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(54) **WRIST-WORN APPARATUS CONTROL WITH FINGERPRINT DATA**

AM HANDGELENK GETRAGENE VORRICHTUNGSSTEUERUNG MIT FINGERABDRUCKDATEN  
APPAREIL DE CONTRÔLE PORTÉ AU POIGNET AVEC DES DONNÉES D'EMPREINTE DIGITALE

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**Description****Field**

[0001] The invention relates to an apparatus, a computer program and a method.

**Background**

[0002] Usability of user interfaces may be compromised for various reasons. A small display, for example, may cause complicated menu structures etc. Wrist-worn apparatuses capable of a physical activity-related measurement such as sports watches, utilize such small displays. Wrist-worn apparatuses typically utilize buttons or a touch display for user interaction, but their small size causes problems for usability (ease of use, learnability, precision).

[0003] US 2014/0239065 discloses a wearable personal digital device with access control based on matching a scanned fingerprint with one of stored fingerprints.

[0004] US 2011/0270055 discloses a measurement system, wherein fingerprint signals of different fingers may be used to activate different modes of operation in the system.

[0005] US 2011/0300829 discloses a device including a fingerprint sensor and has a specific function to be performed associated with at least two of the fingers of an authorized user of the device.

[0006] WO 2013/173838 discloses a user interface with a fingerprint sensor detecting a first fingerprint in a first orientation and a subsequent fingerprint in a second orientation.

[0007] US 2009/0243790 discloses an electronic device controlled with a clockwise or counter-clockwise rotation of a fingertip: zooming camera in and out, zooming document or image in and out, adjusting backlight illumination.

**Brief description**

[0008] According to an aspect of the present invention, there is provided a wrist-worn apparatus as specified in claim 1.

[0009] According to another aspect of the present invention, there is provided a non-transitory computer-readable storage medium as specified in claim 19.

[0010] According to another aspect of the present invention, there is provided a method as specified in claim 20.

**List of drawings**

[0011] Example embodiments of the present invention are described below, by way of example only, with reference to the accompanying drawings, in which

Figures 1, 2, 3 and 4 illustrate example embodiments

of an apparatus;

Figures 5A, 5B, 5C, 5D, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 6H and 6I illustrate various example embodiments of processing of fingerprint data;

Figures 7A, 7B, 7C, 7D, 8A, 8B, 9A, 9B, 10A, 10B, 10C, 10D, 11A, 11B, 11C, 11D, 12A, 12B, 12C, 12D, 13A, 13B, 14A and 14B illustrate various functions implemented in a user interface on the basis of the fingerprint data identification; and

Figure 15 is a flow-chart illustrating a method.

**Description of embodiments**

[0012] The following embodiments are only examples. Although the specification may refer to "an" embodiment in several locations, this does not necessarily mean that each such reference is to the same embodiment(s), or that the feature only applies to a single embodiment. Single features of different embodiments may also be combined to provide other embodiments: the described fingerprint identification may be augmented with various other processing phases. Furthermore, words "comprising" and "including" should be understood as not limiting the described embodiments to consist of only those features that have been mentioned and such embodiments may contain also features/structures that have not been specifically mentioned.

[0013] Figure 1 illustrates example embodiments of an apparatus 100. It should be noted that while Figure 1 illustrates various example embodiments of the apparatus 100, it is only a simplified block diagram that only shows some structures and functional entities. The connections shown in Figure 1 are logical connections; the actual physical connections may be different. It is apparent to a person skilled in the art that the described apparatus 100 may also comprise other functions and structures. It should be appreciated that details of some functions, structures, and the protocols used for communication are irrelevant to the actual invention. Therefore, they need not be discussed in more detail here.

[0014] The apparatus 100 comprises a physical activity-related measurement sensor interface 108, a fingerprint sensor 104, one or more processors 110, and one or more memories 120 including computer program code 122.

[0015] The physical activity-related measurement sensor interface 108 may be utilized to obtain measurement data obtained by monitoring a user of the apparatus 100.

[0016] In an example embodiment, the apparatus 100 may further comprise measurement sensors 102, 124. The sensors 102, 124 may produce the physical activity-related measurement data such as sports, exercise or activity related data. A non-exhaustive list of sensors 102, 124 includes heart rate sensors, motion sensors, location sensors, swimming sensors and bike sensors, as well as other sensors gathering information regarding the training. The heart rate sensors include, but are not limited to, a cardiovascular sensor (such as an electrocardio-

gram ECG sensor), and an optical heart rate sensor (heart rate, heart rate variability). Motion sensors may include accelerometers worn on chest, wrist, or ankle, for example. Location sensors may utilize GPS (Global Positioning System) or other satellite-based, or radio system-based system for locating the user and measuring various parameters (speed, distance, location, route) relating to the movement of the user. Swimming sensors may measure swimming specific parameters such as number of strokes or distance, for example. Bike sensors may be sensors attached to various parts of the bike for measuring speed, cadence, or power, for example. The gathered sensor information may be utilized to calculate further physical activity-related measurement data of the user such as a total energy consumption, an energy consumption speed, an activity level, a cumulated activity, for example.

**[0017]** As illustrated in Figure 1, the sensors may be internal measurement sensors 102 (within the apparatus 100) and/or wireless external measurement sensors 124 (outside of the apparatus 100). The apparatus 100 may comprise a transceiver 108 for communicating with the wireless external measurement sensor(s) 124, or even just a receiver for receiving measurements from the wireless external measurement sensors 124. For the internal measurement sensors 102, the interface 108 may be a suitable hardware communication interface such as a wired interface or an appropriate communication bus.

**[0018]** The fingerprint sensor 104 receives fingerprint data from a user. Fingerprint data generated by the fingerprint sensor 104 refers to an image of the fingerprint pattern and/or to a description of such features (ridges forming patterns such as arches, loops and whorls or other fine details) that cause the uniqueness of the fingerprint. The description may be generated by applying a mathematical algorithm on the image in order to create a fingerprint template (= a representation of some distinguishing features of the fingerprint). Furthermore, for reasons of data security, the fingerprint template may be cryptographically hashed.

**[0019]** The fingerprint sensor 104 may utilize various technologies to generate the fingerprint data. These technologies include, but are not limited to optical and capacitance sensors. An optical fingerprint sensor 104 takes a picture of the fingerprint with a digital camera. A capacitance fingerprint sensor 104 detects differences in electrical conductivity caused by raised parts of the fingerprint and generates an image based on those differences.

**[0020]** The term 'processor' 110 refers to a device that is capable of processing data. Depending on the processing power needed, the apparatus 100 may comprise several processors 110 such as parallel processors or a multicore processor. When designing the implementation of the processor 110, a person skilled in the art will consider the requirements set for the size and power consumption of the apparatus 100, the necessary processing capacity, production costs, and production volumes, for example. The processor 110 and the memory 120 may be imple-

mented by an electronic circuitry.

**[0021]** The term 'memory' 120 refers to a device that is capable of storing data run-time (= working memory) or permanently (= non-volatile memory). The working memory and the non-volatile memory may be implemented by a random-access memory (RAM), dynamic RAM (DRAM), static RAM (SRAM), a flash memory, a solid state disk (SSD), PROM (programmable read-only memory), a suitable semiconductor, or any other means of implementing an electrical computer memory.

**[0022]** In an example embodiment, a system clock 118 constantly generates a stream of electrical pulses, which cause the various transferring operations within the apparatus 100 to take place in an orderly manner and with specific timing.

**[0023]** In an example embodiment, the processor 110 may be implemented as a microprocessor implementing functions of a central processing unit (CPU) on an integrated circuit. The CPU is a logic machine executing a computer program code 122. The computer program code 122 may be coded as a computer program using a programming language, which may be a high-level programming language, such as C, or Java, or a low-level programming language, such as a machine language, or an assembler. The CPU may comprise a set of registers 112, an arithmetic logic unit (ALU) 114, and a control unit (CU) 116. The control unit 116 is controlled by a sequence of the computer program code 122 transferred to the CPU from the (working) memory 120. The control unit 116 may contain a number of microinstructions for basic operations. The implementation of the microinstructions may vary, depending on the CPU design. The microprocessor 110 may also have an operating system (a dedicated operating system of an embedded system, a real-time operating system, or even a general-purpose operating system), which may provide the computer program code 122 with system services.

**[0024]** A non-exhaustive list of implementation techniques for the processor 110 and the memory 120 includes, but is not limited to: logic components, standard integrated circuits, application-specific integrated circuits (ASIC), system-on-a-chip (SoC), application-specific standard products (ASSP), microprocessors, microcontrollers, digital signal processors, special-purpose computer chips, field-programmable gate arrays (FPGA), and other suitable electronics structures.

**[0025]** The computer program code 122 may be implemented by software and/or hardware. In an example embodiment, the software may be written by a suitable programming language, and the resulting executable code 122 may be stored on the memory 120 and run by the processor 110.

**[0026]** In an example embodiment, the functionality of the hardware may be designed by a suitable hardware description language (such as Verilog or VHDL), and transformed into a gate-level netlist (describing standard cells and the electrical connections between them), and after further phases the chip implementing the processor

110, memory 120 and the code 122 of the apparatus 100 may be fabricated with photo masks describing the circuitry.

**[0027]** In an example embodiment, the processor 110 and the memory 120 of the apparatus 100 are a part of a microcontroller.

**[0028]** In an example embodiment, the fingerprint sensor 104, the processor 110 and the memory 120 are separate entities, communicatively coupled together by an appropriate serial bus, for example. In general interfaces between the various elements may be implemented with suitable interface technologies, such as a message interface, a method interface, a sub-routine call interface, a block interface, an appropriate serial/parallel bus, or any hardware/software means enabling communication between various sub-units of the apparatus 100.

**[0029]** An example embodiment provides a computer-readable medium 126 for the apparatus 100 comprising a computer program comprising the computer program code 122. Said computer program code 122, when loaded into the apparatus 100 and executed in the apparatus 100, causes the apparatus 100 to receive fingerprint data from a user, identify the fingerprint data as matching with one finger of the user on the basis of a comparison between the fingerprint data and reference data of a plurality of fingers of the user, and select a function of a physical activity-related measurement on the basis of the identified finger. The computer program code 122 also performs the operations required to implement the described other example embodiments. In an example embodiment, the computer program code 122 may be in source code form, object code form, executable file, or in some intermediate form. The computer-readable medium 126 may comprise at least the following: any entity or device capable of carrying computer program code 122 to the apparatus 100, a record medium, a computer memory, a read-only memory, an electrical carrier signal, a telecommunications signal, and a software distribution medium. In some jurisdictions, depending on the legislation and the patent practice, the computer-readable medium 126 may not be the telecommunications signal. In an example embodiment, the computer-readable medium 126 may be a non-transitory computer readable storage medium.

**[0030]** In an example embodiment, the apparatus 100 comprises a display 106. The display 106 may be implemented with suitable technologies including, but not limited to at least the following: LCD (liquid crystal display), EL (electroluminescence), LED (light emitting diode), and OLED (organic light emitting diode).

**[0031]** A non-exhaustive list of apparatuses 100 includes but is not limited to: a wrist-worn sports watch, a bicycle computer, a mobile apparatus, or any other suitable apparatus for processing or displaying physical activity-related data such as sports, exercise or activity related data.

**[0032]** Figure 2 illustrates an example embodiment of the apparatus 100: a wrist-worn measurement apparatus

with the fingerprint sensor 104 and the display 106 facing outwards, and a wrist strap 200A, 200B for attaching the apparatus 100 to the wrist.

**[0033]** Figure 3 illustrates an example embodiment where the apparatus 100 is implemented as a running computer, such as Polar RCX5. A user 300 is provided with the the wrist-worn apparatus 100. Furthermore, the user 300 may be provided with a heart rate transmitter 124A strapped around the chest, and possibly also with a shoe-mounted stride sensor 124B. The accessories 124A, 124B communicate wirelessly with the apparatus 100. Various accessories may be flexibly used as needed, i.e. all of them are not necessarily needed all the time, or by all users, or in all use cases.

**[0034]** However, in an example embodiment, the apparatus 100 may also be interpreted as a circuitry implementing the required functionality within some suitable equipment.

**[0035]** Figure 4 illustrates further example embodiments of the apparatus 100.

**[0036]** The one or more memories 120 and the computer program code 122 of the apparatus 100 are configured to, with the one or more processors 110, cause the apparatus 100 at least to receive fingerprint data 400/402/404/406/408 from the user 300 with the fingerprint sensor 104, identify 420, 410/412/414/416/418 the fingerprint data 400/402/404/406/408 as matching with one finger of the user 300 on the basis of a comparison between the fingerprint data 400/402/404/406/408 and reference data 422 of a plurality of fingers of the user 300 stored in the memory 120, and select 424 a function of a physical activity-related measurement on the basis of the identified finger 410/412/414/416/418.

**[0037]** In the example embodiment, five fingers of the user 300, the little finger, ring finger, middle finger, index finger and thumb, are utilized, but any number of fingers from 1 to 10 may be utilized depending on the application and whether both hands may conveniently be used for user interaction with the apparatus 100 or whether only one hand may be utilized.

**[0038]** In an example embodiment, the fingerprint sensor 104 produces a hash of the fingerprint template 400/402/404/406/408, which is then compared with the stored reference 422 hashes of the fingers in order to identify the finger 410/412/414/416/418.

**[0039]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to identify the fingerprint data as matching with one finger of the user on the basis of the comparison between the fingerprint data 400/402/404/406/408 and the reference data 422 of the plurality of fingers of the user 300 stored in the memory 120 such that the reference data 422 comprises a plurality of data elements, each data element comprising finger-specific reference data of a finger of the user 300 and a pointer to a single operation of the operation state in one of a collection of operations, a sequence of con-

secutive operations, and select the operation state of the apparatus 100 on the basis of the identified finger such that the single operation pointed to by the pointer in the data element of the identified finger is executed.

**[0040]** In an example embodiment, the pointer comprises a pointer to a memory location in the memory 120 storing an entry point to a function implementing the operation.

**[0041]** In an example embodiment, the pointer provides a shortcut to select the operation from the plurality of the operations.

**[0042]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to set the apparatus 100 in a setting state on the basis of received user interface manipulation by the user 300, receive fingerprint learning data from the user 300 with the fingerprint sensor 104, and generate and store the reference data 422 on the basis of the received fingerprint learning data.

**[0043]** As was explained earlier, in an example embodiment the apparatus 100 further comprises the display 106. In a further example embodiment, the selected function comprises a user interface displayed on the display 106 comprising at least one of a control of an apparatus 100 internal sensor 102 measuring functioning of the body of the user 300, a control of an apparatus 100 external sensor 124 measuring functioning of the body of the user 300, a control of a heart rate measurement of the user 300, a control of an acceleration measurement related to a movement of the user 300, a control of a well-being measurement of the user 300, a control of a menu related to a sport exercised by the user 300, a control of a start of an exercise measuring function of the user 300, a control of a stop of the exercise measuring function of the user 300.

**[0044]** Besides control by the identified finger, further parameters may be detected by the fingerprint sensor 104.

**[0045]** As illustrated in Figures 5A, 5B, 5C and 5D, the one or more memories 120 and the computer program code 122 may further be configured to, with the one or more processors 110, cause the apparatus 100 further to identify an angular position of the finger in relation to a predetermined reference position 404 on the fingerprint sensor 104, and select 424 the function of the apparatus 100 on the basis of the identified finger and further on the basis of the identified angular position.

**[0046]** In Figure 5A, the angular position of the fingerprint 404 is according to the reference position 502 as the finger is pressed 500 on the fingerprint sensor 104.

**[0047]** In Figure 5B, the angular position 506 of the fingerprint 404 is turned 90 degrees from the reference position 502 as the finger is pressed 504 on the fingerprint sensor 104.

**[0048]** In Figure 5C, the angular position 510 of the fingerprint 404 is turned 270 degrees from the reference position 502 as the finger is pressed 508 on the fingerprint

sensor 104.

**[0049]** In Figure 5D, the angular position 514 of the fingerprint 404 is turned 180 degrees from the reference position 502 as the finger is pressed 512 on the fingerprint sensor 104.

**[0050]** It is to be noted that these angular positions are just example embodiments as there may be more or less positions. For example positions of 0, 30, 60, 90 etc. degrees are still easy to use.

**[0051]** With the identified finger and its angular position, the number of different control gestures rises significantly: with five different fingers each having four possible angular positions there will be twenty different gestures.

**[0052]** As illustrated in Figures 6A, 6B, 6C, 6D, 6E, 6F, 6G, 6H and 6I, the one or more memories 120 and the computer program code 122 may further be configured to, with the one or more processors 110, cause the apparatus 100 further to identify a rotary movement of the finger on the fingerprint sensor 104, and select 424 the function of the apparatus 100 on the basis of the identified finger and further on the basis of the identified rotary movement.

**[0053]** In Figure 6A, the finger is pressed 600 on the fingerprint sensor 104, whereupon the fingerprint 404 is detected in the reference position 602.

**[0054]** In an example embodiment, the one or more memories 120 and the computer program code 122 may further be configured to, with the one or more processors 110, cause the apparatus 100 further to identify a direction of the rotary movement either as a clockwise rotary movement or an anticlockwise rotary movement, and select 424 the function of the apparatus 100 on the basis of the identified finger, the identified rotary movement and further on the basis of the identified direction of the rotary movement.

**[0055]** In Figure 6B, the fingerprint 404 is starting to turn 604 anticlockwise.

**[0056]** In Figure 6C, the fingerprint 404 has performed a rotary movement 606 of 30 degrees, but it continues to turn 604.

**[0057]** In Figure 6D, the fingerprint 404 has performed a rotary movement 608 of 60 degrees, but it continues to turn 604.

**[0058]** In Figure 6E, has reached a rotary movement 610 of 90 degrees and stopped.

**[0059]** In Figure 6F, the fingerprint 404 is starting to turn 612 clockwise.

**[0060]** In Figure 6G, the fingerprint 404 has performed a rotary movement 614 of 30 degrees, but it continues to turn 612.

**[0061]** In Figure 6H, the fingerprint 404 has performed a rotary movement 616 of 60 degrees, but it continues to turn 612.

**[0062]** In Figure 6I, has reached a rotary movement 618 of 90 degrees and stopped.

**[0063]** With the identified finger and its rotary movement, the control possibilities are increased: the rotary

movement implements a sliding type continuous control or also a control sequence of steps following each other as a predetermined amount of rotary movement is detected.

**[0064]** Let us next study the already explained example embodiments and further example embodiments with reference to a simplified user interface illustrated in Figures 7A, 7B, 7C and 7D.

**[0065]** The apparatus 100 utilizes four functions.

**[0066]** In Figure 7A, the default function is shown. A watch function is displayed on the display 102: date 700 and time 702 are shown.

**[0067]** In Figure 7B, the user has pressed his index finger on the fingerprint sensor 104, and the fingerprint 406 of the index finger has been identified 416. As a result of this function selection 424, 416, a sports measurement function is displayed on the display 102: running is the selected sport 710, the current heart rate 712 is 77 beat per minute, the exercise time 714 is still 00:00 and the distance is 0.00 km as the exercise has not yet been started, the next possible control (START) 718 is also indicated for the user 300.

**[0068]** In Figure 7C, the user has pressed his middle finger on the fingerprint sensor 104, and the fingerprint 404 of the index finger has been identified 414. As a result of this function selection 424, 414, a data function is displayed on the display 102: recorded training sessions 732 are displayed as a list with entries 734, 736, 738 on different days, and the next possible control (SELECT) 740 is also indicated for the user 300.

**[0069]** In Figure 7D, the user has pressed his ring finger on the fingerprint sensor 104 and the fingerprint 402 of the index finger has been identified 412. As a result of this function selection 424, 412, a settings function is displayed on the display 102: various personal parameters (date of birth, weight, height, zones) 752, 754, 756, 758 are displayed, and the next possible control (SELECT) 760 is also indicated for the user 300.

**[0070]** Figures 8A and 8B illustrate a further example embodiment. The one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to select 424, 418 a home button press as the function on the basis of an earlier assignment of a finger 408 of the user 300 to the home button press function, whereupon the apparatus 100 navigates to a predetermined page of the user interface displayed on the display 102. In Figure 8A, the user 300 is in the middle of a running session, and the sport measurement function 800 is shown on the display 102. The user 300 presses his thumb on the fingerprint sensor 104, and, as this thumb pressing is interpreted 424, 418 as the home button press, the watch function 802 of Figure 8B is consequently displayed.

**[0071]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to wake up the ap-

paratus 100 with the function of the user interface selected on the basis of the identified finger, whereupon the selected function is displayed on the display 100. This example embodiment is not illustrated in its own Figures, but we may refer to Figures 7B, 7C and 7D, for example: the apparatus 100 may be in a so-called sleep mode in order to save battery power, the display 102 may be turned off, for example. Now, the user 300 may wake up the apparatus with index, middle or ring finger, whereupon one of the functions of Figures 7B, 7C or 7D is displayed on the display 102 on the basis of the fingerprint identification 420 and function selection 424.

**[0072]** Figures 9A and 9B illustrate an example embodiment, wherein the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to perform zoom control on the user interface displayed on the display 102 on the basis of the identified rotary movement. The principle of the rotary movement was already explained with reference to Figures 6A to 6I.

**[0073]** The user 300 is looking at the data function 900 and puts his middle finger on the fingerprint sensor 104 and starts to turn 604 the middle finger anticlockwise. The fingerprint 404 of the middle finger and the rotary movement 606 are identified 414, 420, whereupon the window is zoomed out and the view of Figure 9B is shown: the training session window 902 is now smaller and another window 904 for fitness test results is shown on the side. With this example embodiment zoom control including continuous zooming in and zooming out may easily be implemented.

**[0074]** Figures 10A, 10B, 10C and 10D illustrate further example embodiments.

**[0075]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to perform selection control on user interface elements of the user interface displayed on the display 102 on the basis of the identified rotary movement 614. In Figure 10A, the user is watching at the data function 1000, where a scrollable window 1002 includes a list of the training sessions, and a selection pointer 1004 encircles one training session at a time. The user presses his index finger on the fingerprint sensor 104 and turns 612 the finger clockwise. As a result of this, as shown in Figure 10B, the selection pointer 1006 moves to the next training session in the list.

**[0076]** In an example embodiment, shown in Figure 10C, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to detect clicking 1010 of the finger on the fingerprint sensor 104, and select 424, 1008 the function of the apparatus 100 on the basis of the identified finger and further on the basis of the detected clicking of the finger. Figure 10D illustrates that the training session 1012 of 21st September 2014 is displayed on the display 102 as

a result of the function selection 424, 1008 with the clicking 1010 in Figure 10C. The clicking 1010 may be implemented by integrating a pushbutton with the fingerprint sensor 104, for example. Another implementation possibility is to integrate a touch pad type of functionality with the fingerprint sensor 104, with resistive or capacitive technology used for touchscreens, for example.

**[0077]** Figures 11A, 11B, 11C and 11D illustrate the same operation sequence as Figures 10A, 10B, 10C and 10D, but implemented with a different example embodiment: instead of using the rotary movement, hold time is utilized for the additional control.

**[0078]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to measure a hold time of the finger on the fingerprint sensor 104, and select the function of the apparatus 100 on the basis of the identified finger and further on the basis of the measured hold time.

**[0079]** In Figure 11A, the user is watching at the data function 1000 with the scrollable window 1002 and the selection pointer 1004. The user presses his index finger on the fingerprint sensor 104 and as shown in Figure 11B keeps his finger on the fingerprint sensor 104 which is recognized 420, 1100 and the hold time is measured. As a result of this, as shown in Figure 11B, the selection pointer 1006 moves to the next training session in the list. Figure 11D illustrates that the training session 1012 of 21st September 2014 is displayed on the display 102 as a result of the function selection 424, 1008 with the clicking 1010 in Figure 10C.

**[0080]** Figures 12A, 12B, 12C and 12D illustrate an example embodiment wherein the user interface is manipulated on the basis of the relative positions of different user interface elements.

**[0081]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to select the function of the apparatus 100 on the basis of the identified finger such that the function is selected from among the selections displayed on the user interface such that different fingers relate to different relative positions on the user interface displayed on the display 102, wherein the different relative positions comprise at least one of left, middle, right, top, center, bottom, first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth, a first element on a list, a next element on the list, a last element on the list.

**[0082]** Figure 12A illustrates an example embodiment, where zones 758 from settings 750 function illustrated in Figure 7D has been opened for processing. The set limits function for the zones 1200 are shown in window 1202: the lower limit is currently 70 heartbeats per minute and the upper limit 170 heartbeats per minute. Now, the different relative positions are: the lower limit is on the left and the upper limit is on the right.

**[0083]** In Figures 12A and 12B the user 300 adjusts the lower limit by pressing his index finger on the fingerprint sensor 104, whereupon the fingerprint 406 of the index finger is identified 420, 416. As a result of this a set function 1206 is selected and a selection pointer 1204 is shown around the numerical value of the lower limit. Next, the user 300 starts to turn 604 his finger anticlockwise up to the angle 606. This causes that the lower limit is increased, number-by-number, up to 100 heartbeats per minute, circled with a selection pointer 1208.

**[0084]** In Figures 12C and 12D the user 300 adjusts the upper limit by pressing his middle finger on the fingerprint sensor 104, whereupon the fingerprint 404 of the middle finger is identified 420, 414. As a result of this a set function 1212 is selected and a selection pointer 1210 is shown around the numerical value of the upper limit. Next, the user 300 starts to turn 612 his finger clockwise up to the angle 614. This causes that the upper limit is decreased, number-by-number, down to 150 heartbeats per minute, circled with a selection pointer 1214.

**[0085]** Figures 13A and 13B illustrate an example embodiment wherein the user interface is manipulated on the basis of the absolute positions of different user interface elements.

**[0086]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to select the function of the apparatus 100 on the basis of the identified finger such that the function is selected from among selections displayed on the user interface such that different fingers relate to different absolute positions of the selections displayed on the display 102, wherein the different absolute positions comprise predetermined areas displayed on the display 102.

**[0087]** Figure 13A illustrates an example embodiment, where data function from Figure 9B is further manipulated: the training session window 1300 and the fitness test result window 1302 are side-by-side. The user 300 sees that the training session window 1300 may be manipulated with the index finger as a symbol I 1306 is shown beneath it. Similarly, the fitness test result window 1302 may be manipulated with the middle finger as a symbol M 1308 is shown beneath it. The user 300 chooses to manipulate the training session window 1300 by putting his index finger on the fingerprint sensor 104, whereupon the symbol I 1306 is shown as selected. The fingerprint 406 of the index finger is identified 420, 416. Next, the user 300 turns 604 his index finger to the angle 606, and, as a result of this, a selection pointer 1304 moves from "24 Sep 2014" to a new position 1310 of "9 Sep 2014".

**[0088]** Figures 14A and 14B illustrate an example embodiment wherein the user interface is scrolled with different fingers to different directions.

**[0089]** In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to select the func-

tion of the apparatus 100 on the basis of the identified finger such that the function is selected from among scrolling directions of the user interface such that different fingers relate to the different scrolling directions of the user interface displayed on the display 102.

[0090] Figure 14A now shows a wide view into the training session function: a scrollable window 1400 includes in the vertical line the years, and, for the selected year, on the horizontal line the months. Year 2009 is selected, as indicated by a first selection pointer 1402, and month January is selected, as indicated by a second selection pointer 1404. The scrolling directions are intuitively displayed on the display 102 with symbols up 1406, left 1408, down 1410, and right 1412. The user 300 presses his little finger on the fingerprint sensor 104, and the corresponding symbol, right, 1412 becomes highlighted as the fingerprint 400 of the little finger is identified 420, 410. Figure 14B shows the end result of this function selection 424: a selection pointer 1414 is now shown over August, instead of January as in the beginning. Figures 14A and 14B do not show how the scrolling distance is determined, but this is easily implemented with the other described example embodiments: based on the hold the time, or the rotary movement, for example.

[0091] In an example embodiment, the one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to identify the fingerprint data and select the function of the physical activity-related measurement on the basis of the identified finger in a measurement mode of the apparatus 100. Such a function selection in the measurement mode has already been described with reference to Figures 7B and 8A, for example. Furthermore, the apparatus 100 is capable of distinguishing a consumer electronics mode of the apparatus 100, which is different from the measurement mode of the apparatus 100. The consumer electronics mode refers to an operation mode that is used in communications, entertainment or office equipment such as mobile phone or smartwatch. Figure 7A, for example illustrates such a consumer electronics mode: a watch mode. Another example of such a consumer electronics mode is an interaction mode of a smartwatch with a mobile phone. The one or more memories 120 and the computer program code 122 are further configured to, with the one or more processors 110, cause the apparatus 100 further to select a function related to a consumer electronics functionality of the apparatus 100 on the basis of the identified finger such that a mapping of the identified finger and the selected function is different between the consumer electronics mode and the measurement mode. With this example embodiment, the user 300 may be provided with different user interface logics for the different modes (the consumer electronics mode and the measurement mode), which may improve the learnability of the user interface.

[0092] Next, let us study Figure 15, which is a flow chart illustrating example embodiments of a method. The op-

erations are not strictly in chronological order, and some of the operations may be performed simultaneously or in an order differing from the given ones. Other functions may also be executed between the operations or within the operations and other data exchanged between the operations. Some of the operations or part of the operations may also be left out or replaced by a corresponding operation or part of the operation. It should be noted that no special order of operations is required, except where necessary due to the logical requirements for the processing order. In an example embodiment, the method may be implemented by an electronic apparatus, by the described apparatus 100, for example.

[0093] The method starts in 1500.

[0094] In 1502, fingerprint data is received from a user.

[0095] In 1504, the fingerprint data is identified as matching with one finger of the user on the basis of a comparison between the fingerprint data and reference data of a plurality of fingers of the user.

[0096] In 1506, a function of a physical activity-related measurement is selected on the basis of the identified finger.

[0097] The method ends in 1508.

[0098] The already described example embodiments of the apparatus 100 may be utilized to enhance the method with various further example embodiments.

[0099] The operations and the supplementary operations may be repeated 1502-1504-1506 as required.

[0100] In an example embodiment of 1510, the reference data is created. This may be implemented such that the user 300 sets the apparatus 100 in a setting state on the basis of received user interface manipulation by the user. Next, the apparatus 100 receives fingerprint learning data from the user with the fingerprint sensor 104, and generates and stores the reference data on the basis of the received fingerprint learning data. The apparatus 100 may ask the user 300 to press each finger one-by-one on the fingerprint sensor 104, whereby each fingerprint is scanned and appropriate reference data 422 is generated.

[0101] It will be obvious to a person skilled in the art that, as technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the example embodiments described above but may vary within the scope of the claims.

## Claims

1. A wrist-worn apparatus (100) comprising:

- a wrist strap (200A, 200B) for attaching the apparatus (100) to a wrist of a user (300);
- a physical activity-related measurement sensor interface (108);
- a fingerprint sensor (104);
- a display (106);

one or more processors (110); and  
 one or more memories (120) including computer  
 program code (122);  
 the one or more memories (120) and the com-  
 puter program code (122) are configured to, with  
 the one or more processors (110), cause the  
 apparatus (100) at least to:

receive fingerprint data  
 (400/402/404/406/408) from a finger of the  
 user (300) with the fingerprint sensor (104);  
 and  
 identify (420, 410/412/414/416/418) the fin-  
 gerprint data (400/402/404/406/408) as  
 matching with one finger of the user (300)  
 on the basis of a comparison between the  
 fingerprint data (400/402/404/406/408) and  
 reference data (422) of a plurality of fingers  
 of the user (300) stored in the memory  
 (120);

**characterized in that** the apparatus (100) is fur-  
 ther caused to:

identify a rotary movement of the finger of  
 the user (300) on the fingerprint sensor  
 (104);  
 identify a direction of the rotary movement  
 either as a clockwise rotary movement or  
 an anticlockwise rotary movement; and  
 select (424) a function of a physical activity-  
 related measurement based on the identi-  
 fied finger, the identified rotary movement,  
 and the identified direction of the rotary  
 movement, wherein the rotary movement  
 implements a sliding type continuous con-  
 trol of a user interface element displayed on  
 the display.

2. The apparatus of claim 1, wherein the selected func-  
 tion comprises a user interface displayed on the dis-  
 play comprising at least one of a control of an appa-  
 ratus internal sensor measuring functioning of the  
 body of the user, a control of an apparatus external  
 sensor measuring functioning of the body of the user,  
 a control of a heart rate measurement of the user, a  
 control of an acceleration measurement related to a  
 movement of the user, a control of a well-being  
 measurement of the user, a control of a menu related  
 to a sport exercised by the user, a control of a start  
 of an exercise measuring function of the user, a con-  
 trol of a stop of the exercise measuring function of  
 the user.
3. The apparatus of claim 2, wherein the one or more  
 memories (120) and the computer program (122)  
 code are further configured to, with the one or more  
 processors (110), cause the apparatus (100) further

to:

select (424, 418) a home button press as the function  
 on the basis of an earlier assignment of a finger (408)  
 of the user (300) to the home button press function,  
 whereupon the apparatus (100) navigates to a pre-  
 determined page of the user interface displayed on  
 the display (106).

4. The apparatus of claim 2 or 3, wherein the one or  
 more memories (120) and the computer program  
 code (122) are further configured to, with the one or  
 more processors (110), cause the apparatus (100)  
 further to:  
 wake up the apparatus (100) with the function of the  
 user interface selected on the basis of the identified  
 finger, whereupon the selected function is displayed  
 on the display (106).
5. The apparatus of any preceding claim, wherein the  
 one or more memories (120) and the computer pro-  
 gram code (122) are further configured to, with the  
 one or more processors (110), cause the apparatus  
 (100) further to:  
 identify an angular position of the finger in rela-  
 tion to a predetermined reference position (404)  
 on the fingerprint sensor (104); and  
 select (424) the function of the apparatus (100)  
 on the basis of the identified finger and further  
 on the basis of the identified angular position.
6. The apparatus of any preceding claim, wherein the  
 one or more memories (120) and the computer pro-  
 gram code (122) are further configured to, with the  
 one or more processors (110), cause the apparatus  
 (100) further to:  
 detect clicking (1010) of the finger on the finger-  
 print sensor (104); and  
 select (424, 1008) the function of the apparatus  
 (100) on the basis of the identified finger and  
 further on the basis of the detected clicking of  
 the finger.
7. The apparatus of any preceding claim, wherein the  
 one or more memories (120) and the computer pro-  
 gram code (122) are further configured to, with the  
 one or more processors (110), cause the apparatus  
 (100) further to:  
 measure a hold time of the finger on the finger-  
 print sensor (104); and  
 select the function of the apparatus (100) on the  
 basis of the identified finger and further on the  
 basis of the measured hold time.
8. The apparatus of any preceding claim 2 to 7, wherein  
 the one or more memories (120) and the computer

program code (122) are further configured to, with the one or more processors (110), cause the apparatus (100) further to:

select the function of the apparatus (100) on the basis of the identified finger such that the function is selected from among the selections displayed on the user interface such that different fingers relate to different relative positions on the user interface displayed on the display (106), wherein the different relative positions comprise at least one of left, middle, right, top, center, bottom, first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth, a first element on a list, a next element on the list, a last element on the list.

9. The apparatus of any preceding claim 2 to 8, wherein the one or more memories (120) and the computer program code (122) are further configured to, with the one or more processors (110), cause the apparatus (100) further to:

select the function of the apparatus (100) on the basis of the identified finger such that the function is selected from among selections displayed on the user interface such that different fingers relate to different absolute positions of the selections displayed on the display (106), wherein the different absolute positions comprise predetermined areas displayed on the display (106).

10. The apparatus of any preceding claim 2 to 9, wherein the one or more memories (120) and the computer program code (122) are further configured to, with the one or more processors (110), cause the apparatus (100) further to:

select the function of the apparatus (100) on the basis of the identified finger such that the function is selected from among scrolling directions of the user interface such that different fingers relate to the different scrolling directions of the user interface displayed on the display (106).

11. The apparatus of any preceding claim, wherein the one or more memories (120) and the computer program code (122) are further configured to, with the one or more processors (110), cause the apparatus (100) further to:

identify the fingerprint data as matching with one finger of the user (300) on the basis of the comparison between the fingerprint data and the reference data of the plurality of fingers of the user stored in the memory (120) such that the reference data (422) comprises a plurality of data elements, each data element comprising finger-specific reference data of a finger of the user (300) and a pointer to a single operation of the operation state in one of a collection of operations, a sequence of consecutive operations;

and

select the operation state of the apparatus (100) on the basis of the identified finger such that the single operation pointed to by the pointer in the data element of the identified finger is executed.

12. The apparatus of claim 11, wherein the pointer comprises a pointer to a memory location in the memory (120) storing an entry point to a function implementing the operation.

13. The apparatus of claim 11 or 12, wherein the pointer provides a shortcut to select the operation from the plurality of the operations.

14. The apparatus of any preceding claim, wherein the one or more memories (120) and the computer program code (122) are further configured to, with the one or more processors (110), cause the apparatus (100) further to:

set the apparatus (100) in a setting state on the basis of received user interface manipulation by the user (300);

receive fingerprint learning data from the user (300) with the fingerprint sensor (104); and generate and store the reference data (422) on the basis of the received fingerprint learning data.

15. The apparatus of any preceding claim, wherein the one or more memories (120) and the computer program code (122) are further configured to, with the one or more processors (110), cause the apparatus (100) further to:

identify the fingerprint data and select the function of the physical activity-related measurement on the basis of the identified finger in a measurement mode of the apparatus (100); distinguish a consumer electronics mode of the apparatus (100), which is different from the measurement mode of the apparatus (100); and select a function related to a consumer electronics functionality of the apparatus (100) on the basis of the identified finger such that a mapping of the identified finger and the selected function is different between the consumer electronics mode and the measurement mode.

16. The apparatus of claim 1, wherein the user interface element displayed on the display comprises a list and a selection pointer moved in the list based on the identified rotary movement.

17. The apparatus of claim 1, wherein the user interface element displayed on the display comprises a first parameter value incremented or decremented

based on the identified rotary movement and the identified direction of the rotary movement.

18. The apparatus of claim 17, wherein the user interface element displayed on the display comprises a second parameter value, and the identified finger selects whether the first parameter value or the second parameter value is incremented or decremented based on the identified rotary movement and the identified direction of the rotary movement.

19. A non-transitory computer-readable storage medium (126) comprising a computer program comprising computer program code (122) which, when loaded into a wrist-worn apparatus (100) causes the apparatus (100) to perform:

receive (1502) fingerprint data from a finger of a user with a fingerprint sensor of the wrist-worn apparatus; and  
 identify (1504) the fingerprint data as matching with one finger of the user on the basis of a comparison between the fingerprint data and reference data of a plurality of fingers of the user;  
**characterized in that** the apparatus (100) is further caused to perform:

identify a rotary movement of the finger of the user on the fingerprint sensor;  
 identify a direction of the rotary movement either as a clockwise rotary movement or an anticlockwise rotary movement; and  
 select (1506) a function of a physical activity-related measurement based on the identified finger, the identified rotary movement, and the identified direction of the rotary movement, wherein the rotary movement implements a sliding type continuous control of a user interface element displayed on a display of the wrist-worn apparatus (100).

20. A method in a wrist-worn apparatus, comprising:

receiving (1502) fingerprint data from a finger of a user with a fingerprint sensor of the wrist-worn apparatus; and  
 identifying (1504) the fingerprint data as matching with one finger of the user on the basis of a comparison between the fingerprint data and reference data of a plurality of fingers of the user;  
**characterized in that** the method further comprises:

identifying a rotary movement of the finger of the user on the fingerprint sensor;  
 identifying a direction of the rotary movement either as a clockwise rotary movement or an anticlockwise rotary movement; and

selecting (1506) a function of a physical activity-related measurement based on the identified finger, the identified rotary movement, and the identified direction of the rotary movement, wherein the rotary movement implements a sliding type continuous control of a user interface element displayed on a display of the wrist-worn apparatus.

## Patentansprüche

1. Am Handgelenk getragene Vorrichtung (100), umfassend:

ein Armband (200A, 200B) zum Befestigen der Vorrichtung (100) an einem Handgelenk eines Benutzers (300);  
 eine Messungssensorschnittstelle (108), die sich auf körperliche Aktivitäten bezieht;  
 einen Fingerabdrucksensor (104);  
 ein Display (106);  
 einen oder mehrere Prozessoren (110); und  
 einen oder mehrere Speicher (120), die Computerprogrammcode (122) enthalten;  
 wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) zumindest zu Folgendem zu veranlassen:

Empfangen von Fingerabdruckdaten (400/402/404/406/408) von einem Finger des Benutzers (300) mit dem Fingerabdrucksensor (104); und  
 Identifizieren (420, 410/412/414/416/418) der Fingerabdruckdaten (400/402/404/406/408) als übereinstimmend mit einem Finger des Benutzers (300) auf der Basis eines Vergleichs zwischen den Fingerabdruckdaten (400/402/404/406/408) und Referenzdaten (422) einer Vielzahl von Fingern des Benutzers (300), die in dem Speicher (120) gespeichert sind;

**dadurch gekennzeichnet, dass** die Vorrichtung (100) des Weiteren zu Folgendem veranlasst wird:

Identifizieren einer Drehbewegung des Fingers des Benutzers (300) auf dem Fingerabdrucksensor (104);  
 Identifizieren einer Richtung der Drehbewegung entweder als Bewegung im Uhrzeigersinn oder als Bewegung gegen den Uhrzeigersinn; und

- Auswählen (424) einer Funktion einer auf eine körperliche Aktivität bezogenen Messung basierend auf dem identifizierten Finger, der identifizierten Drehbewegung und der identifizierten Richtung der Drehbewegung, wobei die Drehbewegung eine kontinuierliche Steuerung vom Gleittyp eines Benutzerschnittstellenelements implementiert, das auf dem Display angezeigt wird.
2. Vorrichtung nach Anspruch 1, wobei die ausgewählte Funktion eine Benutzerschnittstelle umfasst, die auf dem Display angezeigt wird, umfassend mindestens eines aus einer Steuerung eines vorrichtung-internen Sensors, der Körperfunktionen des Benutzers misst, eine Steuerung eines vorrichtungsexternen Sensors, der Körperfunktionen des Benutzers misst, eine Steuerung einer Herzfrequenzmessung des Benutzers, einer Steuerung einer Beschleunigungsmessung im Zusammenhang mit einer Bewegung des Benutzers, einer Steuerung einer Messung des Wohlbefindens des Benutzers, einer Steuerung eines Menüs im Zusammenhang mit einem Sport, der von den Benutzer ausgeübt wird, einer Steuerung eines Starts einer Trainingsmessungsfunktion des Benutzers, einer Steuerung eines Stopps der Trainingsmessungsfunktion des Benutzers.
  3. Vorrichtung nach Anspruch 2, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:  
Auswählen (424, 418) eines Home-Tastendrucks als die Funktion auf der Basis einer früheren Zuordnung eines Fingers (408) des Benutzers (300) zu der Home-Tastendruckfunktion, woraufhin die Vorrichtung (100) zu einer vorgegebenen Seite der Benutzerschnittstelle navigiert, die auf dem Display (106) angezeigt wird.
  4. Vorrichtung nach Anspruch 2 oder 3, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:  
Aufwecken der Vorrichtung (100) mit der Funktion der Benutzerschnittstelle, die auf der Basis des identifizierten Fingers ausgewählt wird, woraufhin die ausgewählte Funktion auf dem Display (106) angezeigt wird.
  5. Vorrichtung nach einem vorhergehenden Anspruch, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:  
Identifizieren einer Winkelposition des Fingers im Verhältnis zu einer vorgegebenen Referenzposition (404) auf dem Fingerabdrucksensor (104); und  
Auswählen (444) der Funktion der Vorrichtung (100) auf der Basis des identifizierten Fingers und des Weiteren auf der Basis der identifizierten Winkelposition.
  6. Vorrichtung nach einem vorhergehenden Anspruch, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:  
Ermitteln eines Klickens (1010) des Fingers auf dem Fingerabdrucksensor (104); und  
Auswählen (424, 1008) der Funktion der Vorrichtung (100) auf der Basis des identifizierten Fingers und des Weiteren auf der Basis des ermittelten Klickens des Fingers.
  7. Vorrichtung nach einem vorhergehenden Anspruch, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:  
Messen einer Haltezeit des Fingers auf dem Fingerabdrucksensor (104); und  
Auswählen der Funktion der Vorrichtung (100) auf der Basis des identifizierten Fingers und des Weiteren auf der Basis der gemessenen Haltezeit.
  8. Vorrichtung nach einem der vorhergehenden Ansprüche 2 bis 7, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:  
Auswählen der Funktion der Vorrichtung (100) auf der Basis des identifizierten Fingers, so dass die Funktion aus den Auswahlmöglichkeiten ausgewählt wird, die auf der Benutzerschnittstelle angezeigt werden, so dass sich verschiedene Finger auf verschiedene relative Positionen auf der Benutzerschnittstelle beziehen, die auf dem Display (106) angezeigt werden, wobei die verschiedenen relativen Positionen mindestens eines aus einer linken, mittleren, rechten, oberen, zentralen, unteren, ersten, zweiten, dritten, vierten, fünften, sechsten, siebten,

achten, neunten, zehnten Position, einem ersten Element auf einer Liste, einem nächsten Element auf der Liste, einem letzten Element auf der Liste umfassen.

9. Vorrichtung nach einem der vorhergehenden Ansprüche 2 bis 8, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen: Auswählen der Funktion der Vorrichtung (100) auf der Basis des identifizierten Fingers, so dass die Funktion aus den Auswahlmöglichkeiten ausgewählt wird, die auf der Benutzerschnittstelle angezeigt werden, so dass sich verschiedene Finger auf verschiedene absolute Positionen der Auswahlmöglichkeiten beziehen, die auf dem Display (106) angezeigt werden, wobei die verschiedenen absoluten Positionen vorgegebene Bereiche umfassen, die auf dem Display (106) angezeigt werden.

10. Vorrichtung nach einem der vorhergehenden Ansprüche 2 bis 9, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen: Auswählen der Funktion der Vorrichtung (100) auf der Basis des identifizierten Fingers, so dass die Funktion aus den Bildlaufrichtungen der Benutzerschnittstelle ausgewählt wird, so dass verschiedene Finger sich auf die verschiedenen Bildlaufrichtungen der Benutzerschnittstelle beziehen, die auf dem Display (106) angezeigt werden.

11. Vorrichtung nach einem vorhergehenden Anspruch, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:

Identifizieren der Fingerabdruckdaten als übereinstimmend mit einem Finger des Benutzers (300) auf der Basis des Vergleichs zwischen den Fingerabdruckdaten und den Referenzdaten der Vielzahl von Fingern des Benutzers, die in dem Speicher (120) gespeichert sind, so dass die Referenzdaten (422) eine Vielzahl aus Datenelementen umfassen, wobei jedes Datenelement fingerspezifische Referenzdaten eines Fingers des Benutzers (300) sowie einen Zeiger auf einen einzelnen Vorgang des Betriebszustands in einem aus einer Sammlung von Vorgängen, einer Sequenz von konsekutiven Vorgängen umfasst; und  
Auswählen eines Betriebszustands der Vorrich-

tung (100) auf der Basis des identifizierten Fingers, so dass der einzelne Vorgang, auf den durch den Zeiger in dem Datenelement des identifizierten Fingers gezeigt wird, ausgeführt wird.

12. Vorrichtung nach Anspruch 11, wobei der Zeiger einen Zeiger auf einen Speicherort in dem Speicher (120) umfasst, der einen Eintrittspunkt für eine Funktion speichert, welche den Vorgang implementiert.

13. Vorrichtung nach Anspruch 11 oder 12, wobei der Zeiger eine Verknüpfung zum Auswählen des Vorgangs aus der Vielzahl von Vorgängen bietet.

14. Vorrichtung nach einem vorhergehenden Anspruch, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:

Einstellen der Vorrichtung (100) in einen Einstellungszustand auf der Basis der empfangenen Benutzerschnittstellenmanipulation durch den Benutzer (300);  
Empfangen von Fingerabdrucklerndaten von dem Benutzer (300) mit dem Fingerabdrucksensor (104); und  
Erzeugen und Speichern der Referenzdaten (422) auf der Basis der empfangenen Fingerabdrucklerndaten.

15. Vorrichtung nach einem vorhergehenden Anspruch, wobei die einen oder mehreren Speicher (120) und der Computerprogrammcode (122) des Weiteren dazu konfiguriert sind, mit den einen oder mehreren Prozessoren (110) die Vorrichtung (100) des Weiteren zu Folgendem zu veranlassen:

Identifizieren der Fingerabdruckdaten und Auswählen der Funktion der auf die körperliche Aktivität bezogenen Messung auf der Basis des identifizierten Fingers in einem Messungsmodus der Vorrichtung (100);  
Erkennen eines Verbraucherelektronikmodus der Vorrichtung (100), der sich von dem Messungsmodus der Vorrichtung (100) unterscheidet; und  
Auswählen einer Funktion die sich auf eine Verbraucherelektronikfunktionalität der Vorrichtung (100) bezieht, auf der Basis des identifizierten Fingers, so dass sich eine Zuordnung des identifizierten Fingers und der ausgewählten Funktion zwischen dem Verbraucherelektronikmodus und dem Messungsmodus unterscheidet.

16. Vorrichtung nach Anspruch 1, wobei das auf dem Display angezeigte Benutzerschnittstellenelement eine Liste und einen Auswahlzeiger umfasst, der in der Liste basierend auf der identifizierten Drehbewegung verschoben wird.
17. Vorrichtung nach Anspruch 1, wobei das auf dem Display angezeigte Benutzerschnittstellenelement einen ersten Parameterwert umfasst, der basierend auf der identifizierten Drehbewegung und der identifizierten Richtung der Drehbewegung inkrementiert oder dekrementiert wird.
18. Vorrichtung nach Anspruch 17, wobei das auf dem Display angezeigte Benutzerschnittstellenelement einen zweiten Parameterwert umfasst, und der identifizierte Finger auswählt, ob der erste Parameterwert oder der zweite Parameterwert inkrementiert oder dekrementiert wird, basierend auf der identifizierten Drehbewegung und der identifizierten Richtung der Drehbewegung.
19. Nicht flüchtiges, computerlesbares Speichermedium (146), umfassend ein Computerprogramm, das einen Computerprogrammcode (122) umfasst, der, wenn er in eine am Handgelenk getragene Vorrichtung (100) geladen wird, die Vorrichtung (100) zur Durchführung von Folgendem veranlasst:

Empfangen (1502) von Fingerabdruckdaten von einem Finger eines Benutzers mit einem Fingerabdrucksensor der am Handgelenk getragenen Vorrichtung; und  
 Identifizieren (1504) der Fingerabdruckdaten als übereinstimmend mit einem Finger des Benutzers auf der Basis eines Vergleichs zwischen den Fingerabdruckdaten und Referenzdaten einer Vielzahl von Fingern des Benutzers;  
**dadurch gekennzeichnet, dass** die Vorrichtung (100) des Weiteren zur Durchführung von Folgendem veranlasst wird:

Identifizieren einer Drehbewegung des Fingers des Benutzers auf dem Fingerabdrucksensor;  
 Identifizieren einer Richtung der Drehbewegung entweder als eine Richtung im Uhrzeigersinn oder eine Richtung gegen den Uhrzeigersinn; und  
 Auswählen (1506) einer Funktion einer auf eine körperliche Aktivität bezogenen Messung basierend auf dem identifizierten Finger, der identifizierten Drehbewegung und der identifizierten Richtung der Drehbewegung, wobei die Drehbewegung eine kontinuierliche Steuerung vom Gleittyp eines Benutzerschnittstellenelements implementiert, das auf einem Display der am Hand-

gelenk getragenen Vorrichtung (100) angezeigt wird.

20. Verfahren in einer am Handgelenk getragenen Vorrichtung, umfassend  
 Empfangen (1502) von Fingerabdruckdaten von einem Finger eines Benutzers mit einem Fingerabdrucksensor der am Handgelenk getragenen Vorrichtung; und  
 Identifizieren (1504) der Fingerabdruckdaten als übereinstimmend mit einem Finger des Benutzers auf der Basis eines Vergleichs zwischen den Fingerabdruckdaten und Referenzdaten einer Vielzahl von Fingern des Benutzers;  
**dadurch gekennzeichnet, dass** das Verfahren des Weiteren umfasst:

Identifizieren einer Drehbewegung des Fingers des Benutzers auf den Fingerabdrucksensor;  
 Identifizieren einer Richtung der Drehbewegung entweder als eine Richtung im Uhrzeigersinn oder eine Richtung gegen den Uhrzeigersinn; und  
 Auswählen (1506) einer Funktion einer auf eine körperliche Aktivität bezogenen Messung basierend auf dem identifizierten Finger, der identifizierten Drehbewegung und der identifizierten Richtung der Drehbewegung, wobei die Drehbewegung eine kontinuierliche Steuerung vom Gleittyp eines Benutzerschnittstellenelements implementiert, das auf einem Display der am Handgelenk getragenen Vorrichtung angezeigt wird.

## Revendications

1. Appareil porté au poignet (100) comprenant :

une sangle de poignet (200A, 200B) pour fixer l'appareil (100) à un poignet d'un utilisateur (300) ;  
 une interface capteur de mesure liée à l'activité physique (108) ;  
 un capteur d'empreinte (104) ;  
 un affichage (106) ;  
 un ou plusieurs processeurs (110) ; et  
 une ou plusieurs mémoires (120) comprenant un code de programme informatique (122) ;  
 lesdites mémoires (120) et ledit code de programme informatique (122) étant configurés pour, avec lesdits processeurs (110), amener l'appareil (100) au moins à :

recevoir les données d'empreinte (400/402/404/406/408) depuis un doigt de l'utilisateur (300) avec le capteur d'empreinte (104) ; et

identifier (420, 410/412/414/416/418) les données d'empreinte (400/402/404/406/408) comme correspondant à un doigt de l'utilisateur (300) sur la base d'une comparaison entre les données d'empreinte (400/402/404/406/408) et des données de référence (422) d'une pluralité de doigts de l'utilisateur (300) stockées dans la mémoire (120) ;

**caractérisé en ce que** l'appareil (100) est en outre amené à :

identifier un mouvement de rotation du doigt de l'utilisateur (300) sur le capteur d'empreinte (104) ;

identifier un sens du mouvement de rotation soit comme mouvement de rotation dans le sens de rotation des aiguilles d'une montre soit d'un mouvement de rotation contraire au sens de rotation des aiguilles d'une montre ; et

sélectionner (424) une fonction d'une mesure liée à l'activité physique sur la base du doigt identifié, du mouvement de rotation identifié, et du sens identifié du mouvement de rotation, le mouvement de rotation implémentant une commande continue de type glissement d'un élément d'interface utilisateur affiché sur l'affichage.

2. Appareil selon la revendication 1, la fonction sélectionnée comprenant une interface utilisateur affichée sur l'affichage comprenant au moins l'une d'une commande d'un capteur interne d'appareil mesurant le fonctionnement du corps de l'utilisateur, d'une commande d'un capteur externe à l'appareil mesurant le fonctionnement du corps de l'utilisateur, d'une commande d'une mesure de fréquence cardiaque de l'utilisateur, d'une commande d'une mesure d'accélération liée à un mouvement de l'utilisateur, d'une commande d'une mesure de bien-être de l'utilisateur, d'une commande d'un menu lié à un sport pratiqué par l'utilisateur, d'une commande d'un début d'une fonction de mesure d'exercice de l'utilisateur, d'une commande d'un arrêt d'une fonction de mesure d'exercice de l'utilisateur.

3. Appareil selon la revendication 2, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à : sélectionner (424, 418) une pression de bouton d'accueil comme fonction sur la base d'une attribution antérieure d'un doigt (408) de l'utilisateur (300) à la fonction de pression de bouton d'accueil, à l'issue de laquelle l'appareil (100) navigue vers une page prédéterminée de l'interface utilisateur affichée sur

l'affichage (106).

4. Appareil selon la revendication 2 ou 3, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à : réveiller l'appareil (100) avec la fonction de l'interface utilisateur sélectionnée sur la base du doigt identifié, à l'issue de laquelle la fonction sélectionnée est affichée sur l'affichage (106).

5. Appareil selon l'une quelconque des revendications précédentes, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à :

identifier une position angulaire du doigt en relation à une position de référence prédéterminée (404) sur le capteur d'empreinte (104) ; et sélectionner (424) la fonction de l'appareil (100) sur la base du doigt identifié et en outre sur la base de la position angulaire identifiée.

6. Appareil selon l'une quelconque des revendications précédentes, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à :

détecter un clic (1010) du doigt sur le capteur d'empreinte (104) ; et sélectionner (424, 1008) la fonction de l'appareil (100) sur la base du doigt identifié et en outre sur la base du clic détecté du doigt.

7. Appareil selon l'une quelconque des revendications précédentes, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à :

mesurer un temps de maintien du doigt sur le capteur d'empreinte (104) ; et sélectionner la fonction de l'appareil (100) sur la base du doigt identifié et en outre sur la base du temps de maintien mesuré.

8. Appareil selon l'une quelconque des revendications précédentes 2 à 7, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à : sélectionner la fonction de l'appareil (100) sur la base du doigt identifié de sorte que la fonction est sélectionnée parmi les sélections affichées sur l'interface utilisateur de sorte que différents doigts liés à

- différentes positions relatives sur l'interface utilisateur affichées sur l'affichage (106), les différentes positions relatives comprenant au moins l'un d'un élément gauche, médian, droit, supérieur, central, inférieur, premier, second, troisième, quatrième, cinquième, sixième, septième, huitième, neuvième, dixième, d'un premier élément d'une liste, d'un élément suivant sur la liste, d'un dernier élément sur la liste.
9. Appareil selon l'une quelconque des revendications précédentes 2 à 8, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à : sélectionner la fonction de l'appareil (100) sur la base du doigt identifié de sorte que la fonction est sélectionnée parmi les sélections affichées sur l'interface utilisateur de sorte que différents doigts sont liés à différentes positions absolues des sélections affichées sur l'affichage (106), les différentes positions absolues comprenant des zones prédéterminées affichées sur l'affichage (106).
10. Appareil selon l'une quelconque des revendications précédentes 2 à 9, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à : sélectionner la fonction de l'appareil (100) sur la base du doigt identifié de sorte que la fonction est sélectionnée parmi les sens de défilement de l'interface utilisateur de sorte que différents doigts sont liés à différents sens de défilement de l'interface utilisateur affichés sur l'affichage (106).
11. Appareil selon l'une quelconque des revendications précédentes, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à :
- identifier les données d'empreinte comme correspondant à un doigt de l'utilisateur (300) sur la base de la comparaison entre les données d'empreinte et les données de référence de la pluralité des doigts de l'utilisateur stockées dans la mémoire (120) de sorte que les données de référence (422) comprennent une pluralité d'éléments de données, chaque élément de données comprenant des données de référence spécifiques au doigt d'un doigt de l'utilisateur (300) et un pointeur vers une opération unique de l'état de fonctionnement dans l'une d'une collection d'opérations, une séquence d'opérations consécutives ; et sélectionner l'état de fonctionnement de l'appareil (100) sur la base du doigt identifié de sorte
- que l'opération unique pointée par le pointeur dans l'élément de données du doigt identifié est exécutée.
12. Appareil selon la revendication 11, le pointeur comprenant un pointeur vers un emplacement de la mémoire dans la mémoire (120) stockant un point d'entrée vers une fonction implémentant l'opération.
13. Appareil selon la revendication 11 ou 12, le pointeur fournissant un raccourci pour sélectionner l'opération parmi la pluralité des opérations.
14. Appareil selon l'une quelconque des revendications précédentes, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à :
- paramétrer l'appareil (100) dans un état de paramétrage sur la base de la manipulation d'interface utilisateur reçue par l'utilisateur (300) ; recevoir les données d'apprentissage d'empreinte provenant de l'utilisateur (300) avec le capteur d'empreinte (104) ; et générer et stocker les données de référence (422) sur la base des données d'apprentissage d'empreinte reçues.
15. Appareil selon l'une quelconque des revendications précédentes, lesdites mémoires (120) et ledit code de programme informatique (122) étant en outre configurés pour, avec lesdits processeurs (110), amener l'appareil (100) en outre à :
- identifier les données d'empreinte et sélectionner la fonction de la mesure liée à l'activité physique sur la base du doigt identifié dans un mode de mesure de l'appareil (100) ; effectuer une distinction d'un mode électronique grand public de l'appareil (100), qui est différent du mode de mesure de l'appareil (100) ; et sélectionner une fonction liée à une fonctionnalité électronique grand public de l'appareil (100) sur la base du doigt identifié de sorte qu'une cartographie du doigt identifié et que la fonction sélectionnée soient différentes entre le mode électronique grand public et le mode de mesure.
16. Appareil selon la revendication 1, l'élément d'interface utilisateur affiché sur l'affichage comprenant une liste et un pointeur de sélection déplacé dans la liste sur la base du mouvement de rotation identifié.
17. Appareil selon la revendication 1, l'élément d'interface utilisateur affiché sur l'affichage comprenant une première valeur de paramètre incrémentée ou décrémentée sur la base du mouvement de rotation

identifié et du sens identifié du mouvement de rotation.

18. Appareil selon la revendication 17, l'élément d'interface utilisateur affiché sur l'affichage comprenant une seconde valeur de paramètre, et le doigt identifié sélectionnant le fait que la première valeur de paramètre ou la seconde valeur de paramètre est incrémentée ou décrétementée sur la base du mouvement de rotation identifié et du sens identifié du mouvement de rotation. 5  
10

19. Milieu de stockage non temporaire pouvant être lu par ordinateur (126) comprenant un programme informatique comprenant un code de programme informatique (122) qui, lorsqu'il est chargé dans un appareil porté au poignet (100) amène l'appareil (100) à effectuer : 15

la réception (1502) des données d'empreinte d'un doigt d'un utilisateur avec un capteur d'empreinte de l'appareil porté au poignet ; et l'identification (1504) des données d'empreinte comme correspondant à un doigt de l'utilisateur sur la base d'une comparaison entre les données d'empreinte et les données de référence d'une pluralité de doigts de l'utilisateur ; **caractérisé en ce que** l'appareil (100) est en outre amené à effectuer : 20  
25

l'identification d'un mouvement de rotation du doigt de l'utilisateur sur le capteur d'empreinte ; l'identification d'un sens du mouvement de rotation soit comme mouvement de rotation dans le sens de rotation des aiguilles d'une montre soit d'un mouvement de rotation contraire au sens de rotation des aiguilles d'une montre ; et la sélection (1506) d'une fonction d'une mesure liée à l'activité physique sur la base du doigt identifié, du mouvement de rotation identifié, et du sens identifié du mouvement de rotation, le mouvement de rotation implémentant une commande continue de type glissement d'un élément d'interface utilisateur affiché sur un affichage de l'appareil porté au poignet (100). 30  
35  
40  
45

20. Procédé dans un appareil porté au poignet, comprenant : 50

la réception (1502) de données d'empreinte d'un doigt d'un utilisateur avec un capteur d'empreinte de l'appareil porté au poignet ; et l'identification (1504) des données d'empreinte comme correspondant à un doigt de l'utilisateur sur la base d'une comparaison entre les don- 55

nées d'empreinte et les données de référence d'une pluralité de doigts de l'utilisateur ; **caractérisé en ce que** le procédé comprend en outre :

l'identification d'un mouvement de rotation du doigt de l'utilisateur sur le capteur d'empreinte ; l'identification d'un sens du mouvement de rotation soit comme mouvement de rotation dans le sens de rotation des aiguilles d'une montre soit d'un mouvement de rotation contraire au sens de rotation des aiguilles d'une montre ; et la sélection (1506) d'une fonction d'une mesure liée à l'activité physique sur la base du doigt identifié, du mouvement de rotation identifié, et du sens identifié du mouvement de rotation, le mouvement de rotation implémentant une commande continue de type glissement d'un élément d'interface utilisateur affiché sur un affichage de l'appareil porté au poignet.

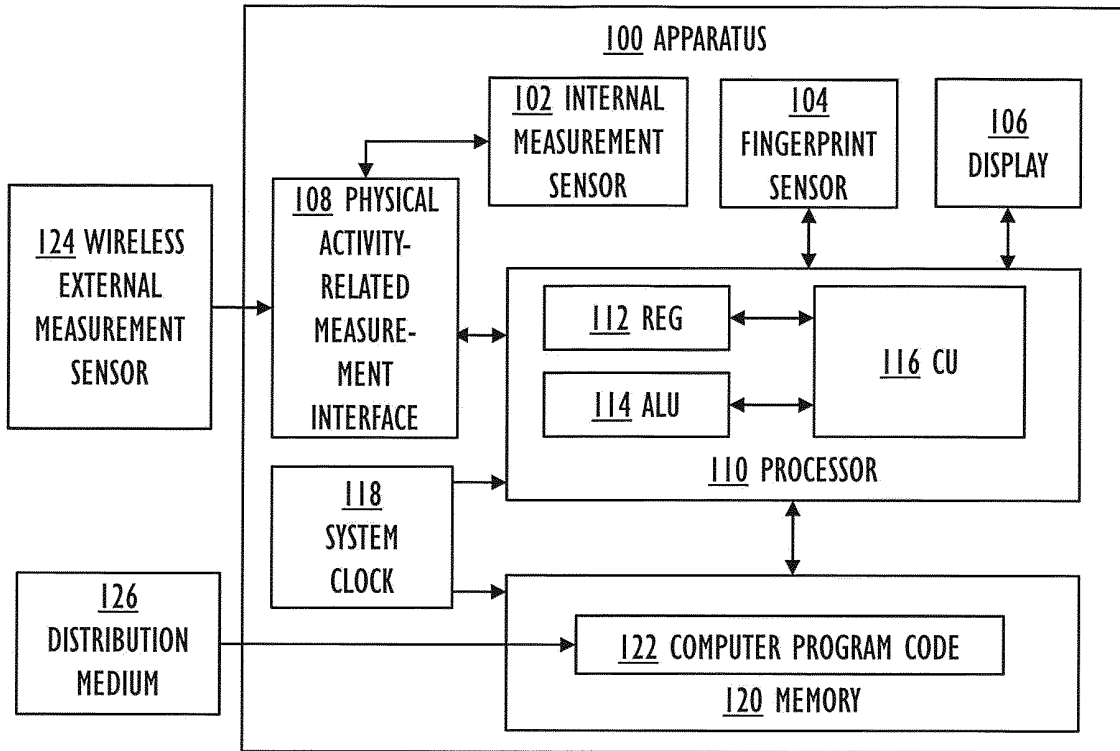


FIG. 1

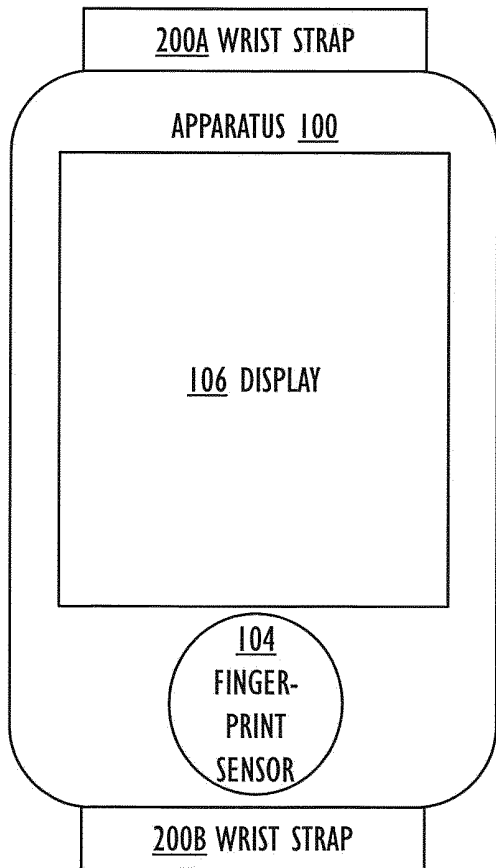


FIG. 2

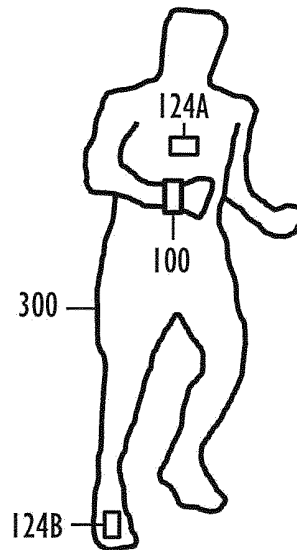


FIG. 3

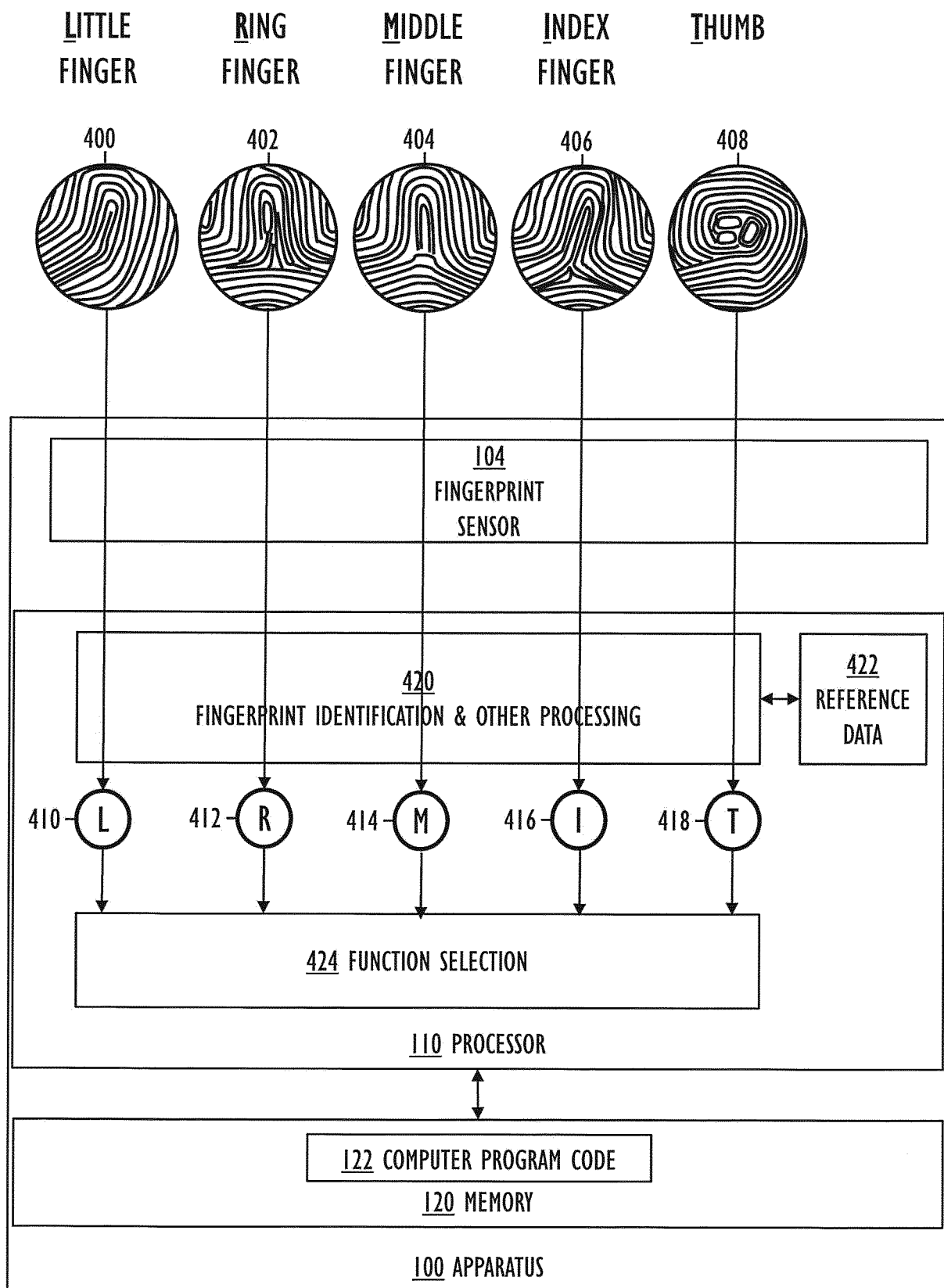


FIG. 4

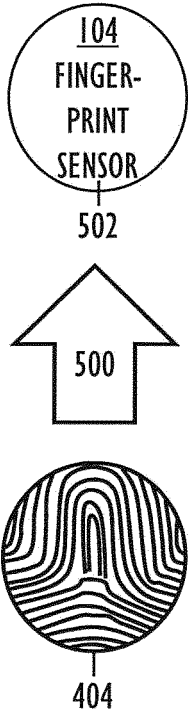


FIG. 5A

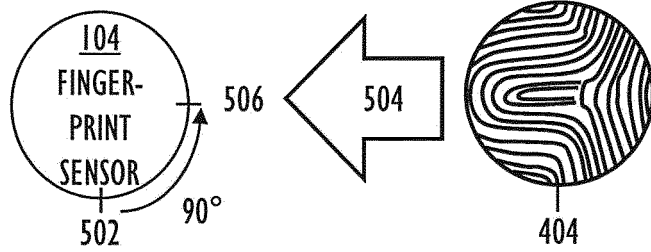


FIG. 5B

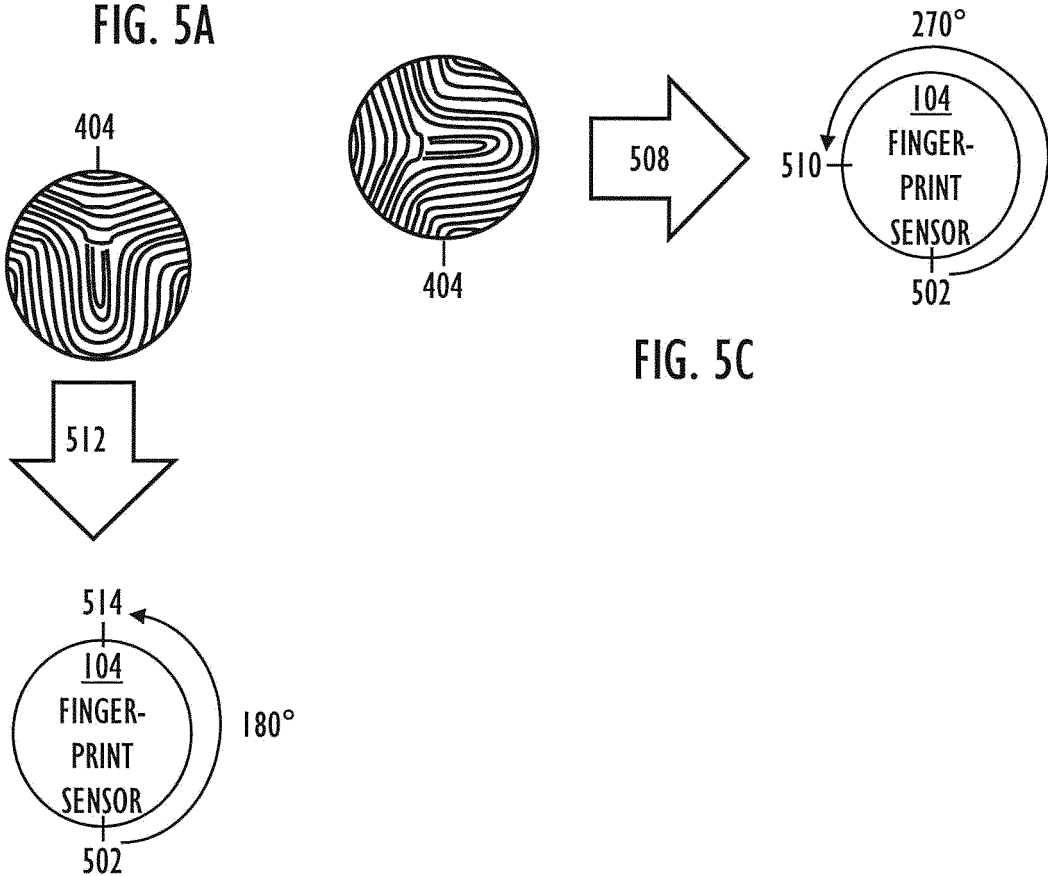


FIG. 5C

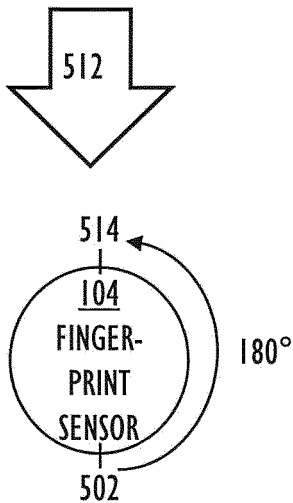


FIG. 5D

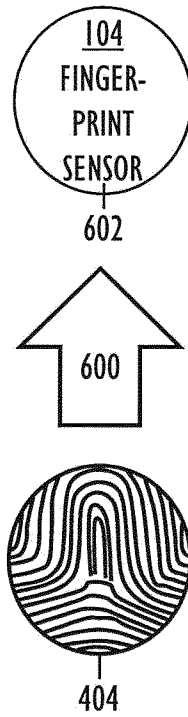


FIG. 6A

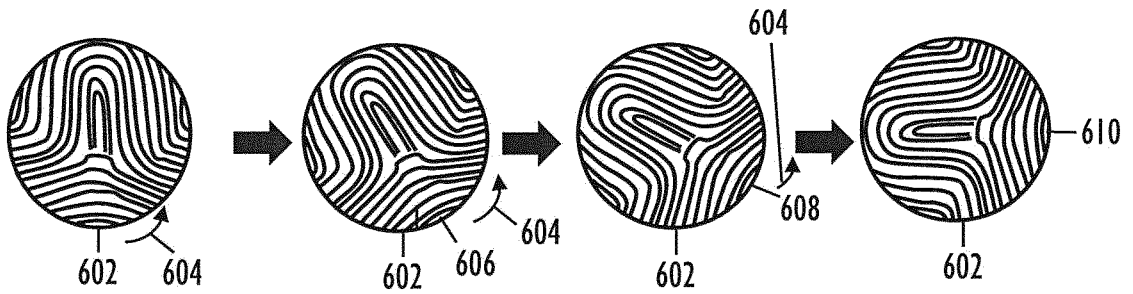


FIG. 6B

FIG. 6C

FIG. 6D

FIG. 6E

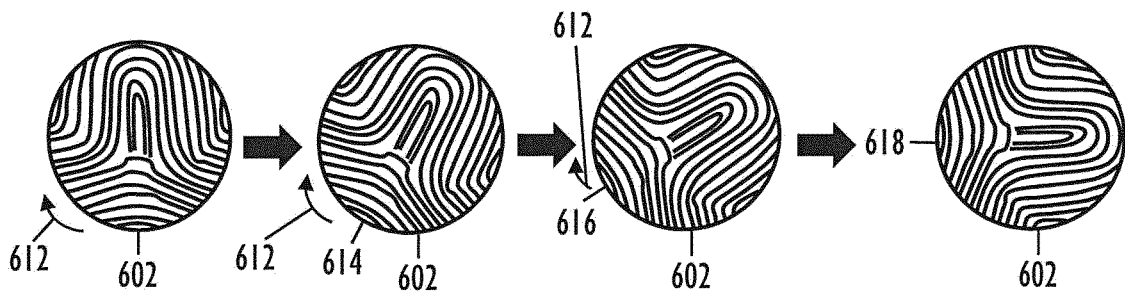


FIG. 6F

FIG. 6G

FIG. 6H

FIG. 6I

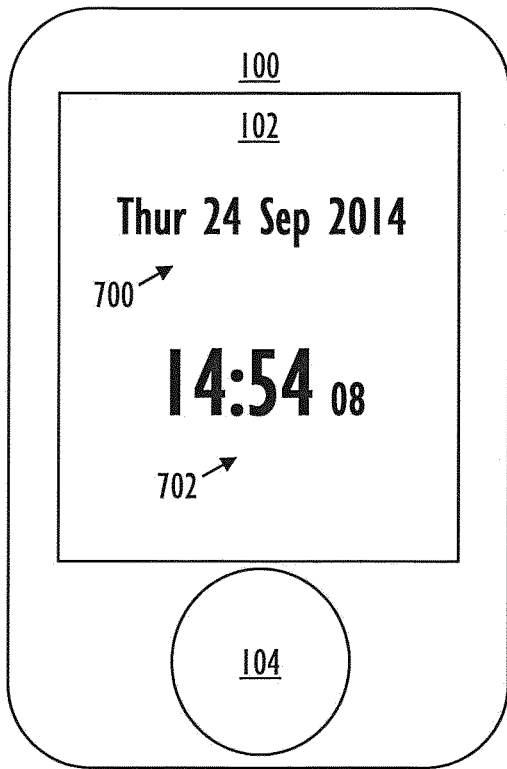


FIG. 7A

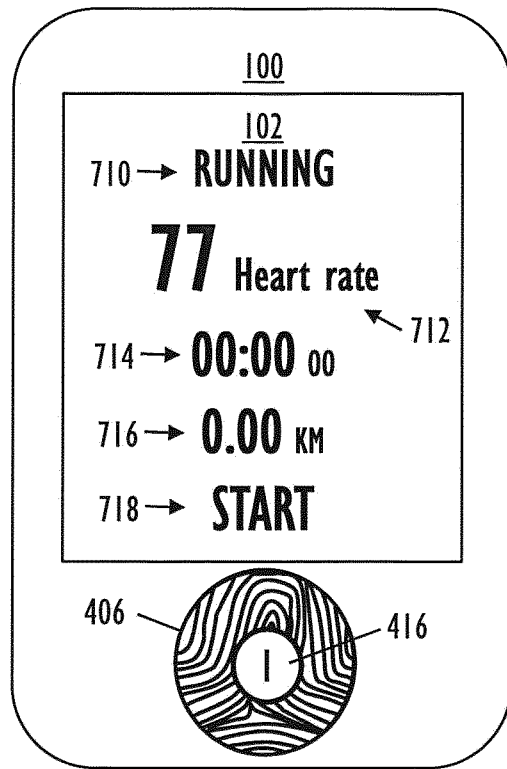


FIG. 7B

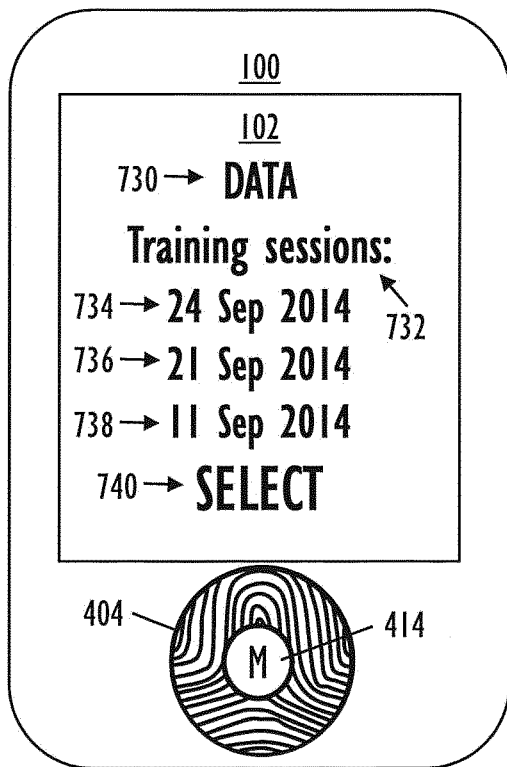


FIG. 7C

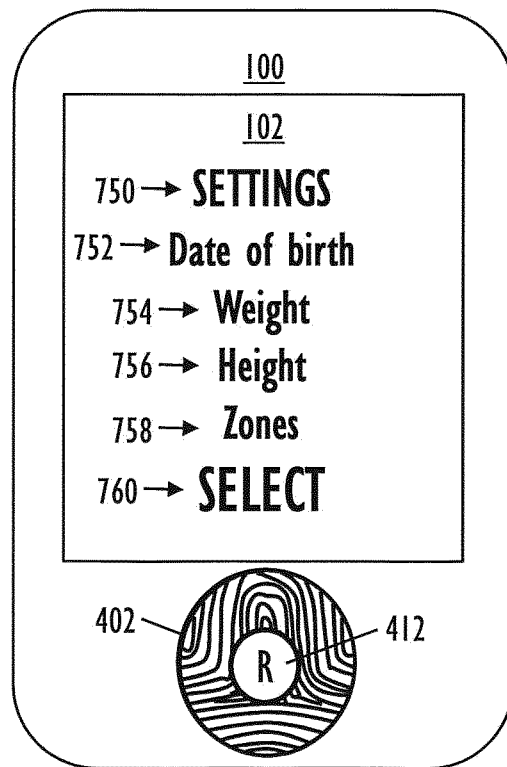


FIG. 7D

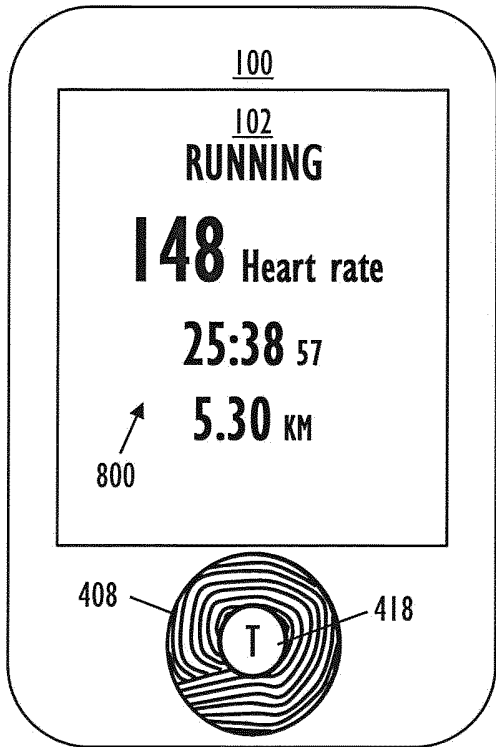


FIG. 8A

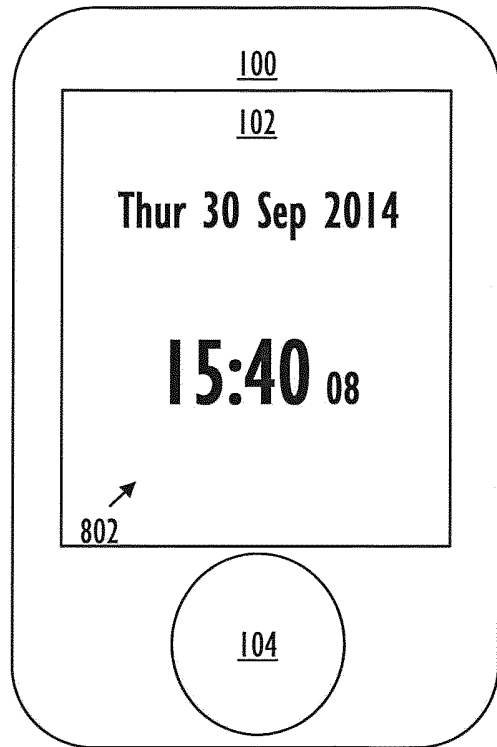


FIG. 8B

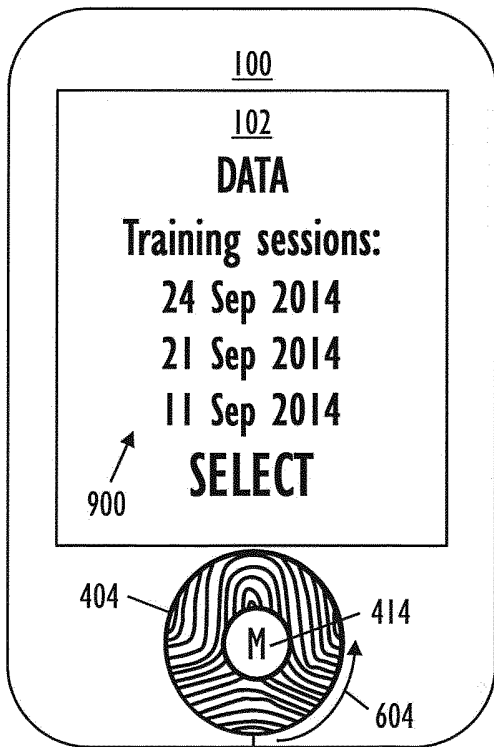


FIG. 9A

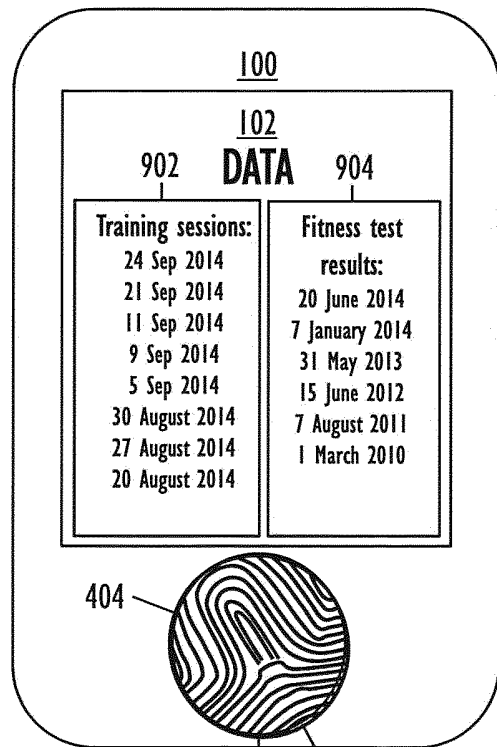


FIG. 9B

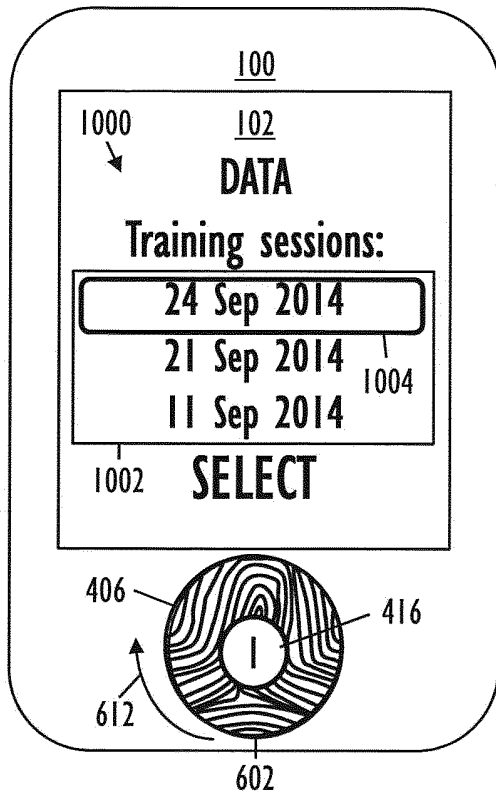


FIG. 10A

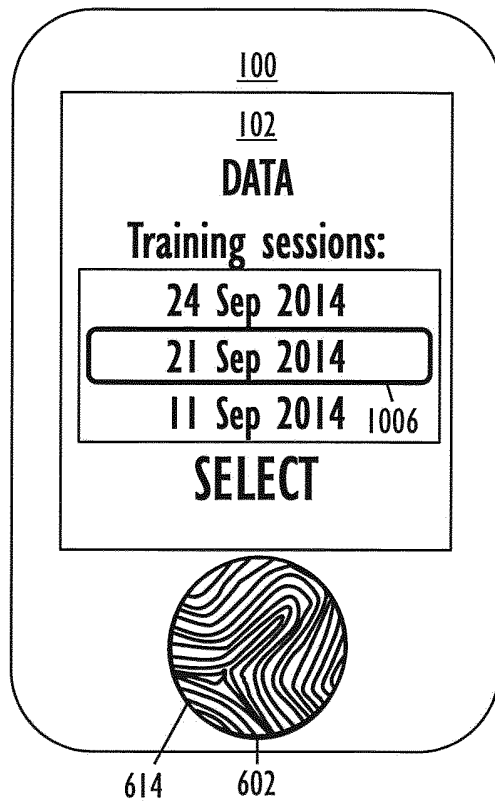


FIG. 10B

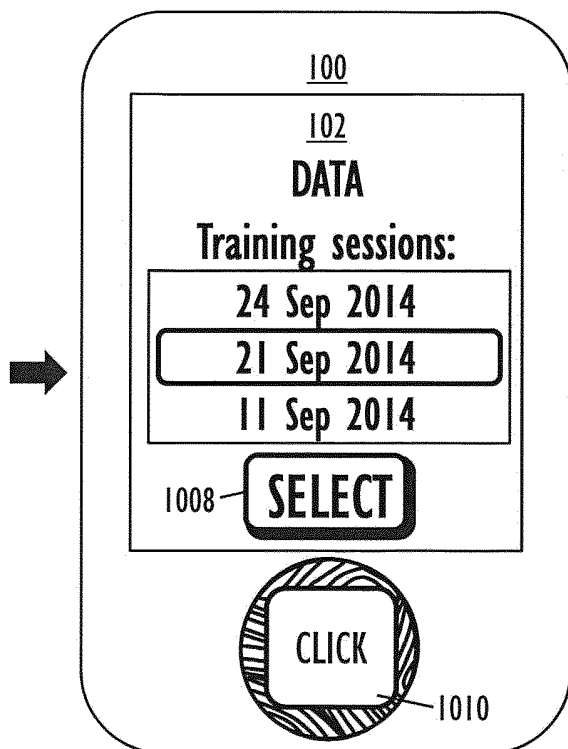


FIG. 10C

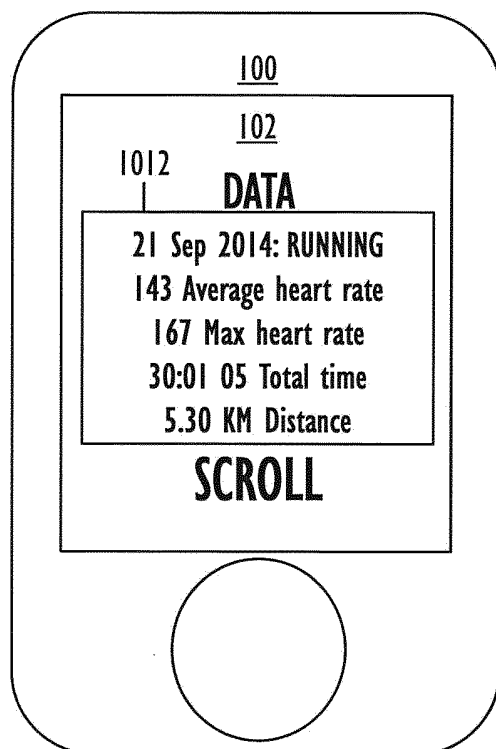


FIG. 10D

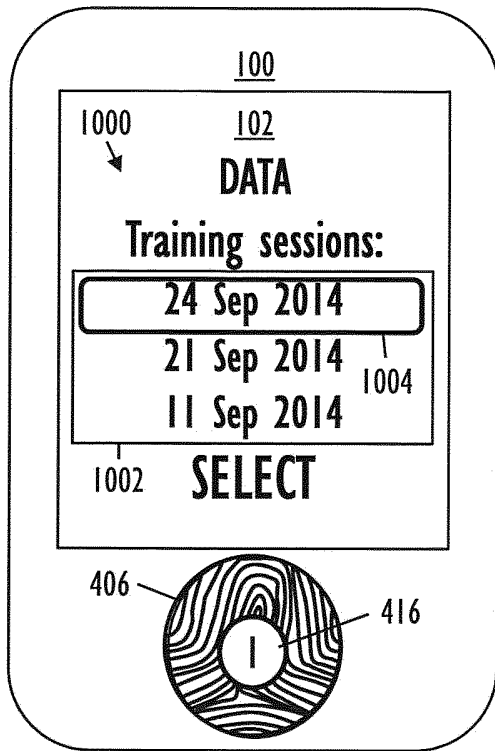


FIG. 11A

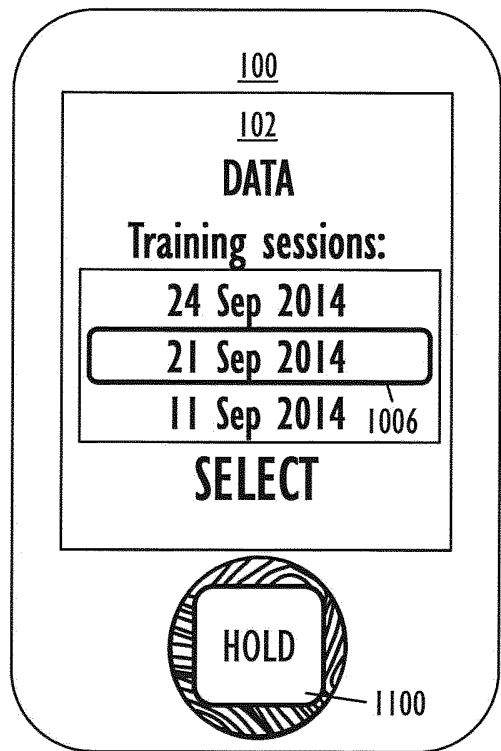


FIG. 11B

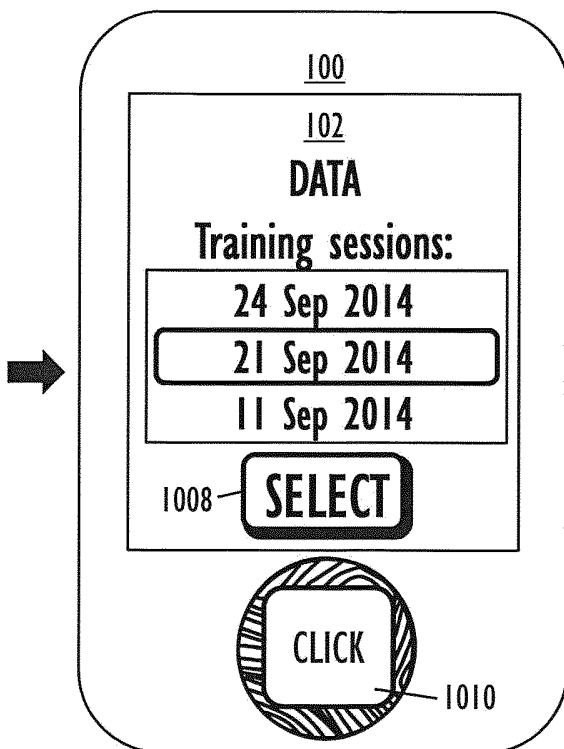


FIG. 11C

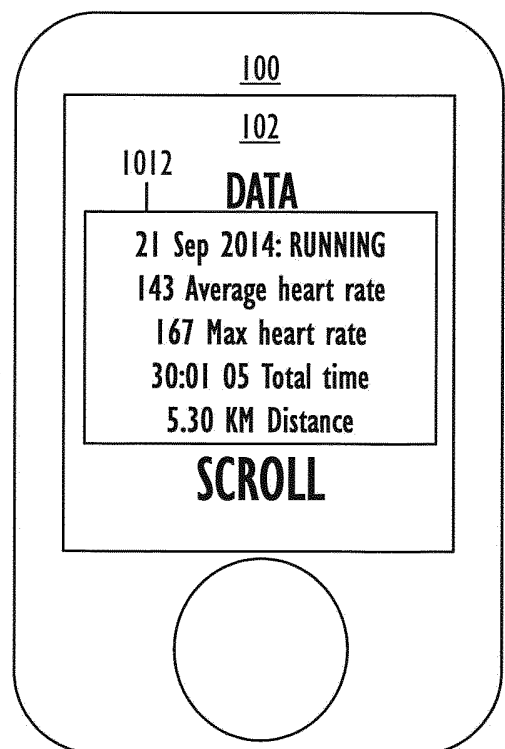


FIG. 11D

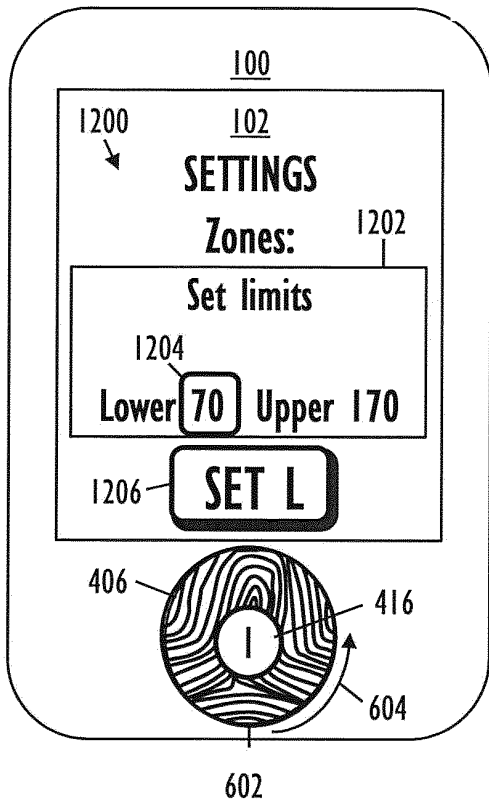


FIG. 12A

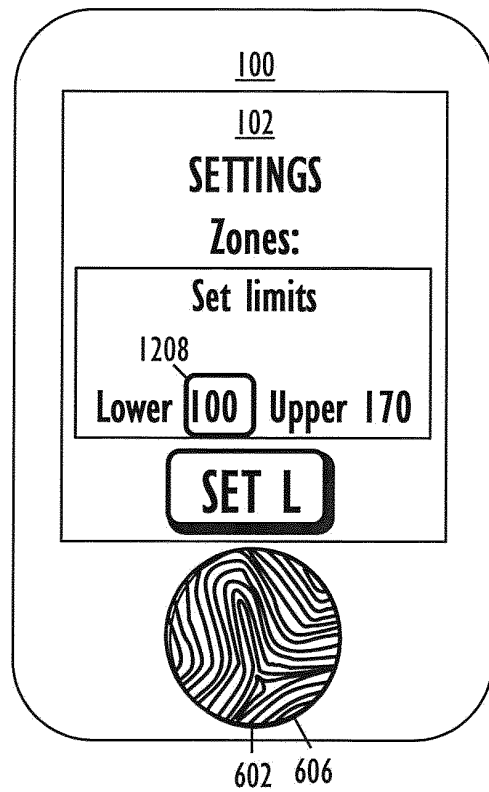


FIG. 12B

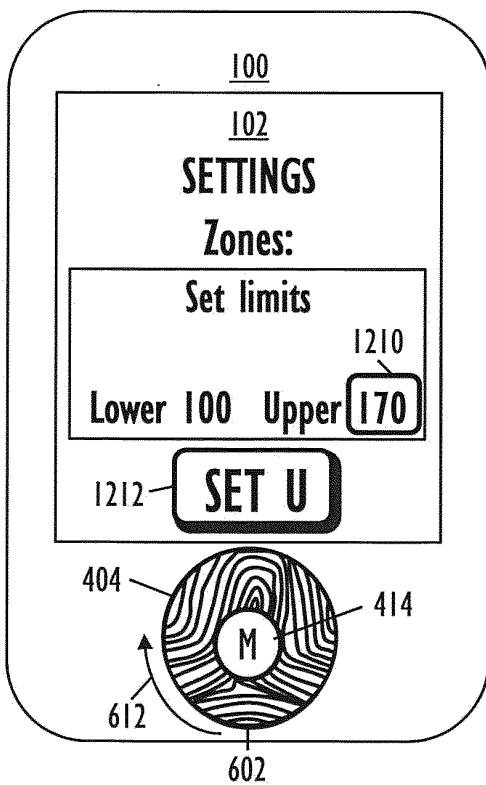


FIG. 12C

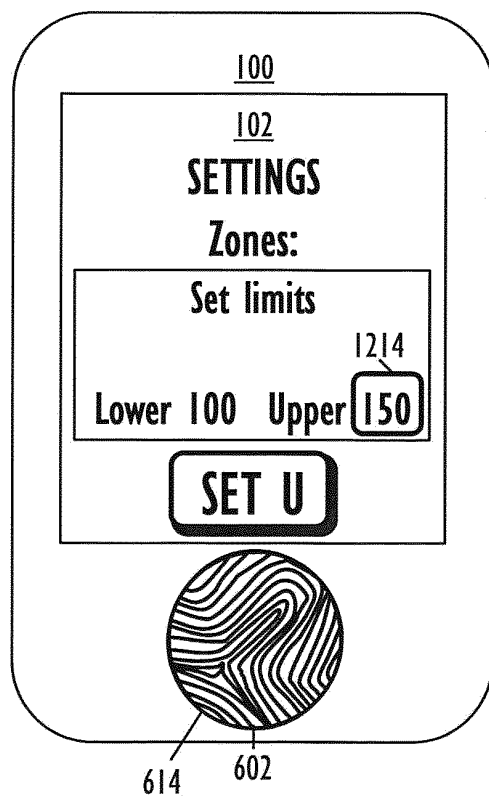


FIG. 12D

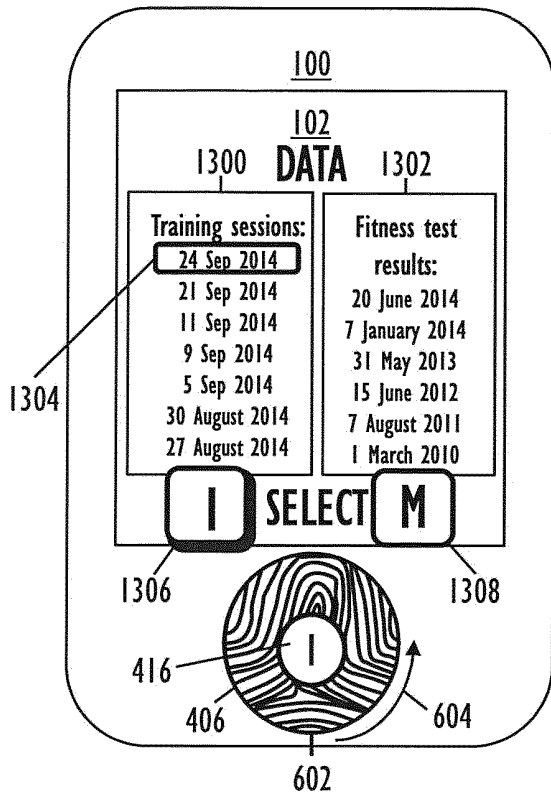


FIG. 13A

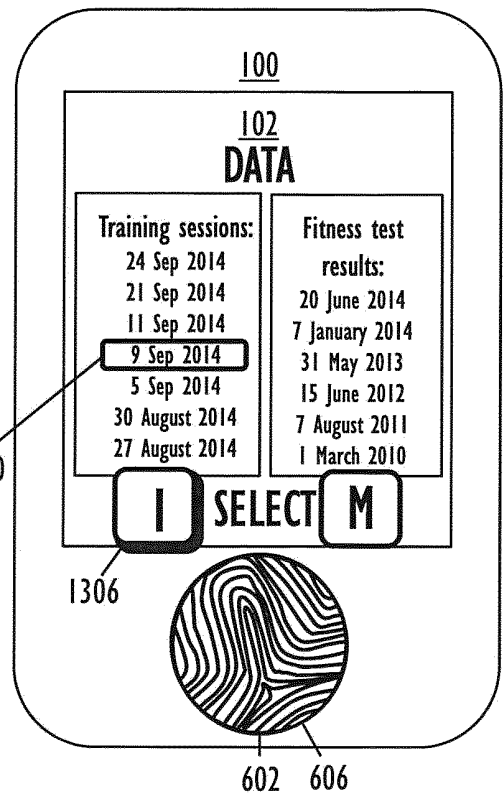


FIG. 13B

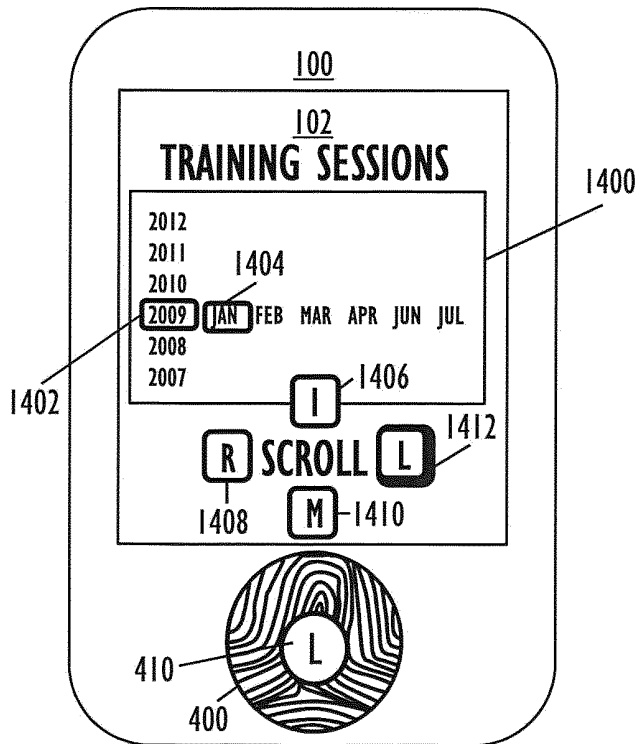


FIG. 14A

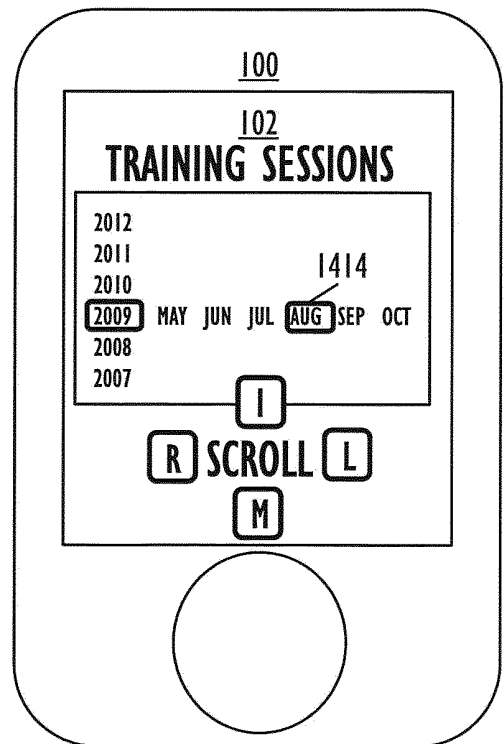


FIG. 14B

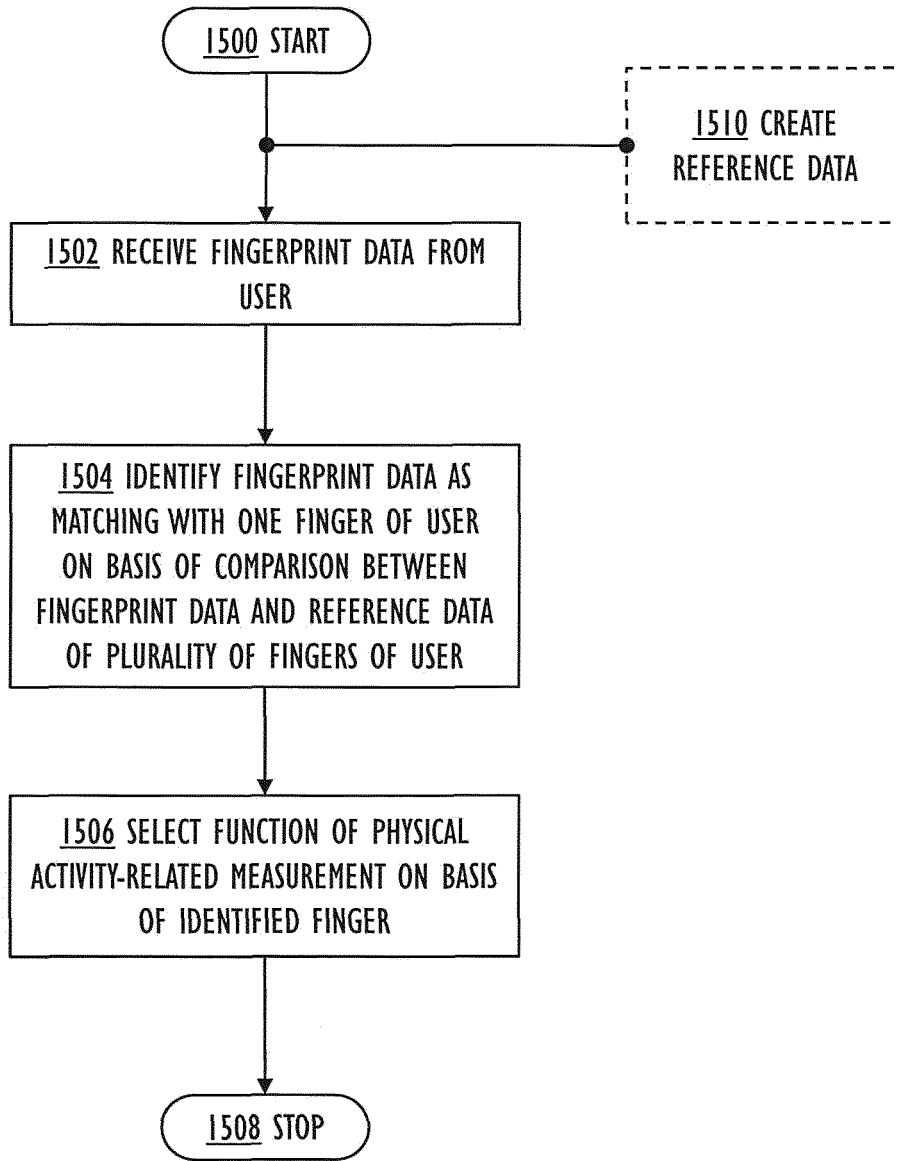


FIG. 15

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 20140239065 A [0003]
- US 20110270055 A [0004]
- US 20110300829 A [0005]
- WO 2013173838 A [0006]
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专利名称(译)	带指纹数据的腕戴式设备控制		
公开(公告)号	<a href="#">EP3015059B1</a>	公开(公告)日	2018-10-17
申请号	EP2015191613	申请日	2015-10-27
[标]申请(专利权)人(译)	博能电子公司		
申请(专利权)人(译)	Polar Electro Oy公司		
当前申请(专利权)人(译)	Polar Electro Oy公司		
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IPC分类号	A61B5/00		
CPC分类号	G06K9/00033 A61B5/02438 A61B5/1118 A61B5/7475 G06F16/583 G06K9/6202		
代理机构(译)	KOLSTER OY AB		
优先权	14/528632 2014-10-30 US		
其他公开文献	EP3015059A1		
外部链接	<a href="#">Espacenet</a>		

摘要(译)

公开了具有指纹数据的腕戴式设备控制。装置 ( 100 ) 包括物理活动相关的测量传感器接口 ( 108 ) ， 指纹传感器 ( 104 ) ， 一个或多个处理器 ( 110 ) ， 以及包括计算机程序代码 ( 122 ) 的一个或多个存储器 ( 120 ) 。 一个或多个存储器 ( 120 ) 和计算机程序代码 ( 122 ) 被配置为利用一个或多个处理器 ( 110 ) 使装置至少从指纹传感器 ( 104 ) 接收来自用户的指纹数据， 基于指纹数据与存储在存储器 ( 120 ) 中的用户的多个手指的参考数据之间的比较， 将指纹数据识别为与用户的一个手指匹配， 并选择身体活动的功能 - 基于所识别的手指的相关测量。

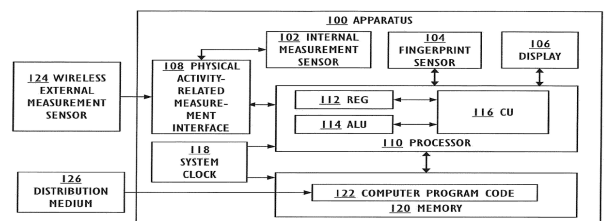


FIG. 1

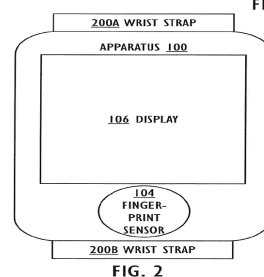


FIG. 2

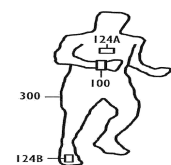


FIG. 3