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(54) **SYSTEM AND METHOD FOR TRACKING LIQUID CONSUMPTION**

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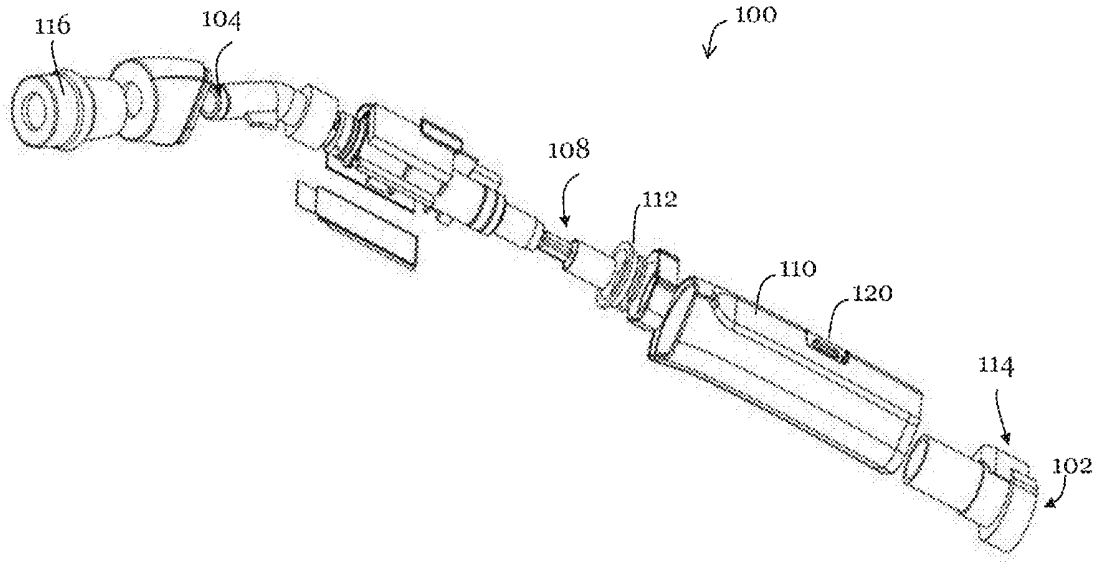
(57) **ABSTRACT**

A method for tracking liquid consumption includes determining, using a portable apparatus for monitoring liquid consumption, data indicative of an amount of liquid consumed by a user from a liquid container. The method also includes transmitting the determined data to an activity tracking device operably connected with the portable apparatus, for determination of: an amount of liquid remaining in the liquid container; and a liquid consumption plan based on the amount of liquid remaining, activity data, and user activity data arranged in the activity tracking device.



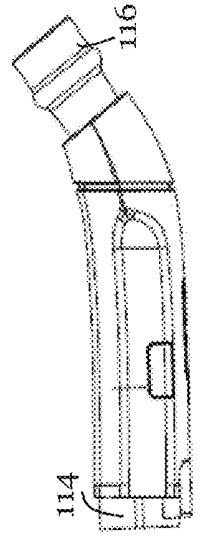


Figure 1C

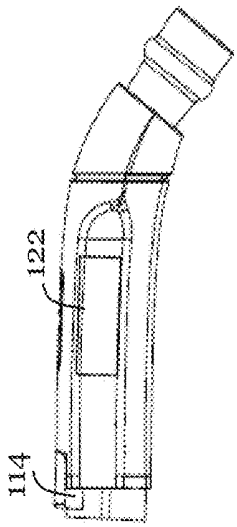


Figure 1D

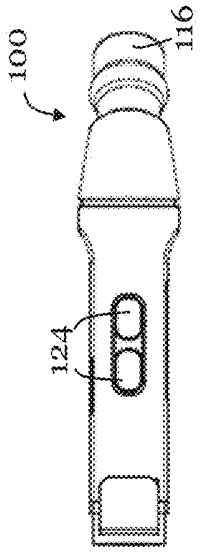


Figure 1A

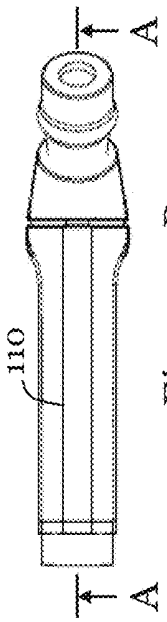


Figure 1B

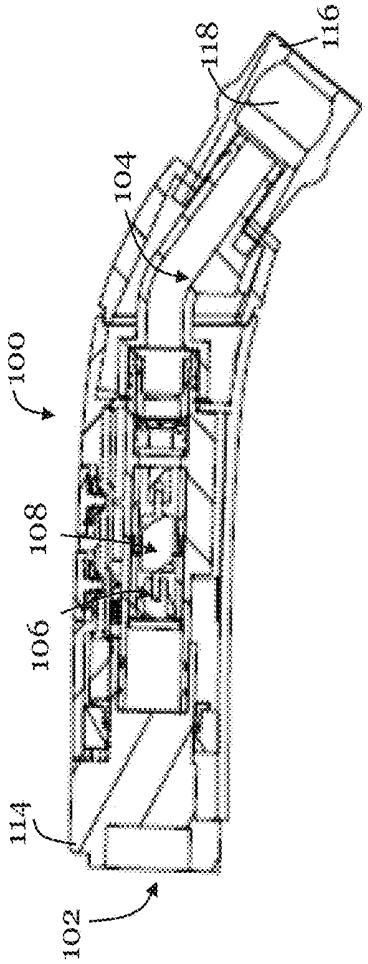


Figure 1E

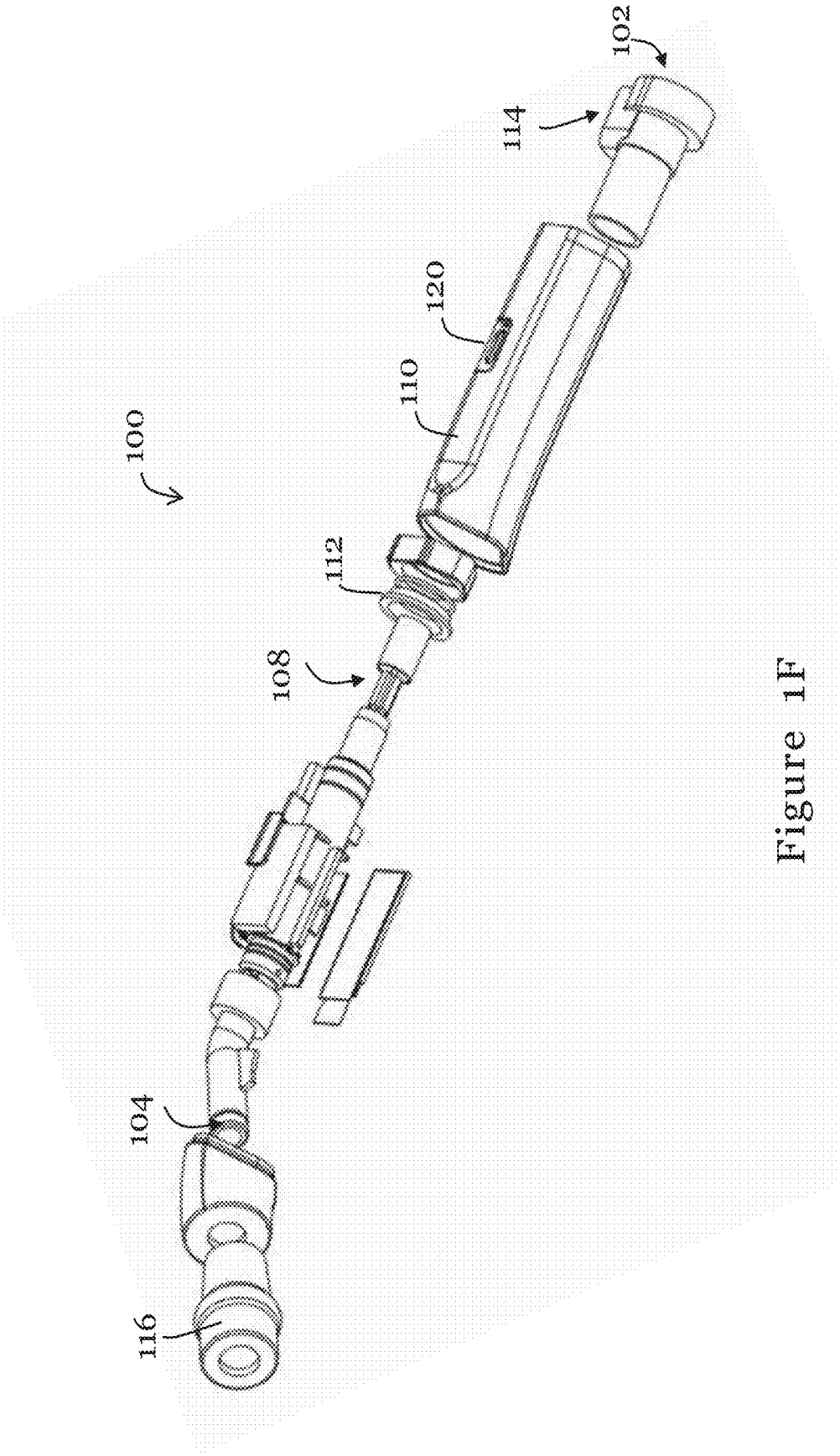


Figure 1F

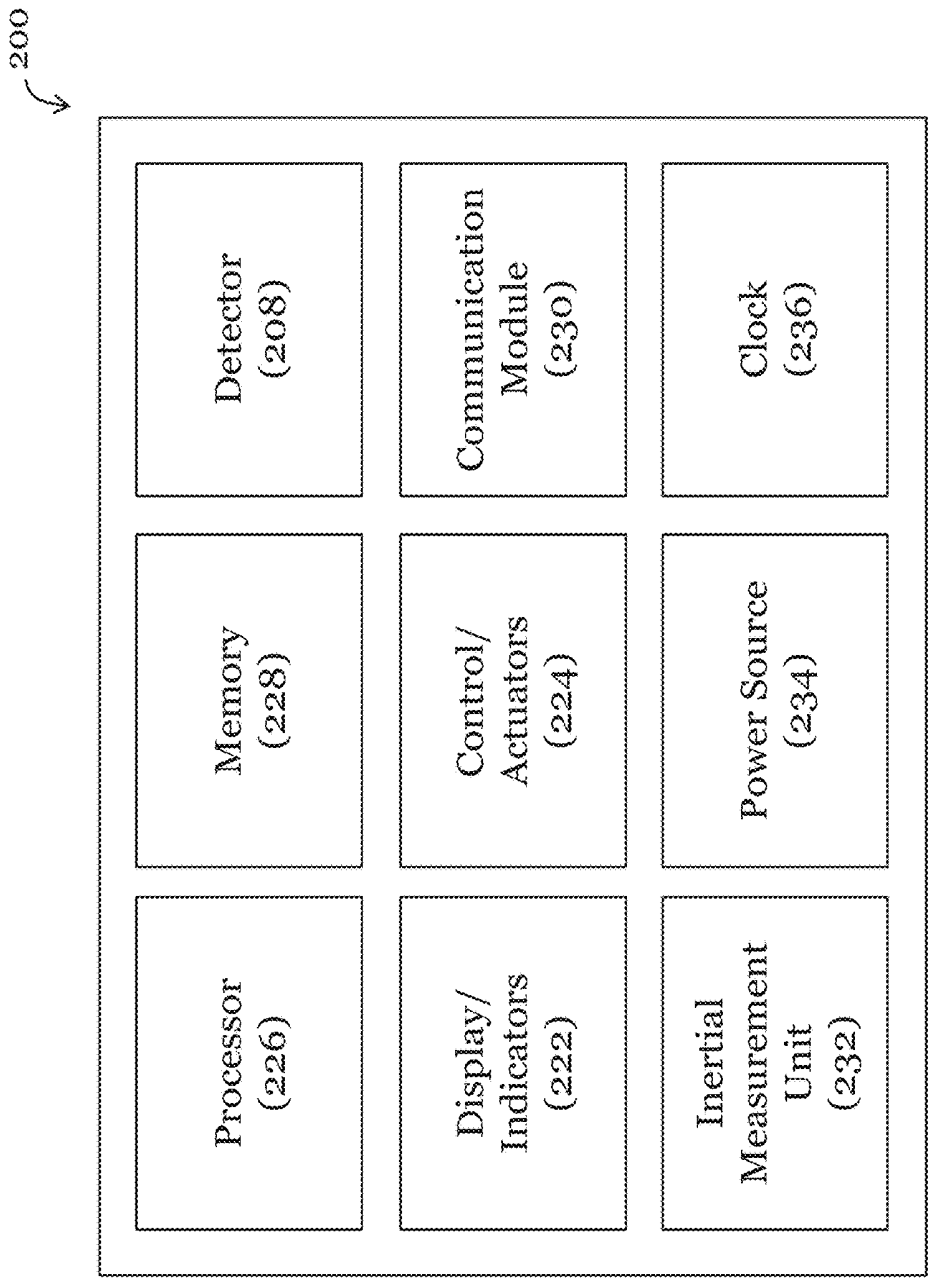

200
Processor (226)
Memory (228)
Detector (208)
Display/ Indicators (222)
Control/ Actuators (224)
Communication Module (230)
Inertial Measurement Unit (232)
Power Source (234)
Clock (236)

Figure 2

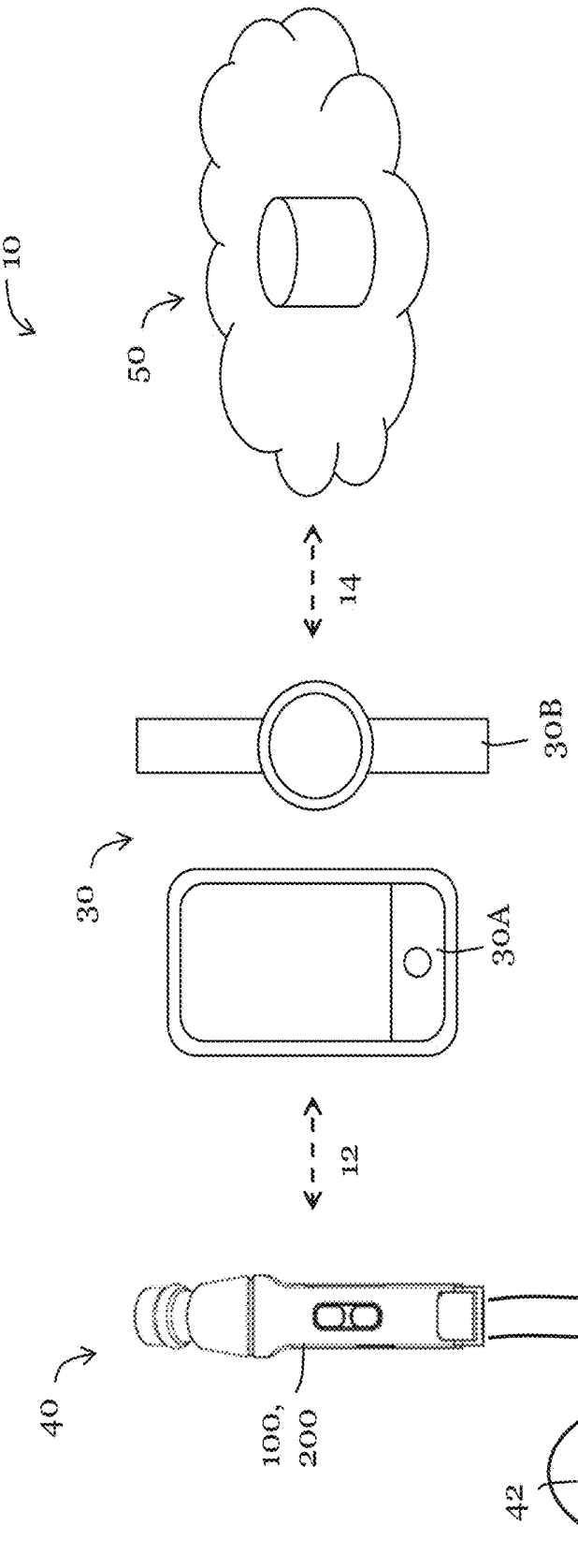


Figure 3

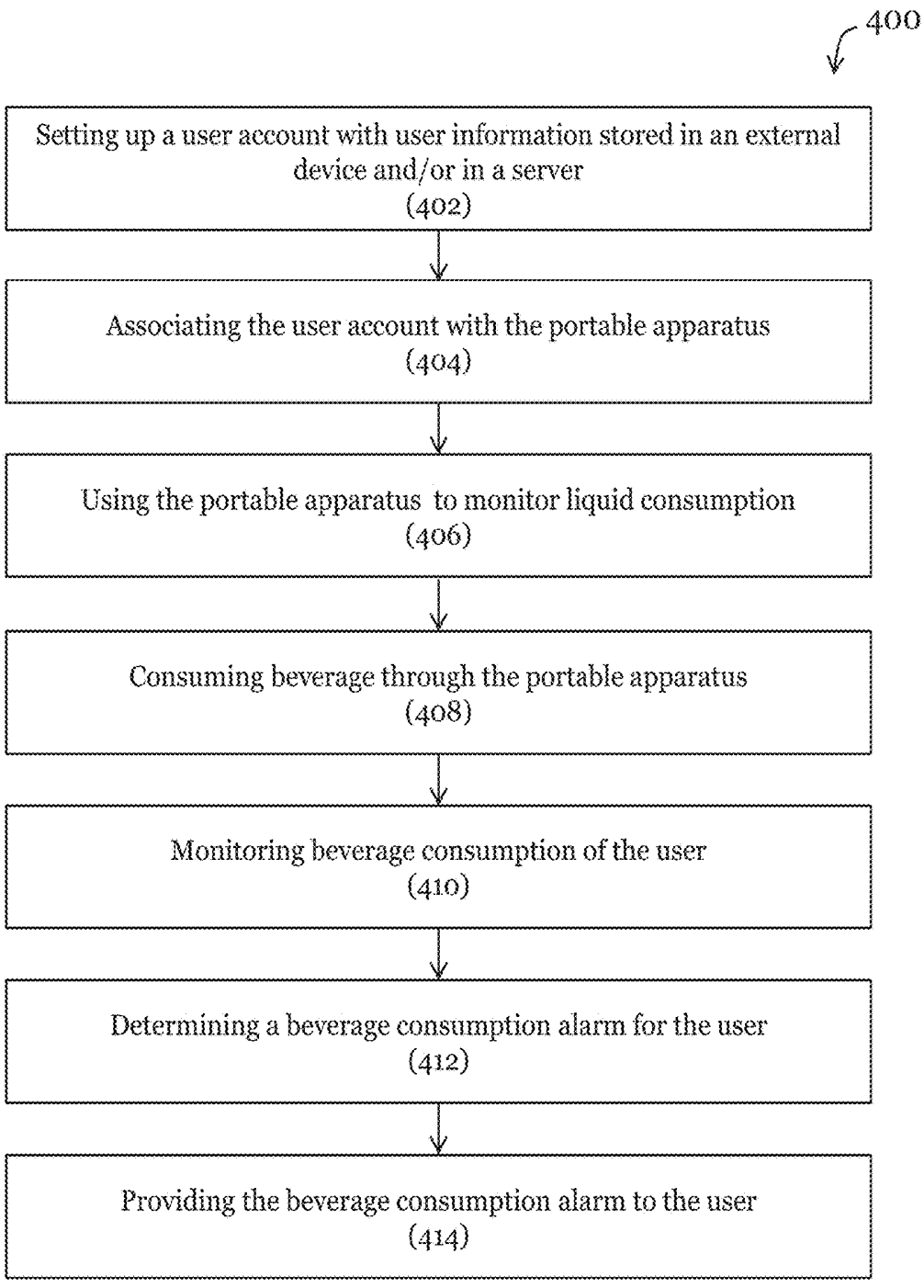
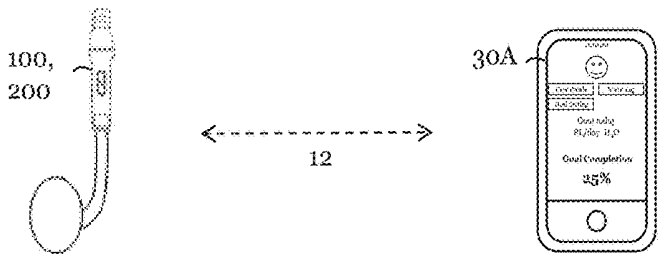

400
Setting up a user account with user information stored in an external device and/or in a server
(402)
Associating the user account with the portable apparatus
(404)
Using the portable apparatus to monitor liquid consumption
(406)
Consuming beverage through the portable apparatus
(408)
Monitoring beverage consumption of the user
(410)
Determining a beverage consumption alarm for the user
(412)
Providing the beverage consumption alarm to the user
(414)

Figure 4


100,
200
12
30A
25%

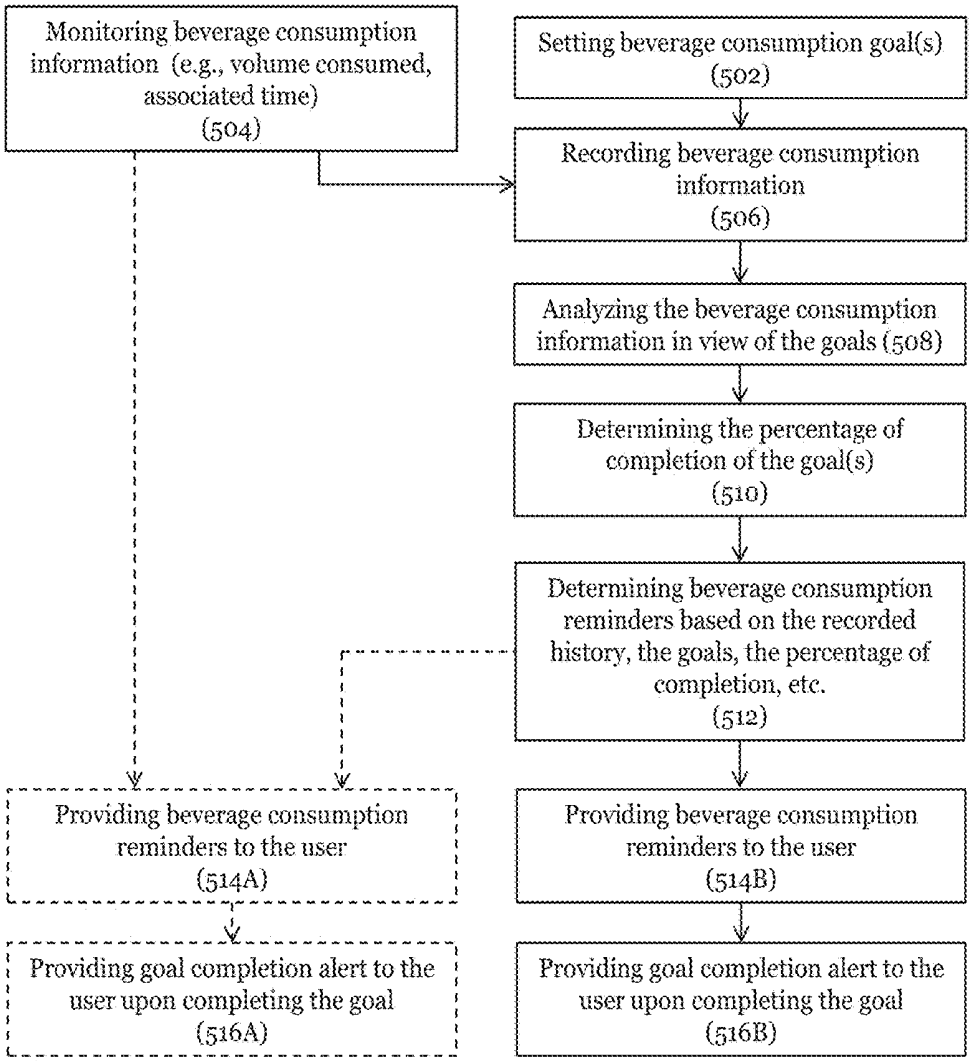

Monitoring beverage consumption information (e.g., volume consumed, associated time) (504)
Setting beverage consumption goal(s) (502)
Recording beverage consumption information (506)
Analyzing the beverage consumption information in view of the goals (508)
Determining the percentage of completion of the goal(s) (510)
Determining beverage consumption reminders based on the recorded history, the goals, the percentage of completion, etc. (512)
Providing beverage consumption reminders to the user (514A)
Providing goal completion alert to the user upon completing the goal (516A)
Providing beverage consumption reminders to the user (514B)
Providing goal completion alert to the user upon completing the goal (516B)

Figure 5

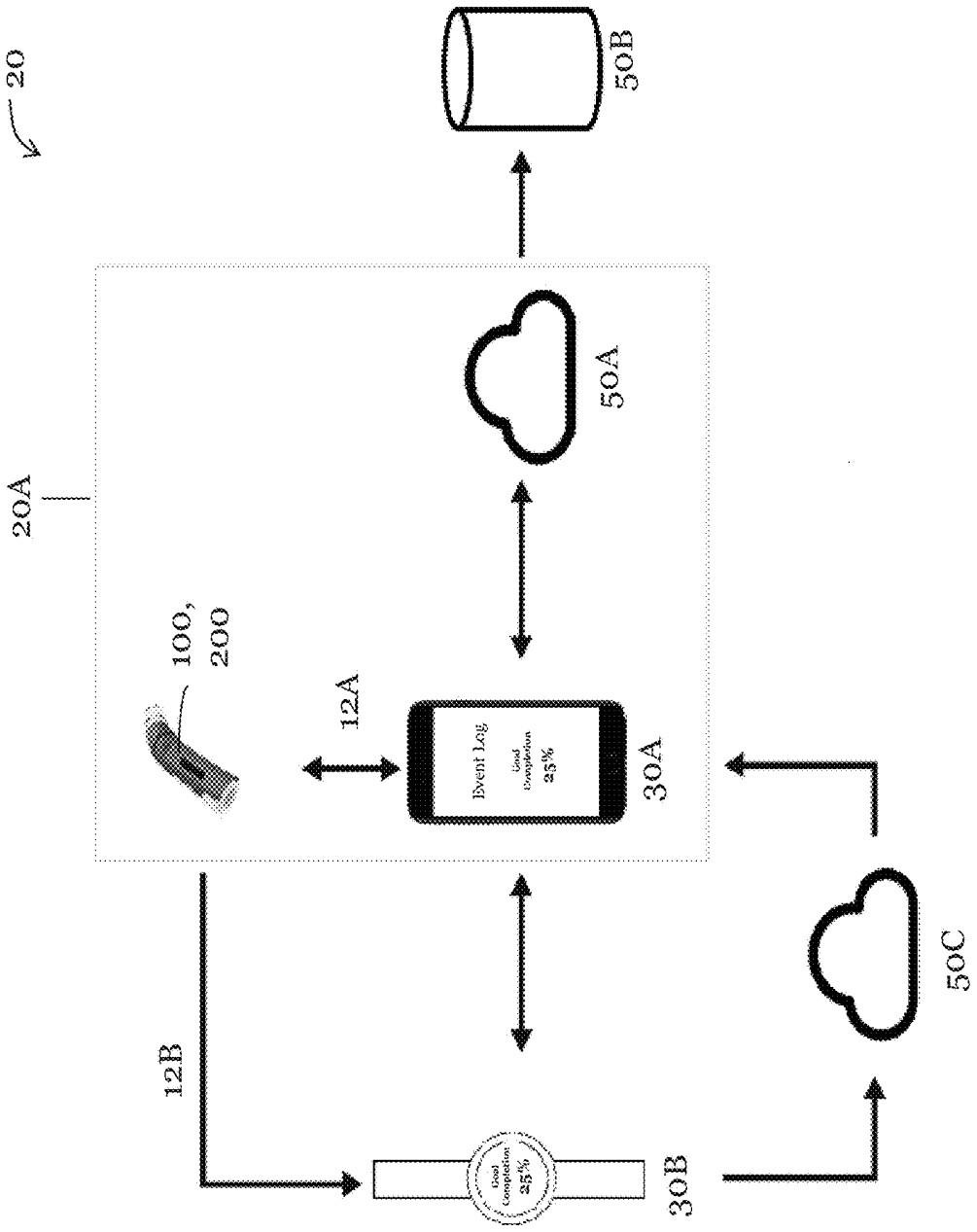

20
50B
20A
50A
100,
200
12A
Event Log
Goal Completion
25%
30A
12B
50C
Goal Completion
25%
30B

Figure 6

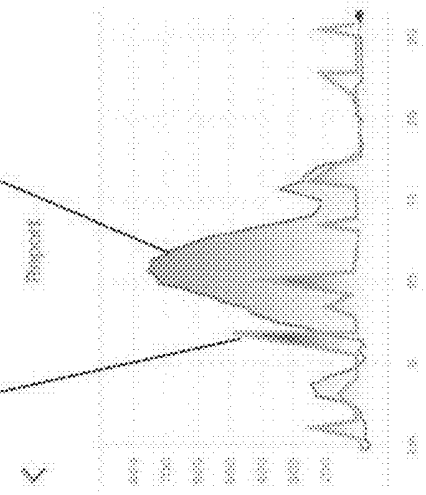


Figure 7C

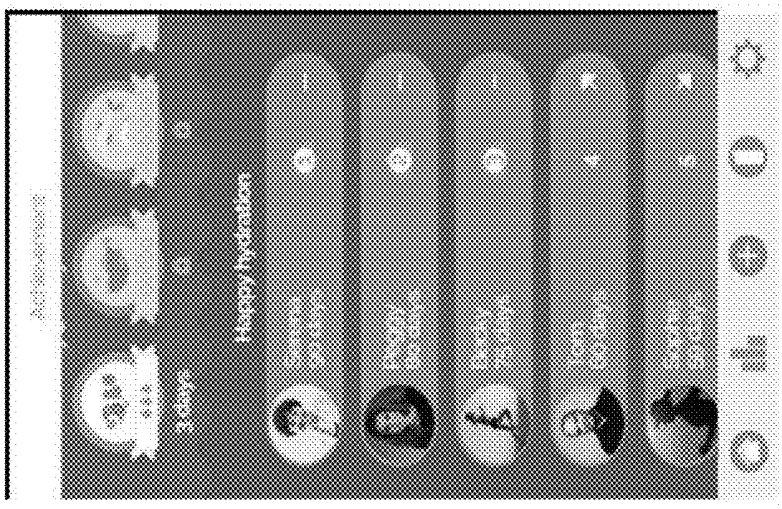


Figure 7B

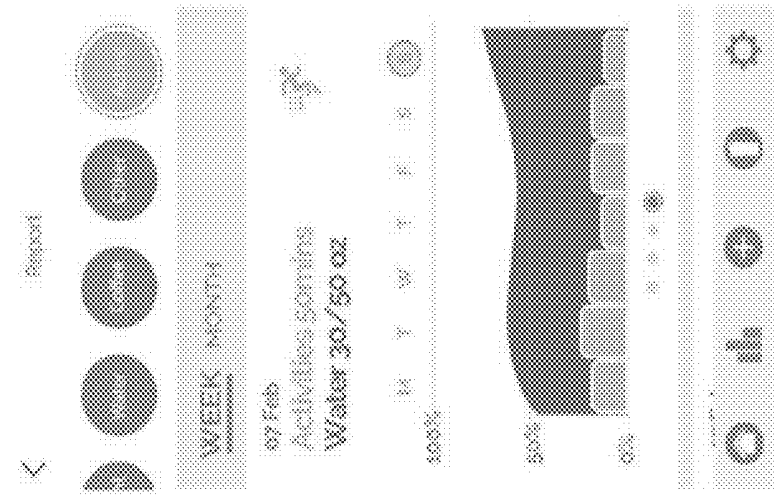


Figure 7A

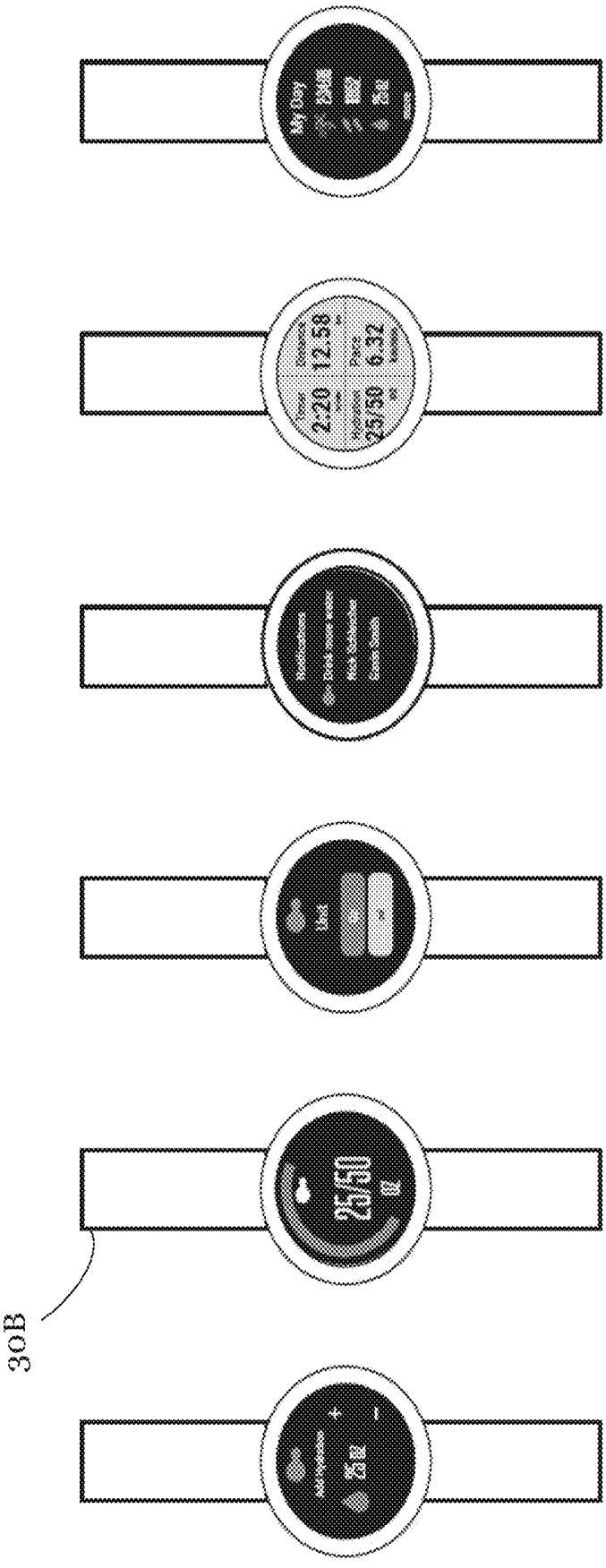


Figure 8A Figure 8B Figure 8C Figure 8D Figure 8E Figure 8F

SYSTEM AND METHOD FOR TRACKING LIQUID CONSUMPTION

TECHNICAL FIELD

[0001] The invention relates to a system and method for tracking liquid consumption. The invention also relates to a portable apparatus for monitoring liquid consumption, and in particular, a flow meter operable to communicate with an external electric device for monitoring beverage consumption.

BACKGROUND

[0002] Water plays an important physiological role in the survival of human beings as a large portion of the human body, in terms of weight or volume, is made up of water. In order for the body to properly grow, develop, and function, proper fluid (liquid) balance in the body is essential. Depending on age, gender, weight, height, and other body conditions, the body water requirement may vary for different people.

[0003] The human body has the intrinsic ability to regulate water content in different tissues and organs of different body parts, and it can produce a thirst sensation to remind one of the need to consume liquid to stay properly hydrated when the water content of the body falls below a threshold as detected by the brain. Problematically, however, in the nowadays rapidly paced society, people are busy with a lot of different tasks and work, and they often neglect the signals generated by their body.

[0004] Conventional ways of keeping track of one's fluid consumption behaviour is by pen and paper. Whenever a fluid consumption event occurs, a note is written on the paper detailing the amount of fluid consumed. More recently, applications have been developed to allow users to record their fluid consumption events, digitally on portable electronic devices. These applications also allow users to review consumption history.

[0005] These known ways of keeping track of one's fluid consumption behaviour is inefficient and unreliable. In one example, the user may forget to record (write down or input in application) a fluid consumption event. In some examples, even if the user remembers to record, he/she may not know accurately how much liquid is consumed, for example due to the lack of marker on the beverage container to indicate the amount of liquid consumed. In another example, when one is involved in intense exercise such as hiking and cycling in outdoor settings, the fluid consumption event(s) cannot be properly recorded.

SUMMARY OF THE INVENTION

[0006] In accordance with a first aspect of the invention, there is provided a method for tracking liquid consumption, comprising: determining, using a portable apparatus for monitoring liquid consumption, data indicative of an amount of liquid consumed by a user from a liquid container; and transmitting the determined data to an activity tracking device operably connected with the portable apparatus, for determination of at least one of: an amount of liquid remaining in the liquid container; and a liquid consumption plan based on the amount of liquid remaining in the liquid container, activity data, and user activity data arranged in the activity tracking device.

[0007] In one embodiment of the first aspect, the activity data comprises at least one of: a type of activity being performed or to be performed by the user; a predetermined duration of the activity being performed or to be performed by the user; a completion state of the activity; geographic data of the environment in which the activity is being or is to be performed; and weather condition of an environment in which the activity is being or is to be performed.

[0008] In one embodiment of the first aspect, the weather condition comprises at least one of: humidity level of the environment; temperature level of the environment; and UV index of the environment.

[0009] In one embodiment of the first aspect, the geographic data includes at least one of: latitude, longitude and altitude of the environment.

[0010] In one embodiment of the first aspect, the liquid consumption plan is determined further based on a liquid consumption record of the user during the activity.

[0011] In one embodiment of the first aspect, the user activity data comprises physiological data of the user during the activity.

[0012] In one embodiment of the first aspect, the physiological data includes at least one of: heart rate, pulse rate, and blood oxygen level of the user.

[0013] In one embodiment of the first aspect, determination of a liquid consumption plan comprises updating an existing liquid consumption plan.

[0014] In one embodiment of the first aspect, the liquid consumption plan is determined further based on a liquid consumption goal set by the user.

[0015] In one embodiment of the first aspect, the method also includes storing, at the activity tracking device, data of an initial amount of liquid in the liquid container.

[0016] In one embodiment of the first aspect, the liquid consumption plan comprises at least one liquid consumption reminder to be provided to the user at a specific time.

[0017] In one embodiment of the first aspect, the liquid consumption reminder comprises an amount of liquid to be consumed.

[0018] In one embodiment of the first aspect, the method also includes determining, at the activity tracking device, at least one of: an amount of liquid remaining in the liquid container; and a liquid consumption plan based on an amount of liquid remaining in the liquid container, activity data, and user activity data arranged in the activity tracking device.

[0019] In one embodiment of the first aspect, the portable apparatus is arranged to communicate directly and wirelessly with the activity tracking device.

[0020] In one embodiment of the first aspect, the method further comprises transmitting the determined data to an electronic device operably connected with the portable apparatus for record or analysis.

[0021] In one embodiment of the first aspect, the electronic device is arranged to receive, from the activity tracking device, at least one of: liquid consumption plan, liquid consumption record, activity data, and user activity data.

[0022] In one embodiment of the first aspect, the electronic device is arranged to analyze data received from the activity tracking device and from the portable apparatus.

[0023] In one embodiment of the first aspect, the electronic device is arranged to use the analysed data for determination of future liquid consumption plan.

[0024] In one embodiment of the first aspect, the electronic device comprises a mobile phone, a tablet, or a computer.

[0025] In one embodiment of the first aspect, the portable apparatus comprises: an inlet arranged to receive liquid; an outlet arranged to output the received liquid; a channel enabling fluid communication between the inlet and the outlet; a detector arranged to detect m one or more flow properties of liquid passing in the channel for determination of an amount of liquid consumed by a user from a liquid container; and a communication module operably connected with the detector for communicating data indicative of the amount of liquid consumed to an external electronic device.

[0026] In accordance with a second aspect of the invention, there is provided a system for tracking liquid consumption, comprising: a portable apparatus for monitoring liquid consumption, arranged to determine an amount of liquid consumed by a user from a liquid container; transmit the determined data to an activity tracking device operably connected with the portable apparatus, for determination of: an amount of liquid remaining in the liquid container; and a liquid consumption plan based on the amount of liquid remaining, activity data, and user activity data arranged in the activity tracking device.

[0027] In one embodiment of the second aspect, the activity data comprises at least one of: a type of activity being performed or to be performed by the user; a predetermined duration of the activity being performed or to be performed by the user; a completion state of the activity; geographic data of the environment in which the activity is being or is to be performed; and weather condition of an environment in which the activity is being or is to be performed.

[0028] In one embodiment of the second aspect, the weather condition comprises at least one of: humidity level of the environment; temperature level of the environment; and UV index of the environment.

[0029] In one embodiment of the second aspect, the geographic data includes at least one of: latitude, longitude and altitude of the environment.

[0030] In one embodiment of the second aspect, the liquid consumption plan is determined further based on a liquid consumption record of the user during the activity.

[0031] In one embodiment of the second aspect, the user activity data comprises physiological data of the user during the activity.

[0032] In one embodiment of the second aspect, the physiological data includes at least one of: heart rate, pulse rate, and blood oxygen level of the user.

[0033] In one embodiment of the second aspect, determination of a liquid consumption plan comprises updating an existing liquid consumption plan.

[0034] In one embodiment of the second aspect, the liquid consumption plan is determined further based on a liquid consumption goal set by the user.

[0035] In one embodiment of the second aspect, the activity tracking device is arranged to store data of an initial amount of liquid in the liquid container.

[0036] In one embodiment of the second aspect, the liquid consumption plan comprises at least one liquid consumption reminder to be provided to the user at a specific time.

[0037] In one embodiment of the second aspect, the liquid consumption reminder comprises an amount of liquid to be consumed.

[0038] In one embodiment of the second aspect, the system also includes the activity tracking device arranged to determine: an amount of liquid remaining in the liquid container; and a liquid consumption plan based on the amount of liquid remaining, activity data, and user activity data arranged in the activity tracking device.

[0039] In one embodiment of the second aspect, the portable apparatus for monitoring liquid consumption is arranged to communicate directly and wirelessly with the activity tracking device.

[0040] In one embodiment of the second aspect, the portable apparatus is arranged to transmit the determined data to an electronic device operably connected with the portable apparatus.

[0041] In one embodiment of the second aspect, the system further includes the electronic device, wherein the electronic device is arranged to receive, from the activity tracking device, at least one of: liquid consumption plan, liquid consumption record, activity data, and user activity data.

[0042] In one embodiment of the second aspect, the electronic device is arranged to analyze data received from the activity tracking device and from the portable apparatus.

[0043] In one embodiment of the second aspect, the electronic device is arranged to use the analysed data for determination of future liquid consumption plan.

[0044] In one embodiment of the second aspect, the electronic device comprises a mobile phone, a tablet, or a computer.

[0045] In one embodiment of the second aspect, the portable apparatus comprises: an inlet arranged to receive liquid; an outlet arranged to output the received liquid; a channel enabling fluid communication between the inlet and the outlet; a detector arranged to detect one or more flow properties of liquid passing in the channel for determination of an amount of liquid consumed by a user from a liquid container; and a communication module operably connected with the detector for communicating data indicative of the amount of liquid consumed to an external electronic device.

[0046] In accordance with a third aspect of the invention, there is provided a portable apparatus for monitoring liquid consumption, comprising an inlet arranged to receive liquid, an outlet arranged to output the received liquid, a channel enabling fluid communication between the inlet and the outlet, a detector arranged to detect one or more flow properties of liquid passing in the channel, and a communication module operably connected with the detector for communicating the one or more detected flow properties to an external electronic device for monitoring liquid consumption. The liquid is preferably a beverage, e.g., water. The portable apparatus in this aspect may be used as the portable apparatus of the first aspect.

[0047] In one embodiment of the third aspect, the portable apparatus further comprises a quick release coupler arranged at the inlet for connection and disconnection with a liquid source. The liquid source may comprise a container and a tube for connection with the inlet.

[0048] In one embodiment of the third aspect, the quick release coupler comprises an actuator arranged to be actuated by a user for ready-connection and disconnection of the liquid source.

[0049] In one embodiment of the third aspect, the detector comprises a flow meter arranged to detect a flow rate or flow volume of liquid in the channel. Preferably, the flow meter is suction-activated.

[0050] In one embodiment of the third aspect, the portable apparatus further comprises a valve arranged to prevent backflow of liquid in the channel. The valve may be arranged downstream or upstream of the flow meter. In some embodiments, multiples valves may be used, arranged both downstream and upstream of the flow meter.

[0051] In one embodiment of the third aspect, the flow meter comprises an axial flow turbine arranged in the channel and a sensor arranged to monitor movement of the axial flow turbine. Preferably, the movement is rotation. The flow meter may determine the flow rate or flow volume based on the detected movement of the turbine.

[0052] In one embodiment of the third aspect, the axial flow turbine comprises a plurality of vanes, at least one of the vanes includes a magnetic member, and the sensor comprises a magnetic sensor for detecting movement of the magnetic member. Preferably, the magnetic sensor is arranged to detect rotation of the magnetic member as the turbine rotates. The magnetic sensor may be a Hall sensor.

[0053] In one embodiment of the third aspect, the portable apparatus further comprises a power source arranged to power electrical components of the portable apparatus. These electrical components may include the detector and the communication module. These electrical components may further include one or more of: a processor, a memory/storage, a clock, a display, etc.

[0054] In one embodiment of the third aspect, the power source is rechargeable.

[0055] In one embodiment of the third aspect, the portable apparatus further comprises a charging port arranged for charging a rechargeable power source in the portable apparatus.

[0056] In one embodiment of the third aspect, the communication module comprises a wireless communication module. Preferably, the wireless communication module comprises one or more of: a Bluetooth communication module arranged to communicate with an external electronic device using a Bluetooth communication link; and an ANT+ communication module arranged to communicate with an external electronic device using an ANT+ communication link. In other embodiments, the wireless communication module may alternatively or additionally comprises one or more communication modules that utilize LTE, Wi-Fi, NFC, ZigBee, etc. communication links.

[0057] In one embodiment of the third aspect, the portable apparatus further comprises a clock for determining a time stamp associated with the one or more detected flow properties. Preferably, the communication module is further arranged to communicate the time stamp associated with the one or more detected flow properties to an external electronic device.

[0058] In one embodiment of the first aspect, the portable apparatus further comprises a mouthpiece arranged at the outlet. The mouthpiece is preferably elastic and may comprise a bite valve.

[0059] In one embodiment of the first aspect, the mouthpiece is detachably connected at the outlet.

[0060] In one embodiment of the third aspect, the portable apparatus further comprises a processor arranged to process the one or more detected flow properties. The processor may be operable to execute program instructions that allow the portable apparatus to interact with the user. For example, the processor may include program instructions for operating the portable apparatus in different modes, or for selectively activating and deactivating different functional modules based on user input.

[0061] In one embodiment of the third aspect, the portable apparatus further comprises input means for enabling a user to provide input to the processor. The input means may be actuators, buttons, dials, touch sensitive display, etc.

[0062] In one embodiment of the third aspect, the portable apparatus further comprises a storage operably connected with the processor and arranged to store the one or more detected flow properties. The storage may comprise one or both of volatile and non-volatile memory.

[0063] In one embodiment of the third aspect, the portable apparatus further comprises a display operably connected with the processor and arranged to display information related to the one or more flow properties or to liquid consumption. The display may also display the time stamp associated with the one or more flow properties.

[0064] In one embodiment of the third aspect, the portable apparatus further comprises an inertial measurement unit operably connected with the processor and arranged to detect an orientation of the portable apparatus; and the processor is arranged to control an orientation of information provided on the display based on a detected orientation of the apparatus.

[0065] In one embodiment of the third aspect, the information related to liquid consumption includes one or more of: an aggregate amount of liquid consumed; an amount of liquid consumed in a previous liquid consumption event; and a percentage representing a ratio of liquid consumed to a targeted liquid consumption.

[0066] In accordance with a fourth aspect of the invention, there is provided a system for monitoring liquid consumption, comprising: a portable apparatus; and an external electronic device arranged to receive the one or more detected flow properties from the portable apparatus; wherein the external electronic device is arranged to determine, based on the one or more detected flow properties, an amount of liquid consumed, an aggregate amount of liquid consumed and provide an alarm to a user when the determined aggregate amount of liquid consumed is less than an expected quantity of liquid consumption.

[0067] In a preferred embodiment of the fourth aspect, the portable apparatus is the portable apparatus of the third aspect.

[0068] In one embodiment of the fourth aspect, the alarm may be in the form of one or more of: a visual alarm, an audible alarm, and a tactile alarm.

[0069] In one embodiment of the fourth aspect, the external electronic device comprises any of a mobile phone, a computer, a smart watch, and a portable health tracker device.

[0070] In accordance with a fifth aspect of the invention, there is provided a portable hydration kit comprises a portable liquid source; and a portable apparatus for monitoring liquid consumption, arranged for connection with the portable liquid source.

[0071] In a preferred embodiment of the fifth aspect, the portable apparatus is the portable apparatus of the third aspect.

[0072] In one embodiment of the fifth aspect, the portable liquid source includes a hydration bladder and a connection tube.

[0073] In accordance with a sixth aspect of the invention, there is provided a method for monitoring liquid consumption. The method comprises detecting, using a portable apparatus for monitoring liquid consumption, one or more flow properties of liquid passing in the channel of the portable apparatus; and communicating the one or more detected flow properties to an external electronic device for monitoring liquid consumption.

[0074] In a preferred embodiment of the sixth aspect, the portable apparatus is the portable apparatus of the third aspect.

[0075] In one embodiment of the sixth aspect, the method further comprises the steps of: determining, at the external electronic device, an amount of liquid consumed based on the one or more detected flow properties; determining an aggregate amount of liquid consumed; and providing an alarm to a user when the determined aggregate amount of liquid consumed is less than an expected quantity of liquid consumption.

[0076] In one embodiment of the sixth aspect, the alarm may be in the form of one or more of: a visual alarm, an audible alarm, and a tactile alarm.

[0077] In accordance with a seventh aspect of the invention, there is provided a method for tracking liquid consumption, comprising: receiving, from a portable apparatus for monitoring liquid consumption from a liquid container, data indicative of an amount of liquid consumed by a user from the liquid container; and determining, based on the data received, an amount of liquid remaining in the liquid container. Preferably, the method is performed at an activity tracking device, such as but not limited to that in the above aspects of the invention.

[0078] In one embodiment of the seventh aspect, the method further comprises determining, based on the received data, activity data, and user activity data, a liquid consumption plan.

[0079] In one embodiment of the seventh aspect, the activity data comprises at least one of: a type of activity being performed or to be performed by the user; a predetermined duration of the activity being performed or to be performed by the user; a completion state of the activity; geographic data of the environment in which the activity is being or is to be performed; and weather condition of an environment in which the activity is being or is to be performed.

[0080] In one embodiment of the seventh aspect, the user activity data comprises physiological data of the user during the activity.

[0081] In one embodiment of the seventh aspect, the physiological data includes at least one of: heart rate, pulse rate, and blood oxygen level of the user.

[0082] In one embodiment of the seventh aspect, the liquid consumption plan is determined further based on a liquid consumption record of the user during an activity.

[0083] In one embodiment of the seventh aspect, determination of a liquid consumption plan comprises updating an existing liquid consumption plan.

[0084] In one embodiment of the seventh aspect, the liquid consumption plan is determined further based on a liquid consumption goal set by the user.

[0085] In one embodiment of the seventh aspect, the method further comprises storing data of an initial amount of liquid in the liquid container.

[0086] In one embodiment of the seventh aspect, the liquid consumption plan comprises at least one liquid consumption reminder to be provided to the user at a specific time.

[0087] In one embodiment of the seventh aspect, the liquid consumption reminder comprises an amount of liquid to be consumed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0088] Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

[0089] FIG. **1**A is a side view of a portable apparatus for monitoring liquid consumption in accordance with one embodiment of the invention;

[0090] FIG. **1**B is another side view of the portable apparatus of FIG. **1**A;

[0091] FIG. **1**C is a bottom view of the portable apparatus of FIG. **1**A;

[0092] FIG. **1**D is a top view of the portable apparatus of FIG. **1**A;

[0093] FIG. **1**E is a cross-sectional view of the portable apparatus of FIG. **1**A, taken along line A-A in FIG. **1**B;

[0094] FIG. **1**F is an exploded view of the portable apparatus of FIG. **1**A;

[0095] FIG. **2** is a functional block diagram of a portable apparatus for monitoring liquid consumption in accordance with one embodiment of the invention;

[0096] FIG. **3** is a schematic diagram illustrating a liquid consumption monitoring system in accordance with one embodiment of the invention;

[0097] FIG. **4** is a flow diagram illustrating the general operation of the liquid consumption monitoring system of FIG. **3** in accordance with one embodiment of the invention; and

[0098] FIG. **5** is a flow diagram illustrating an operation of the liquid consumption monitoring system of FIG. **3** in accordance with one embodiment of the invention.

[0099] FIG. **6** is a schematic diagram illustrating a system for tracking liquid consumption in accordance with one embodiment of the invention;

[0100] FIG. **7**A is an example software application interface (showing an activity and liquid consumption record) arranged to be displayed on an electronic device;

[0101] FIG. **7**B is an example interface of a social network platform for sharing activity information arranged to be displayed on an electronic device;

[0102] FIG. **7**C is an example interface showing the activity and liquid consumption record on the social network platform arranged to be displayed on an electronic device;

[0103] FIG. **8**A is an example of a screen interface of an activity tracking device displaying a completion percentage of liquid consumption goal arranged to be displayed on the smart watch of FIG. **6**;

[0104] FIG. **8**B is an example of a screen interface of an activity tracking device displaying an initial amount of liquid in the liquid container of the portable apparatus, arranged to be displayed on the smart watch of FIG. **6**;

[0105] FIG. **8**C is an example of a screen interface of an activity tracking device for users to set the initial amount of liquid in the liquid container of the portable apparatus, arranged to be displayed on the smart watch of FIG. **6**;

[0106] FIG. **8**D is an example of a screen interface of an activity tracking device displaying notification to the user, arranged to be displayed on the smart watch of FIG. **6**;

[0107] FIG. **8**E is an example of a screen interface of an activity tracking device displaying four pieces of information relating to activity and liquid consumption level, arranged to be displayed on the smart watch of FIG. **6**; and

[0108] FIG. **8**F is an example of a screen interface of an activity tracking device displaying a summary of activity and liquid consumption level, arranged to be displayed on the smart watch of FIG. **6**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0109] FIGS. **1**A to **1**F illustrate a portable apparatus **100** for monitoring liquid consumption. The apparatus **100** includes an inlet **102** arranged to receive liquid from a liquid source and an outlet **104** arranged to output the received liquid. A channel **106** is arranged between the inlet **102** and the outlet **104** for enabling fluid flow between the inlet **102** and the outlet **104**. The apparatus **100** also includes a detector **108** arranged to detect one or more flow properties of liquid passing in the channel **106**, and a communication module operably connected with the detector for communicating the one or more detected flow properties to an external electronic device for monitoring liquid consumption. The external electronic device can be a mobile phone, a computer, a tablet, a smart watch, a portable health tracker device, etc. The liquid is preferably a beverage, for example, water.

[0110] As shown in FIGS. **1**A-**1**F, the portable apparatus **100** includes a housing **110**. The housing **110** is generally elongated along an axis, with the inlet **102** at one end and the outlet **104** at the other end, and the outlet end of the housing **110** being bent to one side. In this embodiment, the channel **106** in the housing **110** generally extends along the housing axis. The housing **110** may be made of relatively strong but light-weighted material, such as plastic or carbon fibre, so that the apparatus **100** is substantially shockproof and be easily carried by a user. One or more seal rings **112** may be positioned in the housing **110** for providing water-tight sealing. In this embodiment, a seal ring **112** is placed at the inlet for preventing leakage of liquid upon connection of liquid source at the inlet **102**. In the present embodiment, the housing **110** is arranged such that various electronic components of the apparatus **100** are isolated from the channel **106** in which liquid passes for protection against water and preferably also dust.

[0111] In a preferred embodiment, a quick release coupler **114** is arranged at the inlet **102** for connection and disconnection with a liquid source, or more particularly with a connector or tube of a liquid source. The coupler **114** includes a locking mechanism and an actuator that can be actuated by a user to lock and unlock the locking mechanism. The coupler **114** allows ready connection and disconnection of the liquid source from the inlet **102**. In the present embodiment, the actuator is a push actuator movable in a direction generally perpendicular to the housing axis. When the actuator is in the normal biased position, the locking mechanism, if connected with a connector of the liquid source, is arranged to firmly engage the connector of the liquid source. The engagement is preferably also substantially fluid tight. To connect the connector of the liquid source to the inlet **102**, a user can actuate the actuator along an actuator axis and connect the tube or connector to the inlet in a direction generally perpendicular to the actuator axis. The user can then release the actuator to lock the locking mechanism such that the tube or connector is firmly secured by the locking mechanism. In one embodiment, the coupler **114** is arranged such that the connection motion of the tube or connector along the direction generally perpendicular to the actuator axis can create a sufficient force to overcome the biasing force of the actuator. In such case, the user need not actuate the actuator for connection. To remove the connector of the liquid source from the inlet **102**, the user has to actuate the actuator to overcome the biasing force. This readily releases the coupling. In the present embodiment, the actuator is a push button, but in other embodiments, the actuator may be a dial, a toggle switch, a slide switch, a rotary button, etc. In some embodiments, the coupler **114** may include a threaded coupling, a push-fit coupling, or a bayonet coupling.

[0112] Preferably, a mouthpiece **116** is arranged at the curved outlet end of the housing **110**. The mouthpiece **116** defines a channel **118** that is continuous with the channel **106**. Preferably, the mouthpiece **116** can be detachably connected to the housing **110** through a fitting mechanism (snap fit, friction fit, etc.) for replacement, repair, cleaning, etc. when needed. The coupling between the mouthpiece **116** and the housing **110** is preferably substantially fluid tight. The mouthpiece **116** is preferably elastic and it may include a bite valve. In this embodiment, the mouthpiece **116** extends generally along the deviated direction of the outlet end of the housing **110**. In operation, the user applies suction at the mouthpiece **116** to draw liquid from the liquid source to the inlet **102** through the channel **106** and hence out of the mouthpiece **116**, for consuming the liquid.

[0113] The detector **108** for detecting flow properties of liquid passing in the channel **106** is arranged inside the housing **110**. Preferably, the detector **108** comprises a flow meter for detecting flow rate or flow volume of liquid passing in the channel **106**. The flow meter may be a suction-activated flow meter. In a preferred embodiment, the flow meter comprises an axial flow turbine arranged in the channel **106**, and a sensor arranged to monitor the movement (e.g., rotation) of the axial flow turbine. The axial flow turbine may be mounted on a shaft and include a plurality of vanes. Preferably, the vanes are angled or spiralled such that the axial flow turbine rotates when liquid flows through it. Preferably, at least one of the vanes includes a magnetic member such as a magnet and the sensor includes a corresponding magnetic sensor such as a Hall-effect sensor. The sensor is preferably fixed external to the channel and is operable to generate a pulse when it detects the magnetic member as the turbine rotates. Generally, the faster the turbine rotates, the more frequent the pulses are detected. In some embodiments, the sensor may be operable to determine a direction of rotation of the turbine based on the pattern of the detected pulses. Preferably, the sensor detects the speed of rotation of the turbine or counts the number (or direction) of revolutions of the turbine. This information, along with the time or duration of flow, can then be used for determining the flow rate or flow volume of liquid based on predetermined geometric parameters of the channel **106** and the detector **108**.

[0114] It should be noted that the detector **108** comprising an axial flow turbine with magnetic vanes and corresponding magnetic sensor in this embodiment are merely exemplary.

In some embodiments, the rotation of turbine may be detected mechanically, optically, electrically, etc. In some embodiments, other types of flow meters may be used. For example, the flow meter may be a radial flow turbine with a shaft generally perpendicular to the fluid flow direction.

[0115] One or more valves may be arranged in the apparatus **100**, for example, in positions upstream of the flow meter, downstream of the flow meter, or both. These valves only permit flow in one direction from the inlet **102** to the outlet **104**, and they can prevent backflow of liquid, especially after the user withdraws the suction force at the mouthpiece **116**. With these valves, detection errors caused by backflow may be prevented or at least reduced. In an alternative embodiment, a valve may not be necessary as the detector **108** may be able to differentiate between forward and backward flow, and so can correct for the detected flow volume or flow rate accordingly. In one embodiment, the valve may be positioned immediately downstream or upstream of the flow meter such that little gap is arranged between the valve and the flow meter. In another embodiment, one valve is positioned downstream of the flow meter at the end of the mouthpiece **116**, one valve is positioned upstream of the flow meter. The valve(s), if appropriately positioned, can minimize leakage of liquid from the mouthpiece **116** after the user withdraws the suction force at the mouthpiece **116**.

[0116] The portable apparatus **100** may include a power source arranged to power the electrical components of the apparatus **100**. Preferably, the power source is rechargeable, and may be a battery with lithium-based chemistry. As shown in FIG. **1**F, a charging port **120** is arranged in the housing **110** for allowing the power source to be charged. In one embodiment, the charging port **120** may be a USB port that is optionally covered by a cover when not in use. A USB cable connected to an external power source (e.g., AC power, adapter, etc.) can be plugged into the charging port **120** for charging the power source. In some embodiments, the USB port may be used to transfer data, separately from or in addition to providing power.

[0117] A display **122** may be provided on the housing **110** to display information related to the detected flow properties or to the liquid consumption (e.g., instant consumption volume, cumulative consumption volume, targeted consumption volume, etc.). In some embodiments, the display **122** may also display user instruction, time, etc. The display **122** is preferably an LED display. In this embodiment, two buttons **124** are arranged on the housing **110** for allowing the user to control operation of the apparatus **100** and to input information or data into the apparatus **100**. In this embodiment, the two buttons are spring-biased push buttons but in other embodiments they may be of different form.

[0118] Although not clearly shown in FIGS. **1**A-**1**F, the apparatus **100** may also include one or more of: a processor, a memory, a communication module, a clock, an inertial measurement unit, and an alarm module. In one embodiment, the apparatus **100** may include additional or alternative functional components.

[0119] FIG. **2** shows the major functional components of a portable apparatus **200** in one embodiment of the invention. The portable apparatus **200** has similar construction with the apparatus **100** shown in FIGS. **1**A-**1**F. It should be appreciated that the functional modules in FIG. **2** can be implemented using various electrical and/or mechanical components suitably positioned in the apparatus **200**. Also, the function modules, where appropriate, are operably connected with each other. Preferably, the functional modules are arranged in the housing of the apparatus **200** such that they are water- and dust-proof.

[0120] The portable apparatus **200** includes a processor **226**. The processor **226** may be arranged in an electric circuit, and it may be operably connected with the other functional modules. The processor **226** is arranged to process information related to the detected flow properties such as flow rate or flow volume of liquid passing in the channel of the apparatus **200**. The processor **226** may also receive a time stamp associated with the detected flow properties from the clock **236**.

[0121] In one example, the processor **226** may be operable to determine a liquid consumption routine of a user of the portable apparatus **200** based on the detected information. The liquid consumption routine may include a cumulative amount of liquid consumed by the user, the amount of liquid consumed in the present liquid consumption event, the amount of liquid consumed in a previous liquid consumption event, a percentage representing a ratio of liquid consumed to a targeted liquid consumption, as well as time and/or duration associated with these events. The processor **226** may generate a liquid consumption alarm signal based on the liquid consumption routine of the user, and provide the alarm to an alarm module in the apparatus **200** to remind the user of the need to consume liquid at an appropriate time. The alarm module may provide visual alarm, audible alarm, or tactile alarm. In one example, the processor **226** can determine an amount of liquid that the user should consume for a particular day or for a particular activity in order to stay hydrated. The processor **226** may create a liquid consumption alarm based on the liquid consumption history of the user (e.g., the amount of liquid consumed in a certain time period, time since last consumption, etc.), amount of consumption needed to reach targeted liquid consumption and optionally the personal information of the user (e.g., weight, height, and age of the user). The liquid consumption alarm can be provided by appropriate alarm module at a time determined by the processor **226**, so as to remind the user to consume fluid from the portable apparatus **220** to remain properly hydrated.

[0122] In one embodiment, the processor **226** is operable to execute program instructions that allow the portable apparatus **200** to interact with the user. For example, the processor **226** may include program instructions for enabling operation of the portable apparatus **200** in different modes, such as calibration mode, setting mode, power saving mode, normal operation mode, etc. The program instructions may also enable selective activation and deactivation of the functional modules based on user input(s) received at the control **224**. For example, the program instructions may allow the communication module **230** or the display **222** or even the entire apparatus **200** to be selectively turned on and off based on the user input.

[0123] In the present embodiment, the portable apparatus **200** further includes a storage or memory module **228** operably connected with the processor **226**, the detector **208**, and optionally one or more other functional modules. In one example, the memory module **228** is preferably non-volatile memory but may also be volatile memory. In one example, the memory **228** comprises a RAM chip. The memory module **228** may store the one of more of the detected flow properties, present or previous or cumulative liquid con-

sumption data, consumption alarm schedule, as well as their associated time and/or duration.

[0124] The detector **208** is arranged to detect flow properties of liquid passing in the channel of the apparatus **200**. The detector **208** may be a flow meter arranged to detect flow rate or flow volume of liquid passing in the channel. The flow meter may be a suction-activated flow meter. In one embodiment, the flow meter may include an axial flow turbine arranged in the channel, and a sensor arranged to monitor the movement (e.g., rotation) of the axial flow turbine. The axial flow turbine may be mounted on a shaft and include a plurality of vanes. Preferably, the vanes are angled or spiralled such that the axial flow turbine rotates when liquid flows through it. The turbine and the sensor may magnetically interact with each other, as described with respect to FIGS. **1A-1F**. The detector **208** can determine flow rate or flow volume of liquid passing in the channel based on the detected speed of rotation of the turbine or the detected the number of revolutions of the turbine, the time or duration of flow, as well as predetermined geometric parameters of the channel and the turbine.

[0125] The portable apparatus **200** further comprises a clock **236** operably connected with the processor. The clock **236** can be used for determining time, and may also be used for determining a time stamp associated with the one or more detected flow properties. This information can be processed by the processor **226**, stored in the memory **228**, and/or communicated to the external electronic device. Preferably, the clock **236** is arranged to provide the time of occurrence or duration of an event detected by the detector **208** to the processor **226**. For example, the clock **236** may associate the liquid consumption event with the time of which it occurred. Furthermore, the clock **236** may help the processor **226** to determine the appropriate time for providing an alarm to the user.

[0126] An indicator module **222** is arranged in the portable apparatus **200**. The indicator module **222** can be operably coupled with the processor **226** for indicating information relating to liquid consumption. Preferably, the indicator module **222** is operable to indicate time, a cumulative amount of liquid consumed, the amount of liquid consumed in the present or the previous liquid consumption event, percentage representing a ratio of liquid consumed to a targeted liquid consumption, the status of the memory module, the energy capacity remaining in the power source of the portable apparatus, etc. The indicator module **222** may comprise one or more of: a digital display screen e.g., (LED display, OLED display), a light emitting device (e.g., multiple LEDs, fuel gauge), and a sound emitting device (e.g., buzzer).

[0127] As shown in FIG. **2**, the portable apparatus **200** further comprises control or actuators **224** providing input means for enabling a user to enter input to the processor **226**. In one example, the control actuators **224** include push-buttons positioned on the housing near the display **222**. In other example, the actuators **224** may include a touch sensitive display screen, one or more button, dial, knob, trigger, etc. A user may use the control actuators to select different operation modes (such as normal measurement mode, setting mode, factory test mode, and calibration mode) of the apparatus **200**. A user may further provide input for setting targeted liquid consumption, resetting the time, reviewing consumption history, etc. The control actuators **224** also allow users to easily customise and manage the apparatus **200**, for example, by changing a setting of the apparatus **200** (e.g., setting of the brightness of display **222**, turning on or off the communication module **230**).

[0128] The portable apparatus in the present embodiment further includes a communication module **230** arranged to communicate the liquid consumption data (consumption volume, time stamp, etc.) to an external electronic device. Preferably, the communication module **230** is a wireless communication module that enables wireless communication between the apparatus **200** and an external electronic device. Preferably, the communication module **230** may be a Bluetooth communication module that can establish a Bluetooth communication link with the external electronic device. The communication module **230** can also or alternatively include an ANT+ communication module arranged to establish an ANT+ communication link with the external electronic device. Other communication links such as Wi-Fi, ZigBee, NFC, etc., are also possible in other embodiments. The communication between the external electronic device and the communication module **230** of the portable apparatus **200** may be initiated by either the electronic device or the portable apparatus **200**. For example, the communication can be established actively by the communication module **230** actively seeking a signal from the external device, or passively by the communication module **230** broadcasting a signal to be picked up by the electronic device. The communication module **230** in the present embodiment is operably connected with the processor **226** and/or the memory module **228** for transferring data gathered by the processor or data stored in the memory module **228** to the external electronic device for storage or further processing or analysis. For example, the data that can be transferred to the external electronic device include the liquid consumption data of the user. In one example, the communication module **230** is also operable to receive data or command from the external electronic device. For example, the communication module **230** may be operable to receive a predetermined liquid consumption alarm from the external electronic device.

[0129] The external electronic device operable to communicate with the communication module **230** of the portable apparatus can be any information handling system, preferably a mobile phone, a computer, a smart watch, a tablet, a health tracker device, etc. Preferably, the external electronic device comprises suitable components necessary to receive, store and execute appropriate computer instructions. The components may include one or more of a processing unit, a read-only memory (ROM), a random access memory (RAM), disk drives, input devices such as a power port, a USB port, etc., I/O devices such as a touch sensitive display, a physical or virtual keyboard and communications links. The external electronic device preferably includes instructions that may be included in ROM, RAM or disk drives and may be executed by the processing unit. Optionally, a communication log between the portable apparatus and the electronic device may be recorded in the memory module of the external electronic device.

[0130] An inertial measurement unit **232** is arranged in the portable apparatus **200**. The inertial measurement unit **232** is operably connected with the processor **226** and arranged to detect an orientation of the portable apparatus **200**. In one example, the inertial measurement unit **232** may include an accelerometer, a gyroscope, etc., that can determine an orientation of the portable apparatus **200**. Based on the

orientation detected by the inertial measurement unit **232**, the processor **226** adjusts the orientation of information provided on the display **222** so as to facilitate reading of the information by the user.

[0131] The apparatus **200** may further include a power source **234** arranged to power electrical components of the portable apparatus. The power source **234** is operably coupled with all other functional modules in the portable apparatus **200** that need to be powered. In one implementation, the power source **234** may be a rechargeable battery installed in the housing. The battery may be of Lithium based chemistry. The battery may be removable from the housing, or alternately, it may be hard-wired in the apparatus **200**. Preferably, a charging port is arranged on the housing of the portable apparatus **200** to allow the rechargeable power source to be charged via a power cable connecting to an external power source (e.g., AC mains). The charging port may be provided with a cover for protecting the port when not in use.

[0132] In a preferred embodiment, the power source **234** is operable to cooperate with the processor **226** to selectively operate the functional modules in the portable apparatus **200**. For example, the portable apparatus **200** in the present embodiment may be capable to operate in an idle mode when the portable apparatus **200** is not being used (e.g. no rotation of flow turbine is detected by the sensor) and in an active mode when the portable apparatus **200** is being used (e.g. rotation of flow turbine is detected by the sensor). In one embodiment, in the idle mode, only the sensor is in an operation (power on) state for detection, whereas the other functional modules are put in a reduced power (e.g., power off or hibernation) state. On the other hand, in the active mode, the sensor and at least one other functional module as shown in FIG. **2** are in an operation (e.g., power on) state. In other embodiments, the power source **234** can selectively provide power to different functional modules for optimized resource utilization and energy efficiency. For example, the power source **234** may only provide power to the functional modules that need to be operated at that moment, or may dynamically adjust the level of power provided to different functional modules based on the needs or importance of the task to be performed by the different functional modules. By properly controlling the power supplied by the power source **234** to the other functional modules in the portable apparatus **200**, energy conservation can be achieved and resource utilization efficient can be improved, thereby prolonging the work time and efficiency of the portable apparatus **200**, especially in an outdoor environment where charging source may not be readily available.

[0133] Whilst the portable apparatus **200** is shown in the embodiment of FIG. **2** to include nine different functional modules implemented using different mechanical and/or electrical elements, it should be appreciated that the portable apparatus in other embodiments of the invention may omit some functional modules or include more additional functional modules. Structural and functional features of the portable apparatus **100** of FIG. **1** and structural and functional features of the portable apparatus **200** of FIG. **2** can be interchanged, combined, etc.

[0134] FIG. **3** shows a liquid consumption monitoring system **10** in accordance with one embodiment of the invention. The system **10** includes a portable hydration kit **40** formed by the portable apparatus **100**, **200** for monitoring liquid consumption operably connected with a liquid container **42** through a tube **44**. In one example, the liquid container **42** may be a hydration bladder. As shown, the portable apparatus **100**, **200** is arranged to communicate data or information with an external electronic device **30**. In this example, the external electronic device **30** is a smart phone **30**A or a smart watch **30**B. However, the external electronic device **30** can also be a laptop, a health track device, or other information handling device. Preferably, the external electronic device **30** comprises suitable components necessary to receive, store, and execute appropriate computer instructions. The components may include one or more of a processing unit, a read-only memory (ROM), a random access memory (RAM), disk drives, input devices such as a power port, a USB port, etc., I/O devices such as a touch sensitive display, a physical or virtual keyboard and communications links. The external electronic device preferably includes instructions that may be included in ROM, RAM or disk drives and may be executed by the processing unit.

[0135] In the present embodiment, the portable apparatus **100**, **200** and the external electronic device **30** are operably connected through a communication link **12** for communicating data. Preferably, the communication link **12** is a wireless communication link, preferably a Bluetooth communication link and/or an ANT+ communication link. In an alternative embodiment, the communication link **12** may be a wired connection between the portable apparatus **100**, **200** and the external electronic device **30**. In some embodiments, the communication link **12** may be encrypted. In one embodiment, the communication link **12** between the portable apparatus **100**, **200** and the external electronic device **30** may be established actively, with the communication module of the portable apparatus **100**, **200** actively seeking a signal from the external electronic device **30**, or passively, with the portable apparatus **100**, **200** broadcasting a signal to be picked up by the electronic device **30**. In one embodiment, the communication module of the portable apparatus **100**, **200** may be activated by the user through actuating a button of the control actuators on the portable apparatus **100**, **200**. In another embodiment, the communication module of the portable apparatus **100**, **200** may be activated automatically without user intervention.

[0136] As shown in FIG. **3**, the external electronic device **30** is further connected to a server **50** through another communication link **14**. In a preferred embodiment, the external electronic device **30** is connected to a server **50** that is arranged in a cloud computing arrangement or a distributed computing arrangement distributed on individual software, hardware, or a combination of software and hardware components on a computer network, via a communication link **14** which may be encrypted.

[0137] In the system **10** of FIG. **3**, the portable apparatus **100**, **200** is operable to determine flow rate or flow volume of liquid passing in the channel (e.g., consumed by the user) and the associated time or duration. Optionally, the portable apparatus **100**, **200** may also determine one or more information relating to a cumulative liquid consumption, the occurrence of a liquid consumption event, a liquid consumption alarm, etc., and their associated time and duration. In one embodiment, the portable apparatus **100**, **200** is operable to communicate one or more of these data to the external electronic device **30** via communication link **12**, e.g., when the user of the portable apparatus **100**, **200** connects the portable apparatus **100**, **200** with the external electronic device **30**. The data received by the electronic device **30** may

be stored locally in a memory module of the electronic device **30** and/or may be further communicated to the server **50** in the cloud via communication link **14**. In other implementations, the portable apparatus **100**, **200** may be operable to communicate these data automatically (e.g., push data) to the electronic device **30** and optionally to the server **50** in the cloud. In one embodiment, the portable apparatus **100**, **200** may be operable to communicate these data automatically to server **50** in the cloud directly without using the electronic device **30**. Preferably, the electronic device **30** is operable to retrieve these data from its local memory or from the server **50** in the cloud. The electronic device **30** can display the data to the user through a display screen, provide alarm to the user where appropriate, and/or perform further analysis using the data obtained.

[0138] In one embodiment, the user can associate the portable apparatus **100**, **200** with the electronic device **30** using an interface at the electronic device. The user may add or remove entries in the event log, measurement data, or edit the liquid consumption received from the portable apparatus **100**, **200** using the electronic device **30**. The user may also use the data for other fitness related analysis. For example, the user may use the liquid consumption data obtained from the portable apparatus **100**, **200** in combination with other fitness related measurements (e.g., food consumption, exercise, etc.) determined by other devices or modules, for health related applications. The user may input into the electronic device **30** a liquid consumption alarm to be transferred to the portable apparatus **100**, **200** through the communication link. In one example where the electronic device **30** is a health or fitness related monitoring device (e.g. smart watch) that monitors the physiological signs (such as heart rate, breathing rate, etc.) of the user, the device **30** may determine that the user needs to consume fluid to remain hydrated based on the physiological signs measurements. Accordingly, the device **30** can provide a liquid consumption alarm to the user directly, or can determine and transmit a liquid consumption alarm to the portable apparatus **100**, **200** to remind the user of the need to consume fluid.

[0139] It should be appreciated that the system in the embodiment of the invention is capable of modifications and variations, and is adapted for operation with different portable hydration kit and electronic devices.

[0140] FIG. **4** illustrates the general operation **400** of the liquid consumption monitoring system **10** of FIG. **3** in accordance with one embodiment of the invention. In this embodiment, the method begins from step **402**. In step **402**, a user of the portable apparatus **100**, **200** sets up a user account through a software application or a webpage, using the electronic device **30**. The user sets up his account by inputting his personal information such as weight, height, gender, age, etc., as well as the login information such as a username, password, etc., to the application or webpage. The above information may be stored locally in the electronic device **30** and/or in the server **50**. In step **404**, the user then associates the user account with the portable apparatus **100**, **200** for monitoring liquid consumption. The portable apparatus **100**, **200** can be associated with the user, for example, by establishing communication between the electronic device **30** and the portable apparatus **100**, **200**, and transmitting a user-specific token or identifier to the portable apparatus **100**, **200**. After the portable apparatus **100**, **200** has been associated with the user, the user can then use the portable apparatus **100**, **200** for consuming liquid beverages, in step **406**. The user may carry the portable apparatus **100**, **200** for use with a portable liquid source such as a hydration bladder. In step **408**, the user may consume beverage through the portable apparatus **100**, **200** (e.g., the mouthpiece). In steps **410**, the portable apparatus **100**, **200** is operable to monitor a volume of liquid consumed by the user. This information may be processed locally in the portable apparatus **100**, **200** or may be transmitted to the external electronic device **30**. Based on the information detected or determined, and based on the stored data, the portable apparatus **100**, **200** or the external electronic device **30** may subsequently generate a beverage consumption alarm for the user to remind the user to consume fluid through the portable apparatus **100**, **200**, in step **412**. In a preferred embodiment, the generation of the beverage consumption alarm also takes into account the weight, height, gender, age of the specific user, in addition to the information determined by the portable apparatus **100**, **200** or the electronic device **30**. When the communication between the portable apparatus **100**, **200** and the server **50** or between the external electronic device **30** and the server **50** is established, the portable apparatus **100**, **200** may communicate the beverage consumption alarm, and information associated with the beverage consumption routine of the user to the electronic device **30** and optionally to the server **50**. In some cases, however, the information may not be immediately transferred to the electronic device **30** or the server **50**. Rather, the information may be stored locally in a memory module of the portable apparatus **100**, **200** or electronic device **30**, with or without subsequent transfer to the server **50**. In step **414**, the beverage consumption alarm is broadcasted to the user to remind the user to consume fluid through the portable apparatus **100**, **200**. In one implementation, the beverage consumption alarm may be provided to the user through either the alarm module of the portable apparatus **100**, **200** or through other alarm means in the external device **30**, or both.

[0141] FIG. **5** illustrates an operation of the liquid consumption monitoring system **10** of FIG. **3** in accordance with one embodiment of the invention. In the example of FIG. **5**, the portable apparatus **100**, **200** is in data communication with the smart phone **30**A through a wireless communication link **12**. In the present example, the smart phone **30**A is installed with a software application ("app") that allows the user to interact with the portable apparatus **100**, **200** (see the exemplary interface on the screen of the phone **30**A). Specifically, the software application allows the user to set specific beverage consumption goals such as the amount of beverage (e.g., water) to be consumed in a certain period of time (e.g., per day). After setting the goal, the portable apparatus **100**, **200** and/or the smart phone **30**A will monitor and analyses the beverage consumption routine of the user, and provide suitable indicators or reminders to the user at appropriate times so as to help to user to achieve the goal.

[0142] Referring to FIG. **5**, in step **502**, the user sets beverage consumption goals through the software application installed on the smart phone **30**A. Preferably, the user may set up a user account with his/her personal information (gender, weight, height, etc.), and connect (or "pair") the portable apparatus **100**, **200** with the smart phone **30**A through the software application. In one embodiment, the software application is operable determine the amount of beverage (e.g., water) that needs to be consumed by the user for a certain period of time (e.g. daily) based on the user's

personal information (gender, weight, height, etc.). In another embodiment, the user may input his or her own beverage consumption goal into the software application, i.e., the amount of beverage (e.g., water) that needs to be consumed by the user for a certain period of time (e.g. daily) is determined by the user him-/her-self. Preferably, the beverage consumption goal, once set in step **502**, is stored locally in the smart phone **30**A, and optionally, in the server **50**. After the initial set up in step **502**, in step **504**, the portable apparatus **100**, **200** detects, monitors, and records the beverage consumption events of the user as previously described. As the user carries out his or her daily activities, he or she may consume beverage through the portable apparatus **100**, **200**. Accordingly, the portable apparatus **100**, **200** may detect the volume of beverage consumed and the associated time or duration.

[0143] In step **506**, the consumption data of the user as monitored and recorded by the portable apparatus **100**, **200** are transmitted to the phone **30**A through communication link **12**. The communication can be performed periodically, instantaneously, or manually (e.g. by press a sync button on the phone **30**A), depending on the availability of the communication link **12** between the portable apparatus **100**, **200** and the phone **30**A. In step **506**, the phone **30**A maintains a log of the beverage consumption data including the amount of beverage consumed and the associated time or duration, locally, and optionally, in the server **50**. Then, in step **508**, the phone **30**A analyses the beverage consumption data based on the beverage consumption goal initially set in step **504**. The analysis may include calculating the total consumption from the starting time, the time since last consumption, etc.

[0144] In step **510**, the smart phone **30**A determines the percentage of completion of the goal. The phone **30**A may display the percentage value on its screen through the interface of the software application. In one example, if the user has initially set a goal of consuming four litres of water for one day, and the beverage consumption data shows that the user has, since the starting time, consumed 1 litres of water, the phone will determine that the goal completion percentage is ¼=25%. The goal completion percentage can be displayed on the electronic device **30**A. The phone **30**A may also transmit the result to the portable apparatus **100**, **200** through the communication link for storage in the local processor or memory of the portable apparatus **100**, **200**.

[0145] After step **510**, the phone **30**A may then determine beverage consumption reminders or alerts based on the analysis of the beverage consumption data obtained from the portable apparatus **100**, **200**, in step **512**. In particular, the phone **30**A may determine beverage consumption reminders based on the event log, the beverage consumption goals set, and/or the percentage of completion of the goal. In one embodiment, the phone **30**A may determine the time for alerting the user to consume beverage based on amount of beverage last consumed and/or the time since last consumption to prevent the user from being dehydrated. In addition, the phone **30**A may determine the time for reminding the user of the percentage of completion of the goal set initially. The times for providing these alerts to the user is then stored locally in the phone **30**A and/or transmitted to the portable apparatus **100**, **200** for local storage, through communication link **12**. These times are also optionally stored in the server **50**.

[0146] In steps **514**A and **514**B, the portable apparatus **100**, **200** and/or the phone **30**A may provide the alerts to the user at the determined times to remind the user of dehydration, or to remind the user of the outstanding goal set initially. For example, the phone **30**A may provide an audible alarm and/or a vibratory alarm that reminds the user the need to consume beverage to stay hydrated. The phone **30**A may also display other graphical notifications (e.g., the word "DRINK NOW", the percentage of goal completed, etc.) on the screen through the interface of the software application, to provide a beverage consumption alert or an outstanding goal alert to the user at the determined time. On the other hand, the portable apparatus **100**, **200** may also provide the same alerts to the user using, for example, the alarm module or the display.

[0147] In steps **516**A and **516**B, the portable apparatus **100**, **200** and/or the phone **30**A may provide the alerts to the user upon determining that the goal is completed. For example, the phone **30**A may provide an audible alarm and/or a vibratory alarm, or display other graphical notifications on the screen through the interface of the software application to notify the user that the goal has been completed. The portable apparatus **100**, **200** may also provide the same alerts to the user using, for example, the alarm module.

[0148] It should be readily appreciated that the software application integration operation steps illustrated in FIG. **5** are merely exemplary. The portable apparatus **100**, **200** and the smart phone **30**A (or other external electronic device in communication with the beverage portable apparatus) are operable to perform similar functions in a different operation sequence, and are further operable to perform additional functions based on specific implementations. Also, in some embodiments, the external electronic device need not be a smart phone **30**A, but can be a tablet, a portable computer, or other type of electronic devices that are operable to communicate wirelessly with the beverage portable apparatus.

[0149] FIG. **6** shows a system **20** for tracking liquid consumption in one embodiment of the invention. The system **20** includes a portable apparatus **100**, **200** for monitoring liquid consumption, operably connected with a liquid container through a tube, to form a portable hydration kit. The portable hydration kit may be the portable hydration kit **40** in FIG. **3**. The portable apparatus **100**, **200** of the portable hydration kit is arranged to determine an amount of liquid consumed by a user from the liquid container. The portable apparatus **100**, **200** may further determine other relevant information such as time stamp associated with the liquid consumption. Determined data is then transmitted to an activity tracking device **30**B operably connected with the portable apparatus **100**, **200** through a communication link **12**B. Preferably, the communication link **12**B is a direct and wireless communication link which allows the portable apparatus **100**, **200** to communicate directly (without going through a server) and wirelessly with the activity tracking device **30**B. In one example, the communication link **12**B is an ANT+ communication link.

[0150] The activity tracking device **30**B is arranged to determine an amount of liquid remaining in the liquid container **42** based on the data received from the portable apparatus **100**, **200**. In this embodiment, the activity tracking device **30**B is a smart watch with processor, memory, and wireless communication module. The device **30**B may further include a built-in GPS module, one or more physiologi-

cal measurement modules for determining physiological signals (heart rate, pulse rate, blood oxygen level, etc.) of the user. Preferably, the smart watch stores various activity profiles for activities such as jogging, cycling and hiking. The activity tracker device **30**B can also store a data relating to an initial amount of liquid in the liquid container **42**. The device **30**B can determine the amount of liquid remaining in the liquid container **42** by subtracting the amount of liquid consumed from the known initial amount of liquid inside the liquid container **42**.

[0151] The activity tracker device **30**B is further arranged to determine a liquid consumption plan based on the determined amount of liquid remaining, as well as activity data and user activity data obtained. The activity data may include a type of activity being performed or to be performed by a user and a predetermined duration of the activity being performed or to be performed by the user. These may be inputted at the device **30**B by the user. Additionally or alternatively, the activity data may include a completion state of the activity as determined by the device **30**B during the activity. Preferably, the activity data includes geographic data and weather condition of the environment in which the activity is being or is to be performed. The geographic data includes latitude, longitude and altitude of the environment, and it may be obtained from the build-in GPS in the activity tracker device **30**B before or during the activity. Information of the weather condition may include temperature, humidity, and UV index of the environment. The weather information may be detected by one or more build-in sensors in the activity tracker device **30**B or obtained from a server in wireless communication with the smart watch.

[0152] In some embodiments, the liquid consumption plan may be determined based also on a liquid consumption record of the user during the activity or a liquid consumption goal set by the user before or during the activity. The liquid consumption plan may be updated as the activity progresses (and as the environmental condition and the physiological conditions of the user change). Accordingly, an existing liquid consumption plan is updated during activity for assisting the user to stay properly hydrated or to reach his liquid consumption goal.

[0153] The liquid consumption plan comprises at least one liquid consumption reminder to be provided to the user at a specific time during the activity. The liquid consumption plan may be predetermined based on the activity data inputted by the user prior to the activity, and it may be updated as the activity progresses and the conditions change. The liquid consumption reminder may be provided by the device **30**B to the user at determined time points to remind the user to drink a certain amount of liquid within a specific time through the apparatus **100**, **200** so as to stay hydrated. The reminder may be in the form of a visual, audio, or tactile alarm. Preferably, the reminder also indicates a specific amount of liquid that the user should consume at a particular time point. For example, during a hike, the activity tracker device **30**B may include an initial liquid consumption plan that reminds the user to drink 500 ml of water every hour. But when a steeper ascend is detected by the activity tracker device **30**B, the liquid consumption plan will change and the activity tracker device **30**B may remind the user to drink more water, e.g. 700 ml of water, every hour during the ascend. All the data determined and detected by the activity tracker device **30**B is preferably sent to a server **50**C for storage.

[0154] The portable apparatus **100**, **200** in the system **20** in FIG. **6** is further arranged to transmit the determined data to an electronic device **30**A operably connected with the portable apparatus **100**, **200** through a wireless communication link **12**A, which is further connected to a server. The wireless communication link **12**A in this example can be a Bluetooth communication link. This sub-system **20**A of the system **20** wherein the portable apparatus **100**, **200** is integrated with the electronic device and the server is similar to the system **10** illustrated in FIG. **3**.

[0155] In addition to transmitting and receiving data to and from the portable apparatus **100**, **200**, the electronic device **30**A is further arranged to receive data from the activity tracking device and/or the server **50**C. The received data may include liquid consumption plan, liquid consumption record, activity data and user activity data. Preferably, the electronic device **30**A is a mobile phone, a tablet or a computer with a pre-installed software application ("app") capable of analysing the received data from the activity tracking device **30**B and/or portable apparatus **100**, **200**, and determining a future liquid consumption plan based on the analysed data. For example, the predetermined activity profiles can be adjusted based on the analysed data. The analysed data and liquid consumption plan can be stored in the server **50**A, and may further be sent to a third-party database **50**B, which may integrate with a social network platform for user to share activity information.

[0156] FIG. **7**A shows an interface of an activity and liquid consumption record on a software application in one example. In this example, the software application ("app") is installed on a mobile phone. The mobile phone may be the mobile phone **30**A in FIG. **6**, which receives data from the portable apparatus and/or the activity tracker device, and further processes the data. The activity record and liquid consumption record of each day in the week can be presented in a graph. The record is shown as an achievement percentage of the actual activity and liquid consumption level to the targeted level pre-set by the user. Both the activity achievement percentage and the liquid consumption achievement percentage are plotted on a single graph, such that the user can easily review his activity and liquid consumption record of the past week at one glance.

[0157] FIGS. **7**B and **7**C show example interfaces of a social network platform for sharing activity information. Preferably, the social network platform can be accessed by general public using their mobile devices. The social network platform can also be accessed by the mobile device **30**A in FIG. **6**, which may directly communicate with the portable apparatus and/or the activity tracking device for receiving data. Alternatively, the mobile device **30**A can access to a server in connection with the portable apparatus and/or the activity tracker device for retrieving data of liquid consumption and activity record. A user can upload the received data to the social network platform for sharing. In one example, the social network platform can display the route taken by the user from the last cycling activity, as illustrated in FIG. **7**B. In another example, the platform can display a graph of the elevation (line A) and water consumption (line B) over the whole duration of activity, as illustrated in FIG. **7**C. By sharing activity achievements and liquid consumption record on a social network platform,

users can motivate each other, share their experience, and meet like-minded people for activity in the future.

[0158] FIG. **8**A to FIG. **8**F show some example screen interfaces of an activity tracking device **30**B. In this embodiment, the activity tracking device **30**B is the smart watch of FIG. **6**. The smart watch allows the user to set an initial amount of liquid in the liquid container of a portable apparatus in one interface, and displays the initial amount of liquid in another interface. Liquid consumption level is received from the portable apparatus and being processed to show a completion percentage of a liquid consumption goal. The activity tracking device **30**B can further provide reminder to user by having notification popping up in one interface. The reminder may include reminding the user to drink more water, informing the user of the risk of dehydration and that water is running out in the liquid container connected with the portable apparatus. In another example interface, the activity tracking device **30**B may display useful health and fitness information to the user relating to activity and liquid consumption level, for example but not limited to activity duration, duration and pace of a run, liquid consumption level, number of steps, etc.

[0159] Embodiments of the portable apparatus **100**, **200** of the invention are advantageous in a number of aspects. For example, the portable apparatus can be readily carried by a user and can automatically monitor fluid consumption. The provision of quick release coupler and the mouthpiece at opposite ends allow quick detachment of the device for assembly and disassembly for charging. The portable apparatus, when used with the external electronic device, is arranged to determine beverage consumption events of the user and hence determine a beverage consumption routine of the user. Alarms can be provided to the user through either the portable apparatus or the external electronic device. This is convenient and particularly useful in outdoor applications where the user may not readily have access to the device or the electronic apparatus to read the information on the display. The portable apparatus in some embodiments of the invention can monitor the daily liquid consumption routine of a user in an automatic and efficient manner. This is partly because of the automatic operation of the apparatus, and the apparatus is capable of energy conservation using an idle mode when appropriate. Furthermore, the portable apparatus is operable to provide alarm automatically to remind the user when and how much fluid needs to be consumed in order for the user to remain properly hydrated. Such alarm can be tailored to the need of the user as the generation of the alarm takes into account not only the beverage consumption record of the user, but also the weight, height, gender, age, and other person information of the user. A log of all beverage consumption activities of the user can be maintained automatically. By providing these functions, the portable apparatus in the invention can integrate seamlessly into the user's activities to improve the health and fitness of the user.

[0160] The portable apparatus in the above-embodiments of the invention is further arranged to connect with an activity tracking device and an electronic device to form a system for tracking liquid consumption that is particularly useful during outdoor activities. This liquid consumption tracking system and method are advantageous in that activity and liquid consumption record can be easily processed, stored, displayed, and shared, during activities and afterwards. When integrated with an activity tracking device, useful health and fitness information can be displayed to the user and provide timely reminder according to a liquid consumption plan for assisting user to stay hydrated during activities. When integrated with an electronic device, the user can review the activity and liquid consumption profile during the activity at a glance and keep track of past record.

[0161] Although not required, the embodiments described with reference to the Figures can be implemented as an application programming interface (API) or as a series of libraries for use by a developer or can be included within another software application, such as a terminal or personal computer operating system or a portable computing device operating system. Generally, as program modules include routines, programs, objects, components and data files assisting in the performance of particular functions, the skilled person will understand that the functionality of the software application may be distributed across a number of routines, objects or components to achieve the same functionality desired herein.

[0162] It will also be appreciated that where the methods and systems of the invention are either wholly implemented by computing system or partly implemented by computing systems then any appropriate computing system architecture may be utilized. This will include stand-alone computers, network computers and dedicated hardware devices. Where the terms "computing system" and "computing device" are used, these terms are intended to cover any appropriate arrangement of computer hardware capable of implementing the function described.

[0163] It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

1. A method for tracking liquid consumption, comprising:

determining, using a portable apparatus for monitoring liquid consumption, data indicative of an amount of liquid consumed by a user from a liquid container;

transmitting the determined data to an activity tracking device operably connected with the portable apparatus, for determination of at least one of:

an amount of liquid remaining in the liquid container; and

a liquid consumption plan based on an amount of liquid remaining in the liquid container, activity data, and user activity data arranged in the activity tracking device.

2. The method of claim **1**, wherein the activity data comprises at least one of:

a type of activity being performed or to be performed by the user;

a predetermined duration of the activity being performed or to be performed by the user;

a completion state of the activity;

geographic data of the environment in which the activity is being or is to be performed; and

weather condition of an environment in which the activity is being or is to be performed.

3. The method of claim **2**, wherein the weather condition comprises at least one of:

humidity level of the environment;

temperature level of the environment; and

UV index of the environment.

4. The method of claim 2, wherein the geographic data includes at least one of: latitude, longitude and altitude of the environment.

5. The method of claim 1, wherein the user activity data comprises physiological data of the user during the activity.

6. The method of claim 5, wherein the physiological data includes at least one of: heart rate, pulse rate, and blood oxygen level of the user.

7. The method of claim 1, wherein the liquid consumption plan is determined further based on a liquid consumption record of the user during the activity.

8. The method of claim 1, wherein determination of a liquid consumption plan comprises updating an existing liquid consumption plan.

9. The method of claim 1, wherein the liquid consumption plan is determined further based on a liquid consumption goal set by the user.

10. The method of claim 1, further comprising:

storing, at the activity tracking device, data of an initial amount of liquid in the liquid container.

11. The method of claim 1, wherein the liquid consumption plan comprises at least one liquid consumption reminder to be provided to the user at a specific time.

12. The method of claim 11, wherein the liquid consumption reminder comprises an amount of liquid to be consumed.

13. The method of claim 1, further comprising:

determining, at the activity tracking device, at least one of:

an amount of liquid remaining in the liquid container; and

a liquid consumption plan based on an amount of liquid remaining in the liquid container, activity data, and user activity data arranged in the activity tracking device.

14. The method of claim 1, wherein the portable apparatus is arranged to communicate directly and wirelessly with the activity tracking device.

15. The method of claim 1, further comprising:

transmitting the determined data to an electronic device operably connected with the portable apparatus for record or analysis.

16. The method of claim 15, wherein the electronic device is arranged to receive, from the activity tracking device, at least one of: liquid consumption plan, liquid consumption record, activity data, and user activity data.

17. The method of claim 15, wherein the electronic device is arranged to analyze data received from the activity tracking device and from the portable apparatus.

18. The method of claim 18, wherein the electronic device is arranged to use the analysed data for determination of future liquid consumption plan.

19. The method of claim 15, wherein the electronic device comprises a mobile phone, a tablet, or a computer.

20. The method of claim 1, wherein the portable apparatus comprises:

an inlet arranged to receive liquid;

an outlet arranged to output the received liquid;

a channel enabling fluid communication between the inlet and the outlet;

a detector arranged to detect one or more flow properties of liquid passing in the channel for determination of an amount of liquid consumed by a user from a liquid container; and

a communication module operably connected with the detector for communicating data indicative of the amount of liquid consumed to an external electronic device.

21. A system for tracking liquid consumption, comprising:

a portable apparatus for monitoring liquid consumption, arranged to

determine an amount of liquid consumed by a user from a liquid container;

transmit the determined data to an activity tracking device operably connected with the portable apparatus, for determination of at least one of:

an amount of liquid remaining in the liquid container; and

a liquid consumption plan based on an amount of liquid remaining in the liquid container, activity data, and user activity data arranged in the activity tracking device.

22. A method for tracking liquid consumption, comprising:

receiving, from a portable apparatus for monitoring liquid consumption from a liquid container, data indicative of an amount of liquid consumed by a user from the liquid container; and

determining, based on the data received, an amount of liquid remaining in the liquid container.

23. The method of claim 22, further comprising:

determining, based on the received data, activity data, and user activity data, a liquid consumption plan.

24. The method of claim 23, wherein the activity data comprises at least one of:

a type of activity being performed or to be performed by the user;

a predetermined duration of the activity being performed or to be performed by the user;

a completion state of the activity;

geographic data of the environment in which the activity is being or is to be performed; and

weather condition of an environment in which the activity is being or is to be performed.

25. The method of claim 23, wherein the user activity data comprises physiological data of the user during the activity.

26. The method of claim 25, wherein the physiological data includes at least one of: heart rate, pulse rate, and blood oxygen level of the user.

27. The method of claim 23, wherein the liquid consumption plan is determined further based on a liquid consumption record of the user during an activity.

28. The method of claim 23, wherein determination of a liquid consumption plan comprises updating an existing liquid consumption plan.

29. The method of claim 23, wherein the liquid consumption plan is determined further based on a liquid consumption goal set by the user.

30. The method of claim 22, further comprising:

storing data of an initial amount of liquid in the liquid container.

31. The method of claim 23, wherein the liquid consumption plan comprises at least one liquid consumption reminder to be provided to the user at a specific time.

32. The method of claim **31**, wherein the liquid consumption reminder comprises an amount of liquid to be consumed.

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专利名称(译)	用于跟踪液体消耗的系统和方法		
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当前申请(专利权)人(译)	GROKING LAB LIMITED		
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摘要(译)

一种用于跟踪液体消耗的方法包括使用便携式设备监测液体消耗，确定指示用户从液体容器消耗的液体量的数据。该方法还包括将确定的数据发送到与便携式设备可操作地连接的活动跟踪设备，用于确定：液体容器中剩余的液体量;以及基于活动跟踪装置中布置的剩余液体量，活动数据和用户活动数据的液体消耗计划。