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(54) **SYSTEM FOR EMPTYING AND CLEANING A PORTABLE WASTE HOLDING DEVICE AND RELATED METHOD**

(57) A system 10 for emptying and cleaning a portable waste holding device, in particular a portable waste holding tank 12, the system includes a housing 26, a controller 34, a carriage 36 mounted within the housing 26 and operative to receive the portable waste holding device, in particular the portable waste holding tank 12, the carriage 36 being rotatable relative to the housing 26 between an initial position and an emptying position for

emptying the portable waste holding device, in particular the holding tank 12 through an emptying pipe 20. A water source supplies water to an inside of the portable waste holding device, in particular the portable waste holding tank 12 through the emptying pipe 20 to rinse the portable waste holding device, in particular the portable waste holding tank 12.

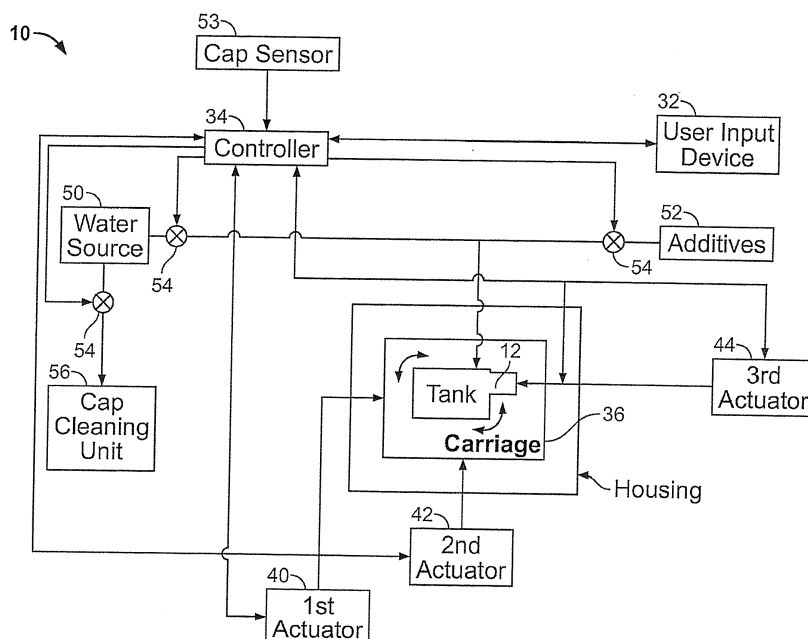


FIG. 1

Description

FIELD

[0001] The present disclosure generally relates to portable waste holding devices. More particularly, the present disclosure relates to a system for emptying and cleaning a portable waste holding device such as portable waste holding tank for a caravan or a portable toilet. The present disclosure also relates to a method for emptying and cleaning such a portable waste holding device.

BACKGROUND

[0002] This section provides background information related to the present disclosure which is not necessarily prior art.

[0003] Vehicles, including but not limited to recreational vehicles ("RVs" in the United States and "Caravans" in Europe), tractor trailers, airplanes, boats, trains, and the like, often incorporate sanitation systems for the comfort and convenience of the occupants. It is necessary to periodically empty such sanitation system. It is generally known in the pertinent art to provide a portable waste transfer tank for transfer waste from an on-board sanitation system to a disposal site.

[0004] The periodic emptying and cleaning of portable waste holding tanks presents challenges to the end user. Similar challenges are presented with the periodic emptying and cleaning of portable toilets. A continuous need in the relevant art remains.

SUMMARY

[0005] In accordance with one particular aspect, the present teachings provide a system for emptying and cleaning a portable waste holding device, such as a portable waste holding tank. The system includes a housing, a controller, a carriage mounted within the housing and operative to receive the portable waste holding tank. The carriage is rotatable relative to the housing between an initial position and an emptying position for emptying the holding tank through an emptying pipe. A water source supplies water to an inside of the portable waste holding tank through the emptying pipe to rinse the portable waste holding tank.

[0006] In accordance with another particular aspect, the present teachings provide a method for emptying and cleaning a portable waste holding device such as a portable waste holding tank. The method includes rotating the holding tank from an initial position to an emptying position to empty the holding tank through an emptying pipe. The method additionally includes supplying a source of water to an inside of the portable waste holding tank through the emptying pipe.

[0007] Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended

for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

[0008] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

Figure 1 is a schematic view illustrating a system for emptying and cleaning a portable waste holding device such as a portable waste holding tank in accordance with the present teachings.

Figure 2 is a simplified side view of an exemplary waste holding tank for use with the system in accordance with the present teachings.

Figure 3 is a simplified top view of the exemplary waste holding tank of Figure 2.

Figure 4 is a simplified side view of the system for emptying and cleaning a portable waste holding tank in accordance with the present teachings.

Figure 5 is a simplified front view of the system for emptying and cleaning a portable waste holding tank in accordance with the present teachings, the system shown with a door in an open position and in receipt of the exemplary waste holding tank within the housing, the cap removed and secured onto a separate cap cleaning unit, and a holding tank clamp in an unclamped position.

Figure 6 is a simplified front view similar to Figure 5, the holding tank clamp shown in a clamped position. Figure 7 a simplified side front similar to Figure 6, a carriage of the system for emptying and cleaning a portable waste holding tank shown rotated through approximately 110 degrees for purposes of emptying the exemplary waste holding tank.

Figure 8 is another simplified front view similar to Figure 5, a nozzle shown inserted into the pour spout of the holding tank.

[0009] Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

DESCRIPTION OF VARIOUS ASPECTS

[0010] Example embodiment(s) will now be described more fully with reference to the accompanying drawings.

[0011] Example embodiment(s) are provided so that this disclosure will be thorough, and will fully convey the scope to those who are skilled in the art. Numerous specific details are set forth such as examples of specific components, devices, and methods, to provide a thorough understanding of embodiments of the present disclosure. It will be apparent to those skilled in the art that specific details need not be employed, that example embodiments may be embodied in many different forms and

that neither should be construed to limit the scope of the disclosure. In some example embodiments, well-known processes, well-known device structures, and well-known technologies may not be described in detail.

[0012] The present teachings are particularly directed to a system for emptying and cleaning a portable waste holding device. The system is generally identified in the drawings at reference character 10. The system 10 may be particularly adapted to facilitate emptying and cleaning a portable waste holding device in the form of a portable waste holding tank 12. The system 10 may also be particularly adapted to facilitate refilling of the portable waste holding tank 12 with suitable additives. Figure 1 schematically illustrates the various features of the system 10 of the present teachings.

[0013] The drawings illustrate the system 10 of the present teachings operatively associated with an exemplary portable waste holding tank 12. The exemplary holding tank 12 is shown further in Figures 2 and 3. Suitable waste holding tanks are manufactured and sold by Thetford Corporation. Furthermore, such waste holding tanks are shown and described in commonly assigned U.S. Patent Nos. 6,189,161; 7,293,298 and 8,225,819. U.S. Patent Nos. 6,189,161; 7,293,298 and 8,225,819 are incorporated by reference as if fully set forth herein. It will be appreciated, however, that the system of the present teachings may be adapted to interface with any other type of portable waste holding tank.

[0014] Briefly, the portable waste holding tank 12 will be understood to conventionally include a housing 14, an opening knob 16, a sliding cover 18, an emptying pipe 20 having a cap 22, and a blade opening 24. The emptying pipe 20 is in fluid communication with an interior of the housing 14 and rotatable relative to the housing 14. The portable waste holding tank 12 may have a length and a width. The length may be greater than the width.

[0015] Figures 4-8 further illustrate the various features and operation of the system of the present teachings. The system 10 is shown to generally include a housing 26. The housing 26 may carry a door 28 that is movable relative to the housing 26 between an open position and a closed position. The door 28 provides access to an opening 30 in the housing 26. The open position is shown in Figure 5, for example. The closed position is shown in Figure 4, for example. In Figures 6-8, the system 10 is shown without the door 28 for purposes of illustration.

[0016] A user input device 32 for user input may be carried on an exterior of the housing 26. In one application, the device 32 may be a touch screen operatively connected to a controller 34 of the system 10 in a known manner. Other applications within the scope of the present teachings may alternatively include a variety of buttons and/or switches on a front face of the housing 26 for user input.

[0017] The system 10 is further shown to generally include a carriage 36. The carriage 36 is positioned inside the housing 26 and may be closed off from outside inter-

ference (e.g. by the movable door 28. The carriage 36 may be rotatable relative to the housing 26. The carriage 36 is adapted to receive the portable waste holding tank 12 upon introduction of the portable waste holding tank 12 into the housing 26.

[0018] The controller 34 may be operative to control one or more actuators for controlling emptying and automated of the portable waste holding tank 12. As illustrated, the one or more actuators may include a first actuator 40, a second actuator 42, and a third actuator 44. The first actuator 40 may be a clamp actuator for selectively moving a tank clamp 46 between an unclamped position and a clamped position. The second actuator may be a carriage actuator 42 for rotating the carriage 36 relative to the housing 26. The third actuator 44 may be a hose or nozzle actuator 44 for introducing a nozzle 49 into the emptying pipe or pour spout 20 of the holding tank 12.

[0019] The system 10 is shown to still further include a water source 50 and an additive source 52 for respectively delivering water and additives to the portable waste holding tank 12. An included pump may deliver pressurized water to the system to improve cleaning results through the nozzle 49. A dosing system including flow meters and/or dosing pumps may be employed to ensure that a correct dosing of additives to be delivered to the portable waste holding tank 12. The water and additive sources 50 and 52 may be put into selective communication with the interior of the portable waste holding tank 12. Suitable valves 54 may be provided and controlled by the controller 34 based on input received from a user.

[0020] The system 10 of the present teachings may further include a cap cleaning unit 56. The cap cleaning unit 56 may be located within the housing 26. The cap cleaning unit 56 may be controlled by the controller 34 and operative to deliver pressurized water from the water source 50 through one of the valves 54.

[0021] With particular reference to Figure 4, the system 10 is shown prior to insertion of the holding tank 12 into the housing 26. In this dormant or non-use state, the door 28 may be closed. While not illustrated, the housing 26 may be associated with ramp for slidably supporting the portable waste holding tank 12 upon insertion into and receipt from the housing 26. Such a ramp may be horizontal or may be tilted downwards towards the housing 26 to avoid spillage of contents of the portable waste holding tank 12.

[0022] With particular reference to Figure 5, the door 28 of the system 10 is shown in an open position and the portable waste holding tank 12 is positioned within the housing 26 and on the carriage 36. The waste holding tank 12 is positioned such that its length extends across the opening in the housing 26 and its width extends into the opening. The emptying pipe 20 of the holding tank 12 is rotated to axially aligned with the nozzle 49. The cap 22 of the pipe 20 has been removed and is shown operatively engaged with the cap cleaning unit 56. In this regard, the cap 22 may be threadably received by the

cap cleaning unit 56. It will be understood that in addition to cleaning of the cap 22, the cap cleaning unit 56 may include a sensor to indicate receipt of the cap 22 by the cap cleaning unit 56.

[0023] In Figure 5, the tank clamp 46 is shown in an unclamped position. The tank clamp 46 may be carried by the carriage 36 and may be operative to secure the tank 12 to the carriage 36. In one embodiment, the tank clamp 46 may be generally L-shaped having an upwardly or vertically extending leg and a horizontal leg.

[0024] With particular reference to Figure 6, the tank clamp 46 has been moved to the clamped position. Upon movement of the tank clamp 46 from the unclamped position to the clamped position, the horizontal leg may engage the holding tank 12 to secure the holding tank 12 to the carriage 36. Movement of the tank clamp 46 may be controlled by the controller 34 with the first actuator 40. Alternatively, the tank clamp 46 may be designed for manual movement between the unclamped and clamped positions. In such an alternative embodiment, the system 10 may incorporate a sensor for delivering a signal to the controller 34 such that the controller 34 is not operable to run a cleaning cycle without the clamp 46 in the clamped position.

[0025] With particular reference to Figure 7, the portable waste holding tank 12 is shown in the housing 26 and on the rotatable carriage 36. The rotatable carriage 36 has been rotated through approximately 110° to an emptying position. In such a position, all or most of the contents within the holding tank 12 may be emptied from the holding tank 12, through the emptying pipe 20, solely under the force of gravity. The carriage 36 may be connected to a drive arrangement (not specifically shown) through a control arm 58 (see Figure 7, for example).

[0026] Prior to the controller 34 of the system 10 initiating a cleaning cycle, the cap 22 of the holding tank 12 used to close the nozzle 20 must be removed and registered with the cap cleaning unit 56. As particularly shown in the figures, the cap 22 may be removed and attached to the separate cap cleaning unit 56 inside the housing 26 so as to activate a sensor. When the cap 22 is received in place, the sensor is activated and sends a corresponding signal to the controller 34. At this point, the controller 34 may execute cleaning steps based on input received from the user through the user input device 32. In a first general step, the controller 34 may function to move the door 28 to its closed position. Alternatively, the door 28 may be manually moved to the closed position. In either event, the system 10 may be designed such that continuation of the cycle by the system 10 requires that the tank clamp 46 is in the clamped position, the door 28 is closed and the cap 22 is registered with the cooperating fitting of the cap cleaning unit 56 carried by the housing 26.

[0027] The system 10 may be adapted for use with various types of portable waste holding tanks 12. As such, the system 10 may need to be controlled differently to accommodate different portable waste holding tanks

12. In certain embodiments, the system 10 may include a camera to detect the type of portable waste holding tank 12. Alternatively, the system 10 may include one or more sensors (not shown) for detecting the type of portable waste holding tank 12 or the user interface may allow the user to input the type of portable waste holding tank 12.

[0028] With the door 28 closed, the cap 22 registered with the cap cleaning unit 56 and the tank clamp 46 in the clamped position, the carriage 36 may be rotated from an initial position (shown in Figures 5, 6 and 8, for example) to an emptying position (shown in Figure 7, for example). In this regard, the carriage 36 may be rotated through approximately 110° from the initial position to the emptying position. In other applications, it is sufficient that the holding tank 12 is rotated to empty a desired amount of the contents of the holding tank 12.

[0029] In certain cleaning cycles, the system 10 may operate such that the controller 34 articulates the carriage 36 from the initial position to the emptying position prior to the introduction of any rinsing water. In this manner, the contents of the holding tank 12 may be emptied prior to rinsing and further cleaning of the holding tank 12. In the emptying position, the contents of the holding tank 12 may be received by a funnel 60. The funnel 60 may drain to a holding tank (not shown) for periodic emptying. Alternatively, the original contents and rinse water may be directly received by a drain for a sewer.

[0030] The source of water 50 and the source of additives 52 may be placed in fluid communication with an interior of the portable waste holding tank 12 through one or more hoses. The water 50 and additives 52 may be introduced into the holding tank 12 through the emptying pipe 20. As illustrated, one hose may terminate at the nozzle 49. The nozzle 49 may be controlled by the controller 34 for movement between a retracted position and an extended position. The retracted position of the nozzle 49 is shown in Figures 5, 6 and 7, for example. The extended position of the nozzle 49 is shown in Figure 8, for example. In the extended position, the nozzle 49 extends into the emptying pipe 20 of the holding tank 12. In the embodiment illustrated, the nozzle 49 is linearly moveable between the retracted and extended positions in a horizontal plane. A cleaning agent may be added to the water 50 to improve cleaning results.

[0031] After the associated valve for the water source 50 has been opened and a desired amount of rinse water has been delivered to the holding tank 12, the carriage 36 may again be rotated from its initial position to its emptying position. As before, the contents of the holding tank 12 may be emptied under the force of gravity. After emptying, the holding tank 12 and carriage 36 may return to the initial position. This process may be repeated where further rinsing and emptying of the holding tank 12 is desired.

[0032] In the embodiment illustrated, the pump simultaneously delivers pressurized water to the cap cleaning unit 56 to ensure proper cleaning of the inside of the cap

22 while the portable waste holding tank 12 is also cleaned. A drying feature for the cap 22 may be added to dry off remaining water from the inside of the cap at the end of the cycle.

[0033] After the controller 34 cycles the system 10 to rinse and empty the holding tank 12, the controller 34 may next control the valve 54 associated with the source of additives 52 to deliver chemical additives to the portable waste holding tank 12. The controller 34 may also control the water supply 50 simultaneously to the supply of chemical additives to ensure addition of a preset mixture of water/additives. The delivery of chemical additives to the portable waste holding tank 12 may be associated with an additional charge to the user. Suitable chemical additives are commercially available from Thetford Corporation.

[0034] The third actuator 44 may next be controlled by the controller 34 to linearly translate the nozzle 49 from the extended position to the retracted position.

[0035] The controller 34 may next control the door 28 to open. Alternatively, the controller 34 may simply allow the door 28 to be opened by the user. The cap 22 may then be replaced by the user and the portable waste holding tank 12 may be removed from the system 10.

[0036] After removal of the portable waste holding tank 12 and its cap 22 from the system 10, the door 28 will again be closed and with the door 28. In certain applications, the system 10 may run a self-cleaning cycle of the inside of the system 10. With such a cycle, all relevant parts of the system 10 may be cleaned by means of the water supply and suitable nozzles.

[0037] It will now be appreciated that the present teachings provide a system which allows for easy emptying of the waste holding tank 12. The contents may be received by the system 10 into a stationary holding tank that may be periodically emptied or the system may be connected to a sewer system. The system 10 also provides for each cleaning of the waste holding tank 12. The system 10 also provides for convenient and easy refilling of the holding tank with chemical additives. The system 10 may be provided in a common area for access by caravan owners. For example, the system 10 may be provided at a camp site.

[0038] By including such a cleaning system 10, camp grounds may better serve their customers. The level of user convenience will be increased as well as the hygienic circumstances of the emptying/cleaning process by avoiding almost all contact of the user with the potentially harmful contents of the portable waste holding tank.

[0039] The system 10 of the present teachings has been described above in connection with the emptying, cleaning and filling of portable waste holding tanks. The present teachings, however, may be readily adapted for use with other portable waste holding devices, such as portable toilets.

[0040] While an exemplary embodiment of the present invention has been described, it is understood that the present invention should not be limited to these exem-

plary embodiments and accompanying drawings. Therefore, various changes and modifications can be apparently made by one skilled in the art without departing from the technical spirit of the present invention. In addition, it is understood that parts that can be easily changed by one skilled in the art are within the spirit and scope of the present invention as hereinafter claimed.

[0041] The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

Claims

1. A system 10 for emptying and cleaning a portable waste holding device, in particular a portable waste holding tank 12 for a caravan, the system 10 comprising:
 - a housing 26;
 - a controller 34;
 - a carriage 36 mounted within the housing 26 and operative to receive the portable waste holding device, in particular the portable waste holding tank 12, the carriage 36 being rotatable relative to the housing 26 between an initial position and a holding tank emptying position for emptying the portable waste holding device, in particular the holding tank 12 through an emptying pipe 20;
 - a water source 50 for supplying water to an inside of the portable waste holding device, in particular the portable waste holding tank 12 through the emptying pipe 20 of the portable waste holding device, in particular the waste holding tank 12 to rinse the portable waste holding device, in particular the portable waste holding tank 12 through a nozzle 49.
2. The system 10 according to claim 1, further comprising a nozzle actuator 44 to moving the nozzle 49 from a retracted position spaced from the portable waste holding device, in particular the holding tank 12 to an extended position within the emptying pipe 20 of the portable waste holding device, in particular the holding tank 12.
3. The system 10 according to claim 2, wherein the nozzle 49 is linearly moveable between the retracted position and the extended position.

4. The system 10 according to any one of the preceding claims, further comprising a carriage actuator 42 controlled by the controller 34 for automatically rotating the carriage 36 about a carriage axis to empty contents from the portable waste holding device, in particular the portable waste holding tank 12, the carriage actuator 42 is rotatable through at least 90 degrees for emptying contents from the portable waste holding device, in particular the portable waste holding tank 12 through the emptying pipe 20 of the portable waste holding device, in particular the waste holding tank 12. 5
5. The system 10 according to any one of claims 1 to 3, further comprising a carriage actuator 42 controlled by the controller 34 for automatically rotating the carriage 36 about a carriage axis to empty contents from the portable waste holding device, in particular the portable waste holding tank 12, the carriage actuator 42 is rotatable through approximately 110 degrees for emptying contents from the portable waste holding device, in particular the portable waste holding tank through the emptying pipe 20 of the portable waste holding device, in particular the waste holding tank 12. 10 15 20 25
6. The system 10 according to any one of the preceding claims, further comprising a cap cleaning unit 56 for automatically cleaning a cap 22 of the emptying pipe 20 of the portable waste holding device, in particular the portable waste holding tank 12. 30
7. The system 10 according to claim 6, wherein the cap cleaning unit 56 includes a receptacle for receiving the cap 22. 35
8. The system 10 according to claim 6 or 7, wherein the cap cleaning unit 56 is in fluid communication with the water source 50. 40
9. The system 10 according to any one of claims 6 to 8, further comprising a sensor for sensing the cap 22 on the cap cleaning unit 56.
10. The system 10 according to any one of claims 6 to 9, wherein the controller 34 is operative to prevent operation of the system 10 until the sensor senses the cap 22 on the cap cleaning unit 56. 45
11. The system 10 according to any one of the preceding claims, further comprising a tank clamp for securing the portable waste holding device, in particular the holding tank 12 to the carriage 36, the tank clamp moveable between a clamped position and an unclamped position. 50 55
12. The system 10 according to claim 11, further comprising a tank clamp actuator controlled by the controller 34 for automatically moving the tank clamp from the unclamped position to the clamped position.
13. The system 10 according to any one of claims 1 to 5, further comprising a cap cleaning unit 56 including a sensor for sensing a cap 22 of an emptying pipe 20 on the cap cleaning unit 56, a door carried by the housing and moveable between an open position and a closed position, and a holding tank clamp moveable from an unclamped position to a clamped position for clamping the holding tank to the carriage, wherein the controller is operative to run a cleaning cycle only when the sensor senses the cap, the door is in the closed position and the holding tank clamp is in the clamped position.
14. A method for emptying and cleaning a portable waste holding device, in particular a portable waste holding tank 12, with the system of any of the preceding claims.
15. The method for emptying and cleaning a portable waste holding device, in particular a portable waste holding tank 12 of claim 14, wherein the carriage is rotated through approximately 110° to the emptying position.

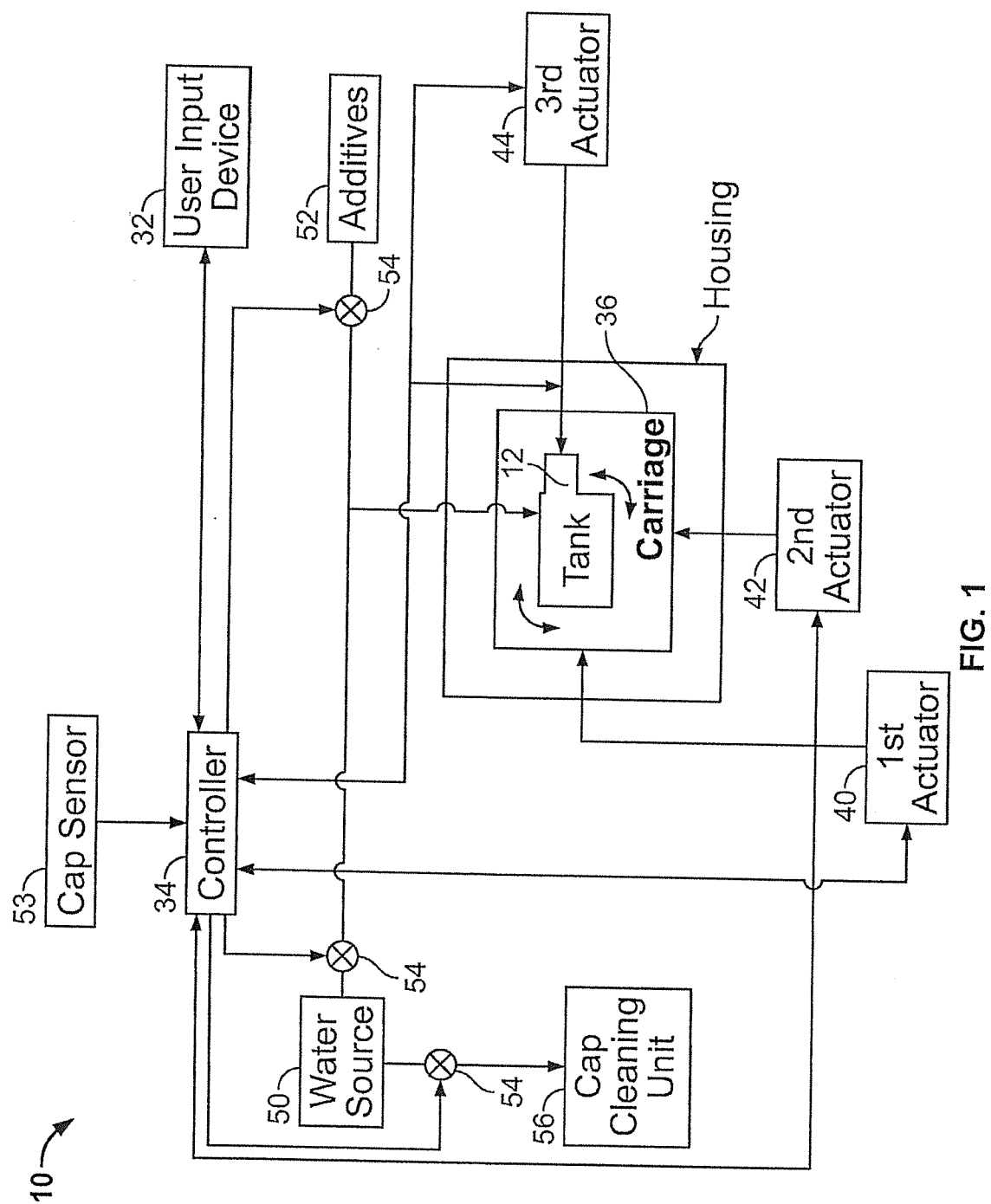
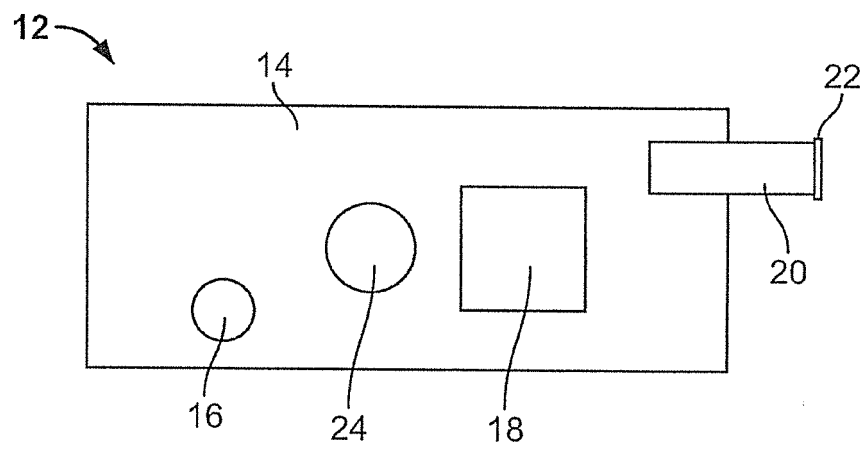
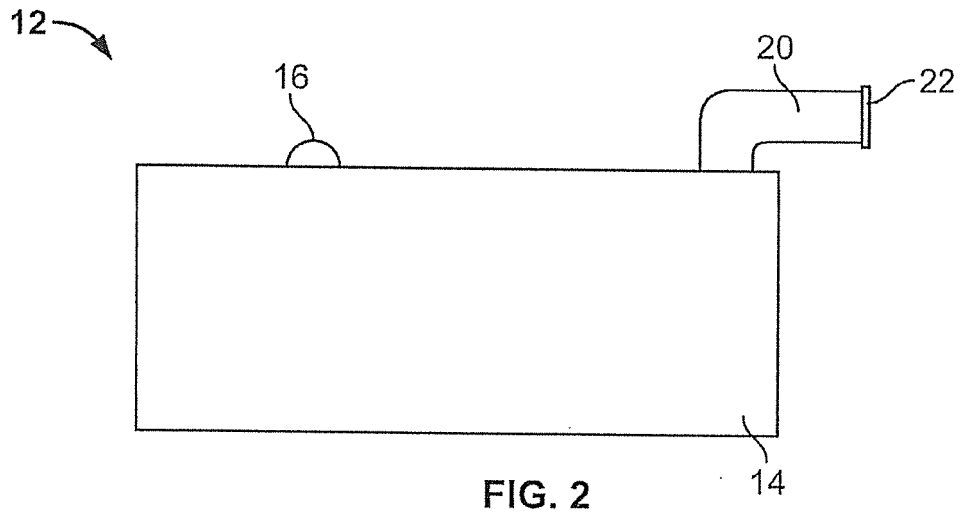


FIG. 1



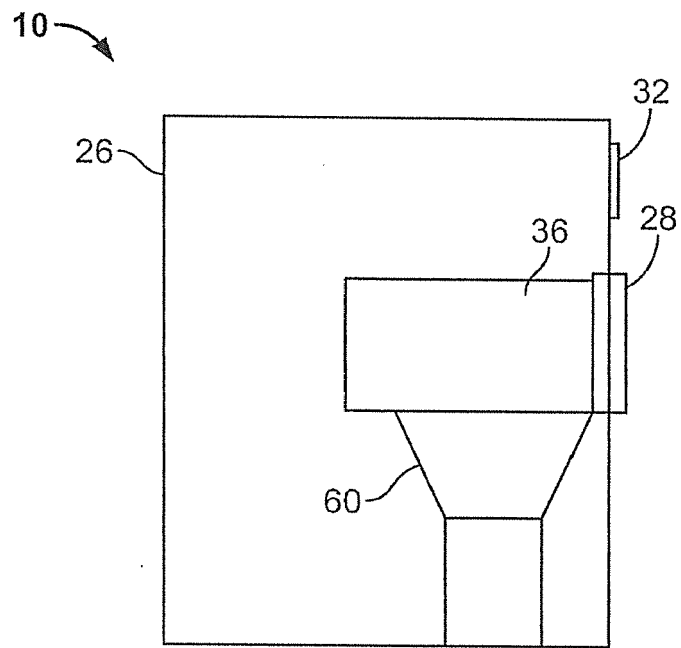


FIG. 4

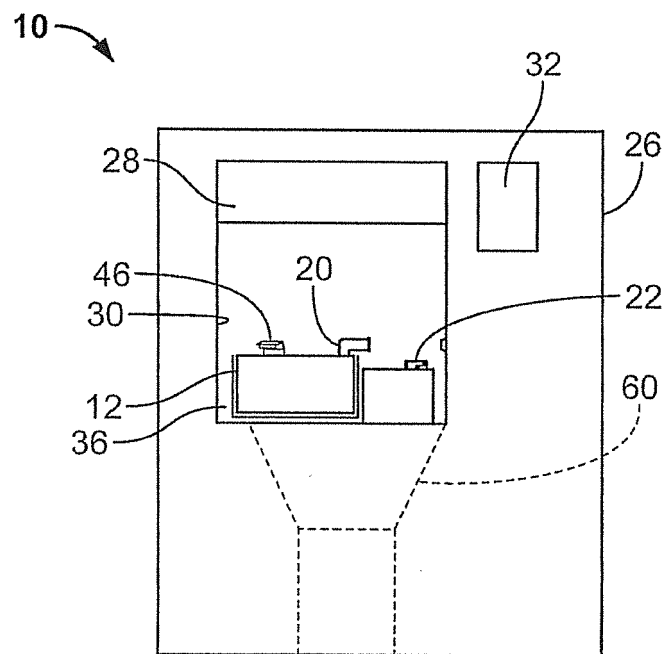


FIG. 5

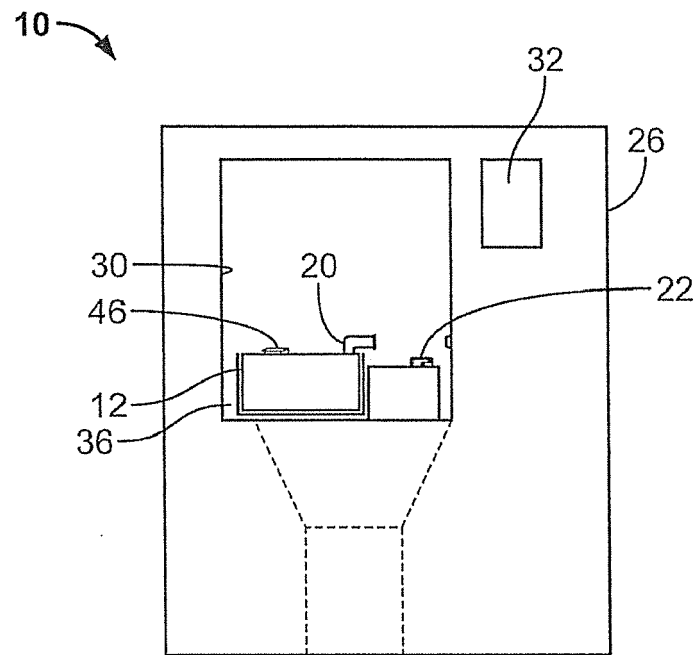


FIG. 6

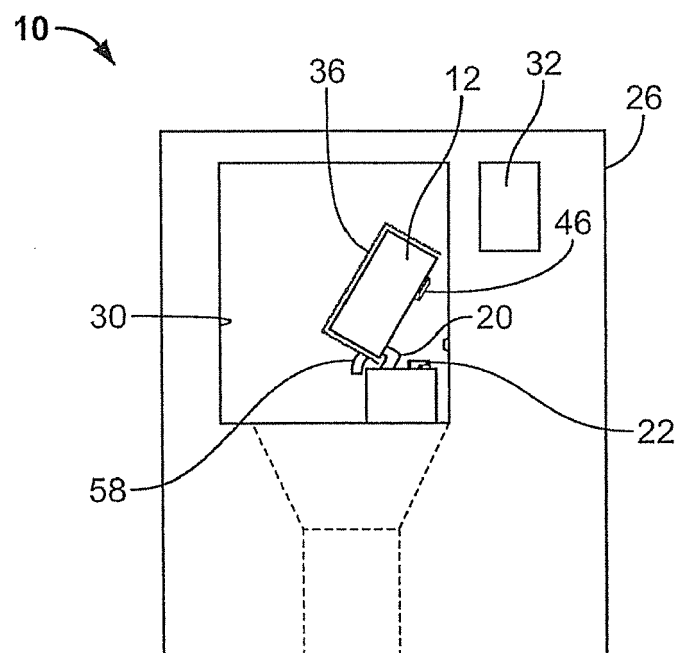


FIG. 7

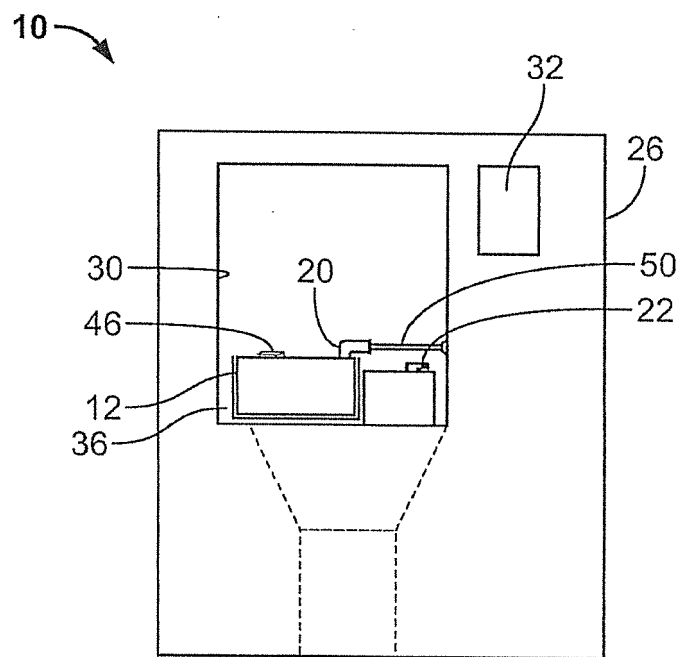


FIG. 8



EUROPEAN SEARCH REPORT

Application Number
EP 17 18 6589

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 January 2018	Examiner Plontz, Nicolas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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

EP 17 18 6589

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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