



US 20110226349A1

(19) **United States**

(12) **Patent Application Publication**  
**Arras**

(10) **Pub. No.: US 2011/0226349 A1**

(43) **Pub. Date: Sep. 22, 2011**

(54) **RAIL VEHICLE HAVING A SANITARY ASSEMBLY**

**Publication Classification**

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(51) **Int. Cl.**  
**B61D 35/00** (2006.01)

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(52) **U.S. Cl.** ..... **137/347**

(21) Appl. No.: **13/051,483**

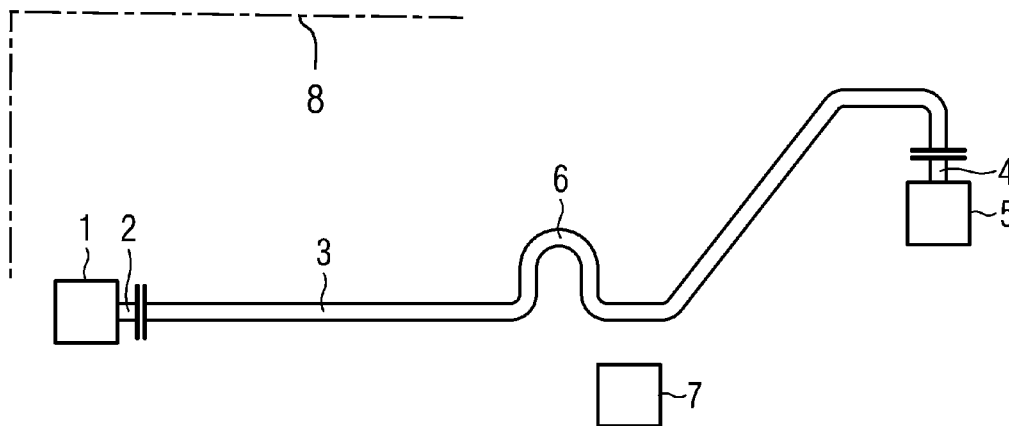
(57) **ABSTRACT**

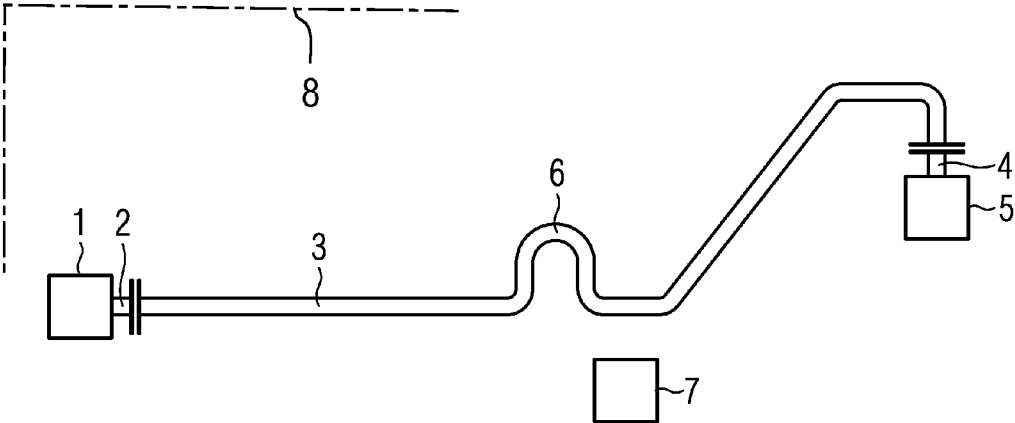
(22) Filed: **Mar. 18, 2011**

(30) **Foreign Application Priority Data**

Mar. 18, 2010 (DE) ..... 10 2010 011 881.8

A rail vehicle has a sanitary assembly at which waste water is produced. A waste water pipeline extends between the sanitary assembly and a connector for a target container for receiving waste water. The waste water connector of the sanitary assembly is located lower than at least a portion of the waste water pipeline to the target container so that the waste water has to be conveyed through the waste water line counter to the force of gravity. The waste water pipeline is formed with at least one return flow barrier.





**RAIL VEHICLE HAVING A SANITARY ASSEMBLY**

**CROSS-REFERENCE TO RELATED APPLICATION**

[0001] This application claims the priority, under 35 U.S.C. §119, of German patent application DE 10 2010 011 881.8, filed Mar. 18, 2010; the prior application is herewith incorporated by reference in its entirety.

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

[0002] The invention relates to a rail vehicle with a sanitary assembly at which waste water is produced, and with a waste water pipeline between the sanitary assembly and a connector for a target container for receiving waste water. It is thereby possible to connect the target container via a further connector to a waste water pipeline in order to empty it into a target container on the land. A waste water connector of the sanitary assembly is located lower than at least a portion of the waste water pipeline so that the waste water has to be conveyed through the waste water line counter to the force of gravity.

[0003] In rail vehicles, waste water is conveyed through a waste water pipeline, which can be formed by a fixed pipe, a flexible tube or a combination thereof, often not under the force of gravity. Rather, it is frequently necessary to use technical measures to support the conveying of waste water to a corresponding target container, which may be for example a waste water tank or else a suction-extraction device on the land. Such technical measures operate for example using compressed air or a vacuum and convey the waste water "upward" counter to the force of gravity.

[0004] The present conveying direction for the waste water pipeline ("upward") results in a return flow of liquid which has not been conveyed to the target container. This return flow wets the inner surface of the pipe and has to be conveyed again at a later time. An accumulation of liquid in the waste water pipe is viewed negatively, since it has repercussions for the frost protection of the waste water pipeline.

**SUMMARY OF THE INVENTION**

[0005] It is accordingly an object of the invention to provide a rail vehicle with a sewage system that overcomes the above-mentioned disadvantages of the heretofore-known devices and methods of this general type and which provides for a rail vehicle of the type mentioned at the beginning such that there is a greater degree of frost protection for the waste water pipeline.

[0006] With the foregoing and other objects in view there is provided, in accordance with the invention, a rail vehicle with a sanitary assembly at which waste water is produced, the rail vehicle comprising:

[0007] a waste water pipeline extending between the sanitary assembly and a connector for a target container for receiving waste water;

[0008] wherein a waste water connector for connecting said waste water pipeline to the sanitary assembly is disposed lower than at least a portion of said waste water pipeline leading to the target container, and the waste water is conveyed through the waste water line counter to a force of gravity; and

[0009] at least one return flow barrier disposed in said waste water pipeline and arranged between said waste water connector of the sanitary assembly and said connector for the target container.

[0010] In other words, the objects of the invention are achieved in that the waste water line has at least one return flow barrier which is arranged between the waste water connector of the sanitary assembly and the portion of the waste water pipeline in which a wastewater backflow is most likely to occur.

[0011] The effect of such a return flow barrier is that waste water that runs back accumulates at one point in the waste water line and can be discharged more effectively at a later time.

[0012] Preferably, the return flow barrier is arranged in a substantially horizontally extending portion of the waste water pipeline. This increases the effectiveness of the return flow barrier in the waste water pipeline.

[0013] Advantageously, the return flow barrier can be formed by a rise and a subsequent drop in the course of the waste water pipeline. This ensures that waste water is prevented from flowing back by the rise in the course of the waste water pipeline and accumulates in the conveying direction downstream of the rise.

[0014] The rise can preferably amount to at least one pipe diameter. It is also possible for the rise to amount to a number of pipe diameters, it being necessary in each case to ensure that an expected quantity of waste water flowing back is reliably held back by the return flow barrier.

[0015] A portion of the waste water pipeline that is located downstream of the return flow barrier in the conveying direction of the waste water can be designed to be heated, so that in the event of frost affecting the waste water pipeline, possible damage can be reliably avoided.

[0016] Other features which are considered as characteristic for the invention are set forth in the appended claims.

[0017] Although the invention is illustrated and described herein as embodied in a rail vehicle having a sanitary assembly, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

[0018] The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

**BRIEF DESCRIPTION OF THE DRAWING**

[0019] The single FIGURE shows a schematic view of a part of a sanitary system of a rail vehicle.

**DETAILED DESCRIPTION OF THE INVENTION**

[0020] Referring now to the FIGURE of the drawing in detail there is shown a sanitary assembly 1 in a rail vehicle 8 in which waste water, or sewage, is produced. It is necessary to provide measures for discharging the waste water. In the exemplary embodiment, the sanitary assembly 1, which may be for example a toilet with a commode, a wash basin, or a shower, is connected via a waste water connector 2 to a waste water pipeline 3. In the conveying direction of the waste water, the waste water pipeline 3 opens out at a connector 4 of

a target container 5 which serves to receive the waste water. The target container 5 can be present as a waste water or sewage container that is carried on the rail vehicle. Alternatively, it is also conceivable to consider a waste water line between the target container 5 and a further target container which is arranged outside the rail vehicle and is present as a suction-extraction device on the land.

[0021] The waste water connector 2 of the sanitary assembly 1 is located lower than a portion of the waste water pipeline 3 to the connector 4 of the target container 5, and so waste water has to be conveyed counter to the force of gravity. This is typically done with the aid of compressed air or with a vacuum.

[0022] Starting from the connector 2, the waste water pipeline 3 first of all extends substantially horizontally in the conveying direction of the waste water, is then arranged in an obliquely upward manner, and opens out via a pipe bend, i.e., an elbow, in an obliquely downward manner in the region of the target container 5.

[0023] On account of the great length of the waste water pipeline 3, which can be found in particular in the case of particular types of rail vehicles, such as double-decker vehicles or sleeper vehicles, the inside of the waste water pipe is wetted with waste water at the end of a conveying cycle. At the end of the conveying cycle, this waste water flows to the nearest locally lowest point in the waste water pipeline, to a certain extent also counter to the conveying direction of the waste water back toward the sanitary assembly 1. In order to limit such a return flow effectively, the waste water pipeline 3 has a return flow barrier 6, which is formed in the flow direction of the waste water by a rise and a subsequent drop in the course of the waste water pipeline 3. In the illustrated exemplary embodiment, the rise corresponds to approximately four times the diameter of the waste water pipeline 3. The return flow barrier 6 causes waste water which has not been discharged from the pipeline region to accumulate in the region of the drop in the return flow barrier 6 downstream of the latter in the conveying direction. This means that unconveyed waste water cannot continue flowing toward the sanitary assembly 1. It is thus easier to move the waste water to the target container 5 in a subsequent waste water conveying cycle.

[0024] In order to avoid frost damage, that is, damage caused by freezing in the region of the drop in the return flow barrier 6, a heating arrangement or heater 7 is provided adjacent to the waste water pipeline 3 immediately downstream of the return flow barrier 6 in the flow direction of the waste water. This heater 7 is suitable for providing warmth to that

region of the waste water pipeline 3 in which waste water that flows back accumulates. As a result, if there is reason to fear frost damage to the waste water pipeline 3, the formation of ice downstream of the return flow barrier 6 in the waste water pipeline 3 can be avoided.

[0025] It is noted that the return flow barrier 6 does not necessarily have to have a uniform pipe diameter. Rather, different diameters are also conceivable over the pipe bend which forms the return flow barrier 6. Three-dimensional forms of the return flow barrier 6 are also possible. If required, a plurality of return flow barriers can also be provided along the waste water pipeline 3.

[0026] The return flow barrier 6 is typically formed from a plurality of pipe bends and so can be constructed easily.

- 1. A rail vehicle with a sanitary assembly at which waste water is produced, the rail vehicle comprising:
  - a waste water pipeline extending between the sanitary assembly and a connector for a target container for receiving waste water;
  - wherein a waste water connector for connecting said waste water pipeline to the sanitary assembly is disposed lower than at least a portion of said waste water pipeline leading to the target container, and the waste water is conveyed through the waste water line counter to a force of gravity; and
  - at least one return flow barrier disposed in said waste water pipeline and arranged between said waste water connector of the sanitary assembly and said connector for the target container.
- 2. The rail vehicle according to claim 1, wherein said return flow barrier is disposed in a substantially horizontally extending portion of said waste water pipeline.
- 3. The rail vehicle according to claim 1, wherein said return flow barrier is formed by a rise and a subsequent drop in a course of said waste water pipeline.
- 4. The rail vehicle according to claim 3, wherein said rise amounts to at least one pipe diameter.
- 5. The rail vehicle according to claim 1, wherein said return flow barrier is formed by pipe bends.
- 6. The rail vehicle according to claim 1, wherein a portion of said waste water pipeline that is located downstream of said return flow barrier in a conveying direction of the waste water is a heatable portion.
- 7. The rail vehicle according to claim 6, which comprises a heater disposed in a vicinity or at said heatable portion of said waste water pipeline.

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