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

(11) **EP 2 524 998 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.11.2012 Bulletin 2012/47

(51) Int Cl.:
E03B 1/04 *(2006.01)* ***B61D 35/00*** *(2006.01)*

(21) Application number: **11305621.2**

(22) Date of filing: **20.05.2011**

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) A water storage and distribution system having a fresh water pollution prevention valve

(57) A system (209) for storing and distributing water, the system comprising:
- a water tank (230) having a fresh water inlet (232), a collected water inlet (234), and a main water outlet (236);
- a fresh water conduit (242) connected to the fresh water inlet; and
- a main drain (248) connected to the main water outlet, wherein the system does not have a water tank bypass connecting the

fresh water conduit (242) to the main drain (248), the system being characterised by a fresh water pollution prevention valve (244) in the fresh water conduit.

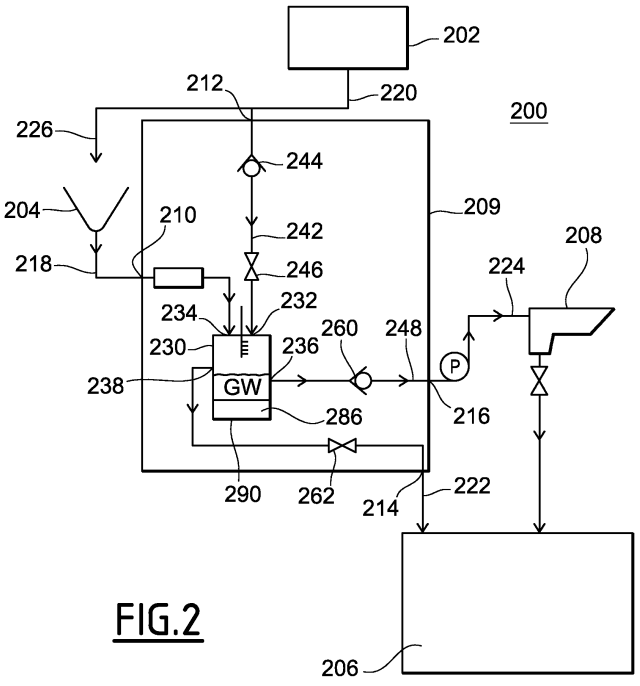

FIG.2

EP 2 524 998 A1

Description

[0001] The invention pertains to a system for storing and distributing water, the system comprising a water tank having a fresh water inlet, a collected water inlet, and a main water outlet; a fresh water conduit connected to the fresh water inlet; and a main drain connected to the main water outlet, wherein the system does not have a water tank bypass connecting the fresh water conduit to the main drain.

[0002] It is getting more and more important to reduce the weight of all components on vehicles such as trains. In vehicles with sanitary facilities, there are two components whose weight has a big contribution to the total weight of the vehicle, namely the fresh water tank and the waste water tank.

[0003] At the same time, it is required to have more autonomy of the sanitary facilities between filling operations of the fresh water tank, and especially between emptying operations of the waste water tank. Higher autonomies result in bigger tanks, while of course the weight and volume of the equipments increase.

[0004] In vehicles with the usual sanitary facilities, fresh water is used both for the wash basin and the toilet bowl. For every use of the sanitary facilities, 0.4 (aprox.) liters are used on the wash basin and 0.4 (aprox) liters on the toilet bowl (0.2 effluent evacuation + 0.2 after cleaning).

[0005] In more recent sanitary facilities for vehicles, thanks to a grey water recovery system, the water used on the wash basin is re-used on the toilet bowl, and therefore, less quantity of water is required for the autonomy requested. The size of fresh and waste water tanks can be then optimized taking into account the recovery operation. Less fresh water is needed to cover the basin and bowl functions (smaller fresh water tank), and so less water will be also kept with human effluents (smaller waste water tank). The system allows reducing the size of the tanks and the weight on the vehicle.

[0006] Figure 1 shows a known sanitary facility with a grey water recovery system. These facilities are currently implemented in the Euro tunnel shuttles.

[0007] Figure 1 illustrates the sanitary facility 100 of a railway carriage. The main components of sanitary facility 100 are a main fresh water tank 102, an intermediate fresh water tank 104, a wash basin 106, a toilet bowl 108, a waste water tank 110 and a grey water tank 112. The grey water tank 112 is used to recover the water coming from the wash basin 106 to flush the toilet bowl 108. The sanitary facility 100 comprises three filters 114 to 118. The first filter 114 is located between the wash basin 106 and the grey water tank 112, the second filter 116 is located inside the grey water tank 112, and the third filter 118 is located between the grey water tank 112 and the toilet bowl 108.

[0008] A major concern with this and other known sanitary facilities is fresh water contamination.

[0009] Accordingly, it is an object of the present invention to provide a water storage and distribution system with improved protection against fresh water contamination.

[0010] More precisely, in the context of a grey water recovery system where the fresh water circuit and the grey water circuit are connected to a same water tank, it is an object of the present invention to prevent contaminants present in the grey water circuit from contaminating the fresh water stored in the fresh water tank.

[0011] These objects are achieved in a system for storing and distributing water of the aforementioned type with a fresh water pollution prevention valve in the fresh water conduit.

[0012] Preferred embodiments of the inventive water storage and distribution system have one or several of the following features:

- a filter at the bottom of the water tank, wherein the collected water inlet leads into said filter;
- the collected water inlet is arranged at the top of the water tank;
- the water tank further comprises a water evacuation outlet;
- the system is a greywater recovery system;
- the water tank comprises a contaminant spreading inhibiting air gap.

[0013] The invention also relates to a sanitary facility comprising the afore-mentioned water storage and distribution system; a wash basin having a basin drain connected to the collected water inlet; a toilet bowl having a bowl inlet connected to the main drain; and a fresh water tank having an outlet connected to the fresh water conduit.

[0014] Preferably, the sanitary facility further comprises a wastewater tank having an inlet connected to the water evacuation outlet.

[0015] The invention also relates to a vehicle, and in particular a railway carriage, comprising the aforementioned sanitary facility.

[0016] The invention will be better understood when reading the following exemplary and non limiting description in conjunction with the drawings, in which:

- figure 1 is a diagram of a prior art sanitary facility;
- figure 2 is a diagram of a sanitary facility according to a first embodiment of the invention ;
- figure 3 is a diagram of a sanitary facility according to a second embodiment of the invention.

[0017] Figure 2 shows a sanitary facility 200 according to the invention. The sanitary facility 200 is installed in a vehicle such as a railway carriage. The main components of sanitary facility 200 are a fresh water tank 202, a wash basin 204, a waste water tank 206, a toilet bowl 208 and a water storage and distribution system, namely a grey water recovery system 209. The grey water recovery system 209 has a grey water input 210, a fresh water input

212, a waste water output 214 and a flushing water output 216. The grey water input 210 is connected to the drain 218 of wash basin 204. The fresh water input 212 is connected to the outlet 220 of fresh water tank 202. The waste water output 214 is connected to the inlet 222 of the waste water tank 206. The flushing water output 216 is connected to the inlet 224 of the toilet bowl 208. The fresh water tap 226 of the wash basin 204 is connected to the outlet 220 of fresh water tank 202.

[0018] The central element of the grey water recovery system 209 is a grey water tank 230. The grey water tank 230 has a fresh water inlet 232, a collected water inlet 234, a main water outlet 236, and a water evacuation outlet 238. A fresh water conduit 242 connects the fresh water input 212 with the fresh water inlet 232. A fresh water pollution prevention valve 244 and a fresh water feed valve 246 are located in the fresh water conduit 242. The collected water inlet 234 is connected to the grey water input 210.

[0019] In the embodiment shown in figure 2, the collected water inlet 234 is arranged at the top of the grey water tank 230 next to the fresh water inlet 232, similar to the prior art solution shown in Fig. 1.

[0020] A main drain 248 connects the main water outlet 236 to the flushing water output 216. A non return valve 260 is located in the main drain 248.

[0021] It should be noted that the system does not have a water tank bypass connecting the fresh water conduit 242 to the main drain 248.

[0022] The water evacuation outlet 238 is connected, via an evacuation valve 262, to the evacuation output 214. A grey water filter 286 is fitted inside the water tank 230. The filter 286 may be accessed via a removable filter cap, for filter cleaning. The filter 286 is located at the bottom 290 of the water tank 230.

[0023] The operation of the sanitary facility 200 will now be described.

[0024] Grey water GW coming from the wash basin 204 enters the grey water tank 230 via the collected water inlet 234. If a toilet flush is required, the grey water GW leaves the grey water tank 230 through the main water outlet 236, transits through the non return valve 260, and finally goes to the toilet bowl 208. If no grey water is available in the grey water tank 230 for the flushing, the opening of the fresh water valve 246 is triggered such that grey water tank 230 is filled with fresh water coming from the fresh water tank 202. This fresh water will then leave through the main water outlet 236 for flushing the toilet bowl 208.

[0025] Thanks to the non return valve 244, no grey water GW can flow back from the grey water tank 230 to the fresh water tank 202. Accordingly, bacteria and other pollutants cannot cross from the grey water tank through to the fresh water tank. Preferably, the non return valve 244 is designed according to the standard EN 1717.

[0026] If there is no bowl flushing while there are lots of basin uses, the grey water tank 230 will fill up. Thus, the opening of the evacuation valve 262 is triggered, so that the content of the grey water tank 230 will be evacuated to waste water tank 206.

[0027] A second embodiment is shown in figure 3. In this figure 3, the elements similar to those of figure 2 are referenced with the same numbers.

[0028] According to the second embodiment, the collected water inlet 234 is arranged at the bottom of the grey water tank 230. Thus, this collected water inlet 234 reaches into filter 286, so that the grey water GW is filtered and temporarily stored in the grey water tank 230. An air gap 289 is present between the collected water inlet 234 and the fresh water inlet 232. This air gap 289 fills the space between the grey water surface and the top of the grey water tank 230. The air gap 289 acts as a barrier for contaminants in the grey water GW, which are thus prevented from reaching the fresh water inlet 232. Accordingly, the air gap 289 can be qualified as a contaminant spreading inhibitor.

[0029] In summary, the inventive water storage and distribution system and corresponding sanitary facility stand out thanks to their small tank size and thus small weight, their reliability and small number of components, the protection against fresh water pollution, and the easy cleaning. A further advantage is the use of a single filter for the whole system.

Claims

1. A system (209) for storing and distributing water, the system comprising:

   - a water tank (230) having a fresh water inlet (232), a collected water inlet (234), and a main water outlet (236);
   - a fresh water conduit (242) connected to the fresh water inlet; and
   - a main drain (248) connected to the main water outlet,

   wherein the system does not have a water tank bypass connecting the fresh water conduit (242) to the main drain (248),
   the system being **characterised by** a fresh water pollution prevention valve (244) in the fresh water conduit.

2. The system of claim 1, wherein the collected water inlet (234) is arranged at the bottom (290) of the water tank (230).

3. The system of claim 2, wherein the water tank (230) comprises a contaminant spreading inhibiting air gap (289) between the collected water inlet (234) and the fresh water inlet (232).

4. The system of any one of the previous claims, further comprising a filter (286) at the bottom (290) of the

water tank (230), wherein the collected water inlet (234) preferably leads into said filter.

5. The system of claim 1 or 4, wherein the collected water inlet (234) is arranged at the top of the water tank (230).

6. The system of any one of the previous claims, the water tank (230) further comprising a water evacuation outlet (238).

7. The system of any one of the previous claims, the system being a greywater recovery system.

8. A sanitary facility (200) comprising:

- the system (209) of any one of the previous claims;
- a wash basin (204) having a basin drain (218) connected to the collected water inlet;
- a toilet bowl (208) having a bowl inlet (224) connected to the main drain; and
- a fresh water tank (202) having an outlet (220) connected to the fresh water conduit.

9. The sanitary facility of claim 8 with the system of claim 6, further comprising a wastewater tank (206) having an inlet (222) connected to the water evacuation outlet (238).

10. A vehicle, in particular a railway carriage, comprising the sanitary facility of claim 8 or 9.

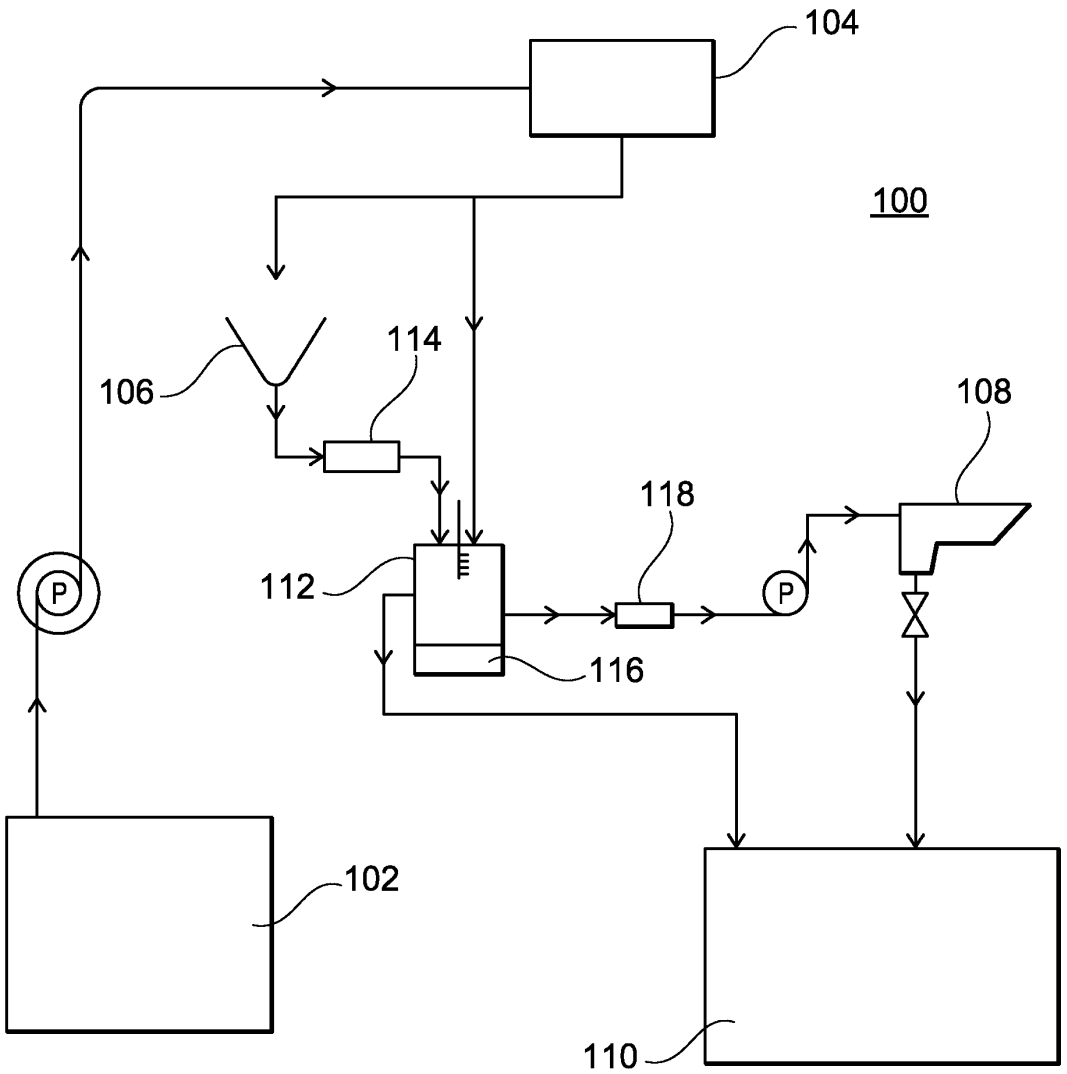

FIG.1

Prior Art

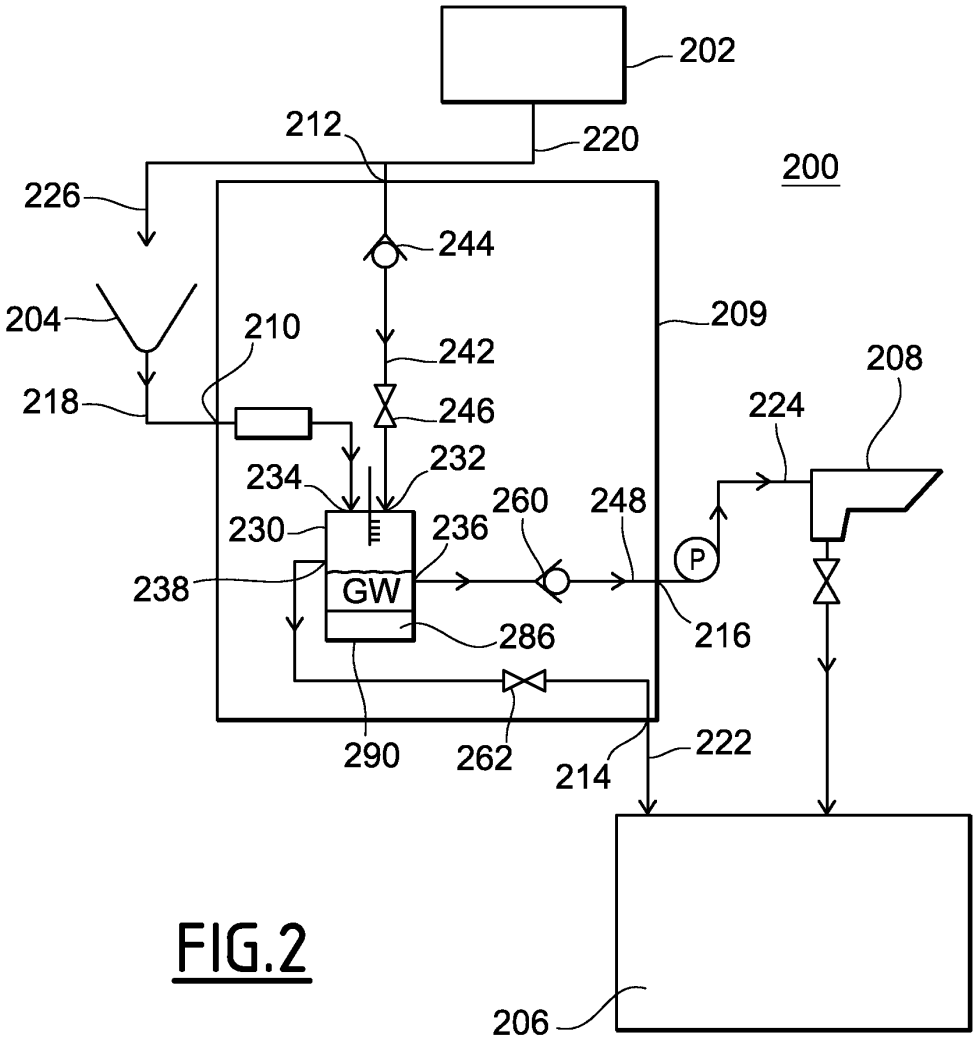
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FIG.2

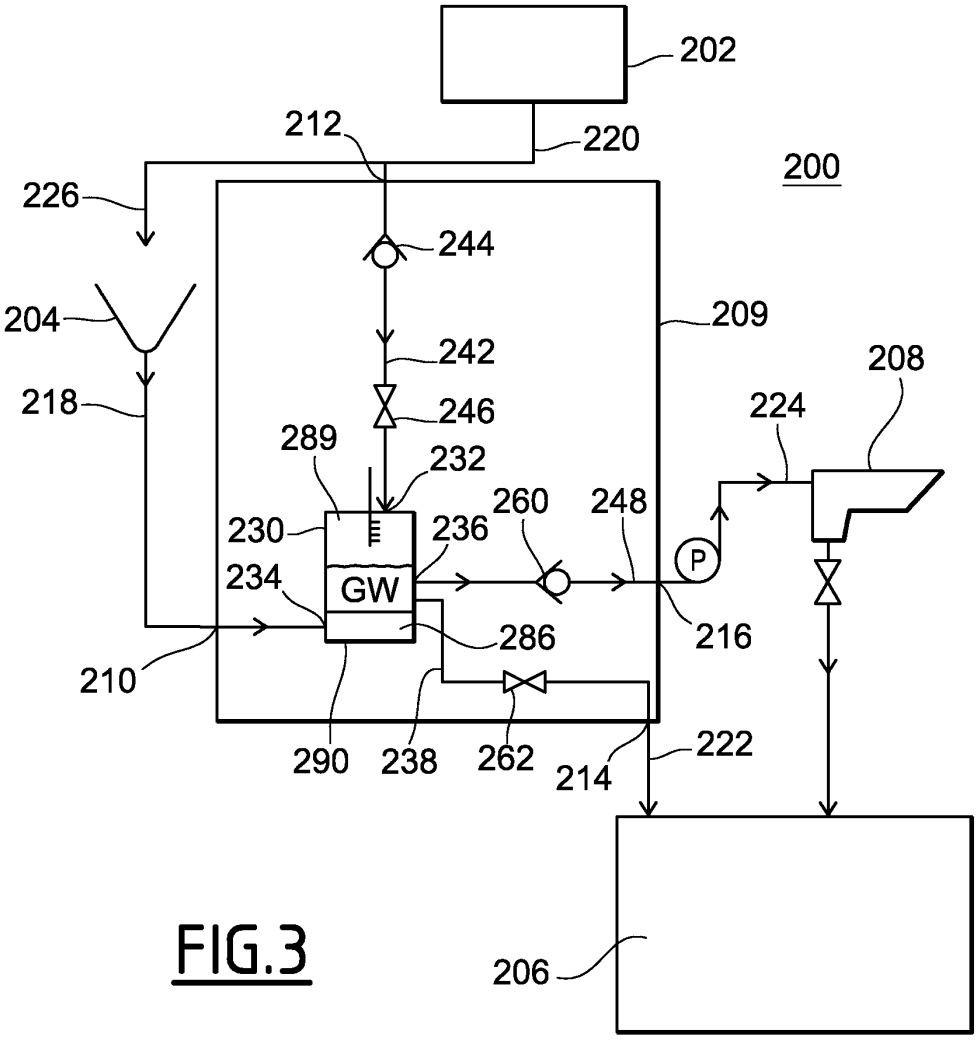
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FIG.3

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EUROPEAN SEARCH REPORT

Application Number
EP 11 30 5621

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	DE 29 08 679 A1 (BOSCH GMBH ROBERT) 18 September 1980 (1980-09-18) * page 4, paragraph 1 *	3	
A	GB 2 320 942 A (BAGLEY PHILIP JOHN [GB]) 8 July 1998 (1998-07-08) * abstract *	1	TECHNICAL FIELDS SEARCHED (IPC) E03B B61D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 September 2011	Geisenhofer, Michael

CATEGORY OF CITED DOCUMENTS

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