

(19) **DANMARK**

(10) **DK/EP 2781248 T3**



(12) **Oversættelse af
europæisk patentskrift**

Patent- og
Varemærkestyrelsen

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- (51) Int.Cl.: **B 01 D 21/00 (2006.01)** **B 61 D 35/00 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2019-10-07**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2019-07-24**
- (86) Europæisk ansøgning nr.: **14159177.6**
- (86) Europæisk indleveringsdag: **2014-03-12**
- (87) Den europæiske ansøgnings publiceringsdag: **2014-09-24**
- (30) Prioritet: **2013-03-22 DE 102013205084**
- (84) Designerede stater: **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**
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- (54) Benævnelse: **Skinnekøretøj med en behandlingsindretning til gråt spildevand**
- (56) Fremdragne publikationer:
EP-A1- 2 484 574
JP-A- 2001 079 594

Description

The invention relates to a rail vehicle having a device for treating grey water, said device having a grey water container which is provided with a cover-side inlet for grey water, a base-side drain for treated grey water and a filter which is arranged between the inlet for grey water and the drain for treated grey water.

Such a rail vehicle is known from EP 2 484 574 A1. In this instance, the filter is present in the form of a cartridge and, in the event that the filter is full or clogged, a bypass is proposed in order to maintain a cleaning function. A cleaning operation is then carried out using fresh water. The Offenlegungsschrift JP 2001 079594 A also discloses a filter system for treating waste water.

Generally, grey water, for example, hand-washing water, is directed in rail vehicles in a conventional manner after use onto the track or, together with waste matter from the toilet, is collected in the waste-holding tank and emptied. Since water in the rail vehicle, on the one hand, has a negative influence on the vehicle weight and, on the other hand, has to be regularly re-filled and emptied, this leads to high maintenance costs.

Efforts are therefore made to treat grey water on the rail vehicle in such a manner that it can be re-used in place of fresh water, for example, for cleaning operations. The solution according to the above-mentioned document corresponds to this procedure.

In the prior art, it is further known to carry out a chemical treatment of the water in the grey water container so that it can be re-used. Such a solution is described, for example, in

DE 10 2010 007 115 A1. Both known solutions have the disadvantage that the treatment of the grey water is complex. Filter cartridges which are used thus have to be regularly replaced, whilst a chemical treatment of the grey water as a result of the chemicals used also requires regular maintenance.

Based on this, an object of the invention is to develop the rail vehicle mentioned in the introduction in such a manner that a treatment of grey water, in particular hand-washing water, can be carried out with a lower level of maintenance complexity.

This object is achieved with the rail vehicle mentioned in the introduction in that the filter is formed by a slotted filter and the grey water container has at least one dirt particle outlet in its base region.

In this manner, a treatment of grey water in the rail vehicle is carried out without the use of consumables, such as chemicals or filter cartridges, so that the maintenance complexity is reduced compared to the prior art.

A base of the grey water container from now on has a raised portion in the region of the drain for treated grey water, and slotted members of the slotted filter are arranged on resulting slopes between the raised portion of the base of the grey water container and lower base portions of the grey water container, in which the at least one dirt particle outlet is also arranged.

There are then produced in the region of the slopes of the base of the grey water container slotted members which are arranged obliquely one above the other and which each

cooperate with the adjacent base of the grey water container in order to collect dirt particles.

5 The slotted members which are arranged on the slopes can in this instance be actuated in such a manner that they can be moved from a first position, in which the lower ends thereof are located on the base of the grey water container, and a second position, in which they are raised in relation to the first position. This results in the slotted members in the
10 raised position thereof permitting a movement of the dirt particles in the direction of the lower base portions and consequently towards the at least one dirt particle outlet. This movement can be supported by other measures.

15 The slotted members which are arranged on the slopes can preferably be able to be raised by means of compressed air. This compressed air may additionally have the effect of moving the dirt particles in the direction towards the at least one dirt particle outlet.

20 To this end, it is advantageous when a cover portion of the grey water container which is connected flexibly to a surrounding region of the cover of the grey water container has a compressed air connection and the slotted members which
25 are arranged on the slopes are connected to the portion of the cover of the grey water container in such a manner that, when the inner side of the grey water container is acted on with compressed air, they follow a lifting movement of the cover portion. In this embodiment of the invention, a
30 mechanical actuation of the movable slotted members is achieved in a simple manner.

There may be provided fixed slotted members which extend from a cover of the grey water container and which extend in the
35 direction towards the base of the grey water container and

which cooperate with the movable slotted members which are provided on the slopes of the base of the grey water container. In this instance, in particular mutually facing ends of a fixed slotted member and a movable slotted member may overlap
5 so that an effective barrier for dirt particles is provided.

The grey water container may have a cover-side inlet for fresh water and be provided at the inner side thereof with a filling level sensor. This embodiment relates in the first instance
10 to the case in which too little fluid is contained in the grey water container to carry out a subsequent cleaning operation. In this instance, the inadequate fluid level is detected via the filling level sensor and fresh water is supplied to such an extent that a subsequent cleaning operation can be carried
15 out.

An embodiment of the invention is explained in greater detail below with reference to the drawing. The single Figure is a schematic view of a grey water container for use in a rail
20 vehicle.

The Figure shows a generally cylindrically symmetrical grey water container 1 which has a cover-side inlet 2 for grey water which reaches the grey water container 1 via a valve 3.
25

The grey water container 1 has a base having a central raised portion 4, from which there extends an outlet 5 for treated grey water which is also provided with a valve 6.

30 At both sides of the raised portion 4 of the grey water base, inclined base portions 7, 8 adjoin each other. From the respective base of the slopes 7, 8 the base of the grey water container extends horizontally outwards and the grey water container 1 has at both lower corners a dirt particle outlet
35 9, 10.

In the region of the slopes 7, 8, vertically orientated movable slotted members 11, 12, 13, 14 are arranged, in the illustrated embodiment in each case two at each side of the raised portion 4. In other embodiments, it is possible for the number of slotted members to be greater for a higher filter quality.

Since the inlet for grey water 2 is arranged at the edge of the grey water container 1 in such a manner that incoming grey water beyond the outermost slotted member 11, 8 strikes the base of the grey water container 1, a fluid level 15 rises as the grey water continues to flow in until an upper end of the outermost slotted member 11 is reached, after which the then already partially treated grey water flows further in the direction towards the outlet 5 for treated grey water. Any dirt particles, such as floating particles, remain at the outermost filter stage on an outer side of the outermost slotted member 11, 8.

As the filling level of the grey water container 1 increases further, the upper end of the inner slotted members 12, 13 is reached, wherein dirt particles in turn accumulate in the intermediate space between the outermost slotted members 11, 8 and the inner slotted members 12, 13.

The slotted members 11, 12, 13, 14 are vertically movable and stand in their initial state on the base of the grey water container 1. The actuation thereof is carried out by means of compressed air. To this end, a cover portion 15 of the grey water container 1 is connected in a flexible manner to a fixed, surrounding region 16 of the cover of the grey water container 1, via a flexible membrane 17.

The cover portion 15 is provided with a compressed air connection 18 and the grey water container 1, when the valves

3, 6, 9, 10 are closed, is pressure-tight to the extent that acting on the grey water container 1 with compressed air brings about a lifting of the cover portion 15.

5 On the cover portion 15, at an inner side of the grey water container 1, there are fitted actuation elements 19, 20 which initially extend vertically in the direction towards the base of the grey water container 1 and then substantially parallel with the slopes 7, 8 and are mechanically connected to the
10 movable slotted members 11, 12, 13, 14. Consequently, a lifting of the cover portion 15 by means of incoming compressed air also results in the slotted members 11, 12, 13, 14 being raised so that dirt particles can move along the slopes 7, 8
15 downwards in the direction towards the dirt particle outlets 9, 10. If the dirt particle outlets 9, 10 are now opened, but the valve 6 and the valve 3 are closed, the compressed air brings about an emptying of the grey water container 1 via the dirt particle outlets 9, 10, whereby in addition to grey water, filtered dirt particles are also discharged.

20 In order to support the filter action of the slotted filter, the vertically movable slotted members 11, 12, 13, 14 cooperate with associated fixed slotted members 21, 22, 23, 24, which extend from the cover portion 16 vertically
25 downwards into the grey water container 1, wherein the lower ends thereof overlap with the upper ends of the movable slotted members 11, 12, 13, 14 and are each located at the inner side thereof.

30 In the event that the grey water container 1 does not contain a sufficient quantity of treated grey water for an additional cleaning operation, the grey water container 1 is provided with a filling level sensor 25 which detects when a value falls below a predetermined filling level value for a cleaning
35 operation. Water which is not available for a subsequent

cleaning operation is treated via an inlet 26 for fresh water, which in the illustrated embodiment is connected directly to the cover-side inlet 2 for grey water and is connected via a common line piece to the valve 3.

5

Furthermore, the grey water container 1 is provided at the cover side with an overflow valve 27.

P a t e n t k r a v

5 1. Skinnekøretøj med en indretning til behandling af gråt spildevand, som har en beholder (1) til gråt spildevand, som er udstyret med et indløb (2) til gråt spildevand på dækselsiden, et udløb (5) på bundsiden til behandlet gråt spildevand og et filter, der er anbragt mellem indløbet (2) til gråt spildevand og udløbet (5) til behandlet gråt spildevand,

kendetegnet ved, at

10 filteret er dannet af et kulissefilter, og beholderen (1) til gråt spildevand har mindst et udløb til smudspartikler (9, 10) i sit bundområde, hvor en bund af beholderen (1) til gråt spildevand (1) i området ved udløbet (5) til behandlet gråt spildevand har et forhøjet afsnit (4), og kulisser (11 - 14) af kulissefilteret er anbragt på resulterende skråninger (7, 8) mellem det forhøjede afsnit (4) af bunden af beholderen (1) til gråt spildevand og de lavere beliggende bundaf-
15 snit af beholderen til gråt spildevand (1), i hvilke også det mindst ene smudspartikeludløb (9, 10) er anbragt, hvor kulisserne (11-14), der er anbragt på skråningerne (7, 8), kan aktiveres på en sådan måde, at de kan bevæges fra en første position, ved hvilken deres nedre ender står på bunden af beholderen (1) til gråt spildevand, og en anden position, ved hvilken de er løftet i forhold til
20 den første position.

2. Skinnekøretøj ifølge krav 1,

kendetegnet ved, at

25 kulisserne (11-14), der er anbragt på skråningerne (7, 8), kan løftes ved hjælp af trykluft.

3. Skinnekøretøj ifølge krav 2,

kendetegnet ved, at

30 et dækselafsnit (15) af beholderen (1) til gråt spildevand, der er forbundet fleksibelt med et omgivende område (16) af dækslet af beholderen (1) til gråt spildevand, har en tryklufttilslutning (18), og kulisserne (11-14), der er anbragt på skråningerne (7, 8), er forbundet med dækselafsnittet (15) af beholderen (1) til gråt spildevand på en sådan måde, at de ved påvirkning af det indre af beholderen (1) til gråt spildevand med trykluft følger en løftebevægelse af dækselafsnittet (15).
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4. Skinnekøretøj ifølge et af kravene 1 til 3,

kendetegnet ved, at

5 der er tilvejebragt faste kulisser (21-24), der udgår fra et fast område (16) af dækslet af beholderen (1) til gråt spildevand, hvilke strækker sig i retning mod bunden af beholderen (1) til gråt spildevand og samvirker med de bevægelige kulisser (11-14), der er tilvejebragt på skråningerne (7, 8) af bunden af beholderen (1) til gråt spildevand.

10 5. Skinnekøretøj ifølge et af kravene 1 til 4,

kendetegnet ved, at

beholderen (1) til gråt spildevand (1) har et indløb (26) til ferskvand på dækselsiden og i sit indre er forsynet med en fyldstandssensor (25).

