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(72) Inventors:
• **Ebke, Daniel**
33613 Bielefeld (DE)
• **Strothoff, Werner**
48336 Sassenberg (DE)
• **Oßwald, Sebastian**
Winston-Salem NC, 27106 (US)
• **Parda, Andrew**
Providence, RI 02903 (US)
• **Rosenblum, Yael**
Cambridge, MA 02140 (US)
• **Sun, Eric**
Cambridge, MA 02141 (US)

(71) Applicant: **Miele & Cie. KG**
33332 Gütersloh (DE)

(54) **METHOD OF TRACKING USER HEALTH VIA LAUNDRY**

(57) The present disclosure provides a method of tracking user health via laundry in which a water bearing electrical device contains a plurality of sensors, and the sensor data is collected and stored in a sensor database. The sensor database is compared to a health database

which contains thresholds of a plurality of health metrics, such as warning, notifications, and recommendations. If the sensor data exceeds the thresholds the corresponding health metric is extracted and sent to the user.

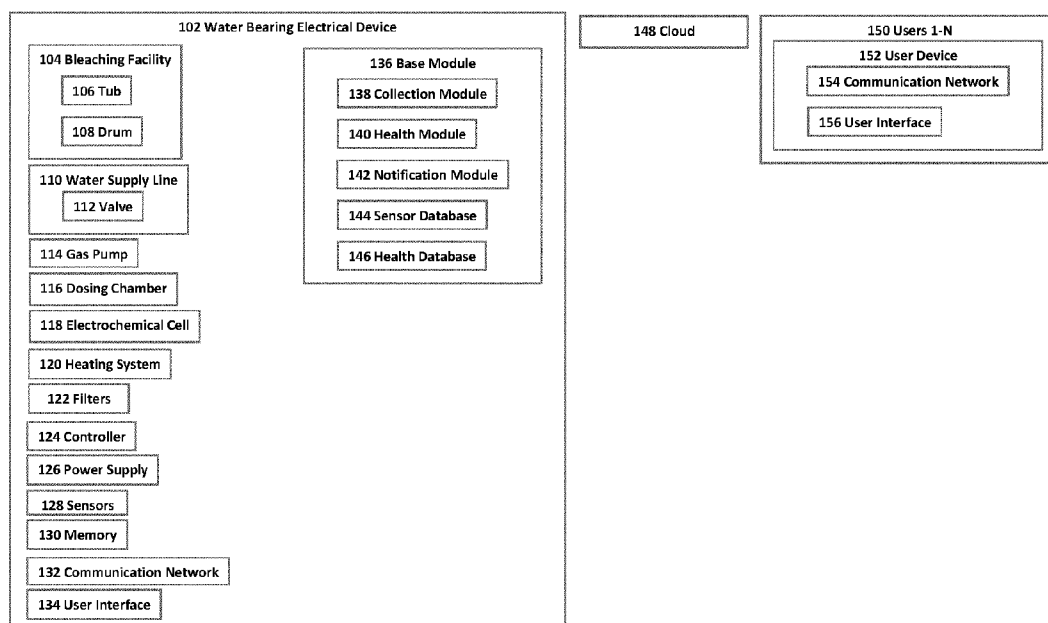


Fig.1 Method Tracking User Health Via Laundry

Description

FIELD OF THE DISCLOSURE

[0001] The present disclosure is generally related to tracking user health through a water bearing electrical device.

BACKGROUND

[0002] Currently, household appliances as well as professional used appliances for washing or cleaning textiles do not contain a method of tracking the user's health through data that can be collected during a wash cycle. Also, such systems do not notify the user of potential health statuses, health recommendations, or health warnings. Lastly, most appliances do not collect sensor data throughout a wash cycle to determine various health data points that can inform the user of potential harmful contaminants or health conditions. Thus, there is a need in the prior art to provide a method for tracking user health via laundry.

DESCRIPTIONS OF THE DRAWINGS

[0003]

FIG. 1: Illustrates a method tracking user health via laundry, according to an embodiment.

FIG. 2: Illustrates a Base Module, according to an embodiment.

FIG. 3: Illustrates a Collection Module, according to an embodiment.

FIG. 4: Illustrates a Health Module, according to an embodiment.

FIG. 5: Illustrates a Notification Module, according to an embodiment.

FIG. 6: Illustrates a Sensor Database, according to an embodiment.

FIG. 7: Illustrates a Health Database, according to an embodiment.

DETAILED DESCRIPTION

[0004] Embodiments of the present disclosure will be described more fully hereinafter with reference to the accompanying drawings in which like numerals represent like elements throughout the several figures, and in which example embodiments are shown. Embodiments of the claims may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. The examples set forth herein are non-limiting examples and are merely examples among other possible examples.

[0005] This is a method for tracking user health via laundry. This method comprises of a water bearing electrical device 102 in which cleaning is to be achieved using a bleaching agent, and a water-bearing electrical device

which carries out cleaning using a bleaching agent, i.e., hydrogen peroxide produced from electrolysis, such as by a washing machine, a dishwasher, a type of household or professional disinfectant appliance, etc. The water bearing electrical device 102 may include a bleaching facility 104 and an electrochemical cell 118 with a cathode arranged in a cathode chamber and an anode arranged in an anode chamber, which are spatially separated, having the following steps during a cleaning program, which includes a washing process and has several rinsing processes. First, providing a solution in the electrochemical cell which comprises water and an electrolyte. Second, applying a current to the electrochemical cell and simultaneously introducing an oxygen-containing gas to produce a bleach in a catholyte. Third, feeding the catholyte from the electrochemical cell into the bleaching facility 104 before and/or during the washing process. In the first step, a water and electrolyte containing solution is provided in the electrochemical cell 118, wherein the solution can be arranged in the electrochemical cell 118 or passed through it. The electrolyte can comprise or consist of an inorganic salt and/or a builder. The inorganic salt is preferably sodium sulfate and/or sodium hydrogen carbonate. In a preferred embodiment, the builder has one or more components selected from the group consisting of citric acid, lactic acid, phosphonate, polycarboxylic acid, aminocarboxylic acid, polyacrylic acid and/or their salts. Alternatively, the builder preferably consists of one or more of these components. In the second step, if the oxygen-containing gas is supplied to the electrochemical cell 118, which preferably has a gas diffusion electrode in the cathode space, and current is applied to it, an electrolysis starts in which a bleaching agent, such as hydrogen peroxide, is formed. Due to the spatial separation of the cathode and anode compartments, the anolyte and the catholyte are produced separately from one another. The pH of the catholyte is shifted into the alkaline pH range, while a pH value of the anolyte is shifted into the acidic pH range. If the anode compartment and the cathode compartment were not separated, the catholyte and the anolyte would at least partially neutralize each other, which has proven to be disadvantageous. A pH of the catholyte is preferably in the range from 9 to 14, more preferably 10 to 12. In the third step, only the catholyte is fed to the bleaching facility 104. In other words, the catholyte is fed to the bleaching facility 104 without an anolyte produced in the second step. The catholyte is anolyte-free. During the washing process, items to be cleaned or the bleaching facility 104 itself is washed with the bleaching agent produced, such as hydrogen peroxide produced from electrolysis, and, if necessary, other ingredients of the solution in order to clean it. During the one or more rinsing processes, the items to be cleaned or the bleaching facility 104 itself is rinsed with water in order to rinse the solution out of the bleaching facility 104 and possibly the items to be cleaned. In some embodiments, the method furthermore has a step of feeding the anolyte produced in the second

step from the electrochemical cell 118 into the bleaching facility 104 after a washing process has been carried out. The anolyte produced in the second step is preferably fed to the bleaching facility 104 before and/or during the execution of a rinsing process from the electrochemical cell 118. By inserting the acidic anolyte solution into one of the wash cycles, any calcium deposits that may have formed in the water-conducting electrical device and/or on the items to be cleaned can be dissolved again. Hygiene is increased, since both alkaline and acidic pH values are run through in the water-bearing electrical device during a washing and rinsing cycle. The anolyte is therefore used sensibly. In some embodiments, the bleaching agent may refer to a chemical compound, may be hydrogen peroxide produced by an electrochemical process, such as by an electrochemical cell 118, may be an anolyte or catholyte resulting from or generated as an intermediary product during an electrochemical process. In some embodiments, the bleaching agent may remove dyes, contaminants, pathogens, etc. from textiles, fabrics, materials, surfaces, fluids, etc. For instance, a water bearing electrical device 102 such as a water bearing electrical device 102 of EP3865614A1. Further, embodiments may include a bleaching facility 104 which may contain a tub 106 and a drum 108 contained within the tub 106. The bleaching facility 104 may receive the catholyte produced from the first electrochemical cell 118 before and/or during a washing process via a supply line to clean the items stored in the drum 108. In some embodiments, after the washing process the anolyte produced by the second electrochemical cell 118 may be fed to the bleaching facility 104 before and/or during the execution of a rinsing process from the second electrochemical cell 118. By inserting the acidic anolyte solution into one of the wash cycles, any calcium deposits that may have formed in the water-conducting electrical device and/or on the items to be cleaned can be dissolved again. Hygiene is increased, since both alkaline and acidic pH values are run through in the water-bearing electrical device during a washing and rinsing cycle. For instance, a bleaching facility 104 such as a bleaching facility 104 of EP3865614A1. Further, embodiments may include a tub 106 that seals in the water of the water bearing electrical device 102 and may vibrate, shake, rotate, etc. by a motor and a counterweight in order to clean, wash, rinse, etc. the items contained in the drum 108 which may be contained within the tub 106. In some embodiments, the bleaching facility 104 may contain a tub 106 and drum 108, such as a washing machine. In some embodiments, the tub 106 may include a drain, drain line, drain pump, and drain valve to dispose of the wastewater created during the wash process. In some embodiments, the tub 106 may be drained or emptied of the wastewater by activating a drain valve located in a drain line connected to a drain entrance at the bottom of the tub 106. In some embodiments, the bleaching facility may only contain a tub 106 or water sealed drum 108, such as a dishwasher. In some embodiments, the bleach-

ing facility may be used for a household or professional use disinfectant appliance that may or may not include a tub 106 or drum 108. For instance, a tub 106 such as a tub 106 of US6841058B2. Further, embodiments may include a drum 108 that is contained within the tub 106 and is where the items to be cleaned are placed. The drum 108 may include sides that perforated with holes to allow water to enter and exit upon spinning the drum 108. For instance, a drum 108 such as a drum 108 of US6841058B2. Further, embodiments may include a water supply line 110 that connects to the electrochemical cell 118 to supply the water for the washing process. The water supply line 110 may include a valve 112 that may be opened or closed based on the control signals received from the controller 130 to feed the water to the electrochemical cell 118 for the wash cycle. The water supply line 110 may be connected to a water source, such as a water line for a household, building, or dwelling. In some embodiments, the water supply line 110 may be replaced with a water tank located within the water bearing electrical device 102 to supply the water to the electrochemical cell 118. In some embodiments, the water supply line 110 may include a pump, a pressurized source, etc. to move the water through the water supply line 110. For instance, a water supply line 110 such as a feed supply of US7950254B2. Further, embodiments may include a valve 112 for the water supply line 110 that may be opened or closed based on the control signals received from the controller 130 to feed the water to the electrochemical cell 118 for the wash cycle. In some embodiments, the valve 112 may be used to control the supply of water from a water tank or another source of water for the washing process or cycle. Further, embodiments may include a gas pump 114 which connects to the cathode through a gas supply line to supply air or oxygen to the cathode chamber. The gas pump 114 supplies air or oxygen as an oxygen-containing gas via a gas supply line to the cathode chamber and a current is applied to the electrochemical cell 118. Applying a current to the electrochemical cell 118 at the same time introducing an oxygen-containing gas, such as air, into the cathode space by activating the gas pump 114 generates hydrogen peroxide in the aqueous electrolyte-containing solution. For instance, a gas pump 114 such as an oxygen supply line of JP2005146344A. Further, embodiments may include a dosing chamber 116 which is designed to meter an electrolyte, for example an electrolyte-containing solution, such as a salt-containing solution, and possibly a detergent into the electrochemical cell 118 by means of a metering pump. When the electrochemical cell 118 is supplied with water in a predetermined quantity, the electrolyte, such as a solution containing salt, and possibly a detergent is metered from the dosing chamber 116 into the electrochemical cell 118 via the metering pump. In some embodiments, the dosing chamber 116 may provide the electrolyte to the electrochemical cell 118 through a pipe, hose, tubing, etc. In some embodiments, the dosing chamber 116 may be replaced with a

dosing pump, metering pump, etc. to provide the electrolyte to the electrochemical cell 118. In some embodiments, the electrolytes may include sodium, chloride, potassium, magnesium, calcium, etc. For instance, a dosing chamber 116 such as a dosing chamber 116 of EP2798995B1. Further, embodiments may include an electrochemical cell 118 with a cathode compartment and an anode compartment, that provides an aqueous electrolyte-containing solution in the electrochemical cell 118 and applies a current to the electrochemical cell 118 and simultaneously introduces an oxygen-containing gas to generate hydrogen peroxide in the aqueous electrolyte-containing solution. Then the electrolyzed solution is fed from the electrochemical cell 118 into the bleaching device and a bleach activator is fed into the electrochemical cell 118 and/or the bleaching facility 104. The electrochemical cell 118 is designed to produce a hydrogen peroxide-containing bleaching agent using the electrolyte, water, air and electric current. If the electrochemical cell 118 has the electrolyte, water and air and an electric current flow, water is oxidized at an anode of the electrochemical cell, with protons being formed. At the same time, the oxygen contained in the air is reduced at a cathode of the electrochemical cell 118, in particular a gas diffusion electrode. The protons are used up, for example, the protons combine with the electrons to form hydrogen, and hydrogen peroxide is produced. The cathode is preferably designed as an oxygen diffusion electrode. The anode can be a dimensionally stable anode, a mixed oxide electrode or a boron-doped diamond electrode. The reaction product of electrolysis is a hydrogen peroxide solution. An anode compartment in which the anode is located and a cathode compartment in which the cathode is located are preferred, for example, through a membrane such as a cation exchange membrane spatially separated, so that an alkaline hydrogen peroxide solution is preferably produced. The electrode, such as diamond electrode, of the reactor is preferably boron- or nitrogen-doped. One or more of the electrodes may be a boron-doped diamond electrode, such as diamond electrodes which have a possibly doped diamond layer applied to a carrier material. The diamond electrode may function as an anode or a cathode in the process, the reactor having a counter electrode of a suitable material, such as steel, which may also form the reactor itself. It is also possible that the reactor has two diamond electrodes which function as anode and cathode. The reactor therefore constitutes an electrolyzer. It may also be designed as an electrolyzer having a membrane which spatially separates the anode and the cathode, so that products and/or intermediates formed on electrolysis on a diffusion from the cathode to the anode space and/or prevented vice versa. For instance, an electrochemical cell 118 such as an electrochemical cell 118 of EP3865614A1, US6132572A, US9994463B2, JP2005146344A. Further, embodiments may include a heating system 120 which may be used to heat the water supply to a desired temperature for a washing process.

The water bearing electrical appliance may include a built in heater to heat the water supply. In some embodiments, the water supply line 110 may include a hot water supply line to provide heated water to the cleaning process. In some embodiments, the heating system 120 may include a container with an inlet channel and an outlet channel and in the container two spaced plates which act as electrodes and each have an electrical connection for connection to an electrical voltage source for generating a current flow I through the water between the plates, with at least one plate being movably mounted to the distance between the plates and thereby to change the volume of water provided between the plates. The plates may have a large distance from each other. A movable plate is guided in the container by means of a lever mechanism. A drive means serves to drive the lever mechanism to move the plate in order to change the parallel distance of the plate to the fixed plate. A control device is designed to switch the appropriate AC voltage to the plates and to activate the drive means in order to set the distance between the plates. The conductance of the liquid located in the container can be detected with the detection means and fed to the control device. Based on the detected conductance and the specified requirements for the water heating, the control device can activate the drive means in order to set the distance in such a way that an electrical current flow is set, which leads to the desired heating of the water. The heating system 120 is designed as a continuous-flow heater, it can also be designed as a boiler. The current is an alternating current of the same frequency due to the alternating voltage applied to the plates. Further, embodiments may include a plurality of filters 122 to capture unwanted elements from entering or exiting the water bearing electrical device 102, such as dirt, lint, harmful contaminants, etc. The filters 122 may be located within the water supply line 110 and/or at the drainage component of the water bearing electrical device 102. For instance, a filter 122 such as a filter 122 of US9994463B2. Further, embodiments may include a controller 124 which is a computing device comprised of a processor for performing computations and communicates with a memory 130 for storing data. The controller 124 is in communication with a plurality of components of the water bearing electrical device 102 and may further be allowed to control the functions of the water bearing electrical device 102. The controller 124 may be a commercially available central processing unit (CPU) or graphical processing unit (GPU) or may be a proprietary, purpose-built design. More than one controller 124 may operate in tandem and may be of different types, such as a CPU and a GPU. A GPU is not restricted to only processing graphics or image data and may be used for other computations. Further, embodiments may include a power supply 126 which may be a hardware component that supplies power to the water bearing electrical device 102. It receives power from an electrical outlet and converts the current from AC, alternating current, to DC, direct current, or may supply the alternat-

ing current, and may regulate the voltage to an adequate amount. The power supply 126 may be wired, wireless, such as through a battery. The power supply 126 may supply a current to the water bearing electrical device 102, electrochemical cell 118, gas pump 114, heating system 120, sensors 128, etc. collectively or individually. Further, embodiments may include a sensor 128 which is a measurement tool for monitoring a characteristic or metric associated with the water bearing electrical device 102. A sensor 128 may be discrete or part of an array or assembly. A sensor 128 may be a pH sensor which may be used to accurately measure acidity and alkalinity in water and other liquid substances. A sensor 128 may be a sensor to detect contamination within the water, either entering or exiting the water bearing electrical device 102, such as chemical sensors, electrochemical piezoelectric sensors, functional DNA biosensors, TOC sensors, etc. One or more of the sensors 128 may include temperature sensors, rotor position sensors, water level sensors, dirt sensors, photoelectric sensors, pressure sensors, vibration sensors, water flow sensors, proximity sensors, humidity sensors, any combination thereof, etc. The sensors 128 may be integrated into the operation of the water bearing electrical device 102 or may monitor the status of the device. In some embodiments, the data collected by the sensors 128 may be in real-time or may need to be analyzed further to produce findings. In some embodiments, the sensors 128 may be able to detect a plurality of pollutants, contaminants, bacteria, viruses, health information about the user, etc. In some embodiments, there may be a plurality of sensors 128 to gather specific data, such as pollutants, contaminants, bacteria, viruses, health information about the user, etc. and each data file of sensor 128 data may be individually compared to the health database 146. In some embodiments, the sensors 128 may be constructed for one wash cycle allowing the user to either replenish the sensor 128 after a wash cycle by inserting a new sensor 128 in a compartment located in the area of the water bearing electrical device 102, such as the water supply line 110, the drum 108, the tub 106, the electrochemical cell 118, the heating system 120, the power supply 126, gas pump 114, valves 112, or any of the lines within the device that is used to move the water, wastewater, solutions, or detergents. In some embodiments, the sensors 128 may be constructed for multiple wash cycles and provide the user with a notification when the sensor 128 needs to be changed, requires maintenance, or is malfunctioning. In some embodiments, a biosensor may be an analytical device, used for the detection of a chemical substance, that combines a biological component with a physicochemical detector. The sensitive biological element, for example tissue, microorganisms, organelles, cell receptors, enzymes, antibodies, nucleic acids, etc., is a biologically derived material or biomimetic component that interacts with, binds with, or recognizes the analyte under study. The biologically sensitive elements can also be created by biological engineering. The transducer or the

detector element, which transforms one signal into another one, works in a physicochemical way, such as optical, piezoelectric, electrochemical, electrochemiluminescence etc., resulting from the interaction of the analyte with the biological element, to easily measure and quantify. The biosensor reader device connects with the associated electronics or signal processors that are primarily responsible for the display of the results in a user-friendly way. In some embodiments, biosensors may be used to detect bacteria, such as E. Coli, salmonella, a plurality of soil pollutants, such as pesticides, toxic substances, chemicals, etc. For instance, a sensor 128 such as a sensor 128 of US9702074B2, US11147650B2, and a gas sensor of EP2397062B1. Further, embodiments may include a memory 130 such as the electronic circuitry within a computing device that temporarily stores data for usage by the controller 124. The memory 130 may additionally comprise persistent data storage for storing data used by the controller 124. The memory 130 may be integrated into a controller 124 or may be a discrete component. The memory 130 may be integrated into a circuit, such as soldered on component of a single board computer (SBC) or may be a removable component such as a discrete dynamic random-access memory (DRAM) stick, secure digital (SD) card, flash drive, solid state drive (SSD), magnetic hard disk drive (SSD), etc. In some embodiments, memory 130 may be part of a controller 124. Further, embodiments may include a communication network 132 that may be a wired and/or a wireless network. The communication network 132, if wireless, may be implemented using communication techniques such as Visible Light Communication (VLC), Worldwide Interoperability for Microwave Access (WiMAX), Long Term Evolution (LTE), Wireless Local Area Network (WLAN), Infrared (IR) communication, Public Switched Telephone Network (PSTN), Radio waves, and other communication techniques known in the art. The communication network 132 may allow ubiquitous access to shared pools of configurable system resources and higher-level services that can be rapidly provisioned with minimal management effort, often over Internet and relies on sharing of resources to achieve coherence and economies of scale, like a public utility, while third-party clouds enable organizations to focus on their core businesses instead of expending resources on computer infrastructure and maintenance. Further, embodiments may include a user interface(s) 134 that may either accept inputs from users or provide outputs to the users or may perform both the actions. In one case, a user can interact with the user interface(s) 134 using one or more user-interactive objects and devices. The user-interactive objects and devices may comprise user input buttons, switches, knobs, levers, keys, trackballs, touchpads, cameras, microphones, motion sensors, heat sensors, inertial sensors, touch sensors, or a combination of the above. Further, the user interface(s) 134 may either be implemented as a Command Line Interface (CLI), a Graphical User Inter-

face (GLTI), a voice interface, or a web-based user-interface. Further, embodiments may include a base module 136 which begins with the user 150 selecting the wash cycle. The base module 136 initiates the collection module 138. The base module 136 initiates the health module 140. The base module 136 receives the health metrics from the health module 140. The base module 136 sends the health metrics to the notification module 142. The base module 136 initiates the notification module 142. The base module 136 ends at step 212. Further, embodiments may include a collection module 138 which begins by being initiated by the base module 136. The collection module 138 sends a request to the first sensor 128 for the sensor 128 data. The collection module 138 receives the sensor 128 data. The collection module 138 stores the sensor 128 data in the sensor database 144. The collection module 138 determines if there are more sensors 128 remaining. If it is determined that there are more sensors 128 remaining the collection module 138 sends a request to the next sensor 128 for the sensor 128 data and the process returns to receiving and then storing the sensor 128 data in the sensor database 144. If it is determined that there are no more sensors remaining the collection module 138 returns to the base module 136. Further, embodiments may include a health module 140 which begins by being initiated by the base module 136. The health module 140 compares the sensor database 144 to the health database 146. The health module 140 extracts the health metric. The health module 140 sends the health metric to the base module 136. The health module 140 returns to the base module 136. Further, embodiments may include a notification module 142 which begins by being initiated by the base module 136. The notification module 142 receives the health metric from the base module 136. The notification module 142 connects to the user device 152. The notification module 142 sends the health metric to the user device 152. The notification module 142 returns to the base module 136. Further, embodiments may include a sensor database 144 which contains sensor 128 data collected from the collection module 138 which is stored in data files once the user selects the wash cycle to begin the wash process. The database contains the sensor 128, such as the type of sensor 128 i.e., a biosensor, the location of the sensor 128, the detection purpose of the sensor 128, the data file of the sensor 128 data collected during the wash cycle. In some embodiments, there may be a plurality of sensors 128 located throughout the water bearing electrical device 102 to collect sensor 128 data at various points, such as the water supply line 110, the textiles located within the drum 108, the wastewater drained from the tub 106 after a wash cycle has been completed. In some embodiments, one sensor, such as a biosensor may be configured to have multiple detection purposes, such as a plurality of bacteria, viruses, etc. In some embodiments, the sensors 128 may be a plurality of sensors 128, such as chemical sensors, electrochemical piezoelectric sensors, functional DNA biosensors, TOC

sensors, etc. One or more of the sensors 128 may include temperature sensors, rotor position sensors, water level sensors, dirt sensors, photoelectric sensors, pressure sensors, vibration sensors, water flow sensors, proximity sensors, humidity sensors, any combination thereof, etc. In some embodiments, the sensor 128 data may be combined or further analyzed to further detect potential health effects on a user, health statuses of a user, potential health concerns of a user, etc. Further, embodiments may include health database 146 which contains threshold for potential health metrics that will be sent to the user if the threshold data is exceeded by the sensor 128 data collected and stored in the sensor database 144. The database is used in the process described in the health module 140 to determine if the sensor 128 data stored in the sensor database 144 has exceeded any of the thresholds stored in the database and requires the user to be notified of a health metric. The database contains the detecting sensor, such as biosensor 1, the health concern detected, the threshold data file the detected health concern, and the health metric that will be sent to the user if the threshold is exceeded. For example, if biosensor 1 located in the water supply line 110 has sensor 128 data collected and stored as a data file in the sensor database 144 is compared to the threshold data file in the health database 146 and exceeds the threshold then the water supply line 110 may have a water pollutant, such as E Coli, and the corresponding health metric would be extracted and sent to the user, such as a boil water notification. In some embodiments, the health metric may be a notification, instructions to avoid a health concern, such as a warning, a suggestion to receive medical attention, a warning that lists possible symptoms that may have already been experienced, etc. Further, embodiments may include a cloud 148 which may be a plurality of servers that are accessed over an Internet connection, and the software and databases may run on those servers. A cloud 148 may be a distributed network of computers comprising servers and databases. A cloud 148 may be a private cloud 148, where access is restricted by isolating the network such as preventing external access, or by using encryption to limit access to only authorized users. Alternatively, a cloud 148 may be a public cloud 148 where access is widely available via the internet. A public cloud 148 may not be secured or may be include limited security features. Further, embodiments may include users 1-N 150 which may be a plurality of users 150 of the water bearing electrical device 102 in a household or professional setting. The users 150 may individuals using the device to wash or clean materials, textiles, etc. and may have their user device 152 connected to the water bearing electrical device 102 to receive health metrics determined by the device. Further, embodiments may include a user device 152 such as a laptop, smartphone, tablet, computer, or smart speaker. Further, embodiments may include a communication network 154 may be a wired and/or a wireless network. The communication network 154, if wireless, may be

implemented using communication techniques such as Visible Light Communication (VLC), Worldwide Interoperability for Microwave Access (WiMAX), Long Term Evolution (LTE), Wireless Local Area Network (WLAN), Infrared (IR) communication, Public Switched Telephone Network (PSTN), Radio waves, and other communication techniques known in the art. The communication network 154 may allow ubiquitous access to shared pools of configurable system resources and higher-level services that can be rapidly provisioned with minimal management effort, often over Internet and relies on sharing of resources to achieve coherence and economies of scale, like a public utility, while third-party clouds enable organizations to focus on their core businesses instead of expending resources on computer infrastructure and maintenance. Further, embodiments may include a user interface(s) 156 may either accept inputs from users or provide outputs to the users or may perform both the actions. In one case, a user can interact with the user interface(s) 156 using one or more user-interactive objects and devices. The user-interactive objects and devices may comprise user input buttons, switches, knobs, levers, keys, trackballs, touchpads, cameras, microphones, motion sensors, heat sensors, inertial sensors, touch sensors, or a combination of the above. Further, the user interface(s) 156 may either be implemented as a Command Line Interface (CLI), a Graphical User Interface (GLTI), a voice interface, or a web-based user-interface.

[0006] Functioning of the base module 136 will now be explained with reference to FIG. 2. One skilled in the art will appreciate that, for this and other processes and methods disclosed herein, the functions performed in the processes and methods may be implemented in differing order. Furthermore, the outlined steps and operations are only provided as examples, and some of the steps and operations may be optional, combined into fewer steps and operations, or expanded into additional steps and operations without detracting from the essence of the disclosed embodiments.

[0007] This figure displays the base module 136. The process begins with the user 150 initiates, at step 200, the wash cycle. For example, the user may select the wash cycle to initiate the wash cycle which may activate the water supply, the solution is provided from the dosing chamber 116, the electrochemical cell 118 is activated, the solution is fed from the electrochemical cell 118 to the bleaching facility 104 to wash the textiles located in the drum 108. The base module 136 initiates, at step 202, the collection module 138. For example, the collection module 138 begins by being initiated by the base module 136. The collection module 138 sends a request to the first sensor 128 for the sensor 128 data. The collection module 138 receives the sensor 128 data. The collection module 138 stores the sensor 128 data in the sensor database 144. The collection module 138 determines if there are more sensors 128 remaining. If it is determined that there are more sensors 128 remaining the collection

module 138 sends a request to the next sensor 128 for the sensor 128 data and the process returns to receiving and then storing the sensor 128 data in the sensor database 144. If it is determined that there are no more sensors remaining the collection module 138 returns to the base module 136. The base module 136 initiates, at step 204, the health module 140. For example, the health module 140 begins by being initiated by the base module 136. The health module 140 compares the sensor database 144 to the health database 146. The health module 140 extracts the health metric. The health module 140 sends the health metric to the base module 136. The health module 140 returns to the base module 136. The base module 136 receives, at step 206, the health metrics from the health module 140. For example, the health metric, such as a notification, instructions to avoid a health concern, such as a warning, a suggestion to receive medical attention, a warning that lists possible symptoms that may have already been experienced, etc. is received by the base module 136. The base module 136 sends, at step 208, the health metrics to the notification module 142. For example, the base module 136 sends the health metric, such as a notification, instructions to avoid a health concern, such as a warning, a suggestion to receive medical attention, a warning that lists possible symptoms that may have already been experienced, etc. to the notification module 142. The base module 136 initiates, at step 210, the notification module 142. For example, the notification module 142 begins by being initiated by the base module 136. The notification module 142 receives the health metric from the base module 136. The notification module 142 connects to the user device 152. The notification module 142 sends the health metric to the user device 152. The notification module 142 returns to the base module 136. The base module 136 ends at step 212.

[0008] Functioning of the collection module 138 will now be explained with reference to FIG. 3. One skilled in the art will appreciate that, for this and other processes and methods disclosed herein, the functions performed in the processes and methods may be implemented in differing order. Furthermore, the outlined steps and operations are only provided as examples, and some of the steps and operations may be optional, combined into fewer steps and operations, or expanded into additional steps and operations without detracting from the essence of the disclosed embodiments.

[0009] This figure displays the collection module 138. The process begins with the collection module 138 being initiated, at step 300, by the base module 136. The collection module 138 sends, at step 302, a request to the first sensor 128 for the sensor 128 data. For example, the collection module 138 sends a request to a first sensor 128, such as a biosensor, for the sensor 128 data that has been collected during the wash cycle. In some embodiments, the sensor 128 data may be collected at various points of the wash cycle, such as once the textiles are loaded into the drum 108, once the water supply line

110 is activated, once the electrochemical cell 118 is activated, once the wash cycle is complete, when the tub 106 is drained with the wastewater, when the solution or detergent is introduced during the wash cycle, etc. In some embodiments, the sensors 128 may be located throughout the water bearing electrical device 102 to collect sensor 128 data throughout the entire wash process. The collection module 138 receives, at step 304, the sensor 128 data. For example, the collection module 138 may receive a data file containing the sensor 128 data collected by the sensor 128. In some embodiments, the collection module 138 may receive data about the sensor 128 such as the type of sensor, the location of the sensor, the purpose of the sensor, for example what the sensor 128 is used to detect for, etc. In some embodiments, the collection module 138 may receive the status of the sensor 128 such as if the sensor 128 requires maintenance, is malfunctioning, needs to be replaced, etc. The collection module 138 stores, at step 306, the sensor 128 data in the sensor database 144. For example, the collection module 138 stores the sensor 128 data in the sensor database 144, such as the type of sensor 128, the location of the sensor 128, the detection purpose of the sensor 128 and the data file containing the sensor 128 data that was collected. For example, the type of sensor 128 may be a pH sensor 128, the location of the pH sensor 128 may be in the drain of the tub 106, the purpose of the sensor 128 may be to detect the acidity or alkalinity of the water, etc. The collection module 138 determines, at step 308, if there are more sensors 128 remaining. For example, the collection module 138 may have a plurality of sensors 128 that have collected data throughout the wash process and may receive the data from each of the sensors 128. In some embodiments, the collection module 138 may use a database that contains a list of all the sensors 128 located in the water bearing electrical device 102 and connects to each sensor 128 to collect all of the available data. In some embodiments, the sensors 128 may be a plurality of sensors 128, such as chemical sensors, electrochemical piezoelectric sensors, functional DNA biosensors, TOC sensors, etc. One or more of the sensors 128 may include temperature sensors, rotor position sensors, water level sensors, dirt sensors, photoelectric sensors, pressure sensors, vibration sensors, water flow sensors, proximity sensors, humidity sensors, any combination thereof, etc. In some embodiments, the sensor 128 data may be combined or further analyzed to further detect potential health effects on a user, health statuses of a user, potential health concerns of a user, etc. If it is determined that there are more sensors 128 remaining the collection module 138 sends, at step 310, a request to the next sensor 128 for the sensor 128 data and the process returns to receiving and then storing the sensor 128 data in the sensor database 144. If it is determined that there are no more sensors remaining the collection module 138 returns, at step 312, to the base module 136.

[0010] Functioning of the health module 140 will now

be explained with reference to FIG. 4. One skilled in the art will appreciate that, for this and other processes and methods disclosed herein, the functions performed in the processes and methods may be implemented in differing order. Furthermore, the outlined steps and operations are only provided as examples, and some of the steps and operations may be optional, combined into fewer steps and operations, or expanded into additional steps and operations without detracting from the essence of the disclosed embodiments.

[0011] This figure displays the health module 140. The process begins with the health module 140 being initiated, at step 400, by the base module 136. The health module 140 compares, at step 402, the sensor database 144 to the health database 146. For example, the health module 140 compares the data files in the sensor database 144 with the threshold data files contained in the health database 146 to determine if the collected sensor 128 data exceeds the thresholds stored in the health database 146. For example, if biosensor 1 located in the water supply line 110 has sensor 128 data collected and stored as a data file in the sensor database 144 is compared to the threshold data file in the health database 146 and exceeds the threshold then the water supply line 110 may have a water pollutant, such as E Coli, and the corresponding health metric would be extracted and sent to the user, such as a boil water notification. The health module 140 extracts, at step 404, the health metric. For example, if the sensor 128 data exceeds the thresholds stored in the health database 146 the corresponding health metric extracted to be sent to notify the user. For example, if biosensor 1 located in the water supply line 110 has sensor 128 data collected and stored as a data file in the sensor database 144 is compared to the threshold data file in the health database 146 and exceeds the threshold then the water supply line 110 may have a water pollutant, such as E Coli, and the corresponding health metric would be extracted and sent to the user, such as a boil water notification. The health module 140 sends, at step 406, the health metric to the base module 136. For example, the health metric, such as a notification, instructions to avoid a health concern, such as a warning, a suggestion to receive medical attention, a warning that lists possible symptoms that may have already been experienced, etc. is sent to the base module 136. The health module 140 returns, at step 408, to the base module 136.

[0012] Functioning of the notification module 142 will now be explained with reference to FIG. 5. One skilled in the art will appreciate that, for this and other processes and methods disclosed herein, the functions performed in the processes and methods may be implemented in differing order. Furthermore, the outlined steps and operations are only provided as examples, and some of the steps and operations may be optional, combined into fewer steps and operations, or expanded into additional steps and operations without detracting from the essence of the disclosed embodiments.

[0013] This figure displays the notification module 142. The process begins with the notification module 142 being initiated, at step 500, by the base module 136. The notification module 142 receives, at step 502, the health metric from the base module 136. For example, the notification module 142 receives the health metric, such as a notification, instructions to avoid a health concern, such as a warning, a suggestion to receive medical attention, a warning that lists possible symptoms that may have already been experienced, etc. from the base module 136. The notification module 142 connects, at step 504, to the user device 152. For example, the notification module 142 may connect to a user's smartphone, smart device, laptop, etc. For example, the notification module 142 of the water bearing electrical device 102 may use an internet connection or a communications network 132 to notify the user 150 of the health metric. For example, the user 150 may receive a notification from the notification module 142, such as an SMS message, e-mail notification, etc. In some embodiments, the water bearing electrical device 102 may have an user interface in which the health metric is displayed after the wash cycle is completed. The notification module 142 sends, at step 506, the health metric to the user device 152. For example, the notification module 142 sends the health metric, such as a notification, instructions to avoid a health concern, such as a warning, a suggestion to receive medical attention, a warning that lists possible symptoms that may have already been experienced, etc. to a user's smartphone, smart device, laptop, etc. In some embodiments, the water bearing electrical device 102 may have a user interface in which the health metric is displayed after the wash cycle. The notification module 142 returns, at step 508, to the base module 136.

[0014] Functioning of the sensor database 144 will now be explained with reference to FIG. 6. One skilled in the art will appreciate that, for this and other processes and methods disclosed herein, the functions performed in the processes and methods may be implemented in differing order. Furthermore, the outlined steps and operations are only provided as examples, and some of the steps and operations may be optional, combined into fewer steps and operations, or expanded into additional steps and operations without detracting from the essence of the disclosed embodiments.

[0015] This figure displays the sensor database 144. The database contains the sensor 128 data collected from the collection module 138 which is stored in data files once the user selects the wash cycle to begin the wash process. The database contains the sensor 128, such as the type of sensor 128 i.e., a biosensor, the location of the sensor 128, the detection purpose of the sensor 128, the data file of the sensor 128 data collected during the wash cycle. In some embodiments, there may be a plurality of sensors 128 located throughout the water bearing electrical device 102 to collect sensor 128 data at various points, such as the water supply line 110, the textiles located within the drum 108, the wastewater drained from

the tub 106 after a wash cycle has been completed. In some embodiments, one sensor, such as a biosensor may be configured to have multiple detection purposes, such as a plurality of bacteria, viruses, etc. In some embodiments, the sensors 128 may be a plurality of sensors 128, such as chemical sensors, electrochemical piezoelectric sensors, functional DNA biosensors, TOC sensors, etc. One or more of the sensors 128 may include temperature sensors, rotor position sensors, water level sensors, dirt sensors, photoelectric sensors, pressure sensors, vibration sensors, water flow sensors, proximity sensors, humidity sensors, any combination thereof, etc. In some embodiments, the sensor 128 data may be combined or further analyzed to further detect potential health effects on a user, health statuses of a user, potential health concerns of a user, etc.

[0016] Functioning of the health database 146 will now be explained with reference to FIG. 7. One skilled in the art will appreciate that, for this and other processes and methods disclosed herein, the functions performed in the processes and methods may be implemented in differing order. Furthermore, the outlined steps and operations are only provided as examples, and some of the steps and operations may be optional, combined into fewer steps and operations, or expanded into additional steps and operations without detracting from the essence of the disclosed embodiments.

[0017] This figure displays the health database 146. The database contains threshold for potential health metrics that will be sent to the user if the threshold data is exceeded by the sensor 128 data collected and stored in the sensor database 144. The database is used in the process described in the health module 140 to determine if the sensor 128 data stored in the sensor database 144 has exceeded any of the thresholds stored in the database and requires the user to be notified of a health metric. The database contains the detecting sensor, such as biosensor 1, the health concern detected, the threshold data file the detected health concern, and the health metric that will be sent to the user if the threshold is exceeded. For example, if biosensor 1 located in the water supply line 110 has sensor 128 data collected and stored as a data file in the sensor database 144 is compared to the threshold data file in the health database 146 and exceeds the threshold then the water supply line 110 may have a water pollutant, such as E Coli, and the corresponding health metric would be extracted and sent to the user, such as a boil water notification. In some embodiments, the health metric may be a notification, instructions to avoid a health concern, such as a warning, a suggestion to receive medical attention, a warning that lists possible symptoms that may have already been experienced, etc. In some embodiments, the sensors 128 may be able to detect a plurality of pollutants, contaminants, bacteria, viruses, health information about the user, etc. In some embodiments, there may be a plurality of sensors 128 to gather specific data, such as pollutants, contaminants, bacteria, viruses, health information about

the user, etc. and each data file of sensor 128 data may be individually compared to the health database 146. In some embodiments, the sensors 128 may be constructed for one wash cycle allowing the user to either replenish the sensor 128 after a wash cycle by inserting a new sensor 128 in a compartment located in the area of the water bearing electrical device 102, such as the water supply line 110, the drum 108, the tub 106, the electrochemical cell 118, the heating system 120, the power supply 126, gas pump 114, valves 112, or any of the lines within the device that is used to move the water, wastewater, solutions, or detergents. In some embodiments, the sensors 128 may be constructed for multiple wash cycles and provide the user with a notification when the sensor 128 needs to be changed, requires maintenance, or is malfunctioning. In some embodiments, a biosensor may be an analytical device, used for the detection of a chemical substance, that combines a biological component with a physicochemical detector. The sensitive biological element, for example tissue, microorganisms, organelles, cell receptors, enzymes, antibodies, nucleic acids, etc., is a biologically derived material or biomimetic component that interacts with, binds with, or recognizes the analyte under study. The biologically sensitive elements can also be created by biological engineering. The transducer or the detector element, which transforms one signal into another one, works in a physicochemical way, such as optical, piezoelectric, electrochemical, electrochemiluminescence etc., resulting from the interaction of the analyte with the biological element, to easily measure and quantify. The biosensor reader device connects with the associated electronics or signal processors that are primarily responsible for the display of the results in a user-friendly way. In some embodiments, biosensors may be used to detect bacteria, such as E. Coli, salmonella, a plurality of soil pollutants, such as pesticides, toxic substances, chemicals, etc.

[0018] The functions performed in the processes and methods may be implemented in differing order. Furthermore, the outlined steps and operations are only provided as examples, and some of the steps and operations may be optional, combined into fewer steps and operations, or expanded into additional steps and operations without detracting from the essence of the disclosed embodiments.

Claims

1. A method of tracking user health via a water-bearing appliance, comprising:
 - collecting data from a plurality of sensors, and
 - comparing the sensor data to a health database, and
 - extracting at least one health metric, and
 - notifying a user of the health metric.

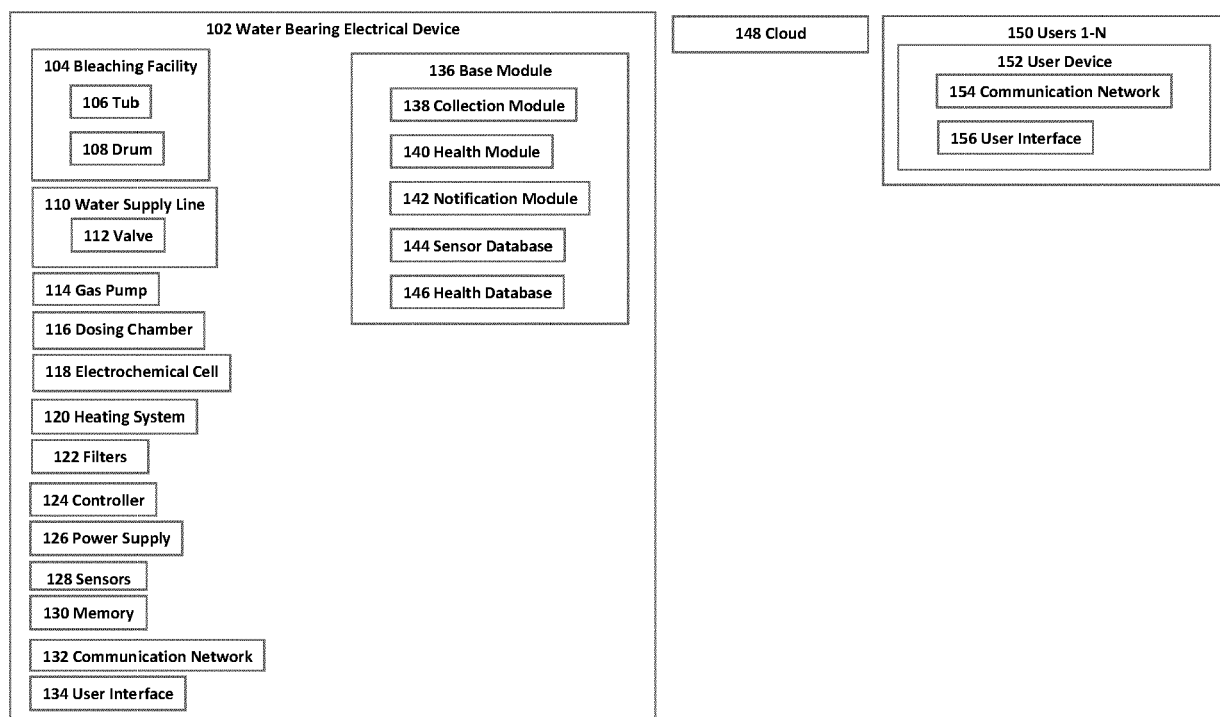


Fig.1 Method Tracking User Health Via Laundry

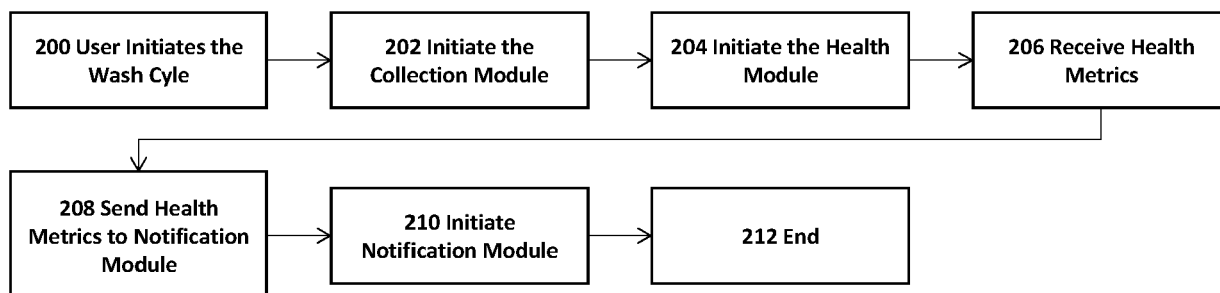


Fig.2 Base Module

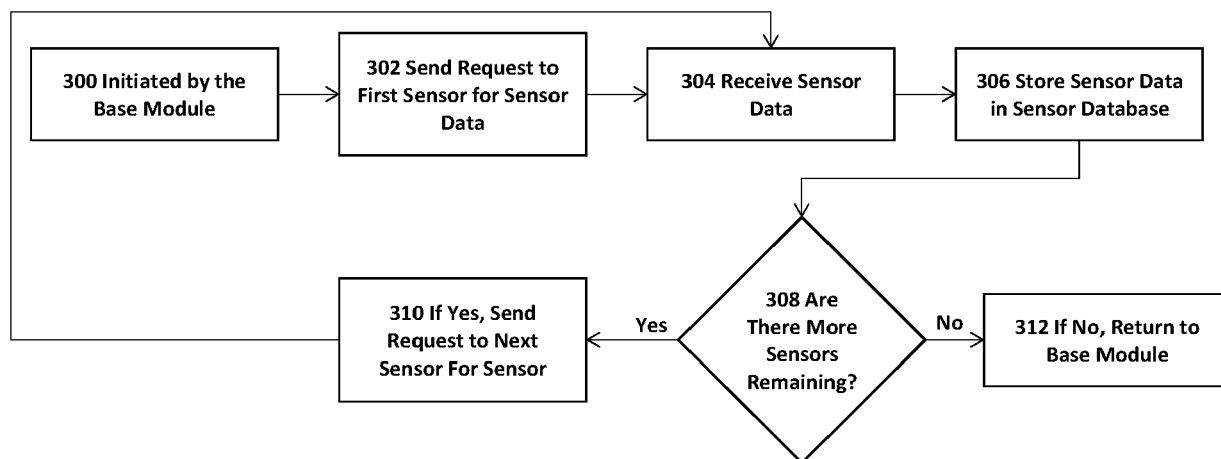


Fig.3 Collection Module

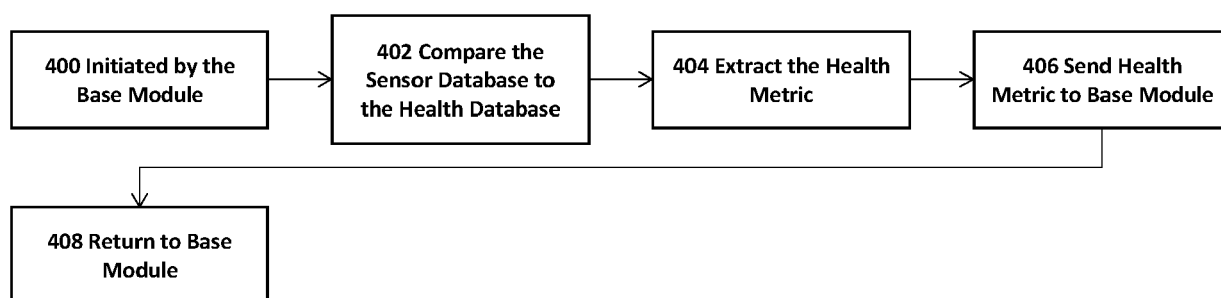


Fig.4 Health Module

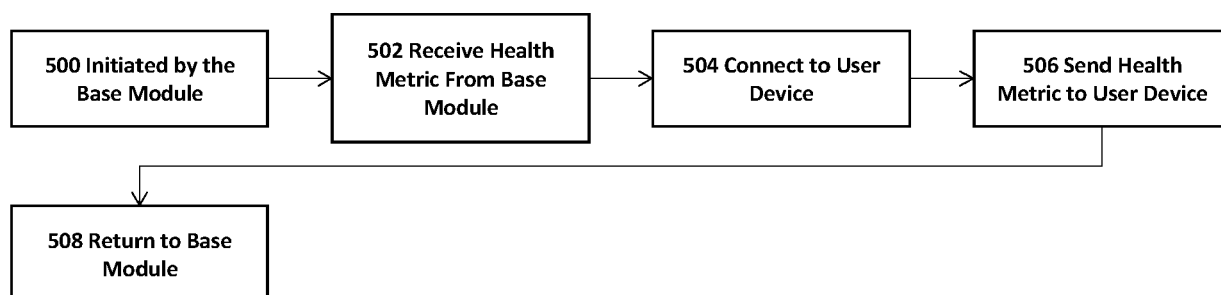


Fig.5 Notification Module

Sensor	Location	Detection Purpose	Data File
Biosensor 1	Water Supply Line	Water Pollutants	WaterPoll.Data
Biosensor 2	Drum	Sweat	Sweat.data
Biosensor 3	Waste Water Line	Bacteria	Bacteria.data
-	-	-	-
-	-	-	-
-	-	-	-

Fig.6 Sensor Database

Detecting Sensor	Detected	Threshold Data File	Health Metric
Biosensor 1	Water Pollutant - E Coli	Ecoli.Data	Boil Water Notification
Biosensor 2	High Chloride/Sodium Ratio	CF.Data	Warning - Potential Cystic Fibrosis
Biosensor 3	Bacteria - Salmonella	Sal.Data	Warning - Salmonella
-	-	-	-
-	-	-	-
-	-	-	-

Fig.7 Health Database



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 7506

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 June 2024	Examiner Werner, Christopher
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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