(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 282 746 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.11.2023 Bulletin 2023/48

(21) Application number: **23174777.5**

(22) Date of filing: **23.05.2023**

(51) International Patent Classification (IPC):
B63B 29/14 *(2006.01)* ***E03F 1/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E03F 1/006; B63B 29/14

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **23.05.2022 IT 202200010643**

(71) Applicant: **RICERCA REALIZZAZIONE & DISTRIBUZIONE S.R.L.**
16121 Genova (IT)

(72) Inventor: **ANDREOLA, Francesca**
16121 GENOVA (IT)

(74) Representative: **Studio Torta S.p.A.**
Via Viotti, 9
10121 Torino (IT)

(54) SANITARY SYSTEM COMPRISING AT LEAST ONE VACUUM SANITARY APPARATUS

(57) A sanitary system (1) comprising:
- at least one vacuum sanitary apparatus (1) comprising a monitoring assembly (7), which is configured to monitor the operation of the sanitary apparatus (1); the monitoring assembly (7) comprising at least one sensor (20a; 20b, 20c; 20d; 20e), which is configured to detect operation data of at least one component of the sanitary apparatus and one control board (21), which is configured to store the data detected by the at least one sensor (20a; 20b, 20c; 20d; 20e); wherein the control board (21) comprises a power supply battery, which is configured to power the control board (21) itself and the at least one sensor (20a; 20b, 20c; 20d; 20e) of the monitoring device (7);
- a monitoring server (31), which is in data communication with the control board (21) of the at least one sanitary apparatus (1); either the control board (21) or the monitoring server (31) being configured to process the data stored by the control board (21).

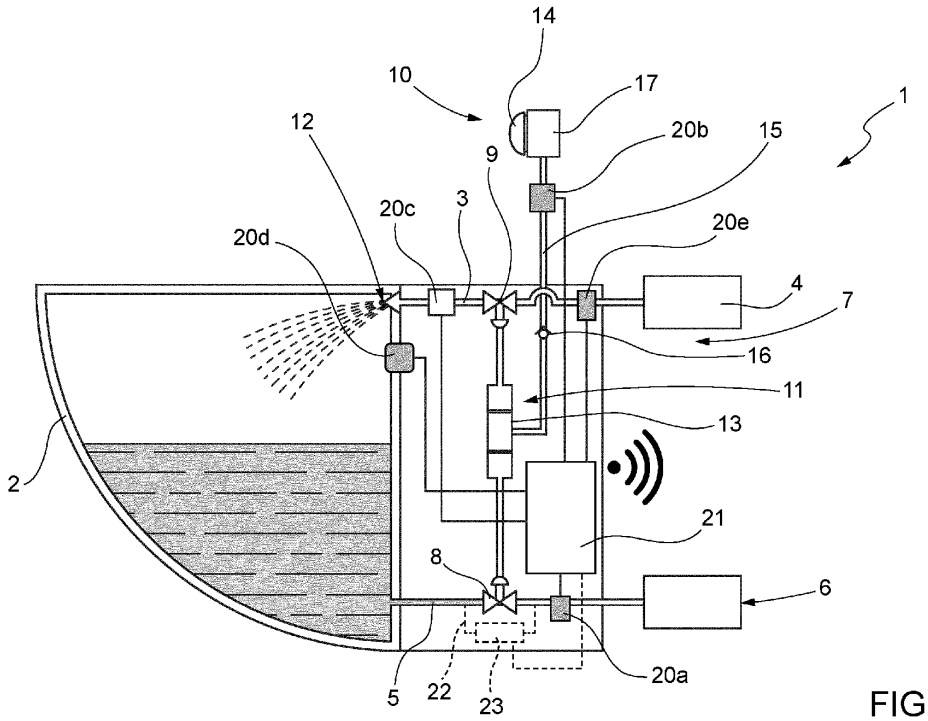

FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102022000010643 filed on 23 May 2022, the entire disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] This invention relates to a sanitary system comprising at least one vacuum sanitary apparatus provided with a monitoring assembly configured to monitor at least the state and operation of the sanitary apparatus.

BACKGROUND

[0003] In the naval sector and, more generally, the transport sector, so-called "vacuum" toilets are normally used, which are connected to a discharge circuit provided with at least one vacuum pump.

[0004] Toilets of this type may also be used inside buildings to avoid architectural constraints for the passage of pipes and to have maximum design flexibility.

[0005] The applications of this type of toilet in the transport sector (ships, etc.) are very widespread.

[0006] In cruise ships, for example, the number of vacuum toilets is very high if you think that a cruise ship, on average, hosts between 2,000 and 5,000 passengers.

[0007] In any case, the ordinary maintenance cannot prevent sudden failures, especially when owing to improper or incorrect use by the users.

[0008] Frequent maintenance operations are, therefore, necessary and, sometimes, the damage done to the toilets is so serious as to require replacement of one or more parts of the apparatus with significant costs in terms of time and money.

[0009] Above all, in the event of the malfunction of toilets provided to individual cabins of cruise ships, operations of this type also impact the organisation and arrangement of guests because they may impose an interruption on using the toilet, potentially for a long time.

SUMMARY

[0010] It is, thus, a goal of this invention to provide a sanitary system that is easy and economical to produce comprising at least one vacuum sanitary apparatus that is able to signal malfunctions in the at least one sanitary apparatus in a timely manner so as to facilitate the maintenance operations and enable, preferably remotely, to check the current state of operation of the at least one sanitary apparatus (for example, to control in real time the operation of the sanitary apparatus of a ship cabin before giving it to the customer.

[0011] Some solutions are known from the patents DE102019007946, DE102018006919, US2018/023275, US2021/404167. However, these solutions require structural works on the system. For this reason, these solutions are not very flexible and are very costly. In accordance with these purposes, this invention relates to a sanitary system comprising:

- at least one vacuum sanitary apparatus comprising:
  - ◦a collecting bowl for collecting sewage;
  - ◦a flush duct, which connects the collecting bowl to a water supply source;
  - ◦a discharge duct, which fluidically connects the collecting bowl to a discharge circuit;
  - ◦a discharge valve, which is arranged along the discharge duct and is configured to selectively allow/interrupt the discharge of sewage from the collecting bowl;
  - ◦a flush valve, which is arranged along the flush duct and is configured to selectively enable/disable the water supply to the collecting bowl;
  - ◦a manual discharge control comprising a pneumatic button and an air supply duct;
  - ◦a control mechanism, which is controlled by the manual discharge control and is configured to regulate the opening/closing of the discharge valve and of the flush valve; wherein the air supply duct connects the pneumatic button to the control mechanism; and
  - ◦a monitoring assembly configured to monitor the operation of the at least one sanitary apparatus; the monitoring assembly comprising at least one sensor configured to detect operation data of at least one component of the sanitary apparatus and one control board, which is configured to store the data detected by the at least one sensor; wherein the control board comprises a power supply battery, which is configured to power the control board itself and the at least one sensor of the monitoring device;
- a monitoring server, which is in data communication with the control board of the at least one sanitary apparatus; either the control board or the monitoring server being configured to process the data stored by the control board.

[0012] Advantageously, the sanitary apparatus of the system according to this invention does not require any wiring nor electricity supply, neither for the operation of the components, nor for the monitoring. This enables fast and simple installation, including in systems already installed on board.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Additional features and advantages of this invention will be clear from the description that follows of a non-limiting embodiment, with reference to the at-

tached figures, in which:

- - Figure 1 is a schematic representation of a vacuum sanitary apparatus of a sanitary system according to this invention;
- - Figure 2 is a schematic representation of a sanitary system in accordance with this invention.

DESCRIPTION OF EMBODIMENTS

[0014] In Figure 1, reference number 1 indicates a vacuum sanitary apparatus.

[0015] In the non-limiting example described and illustrated here, the sanitary apparatus is a sanitary apparatus of a ship sanitary system.

[0016] It is understood that the sanitary apparatus 1 according to this invention may also find application in another context, for example in hydraulic systems on trains, airplanes, or even at home.

[0017] The sanitary apparatus 1 comprises a collecting bowl 2 for collecting sewage; a flush duct 3, which connects the collecting bowl 2 to a water supply source 4; a discharge duct 5, which fluidically connects the collecting bowl 2 to a discharge circuit 6; and a monitoring assembly 7 configured to monitor the operation of the sanitary apparatus 1.

[0018] The discharge circuit 6 is a vacuum one and, as a result, the sanitary apparatus 1 is a vacuum one.

[0019] In the non-limiting example described and illustrated herein, the sanitary apparatus 1 is a toilet. In particular, the collecting bowl 2 is intended to collect sewage to be discharged.

[0020] The flush duct 3 is configured to convey water from the water supply source 4 into the collecting bowl 2, so as to flush the collecting bowl 2.

[0021] The discharge duct 5 is configured to convey the sewage in the collecting bowl 2 into the discharge circuit 6, so as to discharge said sewage from the collecting bowl 2.

[0022] The water supply source 4 is a tank filled with water intended to flush the collecting bowl 2 or a water distribution circuit.

[0023] The discharge circuit 6 (also called vacuum circuit) is schematically represented in Figure 1 and is better detailed (though schematically) in Figure 2.

[0024] With reference to Figure 2, the discharge circuit 6 comprises at least one main duct 6a and multiple connection branches 6b configured to connect the main duct 6a to the discharge duct 5 of the respective sanitary apparatus 1. The main duct 6a is connected to a vacuum-generating device 6c configured to create a depression in the at least one discharge circuit 6 and to facilitate the collection of the sewage in a collection tank 6d.

[0025] The sanitary apparatus 1 also comprises a discharge valve 8, which is arranged along the discharge duct 5 and is configured to selectively allow/interrupt the discharge of sewage from the collecting bowl 2; and a discharge valve 9, which is arranged along the flush duct 3 and is configured to selectively allow/interrupt the supply of water to the collecting bowl 2.

[0026] In addition, the sanitary apparatus 1 comprises a manual discharge control 10 and a control mechanism 11, which is controlled by the manual discharge control 10 and is configured to activate the opening of the discharge valve 8 and of the flush valve 9.

[0027] The discharge valve 8 is a pneumatic valve comprising a shutter (not visible in the attached figure) whose position is adjusted by the control mechanism 11.

[0028] When the shutter of the discharge valve 8 is in the closed position, there is no discharge of sewage between the collecting bowl 2 and the discharge circuit 6.

[0029] When the shutter of the discharge valve 8 is in the open position, the vacuum generated in the discharge circuit 6 causes a pressure difference that encourages the flow of sewage from the collecting bowl 2 to the discharge circuit 6.

[0030] The flush valve 9 is a pneumatic valve comprising a shutter whose position is adjusted by the control mechanism 11.

[0031] When the shutter of the flush valve 9 is in the closed position there is no discharge of water in the collecting bowl 2.

[0032] When the shutter of the flush valve 9 is in the open position, the water of the water supply source 4 is injected into the collecting bowl 2 encouraging flushing.

[0033] In addition, the sanitary apparatus 1 comprises a dispenser 12, which is connected to the flush duct 3 and is configured to deliver flushing water into the collecting bowl 2.

[0034] In the case described here and illustrated, the dispenser 12 comprises at least one nozzle connected to one end of the flush duct 3.

[0035] In more detail, the dispenser 12 comprises multiple end nozzles (not visible in the figure attached), basically distributed along a path basically around the perimeter of the collecting bowl 2 and directed so as to suitably flush the inside of the collecting bowl 2 during flushing.

[0036] The control mechanism 11 comprises a pneumatic actuator 13, which is controlled by the manual discharge control 10 and is configured to selectively move the shutter of the discharge valve 8 and the shutter of the flush valve 9. The pneumatic actuator 13, by definition, does not require any electricity.

[0037] In the non-limiting example described and illustrated here, the control mechanism 11 does not simultaneously control the discharge valve 8 and the flush valve 9. For example, the opening of the flush valve 9 is subsequent to the opening of the discharge valve 8 to avoid excessive accumulation of water in the collecting bowl 2, while the closure of the flush valve 9 is subsequent to the closure of the discharge valve 8 so that a desired amount of stagnant water remains in the collecting bowl 2.

[0038] One variant not illustrated requires that the control mechanism 11 simultaneously controls the discharge

valve 8 and the flush valve 9.

[0039] The manual discharge control 10 comprises a pneumatic button 14, an air supply duct 15, which connects the pneumatic button 14 to the control mechanism 11, and a check valve 16 arranged along the air supply duct 15 intended to prevent the reflux of air towards the pneumatic button 14 along the air supply duct 15.

[0040] Specifically, the pneumatic button 14 is provided with a compression chamber 17 connected to the air supply duct 15, while the air supply duct 15 is connected to the pneumatic actuator 13.

[0041] In use, when the user presses the pneumatic button 14 it sends the slightly compressed air to the pneumatic actuator 13 of the control mechanism 11 through the air supply duct 15. The pneumatic actuator 13 conveys the actuating control so as to open the discharge valve 8 and, subsequently, the flush valve 9.

[0042] The monitoring assembly 7 configured to monitor the operation of the sanitary apparatus 1 comprises at least one sensor configured to detect operation data of at least one component of the sanitary apparatus 1 and a control board 21 configured to store the data detected by the at least one sensor and to process the data detected, if necessary.

[0043] In the non-limiting example described and illustrated here, the monitoring assembly 7 comprises at least one depression sensor 20a arranged along the discharge duct 5 downstream of the discharge valve 8.

[0044] In other words, the depression sensor 20a is arranged between the discharge valve 8 and the discharge circuit 6.

[0045] The depression sensor 20a sends the data detected to the control board 21.

[0046] In use, if the depression sensor 20a detects the presence of a vacuum (i.e. pressures below a certain threshold value) when the valve 8 is closed, the control board 21 does not signal faults, if, in contrast, the depression sensor 20a detects pressures above the threshold value, there is a fault in the discharge of sewage and the control board 21, as we will see below, proceeds with the alert. There could, in fact, be damage in the discharge circuit 6 (for example, the lack of a vacuum) or in the discharge valve 8.

[0047] In the non-limiting example described and illustrated here, the monitoring assembly 7 also comprises a trigger sensor 20b configured to detect the activation of the manual discharge control 10, and at least one valve-monitoring sensor 20c configured to monitor the opening and/or closing of the discharge valve 8 and/or the flush valve 9.

[0048] The trigger sensor 20b is a pressure sensor arranged along the air supply duct 15 and configured to detect the air pressure along the air supply duct 15.

[0049] The data of the trigger sensor 20b are sent to the control board 21 that, as we will see below will process them together with the data coming from the at least one valve-monitoring sensor 20c.

[0050] In the non-limiting example described and illustrated here, there is just one valve-monitoring sensor 20c and it is configured to monitor the flush valve 9.

[0051] It is understood that the monitoring assembly 7 may also comprise an additional valve-monitoring sensor configured to also monitor the discharge valve 8.

[0052] The valve-monitoring sensor 20c is a pressure sensor arranged downstream of the flush valve 9 and it is configured to detect the pressure of the water in the flush duct 3.

[0053] The control board 21, thus, receives the trigger data from the trigger sensor 20b and the operation data of the flush valve 9 from the valve-monitoring sensor 20c.

[0054] If the trigger sensor 20b detects a pressure above the predefined threshold and if the valve-monitoring sensor 20c detects a pressure downstream of the flush valve 9, then the control board 21 does not signal any malfunction in the control mechanism 11. If, on the contrary, the trigger sensor 20b detects a pressure above the predefined threshold and if the valve-monitoring sensor 20c detects a pressure downstream of the flush valve 9 within a predefined time period, then the control board 21 signals a fault. The control mechanism 11 and/or the flush valve 8 could, in fact, have problems.

[0055] Similar considerations are made if there is a valve-monitoring sensor for the discharge valve 8 downstream of the discharge valve 8 along the discharge duct 5 (alternatively to or along with the valve-monitoring sensor for the flush valve 8). If, upon triggering the manual discharge control 10, there is no opening of the flush valve within a predefined time period, there is an operation fault in the control mechanism 11 and/or in the discharge valve 8.

[0056] The control board 21 is preferably configured to process the data detected by the valve-monitoring sensor 20c at a different time to checking the opening and closing times of the valve monitored and to signal any faults encountered.

[0057] For example, if the valve-monitoring sensor 20c does not detect a decrease in the pressure within a defined period from the pressure increase, the monitored valve is open and has closing problems. If this period has passed, there is a fault in the valve being monitored.

[0058] In accordance with a variant represented in dashed lines in Figure 1, the sanitary apparatus comprises an emergency line 22, which connects a portion of the discharge duct 5 arranged upstream of the discharge valve 8 and a portion of the discharge circuit 6 arranged downstream of the discharge valve 8 and is provided an ON/OFF emergency valve 23.

[0059] The control board 21 is, in this case, configured to trigger the emergency valve 23 when the valve-monitoring sensor 20c does not detect a pressure above a reference value within a predefined time period after the triggering of the manual discharge control 10. Basically, the emergency line 22 is a by-pass line configured to potentially circumvent a malfunction in the discharge valve 8 and to enable the discharge of the sewage, avoiding the risk of flooding.

[0060] If the failed discharge issue is not the result of the discharge valve 8, the triggering of the emergency valve 23 cannot resolve the problem.

[0061] The emergency valve 23 may be actuated pneumatically or electrically (for example powered by the battery of the control board 21, as we will see in detail below).

[0062] In the non-limiting example described and illustrated here, the monitoring assembly 7 also comprises a level sensor 20d configured to detect the presence of water in the collecting bowl 2 at a certain level of the collecting bowl 2.

[0063] The level sensor 20d is configured to send a water presence signal to the control board 21.

[0064] The control board 21 is configured to signal a fault when the presence of water is detected for a time period exceeding a threshold value. In this way, the sensor does not detect as a fault the mere passage of water on the walls of the collecting bowl 2 that occurs during normal flushing, but detects as an anomaly the presence of water at the level at which the sensor is arranged for an extended period. This identifies a blocking/failed discharge or a locking of the flush valve in the open position (continual flushing).

[0065] The level sensor 20d is preferably defined by a sensor based on measuring the level of conductivity installed so it is not in contact with the liquid.

[0066] In the non-limiting example described and illustrated here, the monitoring assembly 7 also comprises a water detection sensor 20e configured to detect the pressure of the water supplied to flush the apparatus 1 and to send the data to the control board 21. The water detection sensor 20e is arranged upstream of the flush valve 9.

[0067] If the water detection sensor 20e detects a lower pressure than the desired reference pressure, the control board 21 signals a fault in the water supply source 4.

[0068] As already detailed in part, the control board 21 receives the data detected by the sensors (in the example 20a, 20b, 20c, 20d and 20e) and processes them to send malfunction alerts and/or alarms.

[0069] The control board 21 may be configured to issue local alarms or alerts (for example on a interface screen visible to the user) or to send said alarms or alerts to a data collection server 31, preferably wirelessly, as we will see in more detail below.

[0070] The control board 21 comprises a power supply battery (not visible in the attached figures), which is configured to supply the control board 21 itself and the sensors of the monitoring device 7 installed in the apparatus 1 (in the example, the sensors 20a, 20b, 20c, 20d, and 20e).

[0071] If there is an emergency valve 23 and it is electrically actuated, the power supply battery is configured to also supply said emergency valve 23.

[0072] The control board 21 is preferably housed in a casing (not illustrated) that is resistant to water, for example made of epoxy resin and provided with a ventilation opening arranged so as to avoid the entry of water/sewage if a component malfunctions.

[0073] In other words, the control board and the power supply battery are housed in a watertight casing.

[0074] Figure 2 illustrates the sanitary system 30 according to this invention comprising multiple sanitary apparatuses 1.

[0075] The system 30 comprises multiple sanitary apparatuses 1 located in a monitoring area and a monitoring server 31, preferably a single one.

[0076] In the non-limiting example described and illustrated here, the monitoring area is a ship 34 (schematically represented) and the sanitary apparatuses 1 are distributed in the cabins and in the common areas.

[0077] The system 30 also comprises multiple vacuum-monitoring sensors 28 arranged along the vacuum discharge circuit 6. Preferably, the vacuum-monitoring sensors 28 are arranged along the main duct 6a at predefined intervals so as to basically monitor the presence of a vacuum in the whole main duct 6a.

[0078] Preferably, the vacuum-monitoring sensors 28 are pressure sensors configured to transmit the data detected wirelessly. Preferably, the system 30 also comprises multiple data collection units 32, each of which is configured to collect the data sent by the control boards 21 of a corresponding sub-group of sanitary apparatuses 1 and to send said data to the monitoring server 31, preferably using an Ethernet data line 35.

[0079] Preferably, the data collection units 32 also collect the data sent by corresponding sub-groups of vacuum-monitoring sensors 28.

[0080] The monitoring server 31 is configured to store and process the data/alarms/alerts coming from each control board 21 and from any vacuum-monitoring sensors 28.

[0081] The control boards 21 send the data collected and any processed regularly. Preferably, it is also possible to consult the data of the control boards 21 "on demand" from the monitoring server 31, without waiting for the regular sending thereof.

[0082] The data collection units 32 are supplied by the Ethernet data line 35 and may manage the incoming data of a large number of sanitary apparatuses. In the non-limiting example described and illustrated here, the units 32 may manage the incoming data of 200 sanitary apparatuses 1.

[0083] According to a variant not illustrated, some calculation functions described above as performed by the control board 21 may be assigned to the monitoring server 31 for economy of components and energy consumption.

[0084] Thanks to the introduction of the sensors described, it will be possible to have the situation of the sanitary apparatus 1 continuously monitored, to receive alarms in case of blockages, failures, or other unexpected events, and it will be possible to understand, precisely, the size and locality of the damage. Advantageously, this monitoring may be carried out remotely and the monitor-

ing may concern multiple apparatuses 1 without limitation as to number.

[0085] Thanks to the architecture of the system 30 and to the presence, on each apparatus 1, of a control board 21, the operation of each apparatus 1 will always be monitored using the sensors, controlled by the control board 21 and managed by sending alarms and remote interrogation of the control board 21.

[0086] The introduction of the monitoring device in a vacuum sanitary apparatus ensures and improves the quality of the apparatus, also introducing the concept of monitoring and preventive maintenance with clear savings in terms of costs and intervention times.

[0087] Lastly, it is clear that modifications and variations may be made to the apparatus and system described herein without departing from the scope of the present invention as set forth in the claims.

Claims

1. **A** sanitary system (1) comprising:

- at least one vacuum sanitary apparatus (1) comprising:

  oa collecting bowl (2) for collecting sewage;
  o a flush duct (3), which connects the collecting bowl (2) to a water supply source (4);
  o a discharge duct (5), which fluidically connects the collecting bowl (2) to a discharge circuit (6);
  o a discharge valve (8), which is arranged along the discharge duct (5) and is configured to selectively allow/interrupt the discharge of sewage from the collecting bowl (2);
  oa flush valve (9), which is arranged along the flush duct (3) and is configured to selectively enable/disable the water supply to the collecting bowl (2);
  ◦a manual discharge control (10) comprising a pneumatic button (14) and an air supply duct (15);
  ◦a control mechanism (11), which is controlled by the manual discharge control (10) and is configured to regulate the opening/closing of the discharge valve (8) and of the flush valve (9); wherein the air supply duct (15) connects the pneumatic button (14) to the control mechanism (11); and
  ◦a monitoring assembly (7) configured to monitor the operation of the sanitary apparatus (1); the monitoring assembly (7) comprising at least one sensor (20a; 20b, 20c; 20d; 20e) configured to detect operation data of at least one component of the sanitary apparatus and one control board (21), which is configured to store the data detected by the at least one sensor (20a; 20b, 20c; 20d; 20e); wherein the control board (21) comprises a power supply battery, which is configured to power the control board (21) itself and the at least one sensor (20a; 20b, 20c; 20d; 20e) of the monitoring device (7);

- a monitoring server (31), which is in data communication with the control board (21) of the at least one sanitary apparatus (1); either the control board (21) or the monitoring server (31) being configured to process the data stored by the control board (21).

2. The sanitary system according to claim 1, wherein the monitoring assembly (7) comprises a pressure sensor (20a), which is arranged along the discharge duct (5) downstream of the discharge valve (8) configured to collect pressure data and send them to the control board (21).

3. The sanitary system according to claim 2, wherein either the control board (21) or the server (31) is configured to signal a fault if the pressure sensor (20a) detects pressures above a threshold value.

4. The sanitary system according to any one of the previous claims, wherein the monitoring assembly (7) comprises a trigger sensor (20b), which is configured to detect the activation of the manual discharge control (10), and at least one valve-monitoring sensor (20c), which is configured to monitor the opening and/or closing of the discharge valve (8) and/or the flush valve (9).

5. The sanitary system according to claim 4, wherein the trigger sensor (20b) is a pressure sensor arranged along the air supply duct (15) and configured to detect air pressure data along the air supply duct (15) and send them to the control board (21).

6. The sanitary system according to claim 4 or 5, wherein the monitoring assembly (7) comprises a first valve-monitoring sensor (20c), which is configured to monitor the opening and/or closing of the flush valve (9); wherein the first valve-monitoring sensor (20c) is a pressure sensor arranged downstream of the flush valve (9) and is configured to detect water pressure data in the flush duct (3) and send them to the control board (21).

7. The sanitary system according to any one of claims 4 to 6, wherein the monitoring assembly (7) comprises a second valve-monitoring sensor (20c), which is configured to monitor the opening and/or closing of the discharge valve (8); the second valve-monitoring sensor (20c) being a pressure sensor arranged

downstream of the discharge valve (8) and being configured to detect water pressure data in the discharge duct (5) and send them to the control board (21).

8. The sanitary system according to any one of claims 4 to 7, wherein either the control board (21) or the server (31) is configured to signal a fault if the trigger sensor (20b) detects a pressure above a predefined threshold and if the valve-monitoring sensor (20c) does not detect a pressure above a reference value within a predefined time period.

9. The sanitary system according to claim 8, wherein the at least one sanitary apparatus (1) comprises an emergency line (22), which connects a portion of the discharge duct (5) arranged upstream of the discharge valve (8) and a portion of the discharge circuit (6) arranged downstream of the discharge valve (8) and is provided with an ON/OFF-type emergency valve (23); either the control board (21) or the server (31) being configured to send a trigger signal to the emergency valve (23) when the valve-monitoring sensor (20c) does not detect a pressure above a reference value within a predefined time period from the detection of a pressure above the predefined threshold by the trigger sensor (20b).

10. The sanitary system according to any one of the preceding claims, wherein the monitoring assembly (7) comprises a level sensor (20d) configured to detect the presence of water in the collecting bowl (2) at a given level of the collecting bowl (2) and to send a water presence signal to the control board (21).

11. The sanitary system according to claim 10, wherein either the control board (21) or the server (31) is configured to signal a fault when the presence of water is detected by the level sensor (20d) for a time period exceeding a threshold value.

12. The sanitary system according to any one of the preceding claims, wherein the monitoring assembly (7) comprises a water detection sensor (20e) configured to detect the pressure of the water for flushing to the apparatus (1); the water detection sensor (20e) being a pressure sensor arranged upstream of the flush valve (9) configured to sense pressure data and send them to the control board (21); wherein either the control board (21) or the server (31) is configured to signal a fault if the water detection sensor (20e) detects a pressure below a desired reference pressure.

13. The sanitary system according to any one of the preceding claims, wherein the control board (21) is configured to issue local alarms and alerts and/or to send alarms and alerts to a data collection server (31).

14. The sanitary system according to any one of the previous claims, comprising a vacuum discharge circuit (6) comprising at least one main duct (6a) and multiple connection branches (6b) configured to connect the main duct (6a) to the discharge duct (5) of the at least one sanitary apparatus (1);

a vacuum-generating device (6c) configured to create a depression in the at least one vacuum discharge circuit (6) ;
multiple vacuum-monitoring sensors (28) arranged along the vacuum discharge circuit (6);
the server (31), being in data communication with the multiple vacuum monitoring sensors (28).

15. The system according to any one of the previous claims, comprising:

a plurality of sanitary apparatus (1) located in a monitoring area; and
a plurality of data collection units (32), each of which is configured to collect data sent from the control boards (21) of a respective sub-group of sanitary apparatus (1) and send said data to the server (31), preferably via an Ethernet data line (35); wherein the communication between the plurality of data collection units (32) and the plurality of sanitary apparatus (1) is wireless.

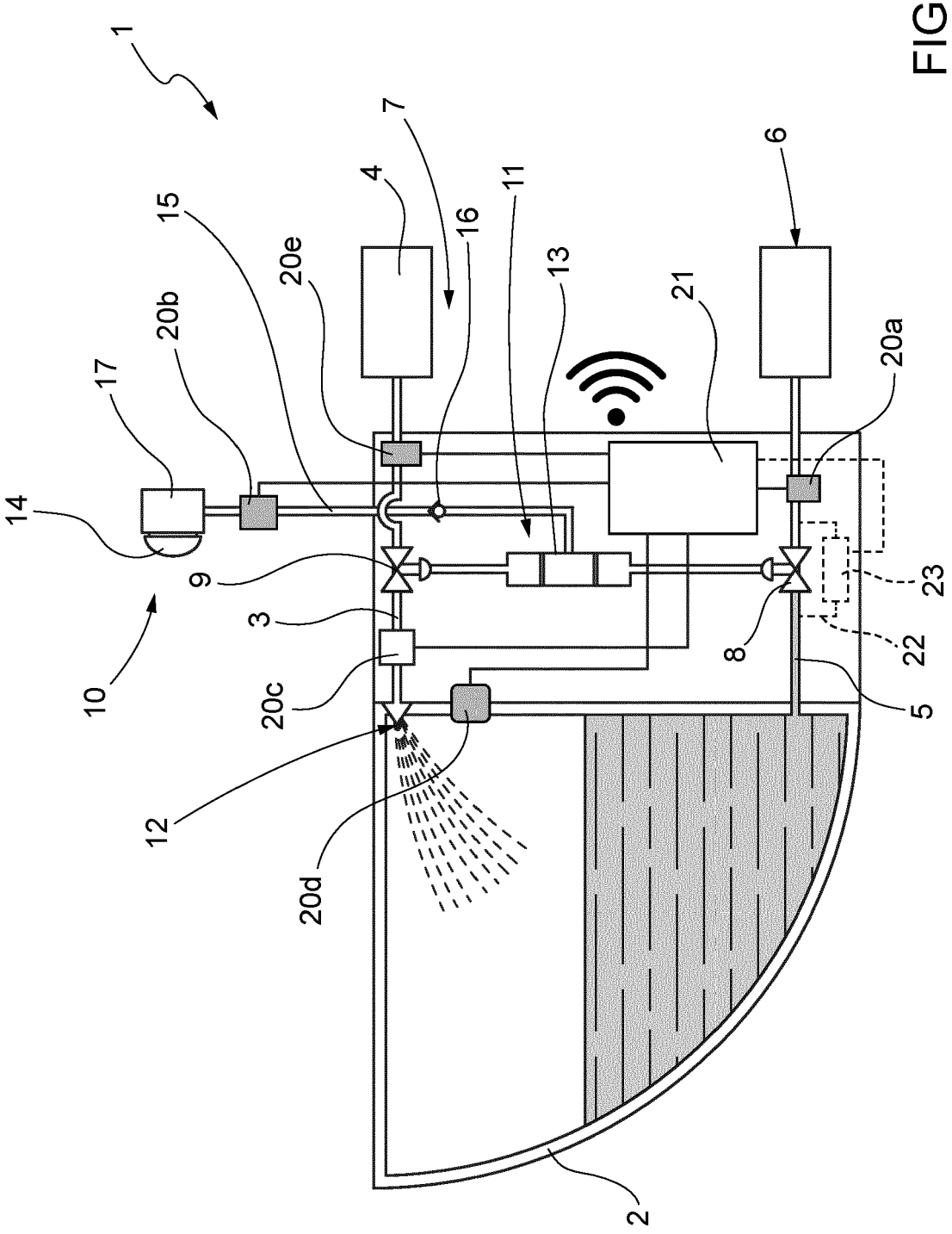

FIG. 1

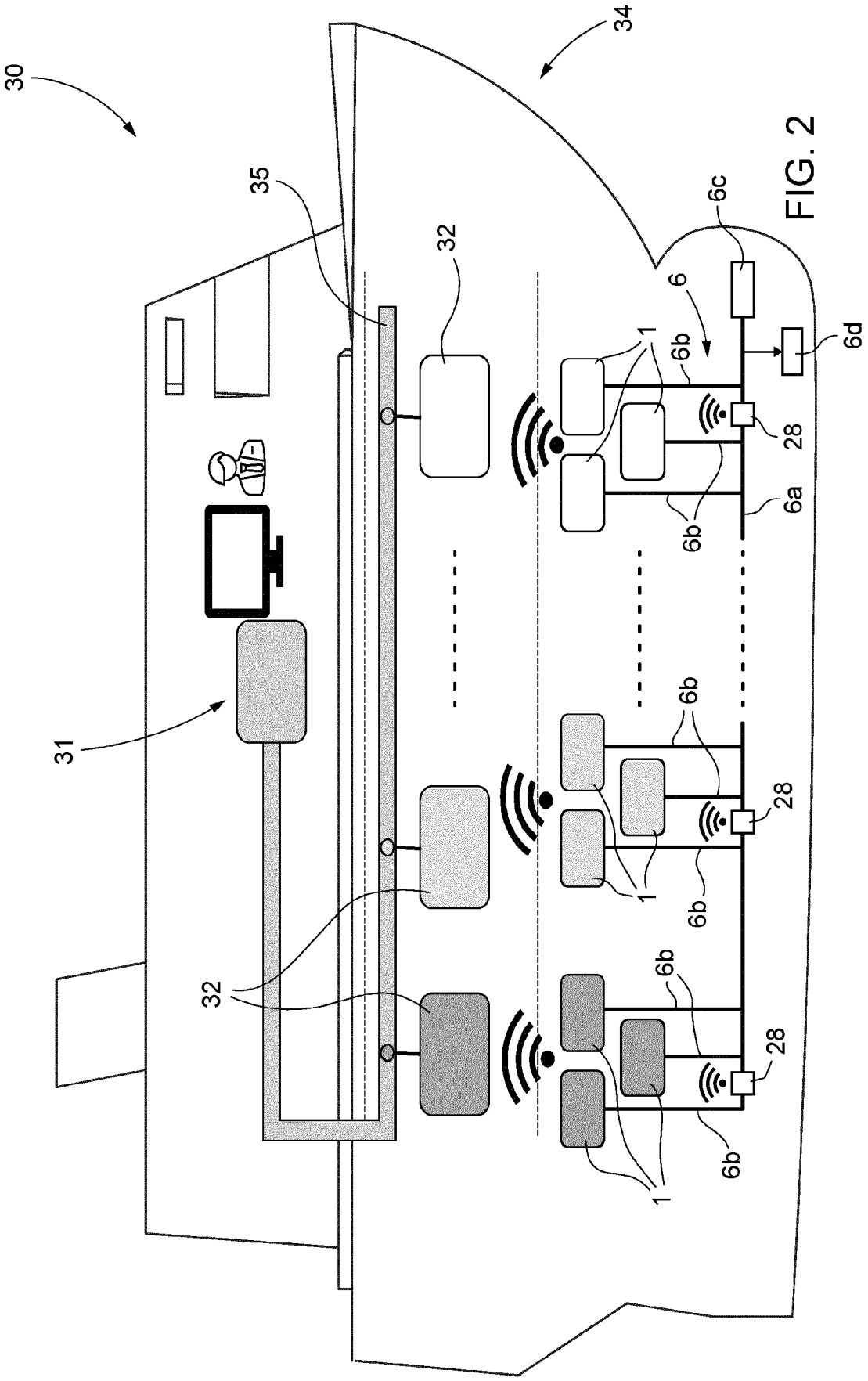

FIG. 2

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 17 4777

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2019 007946 A1 (ACO SEVERIN AHLMANN GMBH & CO KG [DE]) 20 May 2021 (2021-05-20)	1-8,12, 13	INV. B63B29/14 E03F1/00
Y	* the whole document *	10,11, 14,15	
A		9	
X	DE 10 2018 006919 A1 (ACO SEVERIN AHLMANN GMBH & CO KG [DE]) 5 March 2020 (2020-03-05) * paragraph [0034] - paragraph [0042]; figures 1-3 *	1	
X	US 2018/023275 A1 (GETMANN DENNIS [DE] ET AL) 25 January 2018 (2018-01-25)	1,10,11	
Y	* page 5 - page 6; figures 1,2 *	10,11	
X	US 2021/404167 A1 (CROSBY DANIEL [US]) 30 December 2021 (2021-12-30)	1,14	
Y	* the whole document *	14,15	

TECHNICAL FIELDS SEARCHED (IPC)

B63B
B63J
E03F
B61D
B64D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 October 2023	Horst, Werner

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102019007946 A1	20-05-2021	CN 114729537 A	08-07-2022
		DE 102019007946 A1	20-05-2021
		EP 4058643 A1	21-09-2022
		JP 2023503262 A	27-01-2023
		KR 20220128336 A	20-09-2022
		US 2022403640 A1	22-12-2022
		WO 2021094550 A1	20-05-2021
DE 102018006919 A1	05-03-2020	CN 112639230 A	09-04-2021
		DE 102018006919 A1	05-03-2020
		EP 3844352 A1	07-07-2021
		JP 7154418 B2	17-10-2022
		JP 2022501534 A	06-01-2022
		KR 20210041618 A	15-04-2021
		WO 2020043416 A1	05-03-2020
US 2018023275 A1	25-01-2018	CN 107000656 A	01-08-2017
		DE 202014008423 U1	26-01-2016
		DK 3209834 T3	08-03-2021
		EP 3209834 A1	30-08-2017
		ES 2857507 T3	29-09-2021
		JP 6662867 B2	11-03-2020
		JP 2017531751 A	26-10-2017
		PL 3209834 T3	31-05-2021
		US 2018023275 A1	25-01-2018
		WO 2016062765 A1	28-04-2016
US 2021404167 A1	30-12-2021	US 2021404167 A1	30-12-2021
		WO 2021242627 A2	02-12-2021

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 102022000010643 **[0001]**
- DE 102019007946 **[0011]**
- DE 102018006919 **[0011]**
- US 2018023275 A **[0011]**
- US 2021404167 A **[0011]**