(54) **DEVICE AND METHOD FOR DETERMINING A CONTENT OF A STORAGE UNIT**

(57)   The present invention pertains to a device (22) for determining a content of a storage unit (14; 18) which is configured to store and supply a medium for an application-specific use, wherein the device (22) comprises a measuring unit (24; 26) for determining a remaining content stored in the storage unit (14; 18) and a controller (28) for processing the determined remaining content so as to calculate an application-specific parameter being indicative of a remaining service performance of the storage unit (14; 18) for the application-specific use.
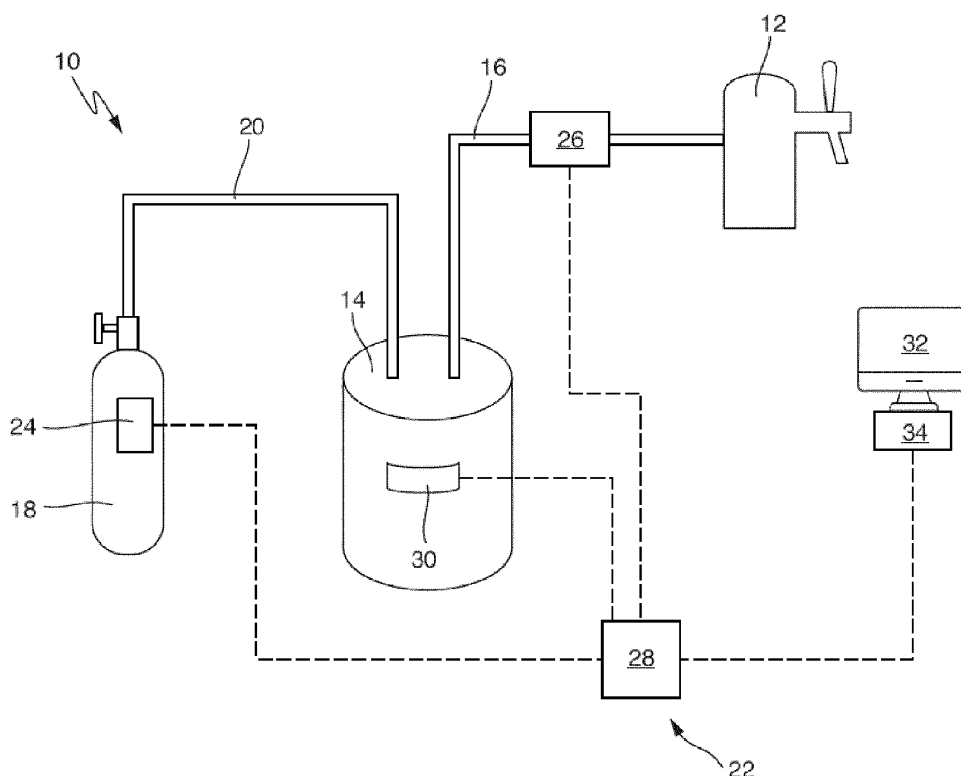
Fig. 1

EP 3 671 007 A1

Description

Technical Field

[0001]　The invention relates to a device and a corresponding method for application-specifically determining a content of a storage unit. Further, the invention relates to a system for storing and discharging a medium having a device of this kind.

Technological Background

[0002]　Storage units, such as gas cylinders or gas tanks, are configured to store a medium and to supply the medium as required. Typically, such storage units store the medium in a gaseous state at high pressure, wherein their filling level is controlled by a user via a manometer which displays a measured value for the pressure prevailing in the storage unit.

[0003]　However, for many applications, it may be difficult for a user to interpret a measured pressure value so as to determine a remaining content, i.e. a remaining volume or a remaining mass, of the medium in the storage unit. In addition, it may even be more difficult for a user to determine how long or for how many products the remaining content can be used for a user specific application.

[0004]　One considers, for example, the use of a gas cylinder for producing, i.e. carbonating, beverages in a beverage dispenser system. For a user, based on a measured pressure prevailing in the gas cylinder, it may be difficult to determine or estimate how many beverages, i.e. how many liters of beverages, can be produced with the remaining content of gas.

[0005]　Colored scales for manometers are known having, for example, a highlighted red zone indicating for the user that the storage unit's content come to an end and thus that the storage unit has to be changed or refilled. However, for many applications, the sole indication of a low pressure level prevailing in the storage unit may not be sufficient for users to application-specifically evaluate or estimate the remaining content of the storage unit.

Summary of the invention

[0006]　It is an object of the present invention to provide an improved device and a corresponding method for determining a content of a storage unit which enable an efficient usage of storage units.

[0007]　This object is addressed by a device having the features of claim 1, a system having the features of claim 11, a beverages dispenser having the features of claim 13, a medical treatment device having the features of claim 14 and a method having the features of claim 15.

[0008]　Accordingly, a device for determining a content of a storage unit is suggested, wherein the storage unit is configured to store and supply a medium for an application-specific use. Specifically, the device comprises a measuring unit for determining a remaining content stored in the storage unit and a controller for processing the determined remaining content so as to calculate an application-specific parameter being indicative of a remaining service performance of the storage unit for the application-specific use. In the context of the present disclosure, the term "application-specific use" refers to a deployment or usage of the storage unit in a specific process, in which the medium stored in the storage unit is supplied so as to contribute to the production of a specific product or to the provision of a specific treatment.

[0009]　For example, the application-specific use may be the production of beverages, such as carbonated beverages. Specifically, in such applications, the storage unit may be configured to store a gas for carbonating a liquid or to store the carbonated beverages itself.

[0010]　Alternatively, the application-specific use may be a welding process for producing a welding seam. Accordingly, for such application, the storage unit may be configured to store a welding gas required for the welding process, i.e. for producing the welding seam.

[0011]　In addition, the application-specific use may be a therapeutic treatment, i.e. dosing or provision of medication or a substance, so as to achieve a desired therapeutic effect. Accordingly, for such application, the storage unit may be configured to store a medication, a component of the medication or a substance to be provided during the therapeutic treatment.

[0012]　Further, the term "service performance" refers to a deployment of the storage unit from beginning of operation to the point of discard, at which the content of the storage unit, in view of the application specific use, is completely consumed. For example, the service performance may indicate the total quantity or amount of a specific product or treatment that can be provided based on the content of medium stored in the storage unit. Alternatively or additionally, the service performance may indicate a life expectancy or an operational time of the storage unit in view of the application-specific use.

[0013]　By calculating the application-specific parameter, the controller translates the remaining content value determined by the measuring unit into a unit of measure that is familiar to a user. Specifically, the application-specific parameter indicates the remaining content of the storage unit in a way that is easy to understand for the user. In this way, the device enables the user to evaluate the remaining content from an application perspective point of view, thereby leading to a simple and more accurate estimation or determination of the remaining service performance of the storage unit. The user can more accurately determine when the storage unit is to be refilled or is to be changed. This applies particularly to less experienced users. Accordingly, the device enables that the storage units are changed or refilled just in time, thereby avoiding idle times, stock buffers or waste caused by discarded storage units that are not completely emptied. As a result, the application-specific use can be carried out more efficiently.

[0014] The storage unit may be a container, a tank or a cylinder. It may be configured for storing a medium in a gaseous and/or a liquid state. Further, the storage unit may be configured to store the medium at a pressure level above an ambient pressure level, i.e. at high pressure. For example, the medium may be a gas, i.e. a gas to carbonate drinks or a gas used in a welding process. Alternatively, the storage unit may store a medium in a solid state. The medium may be a medication or a substance used in therapeutic treatments.

[0015] The application-specific parameter may comprise or be a remaining quantity of goods which, in the application-specific use, can be provided by utilizing or supplying the remaining medium stored in the storage unit. For example, the application-specific parameter may comprise a remaining quantity of products or a remaining quantity of treatments which can be provided in the application-specific use by utilizing the remaining medium stored in the storage unit.

[0016] Additionally or alternatively, the application-specific parameter may comprise or be a remaining life expectancy or a remaining operational time of the storage unit. Specifically, the remaining life expectancy or the remaining operational time may indicate a time period, during which the storage unit can supply the medium as required for the application-specific use. In other words, the remaining life expectancy or the remaining operational time may indicate the remaining time before the content of the storage unit is completely consumed.

[0017] According to the present disclosure, the term "operational time" may refer to a time period, during which the supply unit is engaged in an operational state, in which it supplies or discharges the medium for the application-specific use. Accordingly, the "remaining operational time" may indicate a total time period, during which the storage unit can be operated in the operational state before the medium in the storage unit is completely exhausted or consumed. In this context, the total time period may constitute a sum of intermitted time periods. Further, the storage unit may be operated in different operational states or modes. The operational time may depend on the operational state or mode, i.e. an average discharge rate of the medium during the operational state or mode. For each operational state or mode, a different operational time may be calculated.

[0018] By contrast, the term "idle time" may refer to a time period, during which the supply unit is engaged in an idle state, in which it does not supply or discharge the medium. Further, the term "life expectancy" may refer to a time period comprising idle times and operational times. Accordingly, a "remaining life expectancy" may indicate an uninterrupted or continuous time period, during which the storage unit can be employed for the application-specific use before the medium in the storage unit is completely exhausted or consumed. For estimating or determining the remaining life expectancy of the storage unit, empirical or experienced values may be used for correlating a remaining content to a remaining life expectancy

of the storage unit. For example, the storage unit may be operated according to a periodic, regular or predefined pattern of operational and idle times. Such a pattern may be determined in dependence on empirical or experienced values or based on prior applications. Based on such patterns, the life expectancy may be determined.

[0019] The controller may be configured to calculate the application-specific parameter in dependence on the application-specific use, in particular of a product or treatment to be provided in the application-specific use. For example, the controller may be configured to calculate the application-specific parameter in dependence on a predefined correlation between the determined remaining content and the application-specific parameter. In other words, the correlation enables to calculate the application-specific parameter in dependence on the determined content in consideration of the application-specific use. Specifically, the correlation may be provided in the form of a function or as a data set which enable a distinct mapping between the determined remaining content and the application-specific parameter. In view of the application-specific use, the correlation may be indicative of a specific product or a specific treatment to be provided by the application-specific use. For example, the correlation may be indicative of a quantity or an amount of the medium required to provide a specific quantity or an amount of the product or treatment in the application-specific use. The correlation may be determined based on an empirical method, i.e. based on prior applications.

[0020] For example, the correlation may constitute a ratio between a quantity of the product to be provided and a quantity or amount of the medium to be supplied by the storage unit. Specifically, this ratio may define how many products can be provided in the application-specific per a certain quantity or amount of the medium. For calculating the application-specific parameter based on such a ratio, the measurement unit, in a first step, may determine an amount or a quantity of the medium stored in the storage unit. Then, the controller may process the determined amount or quantity of the medium by multiplying it with the above described ratio. In this way, the controller may calculate the amount or quantity of the product or treatment that can be provided in the application-specific use by utilizing the remaining content in the storage unit. Alternatively or additionally, the correlation may be indicative of an average usage of the medium in the application-specific use. For example, the correlation may provide an average usage of the medium per time. Accordingly, the controller may be configured to process the determined amount or quantity of the medium by dividing it with the average usage of the medium per time, thereby calculating a remaining time period, i.e. a remaining life expectancy or a remaining operational time of the storage unit.

[0021] Alternatively or additionally, the correlation may be provided in the form of a function, a data set or in any other suitable form which correlate a remaining content of the medium in the storage unit to a value of the appli-

cation-specific parameter.

In the application-specific use, a plurality of different products or treatments may be provided. Accordingly, the storage unit may be operated in different operational modes in dependence on the product or treatment to be provided. These operational modes may differ from one another by an average flow rate of the storage unit. Thus, the controller may be configured to calculate the application-specific parameter for different operational modes of the storage unit, wherein different correlations, i.e. indicative of different average flow rates, may be applied in dependence on the different operational modes.

[0022]　As set forth above, the measuring unit is configured to determine a remaining content stored in the storage unit. In other words, the measuring unit may be configured to determine or measure a value indicating the content of medium stored in the storage unit. Further, the measuring unit may be configured to transmit the thus determined value to the controller. In this context, the term "content" refers to a value for quantifying or evaluating a quantity or amount of the medium stored in the storage unit. According to the present disclosure, the content may be quantified in any suitable form or unit of measure, such as volume, mass, pressure, number of predefined units or pieces, etc.

[0023]　For example, the measuring unit may be configured to determine a volume or a mass of the medium stored in the storage unit. Alternatively or additionally, the measuring unit may be configured to determine a pressure prevailing in the storage unit. In a further development, the measuring unit may be configured to determine a volume or a mass of the medium stored in the storage unit in dependence on the determined pressure prevailing therein.

[0024]　The measuring unit may be configured to transmit the determined value indicative of the volume and/or the mass of the medium stored in the storage unit and/or the pressure prevailing in the storage unit to the controller. Accordingly, the controller may be configured to receive the determined value being indicative of the content stored in the storage unit. The thus received value may then be processed so as to calculate the application-specific parameter. If the measuring unit transmits the determined pressure prevailing in the storage unit to the controller, the controller may be configured to, in a first step, calculate a volume and/or a mass of the medium in dependence of the transmitted value and, thereafter, to calculate the application-specific parameter based on the calculated volume and/or mass. Accordingly, the correlation may be provided to quantify the application-specific parameter in dependence on the volume and/or the mass prevailing in the storage unit. Alternatively, the controller may be configured to calculate the application-specific parameter directly from the determined pressure prevailing in the storage unit. Accordingly, the correlation may be provided to quantify the application-specific parameter in dependence on the pressure prevailing in the storage unit.

[0025]　The measuring unit may comprise a pressure sensor for measuring a pressure prevailing in the storage unit. Further, the measuring unit may be configured to determine the remaining content stored in the storage unit based on the measured pressure and to transmit the determined content to the controller. Alternatively or additionally, the measuring unit may be configured to transmit the determined pressure to the controller, wherein the controller may be configured to determine the remaining content stored in the storage unit based on the measured pressure.

[0026]　Alternatively or additionally, the measuring unit may comprise a sensor for measuring a quantity or amount of the medium output from the storage unit. For example, the sensor may be configured to determine a flow rate of the medium discharged from the storage unit and to determine a discharge time so as to calculate a quantity or amount of the medium output from the storage unit. Further, for determining the remaining content stored in the storage unit, the measuring unit may be configured to subtract the measured quantity or amount of the output medium from an initial content of the storage unit and to transmit the thus determined remaining content to the controller. Alternatively or additionally, the measuring unit may be configured to transmit to the controller the determined or measured quantity of the medium output from the storage unit, wherein the controller is configured to determine the remaining content by subtracting the measured quantity from the initial content of the storage unit.

The sensor of the measuring unit for measuring the quantity or amount of the medium output from the storage unit may comprise at least one of a temperature sensor, an acoustic sensor, a vibration sensor, an ultrasonic sensor or a supply rate sensor.

[0027]　In the device, the measuring unit and the controller may be provided together in a single housing, thereby constituting an integral component. Alternatively, the measuring unit and the controller may be provided in separate housings, which may be spaced apart.

[0028]　Further, the measuring unit may be configured to be provided at or in the storage unit. For example, the measuring unit may be configured to be fastened to or be comprised in a discharge valve of the storage unit. Alternatively, the measuring unit may be configured to be provided in or at a supply line for discharging the medium from the storage unit. Specifically, the supply line may be provided downstream of the discharge valve or the storage unit, wherein the term "downstream" refers to a flow direction of the medium.

[0029]　The controller may be provided in or at the storage unit. Alternatively, the controller may be provided spaced apart from the storage unit. Further, the controller may be provided spaced apart from the measuring unit, in particular in a central control unit supervising a process within the application-specific use.

[0030]　The measuring unit and the controller are connected to one another so as to exchange measured or

determined data. For example, the measuring unit and the controller may be connected via a signal wire or cable. Alternatively, the measuring unit and the controller may be connected wirelessly.

[0031] For transmitting or receiving data, in particular for wirelessly transmitting or receiving data, the controller may comprise a communication unit. The communication unit of the controller may be configured to receive data from the measuring unit. Accordingly, the measuring unit may comprise a further communication unit for communicating with the communication unit of the controller, i.e. for transmitting measured or determined data. In a further development, for displaying the application-specific parameter to the user, the communication unit of the controller may be configured to transmit the calculated application-specific parameter, in particular to the central control unit supervising a process within the application-specific use and/or to a display unit.

[0032] Further, the communication unit of the controller and/or the further communication unit of the measuring unit may be configured to receive storage unit-related data, in particular comprising an initial storage content of the storage unit. For example, the communication unit and/or the further communication unit may be configured to read out data from and/or to write data to a memory device coupled to the storage unit. In particular, the memory device may be comprised in a transponder, in particular a RFID (radio-frequency identification) transponder. Preferably, the memory device is a NFC (near field communication) transponder or a NFC-tag, wherein the communication unit and/or the further communication unit may use NFC-techniques to communicate with the memory device. More specifically, the communication unit and/or the further communication unit may be configured to read out an initial storage content of the storage unit from the memory device. Further, the communication unit and/or the further communication unit may be configured to write an actual remaining content of the storage unit to the memory device and in particular to continuously or frequently update the value for the actual remaining content stored on the memory device.

The communication unit and/or the further communication unit may be configured to use wireless communication techniques for transmitting and/or receiving data. Such communication techniques may use electromagnetic waves having a wavelength in the ISM (industrial, scientific and medical) band. For example, the communication unit and/or the further communication unit may use Bluetooth or Bluetooth Low Energy techniques for wirelessly transmitting and/or receiving data.

[0033] In a further development, the controller may be configured to output a notification or warning signal if the calculated application-specific parameter reaches a predefined threshold value. In particular, the threshold value may indicate a minimum service performance. The minimum service performance may be associated with a remaining content of the medium stored in the storage unit that is required to provide a predefined quantity of the product or the treatment in the application-specific use. For example, the threshold value may indicate a minimum remaining content that only lasts for a quantity of, e.g., one or more products or treatments which can be provided in the application-specific use. Alternatively or additionally, the threshold value may indicate a minimum life expectancy or a minimum operational time during which the medium may be supplied by the storage unit. For example, the threshold value may indicate that the life expectancy of the storage unit falls below, e.g., one day or that the operational time falls below, e.g., one hour.

[0034] The notification or warning signal may be output to the display unit for being displayed to the user. Alternatively or additionally, the notification or warning signal may be output as an acoustic signal via a loudspeaker or as a light signal via a signal lamp. Furthermore, a system for storing and discharging a medium is proposed which comprises the storage unit for storing and supplying the medium for an application-specific use and the device as described above. Accordingly, technical features which are previously described in connection with the storage unit and the device may also relate and be applied to the proposed system, and vice versa.

[0035] The system may comprise a supply line for discharging the medium from the storage unit. The device may be provided in or at the storage unit. For example, the device may be provided in a discharge valve of the storage unit. Alternatively, the device may be provided in the supply line of the system. Further, the controller of the device may be provided at the storage unit, wherein the measuring unit may be provided in the supply line.

[0036] Further, the system for storing and discharging a medium may be comprised in a beverage dispenser, a medical treatment device or a welding apparatus. Furthermore, a beverage dispenser system and a medical treatment device are provided, each of which comprises a system as described above. Accordingly, technical features which are described above in connection with the storage unit, the device and the system may also relate and be applied to the proposed beverage dispenser system and the medical treatment device.

[0037] The present disclosure further relates to a method for determining a content of a storage unit configured to store and supply a medium for an application-specific use. The proposed method comprises the steps of determining a remaining content stored in the storage unit and of determining an application-specific parameter being indicative of a remaining service performance of the storage unit for the application-specific use based on the determined remaining content.

Brief description of the drawings

[0038] The present disclosure will be more readily appreciated by reference to the following detailed description when being considered in connection with the accompanying drawings in which:

Figure 1 is a schematic view of a beverage dispenser system having a device for determining a content of a storage unit according to a first embodiment;

Figure 2 is a schematic view of a beverage dispenser system having a device for determining a content of a storage unit according to a second embodiment; and

Figure 3 is a schematic view of a medical treatment device having a device for determining a content of a storage unit.

Detailed description of preferred embodiments

[0039] In the following, the invention will be explained in more detail with reference to the accompanying Figures. In the Figures, like elements are denoted by identical reference numerals and repeated description thereof may be omitted in order to avoid redundancies.

[0040] Figure 1 schematically depicts a beverage dispenser system 10 in the form of a beer tap system for serving beer from a beer tap 12. In such a system, beer is supplied in kegs 14 which are interchangeably connectable to the beer tap 12 via a beer supply line 16. The beer is discharged from the beer keg 14 by the aid of an external pressure source in the form of a gas cylinder 18 storing carbon dioxide which forces the beer out of the beer keg 14 and through the beer supply line 16 to be discharged via the beer tap 12. Accordingly, for supplying carbon dioxide from the gas cylinder 18 to the beer keg 14, a gas supply line 20 connecting the gas cylinder 18 to the beer keg 14 is provided. Similar to the beer keg 14, the gas cylinder 18 can be exchanged within the system 10 when its content is consumed.

[0041] In the context of the present disclosure, both the beer keg 14 and the gas cylinder 18 constitute a storage unit, wherein the beer stored in the beer keg 14 and the gas stored in the gas cylinder 18 constitute a medium according to the present disclosure. Each of the beer keg 14 and the gas cylinder 18 are used for producing and dispensing beer. Thus, the application-specific use of these storing units is the dispensing of beer. The system 10 further comprises a device 22 for determining a content of the storing units, i.e. the beer keg 14 and the gas cylinder 16. Specifically, the device 22 comprises a first measuring unit 24 for determining a remaining content stored in the gas cylinder 18 and a second measuring unit 26 for determining a remaining content stored in the beer keg 14. Further, the device 22 comprises a controller 28 for processing the determined remaining content of the gas cylinder 16 and the determined remaining content of the beer keg 14 so as to calculate application-specific parameters being indicative of a remaining service performance of the storage units 14, 16 for the application-specific use.

[0042] The first measuring unit 24 comprises a pressure sensor provided in the gas cylinder 18 and configured to measure a pressure prevailing in the gas cylinder 18 and to transmit the thus measured value for the pres-

sure prevailing in the gas cylinder 18 to the controller 28. For setting up a communication between the controller 28 and the first measuring unit 24, the controller 28 comprises a first communication unit and the first measuring unit 24 comprises a complementary second communication unit which are configured to wirelessly transmit data indicative of the measured pressure prevailing in the gas cylinder 18 from the first measuring unit 24 to the controller 28, as depicted in Figure 1 by a dashed line.

[0043] The second measuring unit 26 comprises a sensor, i.e. a supply rate sensor, for measuring a quantity of beer output from the beer keg 14 and to transmit the thus measured value for the quantity to the controller 28. The second measuring unit 26 is provided in the beer supply line 16. Alternatively, the second measuring unit 26 may be provided at the beer keg 14, in particular in a discharge valve thereof. For setting up a communication between the second measuring unit 26 and the controller 28, the second measuring unit 26 comprises a third communication unit configured to wirelessly communicate with the first communication unit of the controller 28 as depicted in Figure 1 by a dashed line. In this way, data indicative of the measured value for the quantity of beer output from the beer keg 14 can be wirelessly transmitted from the second measuring unit 26 to the controller 28.

[0044] Further, the first communication unit of the controller 28 is configured to read out data from and to write data to a memory device 30 coupled to the beer keg 14. Preferably, the memory device 30 is a NFC-transponder also referred to as a NFC-tag.

As set forth above, the beer keg 14 is interchangeably connected to the system 10 so as to ensure an unlimited supply of beer. Typically, a beer keg 14 connected to the system 10 is change as soon as the beer stored therein is completely consumed. In the system 10, when a new beer keg 14 is employed in the system 10, the memory device 30 associated with the new beer keg 14 is paired to the first communication unit of the controller 28. Then, the controller 28 reads out storage unit-related data from the memory device 30, i.e. an initial storage content of the storage unit. In this context, the initial storage content refers to a volume of beer stored in the beer keg 14 in an unused and new condition of the beer keg 14. Further, the controller 28 is configured to write application-related data and/or data related to a condition of the beer keg 14 to the memory device 30 during operation. Specifically, as soon as the beer keg 30 is connected to the system 10 and the first communication unit of the controller 28 is paired to the memory device 30, an utilization state of the beer keg 14 stored in the memory device 30 is changed from "new" or "unused" to "used". Further, the controller 28 is configured to write and frequently update an actual remaining content of the beer keg 14 to the memory device 30.

[0045] For calculating the remaining content of the beer keg 14, the controller 28 is configured to subtract the quantity of beer output from the beer keg 14, which is to be measured and transmitted by the second meas-

urement unit 26, from the initial content of the beer keg 14 provided from the memory device 30.

[0046] Similar to the beer keg 14, also the gas cylinder 18 comprises a memory device to which the controller 28 is paired. Accordingly, the controller 28 is configured to read out gas cylinder-related data, i.e. an initial content of the gas cylinder 18, from the memory device and to write data to the memory device, i.e. a utilization state and an actual remaining content.

[0047] Further, the first communication unit of the controller 28 is configured to transmit the calculated application-specific parameter to a display unit 32 for displaying it to a user of the system 10. Specifically, the first communication unit of the controller 28 is configured to wirelessly communicate with a fourth communication unit of a central control unit 34 of the system 10, as depicted in Figure 1 by dashed lines, wherein the central control unit 34 displays the received application-specific parameter on the display unit 32.

[0048] For establishing a communication between the first to fourth communication units and the memory devices 30, the device 22 preferably makes use of Bluetooth or Bluetooth Low Energy as a wireless communication technique.

[0049] In the following, the application-specific parameters and their calculation are further specified. In view of the beer keg 14, the controller 28 is configured to calculate a first application-specific parameter. The first application-specific parameter comprises a remaining volume of beer, in particular remaining liters of beer that can be provided with the remaining content stored in the beer keg 14. The remaining volume of beer corresponds to the remaining content of beer stored in the beer keg 14, the calculation of which is described above.

[0050] The first application-specific parameter calculated by the controller 28 further comprises a remaining life expectancy which is determined in dependence of an average consumption of beer per day. Specifically, for calculating the remaining life expectancy, the controller 28 may be configured to divide the remaining content of beer stored in the beer keg 14 by the average consumption per day or hour. In this way, a time period can be calculated indicating when the beer stored in the beer keg 14 is prospectively consumed and thus when the beer keg 14 is to be exchanged. Furthermore, in view of the gas cylinder 18, the controller is configured to calculate a second application-specific parameter. The second application-specific parameter comprises a remaining volume of beer, in particular remaining liters of beer that can be provided with the remaining content of gas stored in the gas cylinder 18. Specifically, for calculating the remaining volume of beer to be provided with the remaining content stored in the gas cylinder 18, the controller 28 is configured to process the value for the pressure prevailing in the gas cylinder 18 determined and transmitted by the first measuring unit 24 based on a function correlating a pressure prevailing in the gas cylinder 18 to a volume of beer that can be provided with

the remaining content of gas stored in the gas cylinder 18.

[0051] The second application-specific parameter calculated by the controller 28 further comprises a remaining life expectancy which is determined in dependence of an average consumption of beer per day or hour. Specifically, for calculating the remaining life expectancy of the gas cylinder 18, the controller 28 may be configured to divide the calculated remaining volume of beer that can be provided with the remaining content of gas stored in the gas cylinder 18 by the average consumption per day or hour. The controller 28 is configured to output a notification or warning signal if the calculated application-specific parameter reaches at least one predefined threshold value. In particular, the controller 28 is configured to output the notification or warning signal if either the remaining volume of beer stored in the beer keg 14 or the remaining volume of beer that can be provided with the remaining content of gas stored in the gas cylinder 18 falls below a first threshold value, e.g. 10 liters of beer. Further, the controller 28 is configured to output the notification warning signal if either the life expectancy of the beer keg 14 or the life expectancy of the gas cylinder 18 falls below a threshold value, e.g. 30 minutes.

[0052] Figure 2 schematically shows a beverage dispenser system 10 according to a second embodiment. Compared the configuration depicted in Figure 1, the system 10 according to the second embodiment is provided with a controller 28 and a second measuring unit 26 which are provided in the beer tap 12. Accordingly, the second measurement unit 26 is configured to measure a quantity of beer discharged from the beer tap 12. Further, the controller 28 is configured to directly output the application specific parameters and the notification or warning signal to the display unit 32.

In an alternative embodiment, the second measurement unit 26 may be configured to determine both a remaining content stored in the beer keg 14 and a remaining content stored in the gas cylinder 18. By such configuration, the first measurement unit 24 may be omitted, while the application-specific parameter may be calculated based on the measurements carried out by the second measurement unit 24.

[0053] Figure 3 is a schematic view of a part of a medical treatment device 36 configured to provide a specific therapeutic treatment, during which a medium, i.e. a medication, is provided to a patient. The medium is stored in a storage unit 38 at high pressure and supplied via a supply line 40. Under atmospheric conditions, the medium has a gaseous state, wherein it is stored in the storage unit 38 in two phases, i.e. in a gaseous and liquid phase.

[0054] The storage unit 38 comprises a discharge valve 42 which comprises a device 22 for determining a content of the storage unit 38. Specifically, the device 22 comprises a measuring unit in the form of a pressure sensor for determining a pressure prevailing in the storage unit 38 and a controller for processing the determined pressure so as to calculate an application-specific parameter being indicative of a remaining service perform-

ance of the storage unit 38.

[0055] For the storage unit 38, the application-specific use is the provision of therapeutic treatments. Accordingly, the application-specific parameter calculated by the controller comprises a remaining quantity of treatments that can be provided with the remaining content of the medium stored in the storage unit 38. Further, the application-specific parameter comprises a remaining life expectancy. For calculating the application-specific parameter, the controller makes use of a function or a data set which correlate a measured pressure prevailing in the storage unit 38 to a number of treatments that can be provided with the remaining content stored in the storage unit 38 and a remaining life expectancy.

[0056] The controller is further configured to transmit the calculated application-specific parameter to a display device 32 for displaying it to a user of the medical treatment device 36. In this way, the device 22 for determining the content of the storage unit 38 translates and displays the remaining content determined by the measuring unit into a unit of measure that is familiar to a user. In this way, the user is enabled to accurately determine the remaining service performance of the storage unit 38.

[0057] In an alternative embodiment, a welding apparatus may be provided having a similar structural configuration as compared to the arrangement depicted in Figure 3. Accordingly, such a welding apparatus may have a storage unit 38 for storing and supplying a welding gas via a supply line 40 as required. The application-specific use of the storage unit 38 may be the production of a welding seam. In such configuration, the controller comprised in the discharge valve 42 may be configured to calculate an application-specific parameter based on a measured pressure prevailing in the storage unit 38. The application-specific parameter may comprise a total length of welding seams that can be produced by utilizing the remaining gas stored in the storage unit 38. For calculating the application-specific parameter, the controller makes use of a function or a data set which correlate a measured pressure prevailing in the storage and 38 to a total length of a welding seam that can be provided with the remaining content stored in the storage unit 38.

[0058] It will be obvious for a person skilled in the art that these embodiments and items only depict examples of a plurality of possibilities. Hence, the embodiments shown here should not be understood to form a limitation of these features and configurations. Any possible combination and configuration of the described features can be chosen according to the scope of the invention.

List of reference numerals

[0059]

10   beverage dispenser system
12   beer tap
14   beer keg
16   beer supply line

18   gas cylinder
20   gas supply line
22   device for determining a content of a storage unit
24   first measurement unit
26   second measurement unit
28   controller
30   memory device
32   display unit
34   central control unit of the beverage dispenser system
36   medical treatment device
38   storage unit
40   supply line
42   discharge valve

Claims

1. Device (22) for determining a content of a storage unit (14; 18; 38) which is configured to store and supply a medium for an application-specific use, wherein the device (22) comprises:

    - a measuring unit (24; 26) for determining a remaining content stored in the storage unit (14; 18; 38), and
    - a controller (28) for processing the determined remaining content so as to calculate an application-specific parameter being indicative of a remaining service performance of the storage unit (14; 18; 38) for the application-specific use.

2. Device according to claim 1, wherein the application-specific parameter comprises a remaining quantity of products or treatments to be provided by utilizing the remaining medium supplied from the storage unit (14; 18; 38).

3. Device according to claim 1 or 2, wherein the application-specific parameter comprises a remaining life expectancy or a remaining operational time of the storage unit (14; 18; 38).

4. Device according to any one of claims 1 to 3, wherein the controller (28) is configured to calculate the application-specific parameter in dependence on the application-specific use, in particular in dependence on a product or treatment to be provided in the application-specific use.

5. Device according to any one of claims 1 to 4, wherein the measuring unit (24) comprises a pressure sensor for measuring a pressure prevailing in the storage unit (18; 38), wherein the measuring unit (24) or the controller (28) is configured to determine the remaining content stored in the storage unit (18; 38) based on the measured pressure.

6. Device according to any one of claims 1 to 5, wherein the measuring unit (26) comprises a sensor for measuring a quantity of the medium output from the storage unit (14), wherein the measuring unit (26) or the controller (28) is configured to determine the remaining content stored in the storage unit (14) by subtracting the measured quantity from an initial content of the storage unit (14).

7. Device according to any one of claims 1 to 6, further comprising a communication unit for transmitting the calculated application-specific parameter to a display unit (32) for displaying the application-specific parameter to a user.

8. Device according to claim 7, wherein the communication unit is configure to receive storage unit-related data, in particular comprising an initial storage content, and wherein in particular the communication unit is configured to read out data from and/or to write data to a memory device (30) coupled to the storage unit (14).

9. Device according to any one of claims 1 to 8, wherein the communication unit is configured to use wireless communication techniques, in particular Bluetooth or Bluetooth Low Energy techniques, for transmitting and/or receiving data.

10. Device according to any one of claims 1 to 9, wherein the controller (28) is configured to output a notification or warning signal if the calculated application-specific parameter reaches a predefined threshold value, and wherein in particular the threshold value indicates a minimum service performance.

11. System for storing and discharging a medium comprising a storage unit (14; 18; 38) which is configured to store and supply the medium for an application-specific use and a device (22) for determining a content of the storage unit according to any one of claims 1 to 10.

12. System according to claim 11, wherein the device (22), in particular the measuring unit (24), is provided in the storage unit (18; 38), in particular a discharge valve (42) of the storage unit (38), and/or in a supply line (16) connected to the storage unit (18; 38) for discharging the medium from the storage unit (18; 38).

13. Beverage dispenser system (10) having a system according to claim 11 or 12.

14. Medical treatment device (36) having a system according to claim 11 or 12.

15. Method for determining a content of a storage unit (14; 18; 38) which is configured to store and supply a medium for an application-specific use, the method comprises the steps of:

- determining a remaining content stored in the storage unit (14; 18; 38), and
- determining an application-specific parameter being indicative of a remaining service performance of the storage unit (14; 18; 38) for the application-specific use based on the determined remaining content.
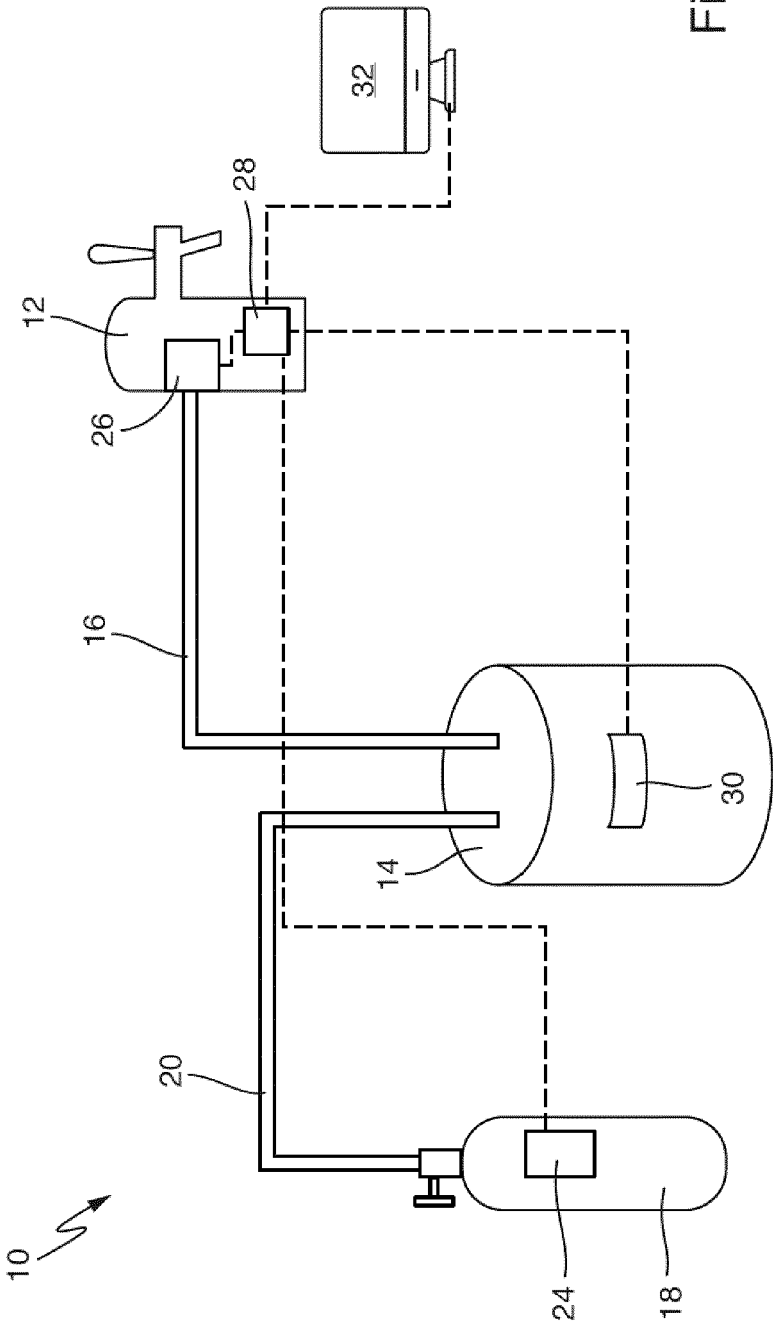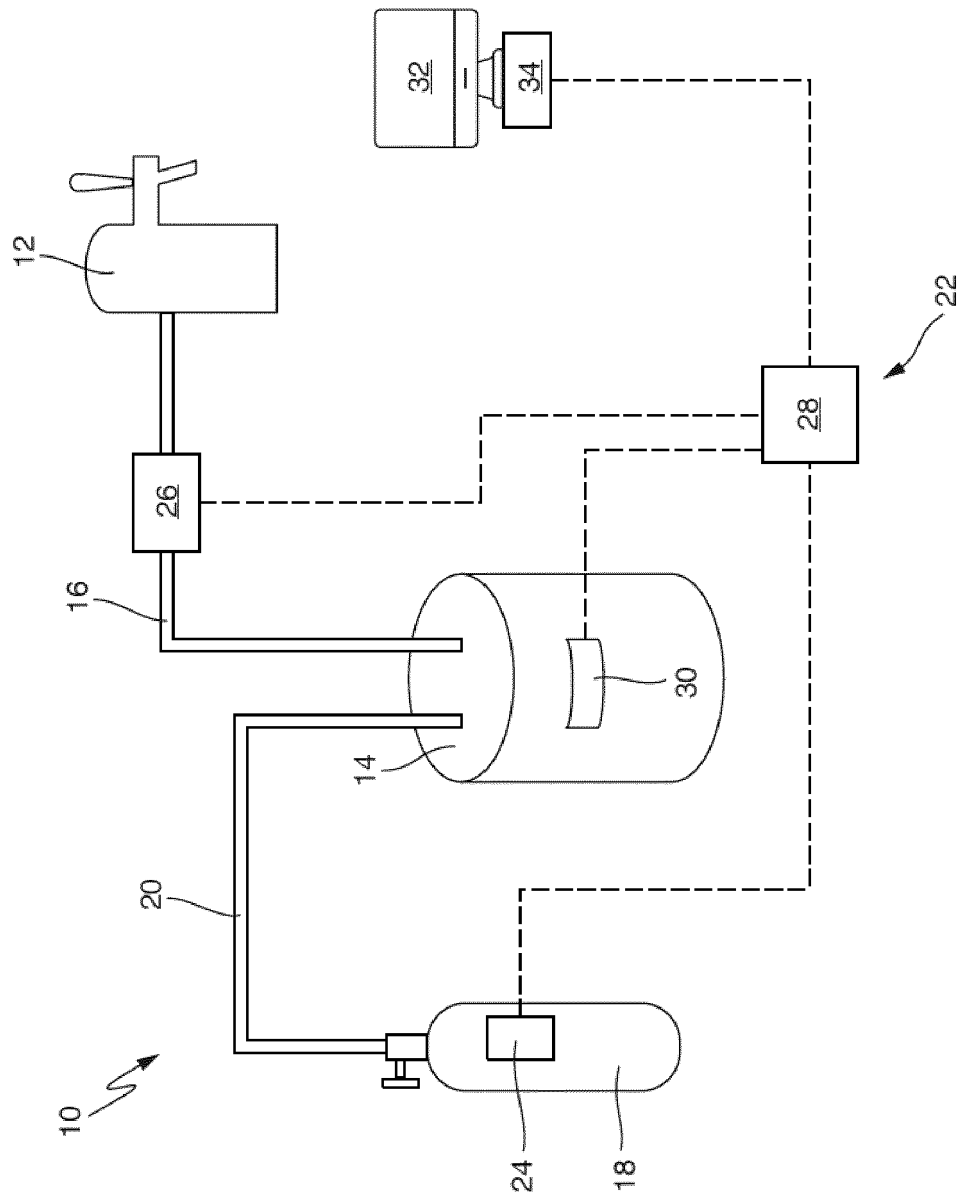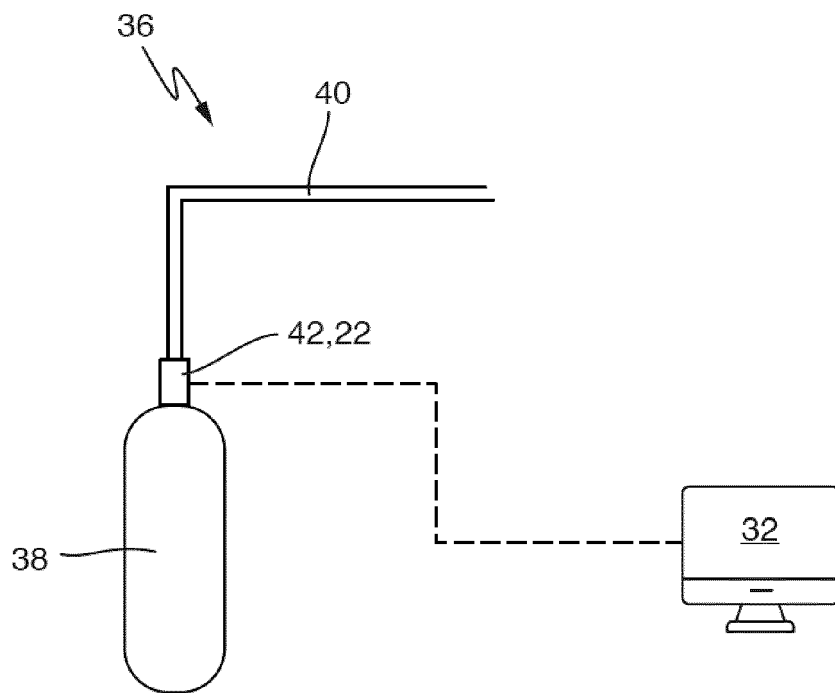
Fig. 1

Fig. 2

36

40

42,22

38

32

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number

EP 18 21 3029

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 May 2019	Papagiannis, Michail

CATEGORY OF CITED DOCUMENTS

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