim 2, wherein the pin-driving assembly comprises one rotating shaft and the motor,

the rotating shaft having a protrusion on a circumferential surface;

the rotating shaft being coaxially installed on a driving shaft of the motor; and

a lower end of one pin contacting the rotating shaft so that the one pin is driven by the pin-driving assembly.

5. The braille display module according to claim 2, wherein the pin-driving assembly comprises:

two rotating shafts, each having a first protrusion and a second protrusion on a circumferential surface; and

the motor,

each of two pins corresponding with one of the two rotating shafts;

the first protrusions of the two rotating shafts being at different locations on the circumferential surfaces of the two rotating shafts;

the second protrusions of the two rotating shafts being at a same location on the circumferential surfaces of the two rotating shafts;

the two rotating shafts being coaxially installed on a driving shaft of the motor; and

a lower end of each of the two pins being respectively pushed by one of the two rotating shafts such that the two pins are driven by the pin-driving assembly.

6. The braille display module according to claim 2, wherein the pin-driving assembly further comprises one or more elastic members, each elastic member corresponding to one rotating shaft;

an upper end of each elastic member being connected with a corresponding pin, and a lower end of the elastic member being in contact with the corresponding rotating shaft.

7. A braille display terminal, comprising:

a communication module for receiving to-be-displayed information;

a control module for generating control signals corresponding to the to-be-displayed information; and

a braille display module for displaying information based on the control signals.

8. The braille display terminal according to claim 7, wherein:

the braille display module comprises a display panel, a plurality of pins, and a plurality of pin-driving assemblies;

each pin-driving assembly corresponds with at least one pin and is for driving the at least one pin;

the plurality of pins are arranged at the display panel in an array form; and

a pin is driven by a corresponding pin-driving assembly to raise above the display panel to present the information based on the control signals.

9. The braille display terminal according to claim 8, wherein each of the plurality of pin-driving assemblies comprises one or more rotating shafts and a motor.

10. The braille display terminal according to claim 8, wherein the plurality of pin-driving assemblies are a plurality of piezoelectric units; and

when a voltage is applied to a piezo unit based on the control signals, the piezo unit expands in volume, and drives a pin corresponding to the piezo unit to raise above the display panel.

11. The braille display terminal according to claim 9, wherein the pin-driving assembly comprises one rotating shaft and the motor,

the rotating shaft having a protrusion on a circumferential surface,

the rotating shaft being coaxially installed on a driving shaft of the motor, and

a lower end of one pin being pushed by the rotating shaft such that the one pin is driven by the pin-driving assembly.

12. The braille display terminal according to claim 9, wherein the pin-driving assembly comprises:

two rotating shafts, each having a first protrusion and a second protrusion on a circumferential surface of the rotating shaft; and

the motor,

each of two pins corresponding with one of the two rotating shafts;

the first protrusions of the two rotating shafts being at different locations on the circumferential surfaces of the two rotating shafts;

the second protrusions of the two rotating shafts being at a same location on the circumferential surfaces of the two rotating shafts;

the two rotating shafts being coaxially installed on a driving shaft of the motor; and

a lower end of each of the two pins being respectively pushed by one of the two rotating shafts such that the two pins are driven by the pin-driving assembly.

13. The braille display terminal according to claim 9, wherein the pin-driving assembly further comprises one or more elastic members, each elastic member corresponding to one rotating shaft;

an upper end of each elastic member being connected with a corresponding pin, and a lower end of the elastic member being in contact with the corresponding rotating shaft.

14. The braille display terminal according to any one of claims 11 to 13, wherein:

a pin has stopping-blocks on a side wall of the pin.

15. The braille display terminal according to any one of claims 7 to 13, wherein the control module further comprises:

a braille conversion unit for converting the to-be-displayed information into braille information; and

a control signal conversion unit for converting the braille information to the control signals.

16. The braille display terminal according to any one of claims 7 to 13, wherein the communication module further comprises one of an infrared communication module, a Bluetooth communication module, and a wireless fidelity (WiFi) module.

17. The braille display terminal according to any one of claims 7 to 13, further comprises:

an audio module for broadcasting displayed information.

18. A braille display system, comprising:

a wearable device for collecting data and generating to-be-displayed information based on the collected data; and

a braille display terminal, comprising:

a communication module for receiving the to-be-displayed information from the wearable device;

a control module for generating control signals corresponding to the to-be-displayed information; and

a braille display module for displaying information based on the control signals.

19. The braille display system according to claim 18, wherein:

the braille display module comprises a display panel, a plurality of pins, and a plurality of pin-driving assemblies;

each pin-driving assembly corresponds with at least one pin and drives the at least one pin;

the plurality of pins are arranged at the display panel in an array form; and

a pin is driven by a corresponding pin-driving assembly to raise above the display panel to present the information based on the control signals.

20. The braille display system according to claim 19, wherein each of the plurality of pin-driving assemblies comprises one or more rotating shafts and a motor.

21. The braille display system according to claim 19, wherein the plurality of pin-driving assemblies are a plurality of piezoelectric units; and

when a voltage is applied to a piezo unit based on the control signals, the piezo unit expands in volume, and drives a pin corresponding to the piezo unit to raise above the display panel.

22. The braille display system according to claim 20, wherein the pin-driving assembly comprises a rotating shaft and a motor,

the rotating shaft having a protrusion on a circumferential surface;

the rotating shaft being coaxially installed on a driving shaft of the motor; and

a lower end of one pin being pushed by the rotating shaft such that the one pin is driven by the pin-driving assembly.

23. The braille display system according to claim 20, wherein the pin-driving assembly comprises:

two rotating shafts, each having a first protrusion and a second protrusion on a circumferential surface of the rotating shaft; and

a motor,

each of two pins corresponding with one of the two rotating shafts;

the first protrusions of the two rotating shafts being at different locations on the circumferential surfaces of the two rotating shafts;

the second protrusions of the two rotating shafts being at a same location on the circumferential surfaces of the two rotating shafts;

the two rotating shafts being coaxially installed on a driving shaft of the motor; and

a lower end of each of the two pins being respectively pushed by one of the two rotating shafts such that the two pins are driven by the pin-driving assembly.

24. The braille display system according to claim 20, wherein the pin-driving assembly further comprises one or more elastic members, each elastic member corresponding to one rotating shaft;

an upper end of each elastic member being connected with a corresponding pin, and a lower end of the elastic member being in contact with the corresponding rotating shaft.

25. The braille display system according to any one of claims 22 to 24, wherein:

a pin has stopping-blocks on a side wall of the pin.

26. The braille display system according to any one of claims 19 to 24, wherein the control module further comprises:

a braille conversion unit for converting the to-be-displayed information into braille information; and

a control signal conversion unit for converting the braille information to the control signals.

27. The braille display system according to any one of claims 19 to 24, wherein the communication module further comprises one of an infrared communication module, a Bluetooth communication module, and a wireless fidelity (WiFi) module.

28. The braille display system according to any one of claims 19 to 24, further comprises:

an audio module for broadcasting the displayed information.

29. The braille display system according to any one of claims 19 to 24, wherein the wearable device includes at least one of a smart collar, a smart headset, smart glasses, a smart ring, and a smart watch.

30. The braille display system according to any one of claims 19 to 24, wherein the to-be-displayed information includes at least one of a position information, a navigation information, a road information, an environmental information, and a weather information.

31. The braille display system according to any one of claims 19 to 24, further comprises:

a voice recognition apparatus for receiving audio information from a user and generating a data retrieving instruction based on the received audio information,

wherein the wearable device further generates the to-be-displayed information based on the data retrieving instruction.

32. The braille display system according to claim 31, wherein the voice recognition apparatus is fully integrated with the wearable device.

33. The braille display system according to any one of claims 19 to 24, wherein:

the wearable device collects data, generates to-be-displayed information based on the collected data, and sends the to-be-displayed information to a braille display terminal; and

the braille display terminal generates control signals corresponding to the to-be-displayed information, and presents information based on the control signals.

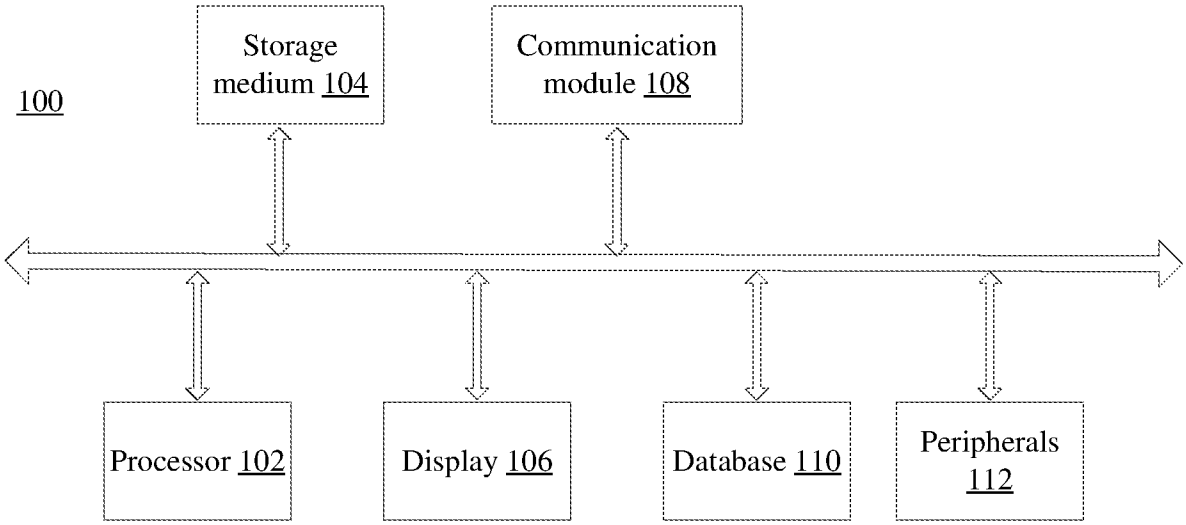
100
Storage medium 104
Communication module 108
Processor 102
Display 106
Database 110
Peripherals 112

FIG. 1

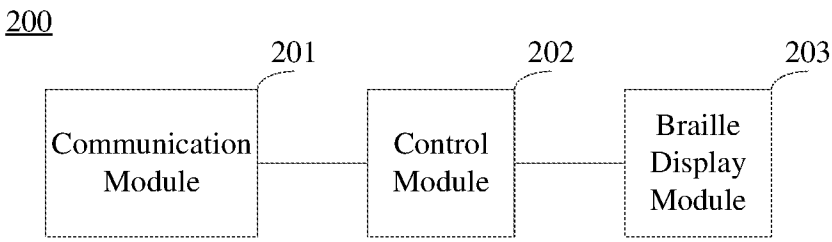
200
201
202
203
Communication Module
Control Module
Braille Display Module

FIG. 2

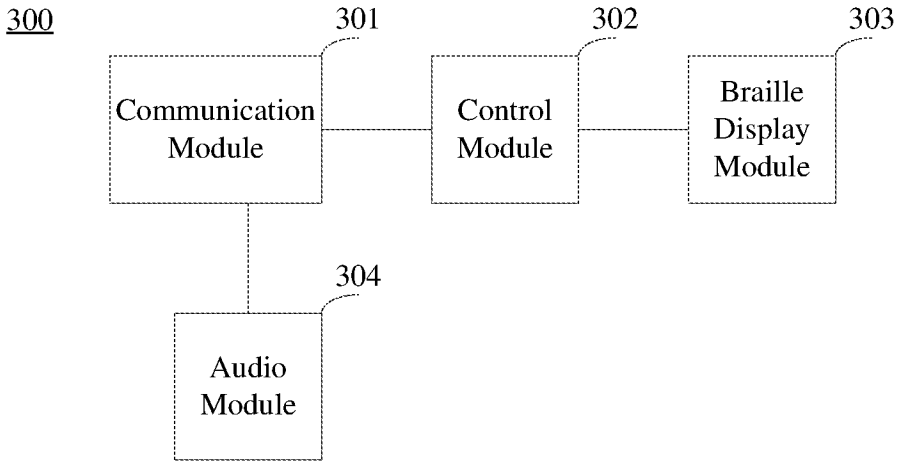
300
301
Communication Module
302
Control Module
303
Braille Display Module
304
Audio Module

FIG. 3

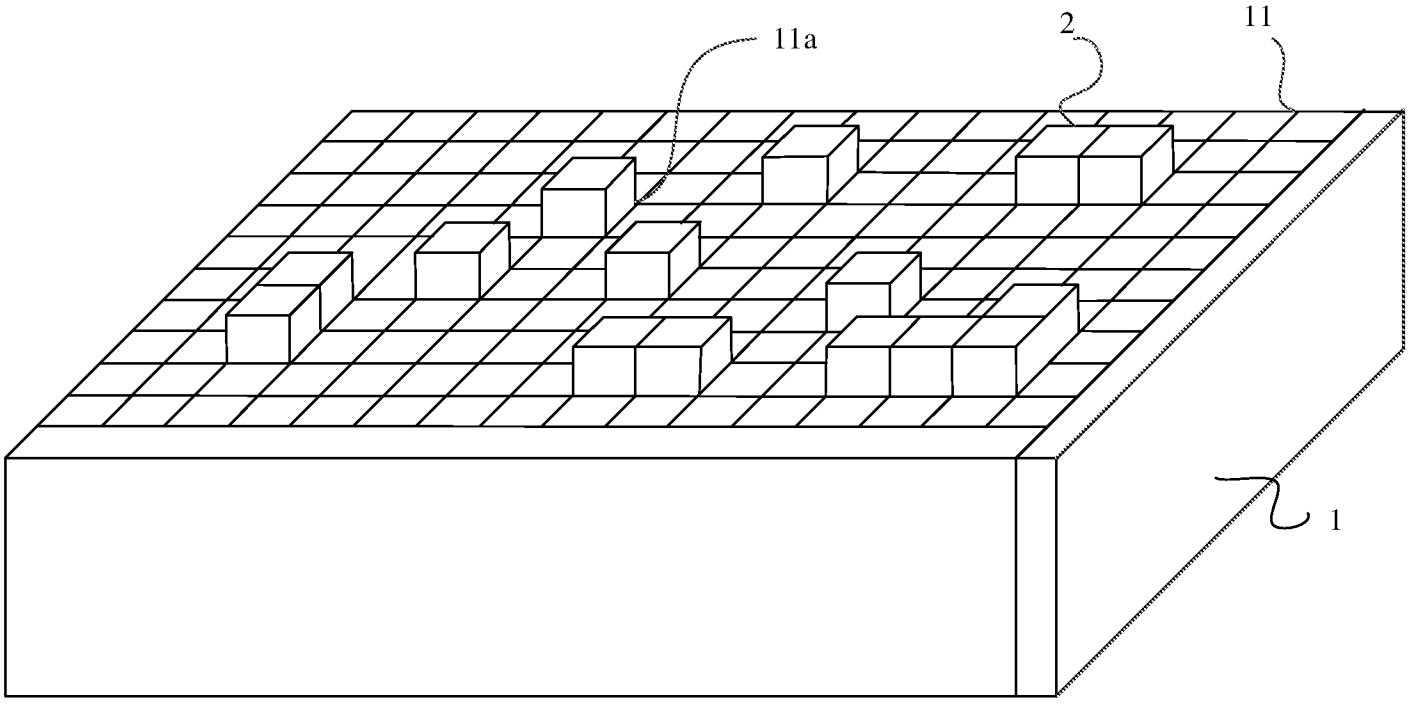
11a
2
11
1

FIG. 4

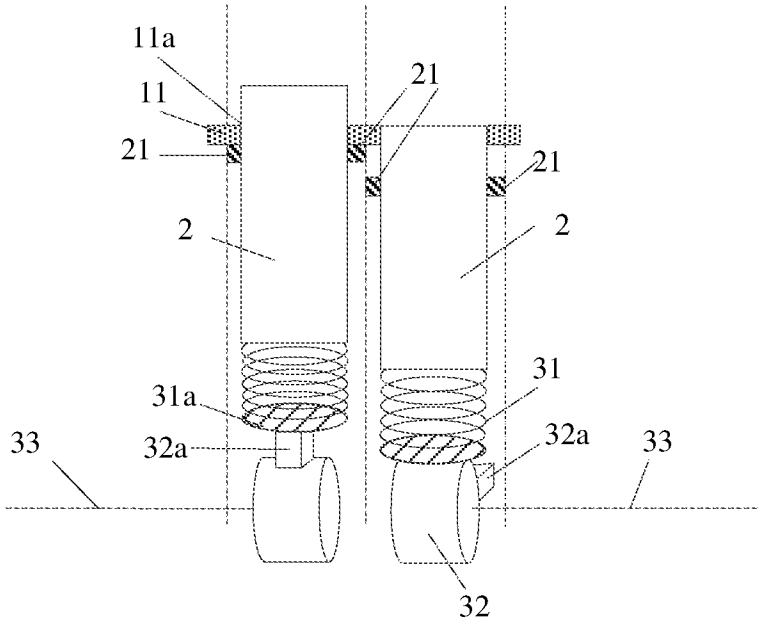
11a
11
21
21
21
21
2
2
31
31a
32a
32a
33
33
32

FIG. 5a

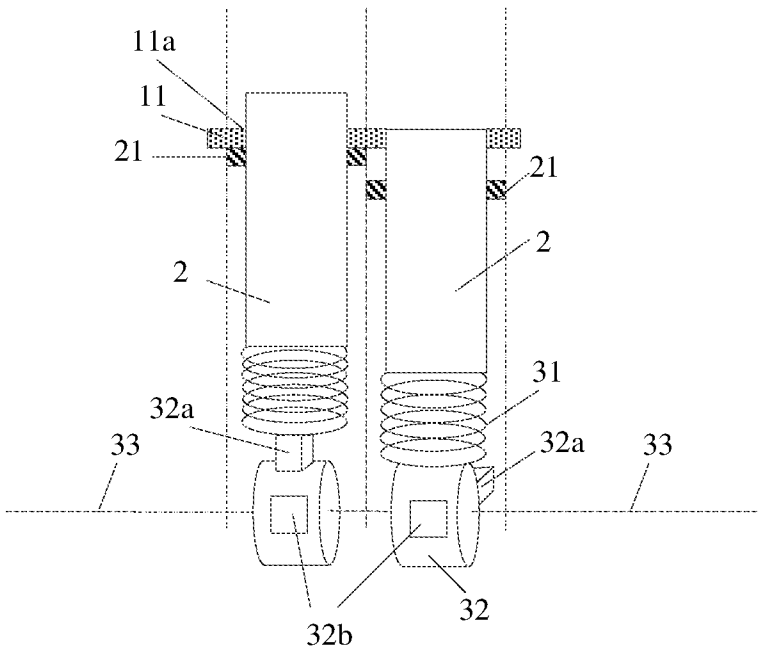
11a
11
21
21
21
2
2
31
32a
32a
33
33
32
32b

FIG. 5b

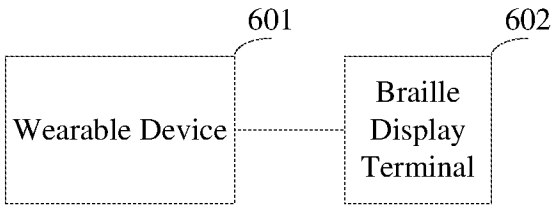

FIG. 6

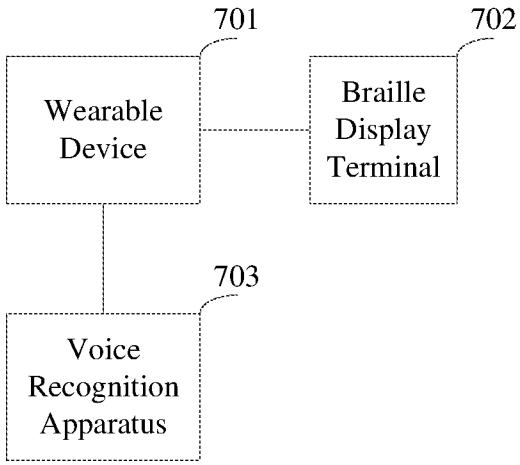

FIG. 7

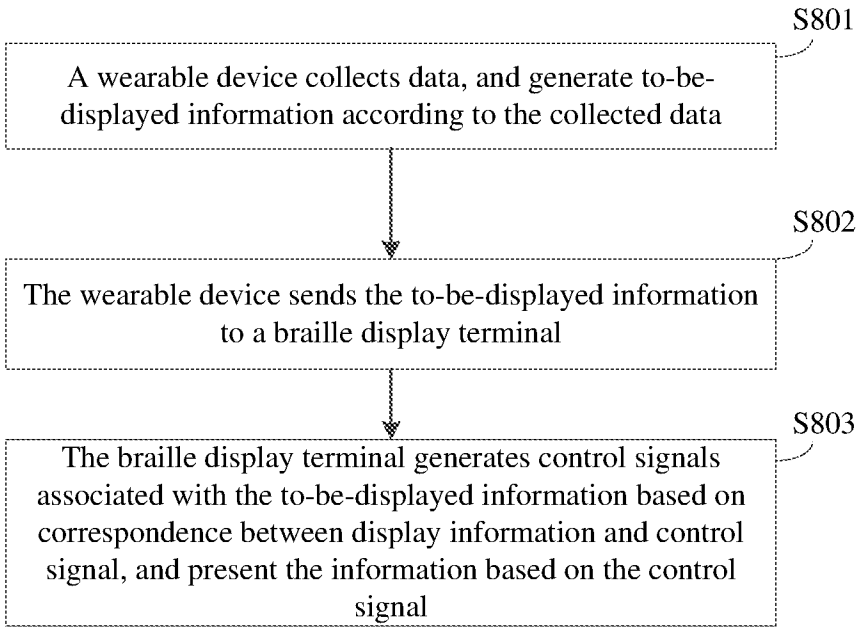

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/099154

A. CLASSIFICATION OF SUBJECT MATTER

H04M 1/247(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04M; G06K; G06F

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

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

WPI,EPODOC,CNPAT,CNKI: braille, blind, display, show, read, convert, transform, pin, spot, driving, array, shaft, motor, piezoelectric, wearable

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 105100346 A (BOE TECHNOLOGY GROUP CO., LTD. ET AL.) 25 November 2015 (2015-11-25) claims 1-20, description, paragraphs [0054]-[0114]	1-33
X	CN 104506733 A (BEIJING BAINA WEIER SCI. & TECHNOLOGY CO.) 08 April 2015 (2015-04-08) description, paragraphs [0043]-[0051] and figures 1, 1A, 1B	1-33
X	CN 101098526 A (BEIJING SAMSUNG TELECOM TECHNOLOGY CO., LTD.ET AL.) 02 January 2008 (2008-01-02) description, page 3, line 11 to page 7, line 20 and figures 3, 4	1-33
A	JP 2006145700 A (ARUZE KK) 08 June 2006 (2006-06-08) the whole document	1-33

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 February 2016	**04 May 2016**

Name and mailing address of the ISA/CN	Authorized officer
STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA **6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China**	**CI,Xue**
Facsimile No. **(86-10)62019451**	Telephone No. **(86-10)62413237**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/099154

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN	105100346	A	25 November 2015	None	
CN	104506733	A	08 April 2015	None	
CN	101098526	A	02 January 2008	None	
JP	2006145700	A	08 June 2006	None	