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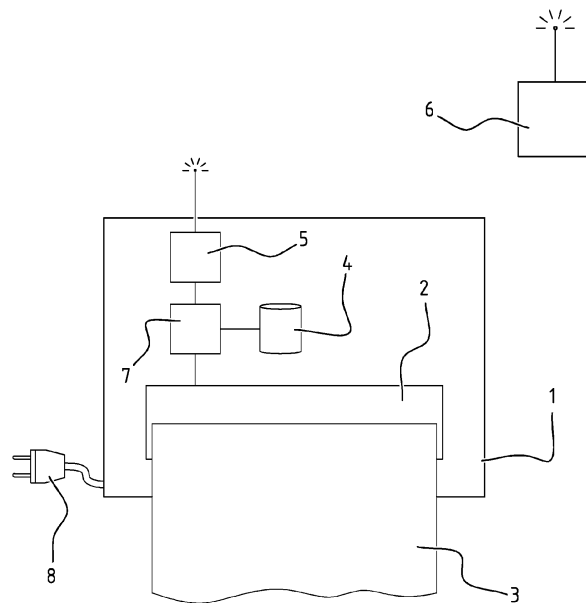
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(54) **DISPENSER**

(57) A method for operating a dispenser (1) comprising a dispensing mechanism (2) for dispensing a predetermined quantity of at least one of liquid and sheet material (3), the method comprising:

- retrieving a dispenser status;
- storing the dispenser status in a non-volatile memory (4) of the dispenser (1); and
- operating the dispensing mechanism (2) based on said dispenser status.



**FIG. 1**

## Description

**[0001]** The present invention relates to automatic dispenser devices, systems, and methods, in particular to dispensers used in public spaces and offices.

**[0002]** Automated dispenser devices are designed to dispense a predetermined quantity of liquid, for example a soap, or sheet material, for example a paper. Such dispensers are known and are frequently used for example for dispensing liquid soap in public toilets. Another example of such a dispenser is a paper-towel dispenser which dispenses paper towels in a public toilet so that hands can be dried after hand washing. Some are operated by a handle, some by pulling the paper from the dispenser, and others by automatic dispensation in response to, for example, a button or a motion sensor.

**[0003]** EP 2 873 357 A1 discloses a dispenser for dispensing a fluid, the dispenser comprising a frame, the frame enclosing a dispensing mechanism and a reservoir, and the frame is provided to enclose a refill, the dispensing mechanism being adapted for emitting discrete charges of said fluid via an outlet to an exterior of said frame, the dispensing mechanism is in fluid connection with a reservoir, the reservoir comprising connection means for fluid connection with the refill, wherein the dispensing mechanism and the reservoir are interconnected via a second frame, which second frame is removeably mounted in said frame. This document further teaches to provide a sensor in the reservoir for detecting an empty state of a refill connected to the reservoir, the dispenser further comprises notification means operationally connected to said sensor for notifying said empty state.

**[0004]** A drawback of the known dispenser is that the disclosed device is not optimized to be managed remotely.

**[0005]** It is an object of the present invention to provide a method for operating a dispenser and to provide a dispenser that is improved to be remotely managed.

**[0006]** To this end, the invention provides a method for operating a dispenser comprising a dispensing mechanism for dispensing a predetermined quantity of at least one of liquid and sheet material, the method comprising the steps of: retrieving a dispenser status; storing the dispenser status in a non-volatile memory of the dispenser; and operating a dispensing mechanism based on said dispenser status.

**[0007]** The invention is based on the insight that some actions, locally performed at the dispenser, may overrule remote instructions. This is a drawback for remotely managing dispensers. For example a remote manager may provide the dispenser with device specific operating settings. These settings may be chosen in line with a maintenance and operations strategy. In one example, a device may be switched off by the remote manager. It has been discovered that local actions, for example disconnecting and reconnecting the device from a power source, may overrule the settings from the remote manager. In other words, a device which has been switched

off by a remote manager may be switched back ON by a local user without consent of the remote manager.

**[0008]** In the method for operating a dispenser of the invention, which comprises a dispensing mechanism for dispensing a predetermined quantity of at least one of liquid and sheet material, a dispenser status is retrieved. This dispenser status is stored in a non-volatile memory of the dispenser. The dispensing mechanism is operated based on said dispenser status.

**[0009]** A non-volatile memory is a type of computer memory that can retain stored information even after power is removed. By storing the dispenser status in the non-volatile memory the local actions cannot overrule the settings from the remote manager and the remote manager keeps control over the dispenser.

**[0010]** Therefore, the dispenser is obtained that improves remote management.

**[0011]** Preferably, the step of retrieving comprises communicating with an external server via a communication module to receive the dispenser status. The communication with the external server allows a manager to control the device remotely.

**[0012]** Due to the communication with an external server, the device may be provided with a smaller non-volatile memory only provided to store the most recent or latest status. In this manner, the invention provides in a device that is less expensive in production. Additionally, the communication module allows a remote manager to set a dispenser status from a remote location.

**[0013]** Furthermore, thanks to the communication with an external server, the device should not be provided with local input/output mechanisms, which makes the dispenser simpler and therefore cheaper.

**[0014]** Preferably, the step of operating comprises disabling the dispensing mechanism when the dispenser status is a first status.

**[0015]** According to this preferred embodiment of the invention, in the first status, the dispensing mechanism is disabled. Due to the fact that the dispenser status is stored in the non-volatile memory of the dispenser, this status of the dispensing mechanism cannot be changed after, for example, turning off and on the power. This facilitates the remotely managing of the dispenser.

**[0016]** Preferably, the method according to the invention further comprises, when the dispenser is in the first status, periodically communicating with the external server via the communication module to update the dispenser status. Due to the fact that the dispenser status is periodically updated, the operational status of the dispensing mechanism can be remotely changed.

**[0017]** Preferably, wherein the step of operating comprises enabling the dispensing mechanism when the dispenser status is a second status. According to this preferred embodiment of the invention, in the second status, the dispensing mechanism is enabled. Due to the fact that the dispenser status is stored in the non-volatile memory of the dispenser, this status of the dispensing mechanism cannot be changed after, for example, turn-

ing off and on the power. This facilitates the remotely managing of the dispenser.

**[0018]** Preferably, the method according to the invention, further comprising, when the dispenser is in the second status, periodically communicating with the external server via the communication module to update the dispenser status. Due to the fact that the dispenser status is periodically updated, the operational status of the dispensing mechanism can be remotely changed.

**[0019]** It is noted that the dispenser status can be changed even if the dispenser is disabled. This is an improvement over a manual management, because when the device would be disabled manually, for example, when power would be switched off, a manual and local action would be needed to re-enable the device. Because the communication module is in disabled status still provided to communicate with the server, remote re-enablement is possible.

**[0020]** Preferably, an operational parameter is received from the external server and the step of operating the dispensing mechanism is additionally based on said operational parameter. Further preferably, the operational parameter comprises at least said predetermined quantity, a working timeslot, a working mode, a sheet length, a liquid volume, an indicator preference. Exposing the operational parameter the maintenance can be scheduled. As a result, maintenance time, and thus maintenance costs are minimized.

**[0021]** Preferably, the method further comprises the step of transmitting a work parameter to the external server via the communication module. Further preferably, the work parameter comprises at least a remaining quantity of liquid and sheet material, a charge status, an indicator status. Knowing the work parameter, the maintenance can be scheduled. As a result, maintenance time, and thus maintenance costs are minimized.

**[0022]** The invention is particularly related to liquid soap dispensers where the fluid is a liquid soap. Alternatively, the invention further relates to the devices, where the sheet material is a paper.

**[0023]** The present invention further relates to a dispenser comprising a dispensing mechanism for dispensing a predetermined quantity of at least one of liquid and sheet material. The dispenser further comprises a processor, a communication module and a non-volatile memory. The processor being operationally connected to the communication module for communicating with an external server and to the non-volatile memory for storing at least a dispenser status, wherein the processor is configured to operate the dispensing mechanism based on said dispenser status.

**[0024]** Due to the presence of the non-volatile memory, the dispenser status, stored in such type of computer memory, can be retained even after power is temporally off. It improves the remote management since local actions cannot overrule the settings from the remote manager. Preferably, the dispenser further comprises a communication module, wherein the processor is operation-

ally connected to the communication module for communicating with an external server, receiving a status, updating the dispenser status in the non-volatile memory, based on the received status. Further preferably, the processor is configured to operate the dispenser in accordance with the method described above.

**[0025]** The advantages and effects described above in relation to the method of the invention apply equally or at least similar to the device.

**[0026]** The invention will now be described in more details with respect to the drawings illustrating some preferred embodiments of the invention. In the drawings:

figure 1 shows a cross-sectional front view of a dispenser according to a first embodiment of the invention;

figure 2 shows a cross-sectional front view of a dispenser according to a second embodiment of the invention; and

figure 3 shows a flowchart illustrating the operation of dispenser according to an embodiment of the present disclosure.

**[0027]** In the drawings a same reference number has been allocated to a same or analogous element.

**[0028]** Figure 1 shows a dispenser 1 according to an embodiment of the invention.

**[0029]** The dispenser 1 comprises a dispensing mechanism 2 for dispensing a predetermined quantity of sheet material 3. The operation of the dispensing mechanism 2 is controlled by a processor 7 connected to a non-volatile memory 4 and a communication module 5. The communication module 5 is adapted for communicating with an external server 6.

**[0030]** In one embodiment shown in figure 1 the dispenser is a dispenser 1 for dispensing sheet material. The sheet material may be dispensed from a roll, for instance a paper roll. A towel roll or a linen roll can also be provided as alternative to a paper roll. The dispensing mechanism 2 can separate one or more sheet products from the roll by actively or passively cutting the roll into discrete parts. Alternatively, the dispenser comprises, instead of a continuous roll, a pile of discrete sheets and is adapted to dispense one or more paper sheets. The dispensing mechanism 2 is provided for the purpose of driving a predetermined quantity of the paper to the outside, for example, via an internal guide roller over which the paper of filling 3 is guided so as to thus move a predetermined quantity of the paper to the outside.

**[0031]** The driving of the dispensing mechanism 2 can be initiated by operating a button. This button is placed on an outer side of dispenser 1 such that a user can operate the button in simple manner. Alternatively or additionally, a proximity sensor can also be provided such that a user can operate dispensing mechanism 2 by moving into the vicinity of proximity sensor. The button and/or the sensor is preferably electrically connected to the dispensing mechanism 2 via the processor 7.

**[0032]** The non-volatile memory 4 is provided to store a dispenser status, preferably at least the most recent or latest status. Due to the fact that the most recent dispenser status is stored in the non-volatile memory 4, the memory may be small. As explained above, a non-volatile memory has the advantage that powering off does not erase the memory. Therefore, data stored in the non-volatile memory can be stored over time independent of power changes.

**[0033]** Furthermore, the information can be encrypted before a storing in the non-volatile memory 4. The encryption ensures that only the remote manager, which has access rights, can change this information, for example, the dispenser status, remotely.

**[0034]** According to an embodiment of the invention, the dispenser status stored in the non-volatile memory can distinguish between at least a first dispenser status and a second dispenser status. The first dispenser status may relate to an inactive or OFF status of the dispenser. The second dispenser status may relate to an active or ON status of the dispenser. Intermediate statuses where the operational activities of the dispenser are limited are also possible. The processor, described hereunder, is adapted to retrieve the dispenser status from the non-volatile memory before operating the dispenser. This allows the processor to operate the dispenser in accordance with the dispenser status. In other words, in an embodiment, the processor only operates the dispenser when it is in the active or ON status.

**[0035]** Processor 7 is operationally connected to the non-volatile memory 4 and is configured to operate the dispensing mechanism 2 based on said dispenser status. When the dispenser status is the first status, processor 7 is provided for sending a stop signal to the dispensing mechanism 2 or for controlling the blocking element such that the blocking element blocks the dispensing mechanism 2. In another embodiment, when the dispenser status is the first status, the processor 7 withholds from sending an activation signal to the dispensing mechanism 2 so that the dispensing mechanism is not operated without actively blocking or sending a stop signal.

**[0036]** When the dispenser status is the second status, processor 7 is provided for sending a start signal to the dispensing mechanism 2 or for controlling the blocking element such that the blocking element unlocks the dispensing mechanism 2 accordingly to the dispenser status stored in the non-volatile memory 4. In this status, the dispensing mechanism 2 is operated and can be used.

**[0037]** The dispenser 1 further comprises a communication module 5. The communication module 5 wirelessly communicates with an external server 6. The communication module 5 may retrieve data from the server 6 and may transmit data to the server for storage at and/or further processing by the server 6. The external server 6 can be accessed by a remote manager.

**[0038]** The processor 7 is operationally connected to the communication module 5 for communicating with the external server 6 for the purpose of receiving or updating

a status of the dispenser 1. Additionally, the communication module 5 may also be used by the processor to communicate one or more of an operational parameter and a work parameter, both further described hereunder.

5 The processor 7 can receive the status, send the status, update the dispenser status in the non-volatile memory 4, based on the received status. The processor 7 periodically communicates with the external server 6 via the communication module 5 to receive the update of the dispenser status. Alternatively or additionally, the processor communicates to the server upon receiving a dispensing request from a user via the button or the sensor.

10 **[0039]** Processor 7 is provided further for the purpose of comparing the latest dispenser status stored in the non-volatile memory 4 with the dispenser status received from the external server 6 via the communication module 5. When processor 7 establishes that the dispenser status received from the external server 6 via the communication module 5 does not correspond to the latest dispenser status stored in the non-volatile memory 4, processor 7 writes the received dispenser status into the non-volatile memory 4.

15 **[0040]** The non-volatile memory 4 can further store an operational parameter received from the external server 6 and/or a work parameter that determines a current state of the device 1. Alternatively, the operational parameter and/or the work parameter is stored in a separate memory which may be a volatile memory (not shown).

20 **[0041]** An operational parameter is a parameter that defines a working property or setting of the dispenser. The operational parameter preferably includes at least one of a predetermined quantity, a working timeslot, a working mode, a sheet length, a liquid volume, an indicator preference.

25 **[0042]** According to an embodiment of the invention, the operational parameter can be the predetermined quantity of a single discrete charge of sheet material 3. For example, the remote manager can determine the length or distance of the sheet of paper which can be moved to the outside by the dispensing mechanism 2, when the dispensing mechanism 2 is operated by a single push of a button or, alternatively or additionally, by a one-time movement in close proximity to the proximity sensor. Such definition of the predetermined quantity is relevant when the dispenser comprises a roll of paper. Alternatively, the remote manager can determine the quantity of one discrete charge of liquid ejected after one dispensing request from a user via the button or the sensor in a liquid dispenser 1.

30 **[0043]** A further operational parameter, which can be determined by the remote manager, is a working timeslot. For example, the device 1 can be operated by the processor 7 accordingly within a predetermined time schedule. The working hours and days can be scheduled.

35 **[0044]** A further operational parameter, which can be determined by the remote manager, is a working mode. For example, in the alternative embodiment shown in fig. 2, the liquid filling can be dispensed by the dispensing

mechanism 2 as foam or liquid or spray. The latter are considered modes of a dispenser. The nozzle may be set to dispense the soap in a predetermined mode selected from foam, liquid or spray.

**[0045]** A further operational parameter, which can be determined by the remote manager, is a liquid volume for the alternative embodiment shown in fig. 2. For example, the liquid volume of one shot can be determined for a liquid dispenser 1.

**[0046]** A further operational parameter, which can be determined by the remote manager, is an indicator preference. For example, when the remaining amount of liquid and sheet material 3 is less than a predetermined percentage of the original amount, the device 1 can send a notification to the external server 6. Said predetermined percentage of the original amount is the indicator preference. Alternatively, the notification can be sent to the external server 6, when the battery state of charge is less than a predetermined value or other disturbances in the operation of device 1, such as, for example, a paper jam. The predetermined value of the battery state of charge is the indicator preference.

**[0047]** One operational parameter can be easily combined with another operational parameter in order to improve the remote management of the device 1.

**[0048]** A current state of the device 1 can be translated into a work parameter. The work parameter comprises for example a remaining quantity of liquid and sheet material 3, a charge status, an indicator status.

**[0049]** According to an embodiment of the invention, the work parameter includes a remaining quantity of liquid and sheet material 3.

**[0050]** According to a further embodiment of the invention, the work parameter includes a current state of the device 1 representative of a charge status.

**[0051]** According to a further embodiment of the invention, the work parameter includes an indicator status. For example, when one disturbance in the operation of device 1, such as, for example, low remaining quantity of liquid and sheet material 3, low battery state of charge or a paper jam, is recognized, the indicator status can change which may be translated into a work parameter and be sent to the external server 6.

**[0052]** Processor 7 is provided further for the purpose of controlling the current state of the device 1, which can be determined by the work parameter, such as a remaining quantity of liquid and sheet material 3, a charge status, an indicator status. Processor 7 is provided further for the purpose of comparing the latest work parameter stored in the non-volatile memory 4 with the obtained work parameter. When processor 7 establishes that the obtained work parameter does not correspond to the latest work parameter stored in the non-volatile memory 4, processor 7 sends the obtained work parameter to the non-volatile memory 4 and to the external server 6 via the communication module 5. The remote manager can be notified via the external server 6 about the current state of the device and a maintenance of the device 1

can be scheduled.

**[0053]** The dispenser can be powered by direct connection to the electricity grid via a power source connection 8. Alternatively, the dispenser 1 can be powered by any suitable type and sizes of batteries, for example, selected from the group consisting of alkaline, NiMH, AA, AAA, C and D.

**[0054]** In the second embodiment shown in figure 2 the dispenser is a liquid dispenser 1. The dispensing mechanism 2 can be a pump (fluid to fluid), can be a spray or atomizer (liquid to small liquid particles or mist) or can be a foamer (liquid to foam). In each case, the dispensing mechanism 2 is provided with a liquid at an input side, and discrete charges of the liquid are emitted (whether or not the emitted liquid has been transformed into foam or mist).

**[0055]** The device of figure 2 is similar in use and structure as the device described above in relation to figure 1. The device of figure 1 is a dispenser for sheet material whereas the device of figure 2 is a dispenser for a liquid.

**[0056]** Figure 3 is a flowchart illustrating the operation of dispenser 1 comprising a dispensing mechanism 2 for dispensing a predetermined quantity of at least one of liquid and sheet material 3 according to an embodiment of the present disclosure.

**[0057]** Referring to figure 3, the remote manager installs specific operating settings for the dispenser 1. Said specific operating settings characterize the operation of the device and comprise at least a dispenser status and optionally also at least one operational parameter. The dispenser status can be a first dispenser status or a second dispenser status. Alternatively, in case of the first use, the non-volatile memory 4 is empty and the processor retrieves the dispenser status from a remote server via the communication module and write the received dispenser status into the non-volatile memory 4.

**[0058]** During operation of the device, the processor 7 retrieves the dispenser status from the external server 6 via the communication module 5. The processor 7 compares the latest dispenser status stored in the non-volatile memory 4 with the received dispenser status, if the dispenser status is already stored in the non-volatile memory 4. When processor 7 establishes that the dispenser status received from the external server 6 via the communication module 5 does not correspond to the latest dispenser status stored in the non-volatile memory 4, processor 7 sends the received dispenser status to the non-volatile memory 4.

**[0059]** According to an embodiment of the invention, the dispenser status stored in the non-volatile memory can be chosen from at least a first dispenser status and a second dispenser status. The first dispenser status may relate to an inactive or OFF status of the dispenser. The second dispenser status may relate to an active or ON status of the dispenser. Intermediate statuses where the operational activities of the dispenser are limited are also possible. The processor, described hereunder, is adapted to retrieve the dispenser status from the non-volatile

memory before operating the dispenser. This allows the processor to operate the dispenser in accordance with the dispenser status. In other words, in an embodiment, the processor only operates the dispenser when it is in the active or ON status.

**[0060]** When the received dispenser status is the first dispenser status, the processor 7 operates the dispensing mechanism 2 in order to disable the dispensing mechanism 2. The processor 7 sends a stop signal to the dispensing mechanism or blocks dispensing mechanism 2 by controlling a blocking element. In another embodiment, when the dispenser status is the first status, the processor 7 withholds from sending an activation signal to the dispensing mechanism 2 so that the dispensing mechanism is not operated without actively blocking or sending a stop signal.

**[0061]** When the received dispenser status is the second dispenser status, the processor 7 operates the dispensing mechanism 2 in order to enable the dispensing mechanism 2. The processor 7 sends a start signal to the dispensing mechanism or unlocks the dispensing mechanism 2 by controlling a blocking element (not shown). When the dispenser 1 is in the second status, the processor 7 periodically communicates with the external server 6 via the communication module 5 to receive the update of the dispenser status. In this status, the dispensing mechanism 2 is operated and can be used.

**[0062]** The dispensing mechanism 2 can be operated by a button placed on an outer side of dispenser 1 such that a user can operate the button in simple manner. Alternatively or additionally, a proximity sensor can also be provided such that a user can operate dispensing mechanism 2 by moving into the vicinity of proximity sensor. The button and/or the sensor is preferably electrically connected to the dispensing mechanism 2 via the processor 7.

**[0063]** When the processor 7 indicates that the button was pushed by the user, it accesses the non-volatile memory 4 to request the latest dispenser status and optionally also the operational parameter stored in the non-volatile memory 4. The dispenser status handled as explained above. Only when the dispenser status is in the ON or enabled state, further steps are executed. When the processor 7 received the operational parameter, such as predetermined quantity of liquid and sheet material 3, a working timeslot, a working mode, a sheet length, a liquid volume, an indicator preference, processor 7 controls the current state of the device 1. The processor 7 operates the dispensing mechanism 2 accordingly to the received operational parameter.

**[0064]** During operation and/or after operation, the work parameter, such as a remaining quantity of liquid and sheet material 3, a charge status, an indicator status, may be determined. When the processor 7 senses or determines changes in the work parameter, the processor 7 sends the determined work parameter to a memory, for example to the non-volatile memory 4, and preferably also to the external server 6 via the communication mod-

ule 5. The remote manager can be notified via the external server 6 about the current state of the device and a maintenance of the device 1 can be scheduled.

**[0065]** The skilled person will appreciate on the basis of the above description that the invention can be embodied in different ways and on the basis of different principles. The invention is not limited to the above described embodiments. The above described embodiments and the figures are purely illustrative and serve only to increase understanding of the invention. The invention will not therefore be limited to the embodiments described herein, but is defined in the claims.

## 15 Claims

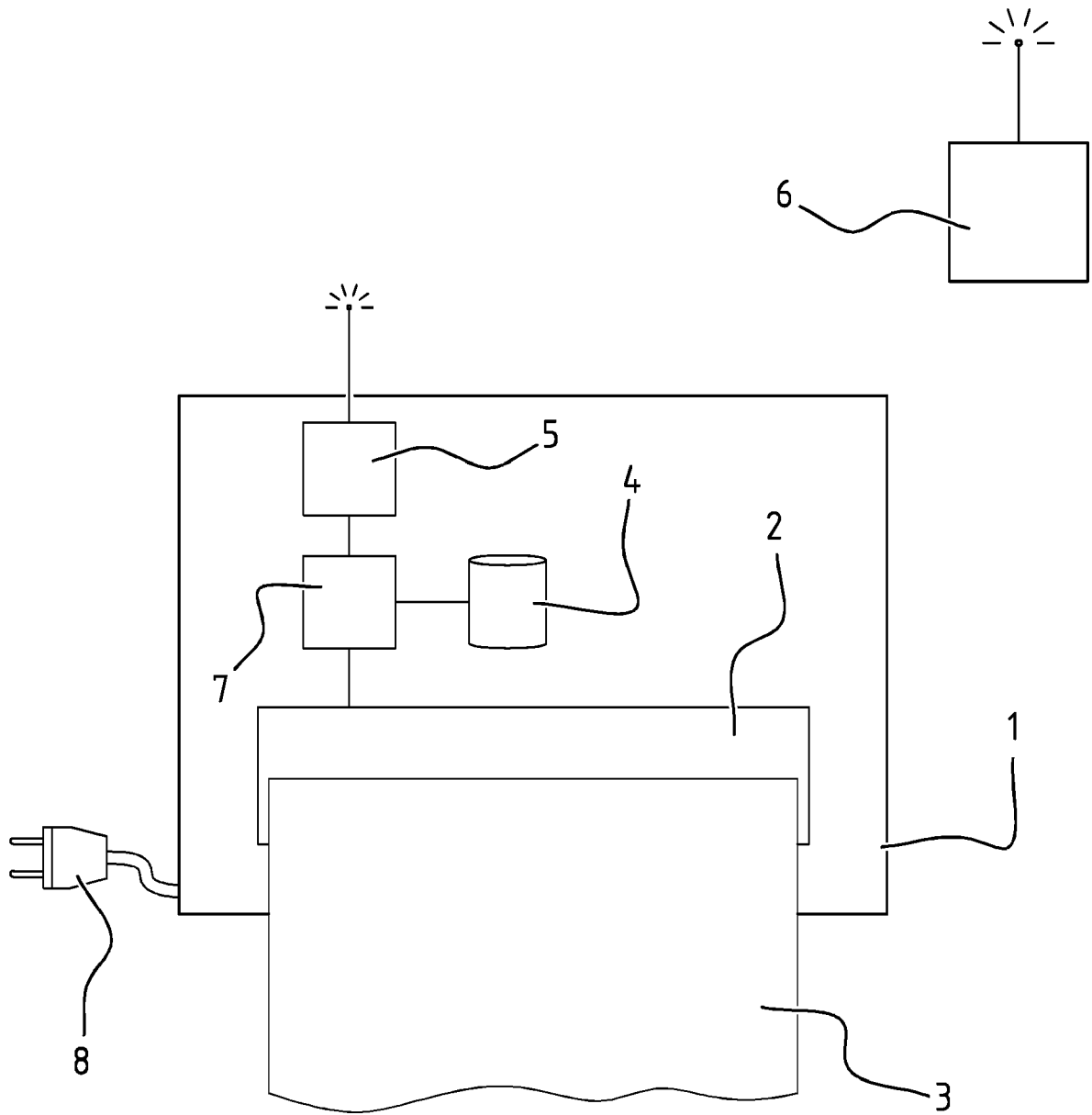
1. A method for operating a dispenser (1) comprising a dispensing mechanism (2) for dispensing a predetermined quantity of at least one of liquid and sheet material (3), the method comprising:
  - retrieving a dispenser status;
  - storing the dispenser status in a non-volatile memory (4) of the dispenser (1); and
  - operating the dispensing mechanism (2) based on said dispenser status.
2. The method according to claim 1, wherein the step of retrieving comprises communicating with an external server (6) via a communication module (5) to receive the dispenser status.
3. The method according to claim 1, wherein the step of operating comprises disabling the dispensing mechanism (2) when the dispenser status is a first status.
4. The method according to claim 2 and 3, further comprising, when the dispenser (1) is in the first status, periodically communicating with the external server (6) via the communication module (5) to update the dispenser status.
5. The method according to any one of the previous claims, wherein the step of operating comprises enabling the dispensing mechanism (2) when the dispenser status is a second status.
6. The method according to claim 2 and 5, further comprising, when the dispenser (1) is in the second status, periodically communicating with the external server (6) via the communication module (5) to update the dispenser status.
7. The method according to any one of the previous claims, wherein an operational parameter is received from the external server (6) and wherein the step of operating the dispensing mechanism (2) is

additionally based on said operational parameter.

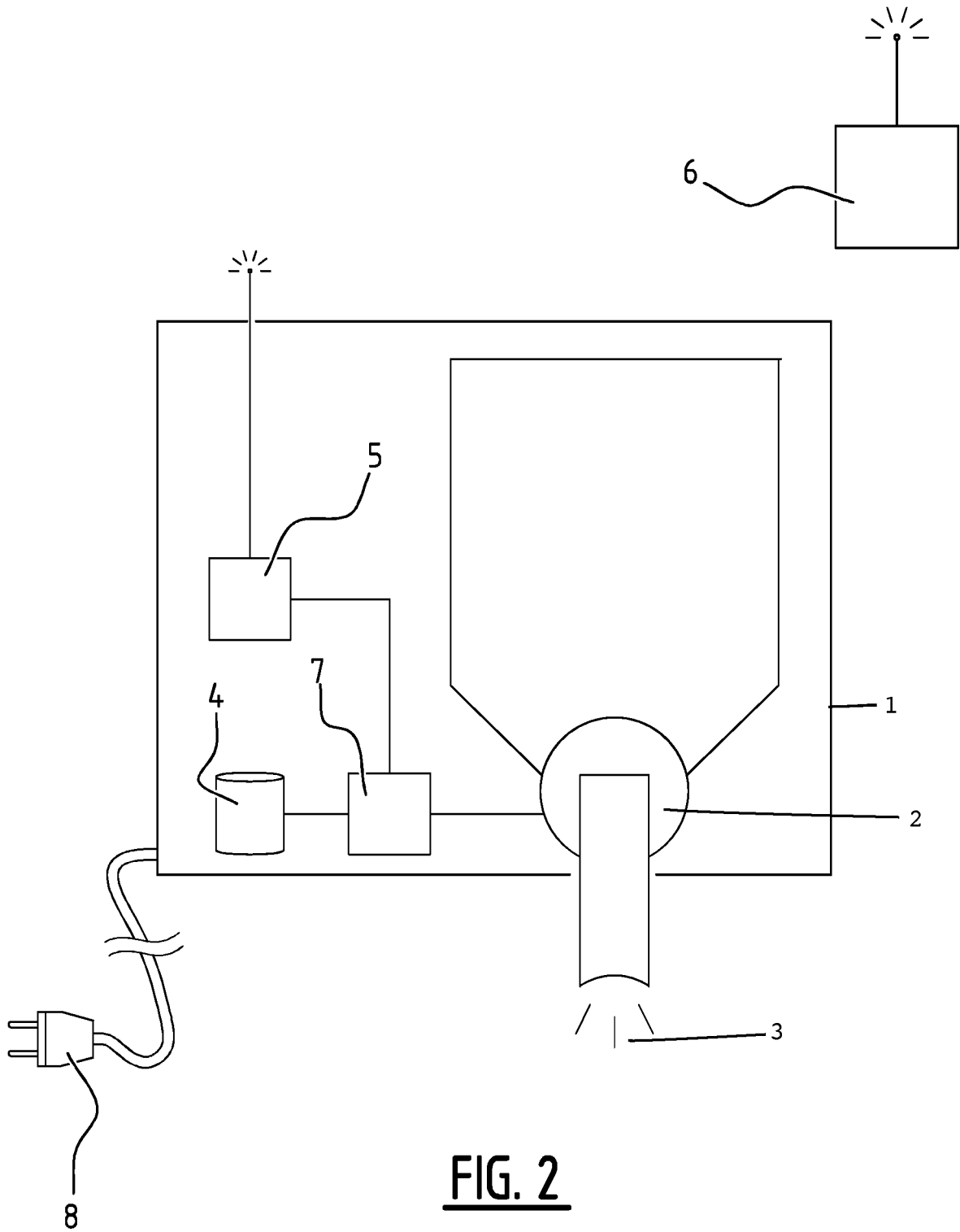
8. The method according to any one of the previous claims, wherein the operational parameter comprises at least said predetermined quantity, a working timeslot, a working mode, a sheet length, a liquid volume, an indicator preference. 5
9. The method according to any one of the previous claims, wherein the method further comprises the step of transmitting a work parameter to the external server (6) via the communication module (5). 10
10. The method according to any one of the previous claims, wherein the work parameter comprises at least a remaining quantity of liquid and sheet material (3), a charge status, an indicator status. 15
11. The method according to claim 1, wherein the liquid material is a liquid soap. 20
12. The method according to claim 1, wherein the sheet material is a paper.
13. A dispenser (1) comprising a dispensing mechanism (2) for dispensing a predetermined quantity of at least one of liquid and sheet material (3), the dispenser (1) further comprising a processor (7) and a non-volatile memory (4), the processor (7) being operationally connected to the non-volatile memory (4) for storing at least a dispenser status, wherein the processor (7) is configured to operate the dispensing mechanism (2) based on said dispenser status. 25  
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14. The dispenser (1) according to any one of the previous claims, further comprising a communication module (5), wherein the processor (7) being operationally connected to the communication module (5) for communicating with an external server (6), receiving a status, updating the dispenser status in the non-volatile memory (4), based on the received status. 40
15. Dispenser (1) according the claim 13 or 14, wherein the processor (7) is configured to operate the dispenser (1) in accordance with the method of any one of claim 1 to 12. 45

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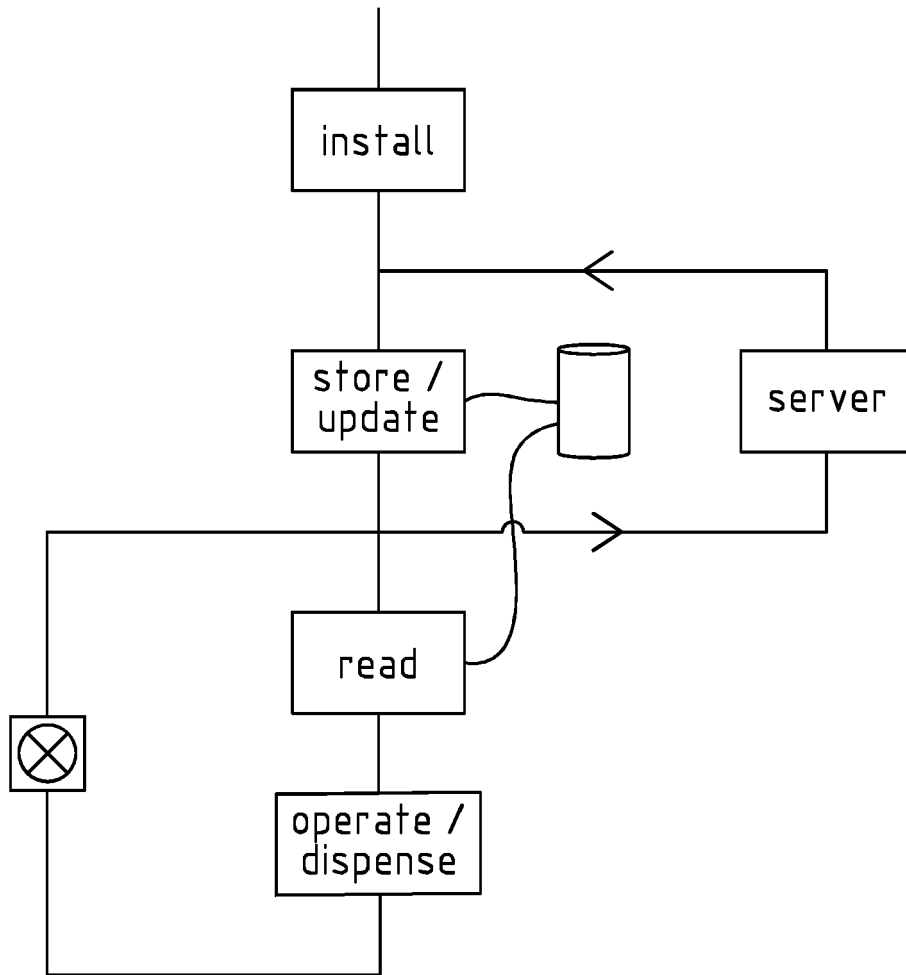
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**FIG. 1**



**FIG. 2**



**FIG. 3**



EUROPEAN SEARCH REPORT

Application Number  
EP 21 16 7906

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 2010/282772 A1 (IONIDIS GEORGIOS [CH]) 11 November 2010 (2010-11-11) * paragraph [0034] *	1-15	
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			TECHNICAL FIELDS SEARCHED (IPC)
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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
The Hague		26 August 2021	Demeester, Jan
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

EPO FORM 1503 03.02 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 21 16 7906

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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