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

(11) EP 3 284 702 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.02.2018 Bulletin 2018/08

(51) Int Cl.:
B65D 88/74 *(2006.01)*

(21) Application number: **17179507.3**

(22) Date of filing: **08.05.2015**

(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 Validation States:
MA

(30) Priority: **16.05.2014 CN 201420250748 U**
12.06.2014 NL 2012992

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
15729951.2 / 3 142 945

(71) Applicant: **Unit 45 B.V.**
3051 BP Rotterdam (NL)

(72) Inventors:
- **Koolen, Johannes Baptistus**
3051 BP Rotterdam (NL)
- **Nouwen, Jan**
3051 BP Rotterdam (NL)

(74) Representative: **V.O.**
P.O. Box 87930
Carnegieplein 5
2508 DH Den Haag (NL)

Remarks:
•This application was filed on 04.07.2017 as a divisional application to the application mentioned under INID code 62.
•Claims filed after the date of filing of the application/after the date of receipt of the divisional application (Rule 68(4) EPC).

(54) FREIGHT CONTAINER AND METHOD FOR TRANSPORTING CARGO

(57) One aspect of the present disclosure provides a freight container (100) for transporting cargo (5), especially temperature sensitive cargo. The container comprises a container body (24) enclosing a cargo space (25) for storing the cargo (5). The container (100) further comprises an air conditioning unit (7) arranged for controlling a temperature and/or humidity in the cargo space. At least part the air conditioning unit (7) is suspended above a cargo floor (3) of the cargo space. A further aspect relates to a method for transporting cargo. The method comprises at least partly charging a battery by means of a generator also at a moment when there is no need to alter the air property of the air inside the container.

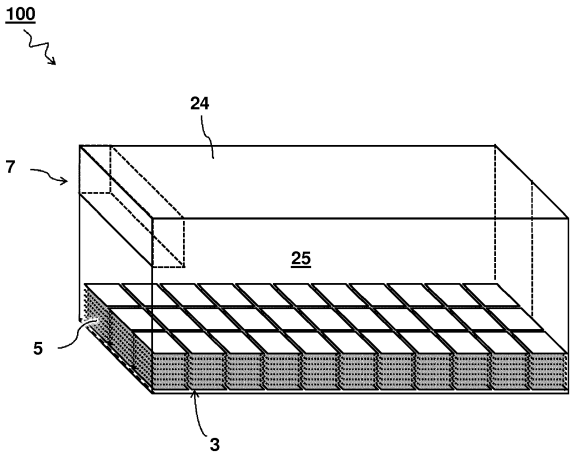

FIG 1

EP 3 284 702 A1

Description

TECHNICAL FIELD AND BACKGROUND

[0001] The present disclosure relates to a freight container for transporting cargo, especially temperature sensitive cargo. The disclosure further relates to a method for transporting cargo.

[0002] Modern society has become increasingly dependent on the long distance transport of cargo. Freight containers are widely used to transport such cargo, e.g. by boat, train, and/or truck. Some cargo, e.g. food, such as fruit, dairy products, meat, etc., but also electronics, may require a climate controlled environment to prevent their deterioration. Temperature and/or humidity sensitive cargo can be transported by a freight container comprising an air conditioning unit. For example, the air conditioning unit can be integrated into the container. To guarantee continuous temperature control, it is desirable to also integrate a power source/generator into the container or air conditioning unit. For example a diesel powered generator and fuel tank can be integrated into the container. However, the extra equipment may affect the available cargo space because the outer dimensions of the container are constrained by international standards. For example, a long range transport container may contain a relatively large fuel tank that occupies part of the cargo space. However, such a design runs counter to the general need for maximizing the cargo capacity of the freight container.

[0003] Therefore, a general need exists for a long range, climate controlled freight container or reefer having an increased cargo capacity. For example, a specific need exists to have sufficient cargo capacity to transport thirty-three or more Euro pallets (each with a size of 80 cm x 120 cm) arranged side by side, while keeping climate control for a journey lasting twenty days or more.

SUMMARY

[0004] To meet these or other challenges, one aspect of the present disclosure provides a freight container for transporting cargo, especially temperature sensitive cargo. The container comprises a container body enclosing a cargo space for storing the cargo. The container further comprises an air conditioning unit arranged for controlling a temperature and/or humidity in the cargo space. It is noted that the air conditioning unit may for instance be arranged for conditioning the temperature of air in the container, e.g. in order to facilitate that the temperature of goods transported by the container can be kept substantially below a predetermined maximum temperature and/or can be kept substantially above a predetermined minimum temperature, preferably said temperature can be kept substantially within a predetermined temperature range. For example, the air conditioning unit can be arranged for cooling air and/or can be arranged for heating air. The container further comprises a generator for powering the air conditioning unit. The container further comprises a fuel tank for supplying the generator with fuel, especially diesel. At least part the air conditioning unit is suspended above a cargo floor of the cargo space.

[0005] Advantageously, the present arrangement may allow cargo to be placed on the cargo floor below the air conditioning system. By arranging the air conditioning unit at or near a front side of the container opposite a back side provided with one or more doors, the unit can be placed against the front without affecting the doors. For example, at least a part of the air conditioning system can be provided against a top side of the container. By providing an outside of the container body with a cavity protruding inward into the container and accommodating at least part of the air conditioning unit in the cavity, the outer dimensions of the container can be kept within specification, while saving cargo space at least at the floor level. For example, a part of the air conditioning unit, e.g. condenser, may be sticking outside from the container body. By shaping the cavity as an inward step of the container body on the upper front side of the container, the air conditioning unit can be placed through a vertical side wall, yet stay within the constrained perimeter of the container. Advantageously, the cargo floor may extends below the step for allowing cargo to be placed on the cargo floor below the step.

[0006] In one aspect, the design made available by the present disclosure can provide a container having an outer length corresponding with the sizes and dimensions of a standard freight container. For example, the freight container can be formed as a 45 foot container, preferably as a so-called 45 ft. pallet wide container. A relevant norm for the standard container dimensions would for example be an ISO standard, such as ISO 668 (1995) or an equivalent standard. The present design allows for a cargo floor that is at least 2.4 meter wide and at least 13.2 meter long, such as to accommodate at least 33 Euro-pallets or EPAL-pallets on the floor (each pallet typically has width x length = 80 cm x 120 cm). For example, 11 rows of 3 pallets (having their longitudinal direction extending in the longitudinal direction of the container/cargo floor) Alternatively, 1 row of 3 pallets (having their longitudinal direction extending in the longitudinal direction of the container/cargo floor) and 15 rows of 2 + 1 * 3 pallets having their longitudinal direction extending in the width direction of the container/cargo floor). The container can be provided with first fitting blocks of which the mutual spacing corresponds to the mutual spacing of a 40 foot container and/or second fitting blocks or so-called corner fittings of which the mutual spacing corresponds to the mutual spacing of the outermost placed fitting blocks of a 45 foot container.

[0007] To save further space, the air conditioning unit can be arranged at least partially above the fuel tank. For example, the fuel tank can be arranged flat against an outer hull of the container. Further space can be saved by integrating components. For example the generator can be integrated as part of the air conditioning unit. Al-

ternatively, or in addition to the generator, the container may comprise one or more batteries for feeding the air conditioning unit and/or starting the generator. Advantageously, the battery can be charged by the generator. To save further space, the fuel tank may comprises an L-shape, wherein the battery is accommodated in a cavity formed by the L-shape.

[0008] The container may comprise a sensor, especially a temperature sensor, associated with the cargo space, and a controller for controlling the air conditioning system. For example, the controller is arranged for determining whether an air property sensed by the sensor needs to be altered by examining whether the sensed air property is below a predetermined bottom threshold value and/or above a predetermined top threshold value, and for controlling the air conditioning unit such as to alter the air property accordingly.

[0009] Another or further problem associated with containers for transporting temperature sensitive cargo is that the batteries of such containers can run low, especially when the containers are transported through relatively cold areas with a relatively cold outdoor temperature (e.g. when being transported overland, for instance by train, e.g. from Europe through Russia to China, or vice versa).

[0010] Accordingly, in another or further aspect, the present disclosure provides a freight container for transporting cargo, especially temperature sensitive cargo as described above, or otherwise. The container comprises a cargo space defining a cargo floor, and an air conditioning unit, preferably a cooling and/or heating unit, a battery for feeding the air conditioning unit, a generator, especially a diesel powered generator, for charging the battery at least partly, and a fuel tank for supplying the generator with fuel. The container further comprises a clock and a controller arranged for controlling the generator in order to charge the battery at least partly at a moment when a predetermined time interval has lapsed since the last time the battery is charged at least partly. Alternatively, or in addition, the container further comprises a voltage sensing device and a controller arranged for controlling the generator in order to charge the battery at least partly at a moment when is determined that the terminal voltage of the battery has dropped below a predetermined minimum voltage threshold value. Alternatively, or in addition, the container further comprises a receiver and a controller arranged for controlling the generator in order to charge the battery at least partly based on a control signal received by said receiver.

[0011] By providing a wall separating the cargo space from a part of the air conditioning system located behind said wall, said wall can define a cavity for guiding air from the cargo space to the air conditioning unit or vice versa.

[0012] In a further aspect, the present disclosure provides a method for transporting cargo, especially temperature sensitive cargo, by means of a freight container. The method comprises providing a freight container, preferably a container as described herein. The container is provided with at least an air conditioning unit, preferably a cooling and/or heating unit. The container is further provided with a battery and a generator, especially a diesel powered generator. The method further comprises sensing an air property of air inside the container, especially the temperature of air inside the container. The method further comprises determining whether said air property needs to be altered by examining whether the sensed air property is below a predetermined bottom threshold value and/or above a predetermined top threshold value. The method further comprises altering said air property when the value of the sensed air property is below said predetermined bottom threshold value, such as to bring said air property above said predetermined bottom threshold value, or altering said air property when the sensed value of the air property is above said predetermined top threshold value, such as to bring said air property below said predetermined top threshold value. The method further comprises at least partly charging the battery by means of the generator at a moment when there is no need to alter the air property of the air inside the container. This may be advantageous for keeping the battery charged also during periods when the air conditioning is not strictly necessary. Otherwise, the battery may discharge which may also prevent the generator from starting.

[0013] In one embodiment, the step of charging the battery at a moment when there is no need to alter the air property of the air inside the container is initiated when a predetermined time interval has lapsed, e.g. when a predetermined time interval has lapsed since the last time the battery is charged at least partly. In another or further embodiment, the step of charging the battery at a moment when there is no need to alter the air property of the air inside the container is initiated when it is determined that the terminal voltage of the battery has dropped below a predetermined minimum voltage threshold value. In another or further embodiment, the freight container further is provided with a receiver, and wherein the step of charging the battery at a moment when there is no need to alter the air property of the air inside the container is initiated by means of a control signal received by said receiver of the freight container. In one embodiment, the air conditioning unit is activated while the air property does not need to be altered based e.g. on temperature. Alternatively, or in addition, the battery can be at least partly charged by means of the generator at a moment when there is a need to alter the air property of the air inside the container.

BRIEF DESCRIPTION OF DRAWINGS

[0014] These and other features, aspects, and advantages of the apparatus, systems and methods of the present disclosure will become better understood from the following description, appended claims, and accompanying drawing wherein:

FIG 1 shows a schematic perspective bird's eye view of an embodiment of a container;
FIG 2 shows a cross-section side view of a front of another embodiment of the container including placement of cargo;
FIG 3 shows a schematic perspective drawing of the front part of the embodiment;
FIG 4 shows a schematic front view of an embodiment of the embodiment;
FIG 5 shows a schematic side view of an embodiment of the embodiment;
FIG 6 shows a schematic top view of an embodiment of the embodiment;
FIG 7 shows a schematic perspective view of an embodiment of a fuel tank.

DESCRIPTION OF EMBODIMENTS

[0015] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs as read in the context of the description and drawings. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein. In some instances, detailed descriptions of well-known devices and methods may be omitted so as not to obscure the description of the present systems and methods. Terminology used for describing particular embodiments is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. The term "and/or" includes any and all combinations of one or more of the associated listed items. It will be understood that the terms "comprises" and/or "comprising" specify the presence of stated features but do not preclude the presence or addition of one or more other features. It will be further understood that when a particular step of a method is referred to as subsequent to another step, it can directly follow said other step or one or more intermediate steps may be carried out before carrying out the particular step, unless specified otherwise. Likewise it will be understood that when a connection between structures or components is described, this connection may be established directly or through intermediate structures or components unless specified otherwise. All publications, patent applications, patents, and other references mentioned herein are incorporated by reference in their entirety. In case of conflict, the present specification, including definitions, will control.

[0016] The invention is described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. The description of the exemplary embodiments is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the drawings, the absolute and relative sizes of systems, components, layers, and regions may be exaggerated for clarity. Embodiments may be described with reference to schematic and/or cross-section illustrations of possibly idealized embodiments and intermediate structures of the invention. Relative terms as well as derivatives thereof should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description and do not require that the system be constructed or operated in a particular orientation unless stated otherwise.

[0017] In the description and drawings, like numbers refer to like elements throughout. In particular, the following reference numbers may apply: 1 container front, 2 container ceiling, 3 cargo floor, 4 container bottom, 5 cargo, 6 corner pieces, 7 cooler, 8 container side, 9 battery, 10 solar panels, 11 cooler gate, 13 reinforced holes, 20 fuel tank, 21 remote control, 22 belt, 23 distribution sheet, 24 container body, 25 cargo space, 100 container.

[0018] FIG 1 shows a schematic perspective bird's eye view of an embodiment of a freight container 100. The container 100 is suitable for transporting cargo 5, especially temperature sensitive cargo. A freight container may also be referred to as an intermodal container, shipping container, e.g. a refrigerated container or a so-called reefer. The container, which preferably can be an intermodal container and/or an ISO container, can be arranged for intermodal freight transport which can involve the use of multiple modes of transportation, e.g. including rail transportation, transportation by truck, and/or ship transportation, without any handling of the freight itself when changing modes of transportation. Typically, on board ships, intermodal containers can be stacked up to seven units high. For instance therefore, the intermodal container can be arranged to be stackable, e.g. can be sufficiently strong and/or can be provided with bottom and top fittings, especially twistlock fittings. The container can be a so-called multimodal transport container, and may be arranged for multimodal transport, or so-called combined transport, wherein the transportation of goods can be under a single contract, but can nevertheless be performed wit at least two different means of transport, e.g. rail, sea and/or road.

[0019] According to the embodiment shown, the container 100 comprises a container body 24 enclosing a cargo space 25 for storing the cargo 5. The container further comprises an air conditioning unit 7 arranged for controlling a temperature and/or humidity in the cargo space 25. At least part the air conditioning unit 7 is suspended above a cargo floor 3 of the cargo space 25 for

allowing cargo to be placed on the cargo floor 3 below the said part of the air conditioning system 30. In another or further embodiment, the container 100 comprises a generator (not shown) for powering the air conditioning unit 7. For example, the generator may be external, or integrated into the air conditioning unit 7. The generator may be coupled to a fuel tank (not shown here) for supplying the generator 33 with fuel, typically diesel. Alternatively, or in addition, the generator may be powered by other means, e.g. electricity

[0020] In one embodiment, at least the outer length of the container corresponds with the sizes and dimensions of a standard freight container, especially a 45 foot container. In another or further embodiment, the container is formed as a 45 foot container, preferably as a so-called 45 ft. pallet wide container. In one embodiment, the cargo floor 3 is at least 2.4 meter wide and at least 13.2 meter long, such as to accommodate at least 33 Euro-pallets, e.g. stored in the manner shown in FIG 1.

[0021] For example, in case the part of the air conditioning system 7 located above the cargo floor 3 is extending above the cargo floor for at most about 0.8 meter, it can be advantageous to place the first Euro-pallets with their longitudinal direction (e.g. two time 120 cm) extending in the width direction of the container (240 cm), such that only the loading height of two pallets (in stead of that of three 3 pallets) is restricted by said part of the air conditioning system located above the cargo floor.

[0022] In one embodiment (not shown here), the container is provided with first fitting blocks of which the mutual spacing corresponds to the mutual spacing of a 40 foot container and/or second fitting blocks or so-called corner fittings of which the mutual spacing corresponds to the mutual spacing of the outermost placed fitting blocks of a 45 foot container.

[0023] FIG 2 shows a cross-section side view of a front of another embodiment of the container 100 including cargo 5 place inside the cargo space 25.

[0024] In one embodiment, e.g. as shown, the air conditioning unit 7 is arranged at or near a front side 1 of the container 100. This may be opposite a back side provided with one or more doors (not shown). In another or further embodiment, at least a part of the air conditioning system is provided against or near a top side 2 of the container 100.

[0025] In one embodiment, e.g. as shown, the container body 24 comprises a cavity 17 protruding inward into the container. In another or further embodiment at least part of the air conditioning unit 7 is sticking out from the container body 24 and accommodated in the cavity 17. For example, a condenser part 7a of the air conditioning unit 7 may stick outside the container body 24 while an evaporator part 7b sticks inside the container body 24, in particular into the cargo space 25. In another or further embodiment, e.g. as shown, the cavity 17 is formed by an inward step of the container body 24 on the upper front side 1,2 of the container 100. In another or further embodiment, e.g. as shown, the cargo floor 3 extends below the step for allowing cargo 5 to be placed on the cargo floor 3 below the step.

[0026] In one embodiment, a sheet or sail 23 is provide at an outlet of the air conditioning unit 7 in the cargo space 25. By arranging the sheet 23, as shown suspended at the top side 2 of the container 100, the cool air from the air conditioning unit 7 may be distributed over the cargo space 25.

[0027] In one embodiment, e.g. as shown, the air conditioning unit 7 is arranged at least partially above the fuel tank 20. For example, in the embodiment shown, part of the condenser 7a is above the fuel tank 20. In another or further embodiment, e.g. as shown, the fuel tank 20 is arranged flat against an outer hull of the container. By providing a relatively flat fuel tank, cargo space 25 inside the container body 24 may be further increased.

[0028] In one embodiment, the container and/or air conditioning unit 7 comprises a sensor (not shown), e.g. a temperature sensor. The sensor may be associated with the cargo space. In another or further embodiment a controller is provided for controlling the air conditioning system. For example, the controller is arranged for determining whether an air property sensed by the sensor needs to be altered by examining whether the sensed air property is below a predetermined bottom threshold value and/or above a predetermined top threshold value. The controller may be arranged for controlling the air conditioning unit such as to alter the air property accordingly.

[0029] In one embodiment, the container 100 comprises a separation wall being located at a distal end of the cargo floor and separating the cargo space at least partly from a second part of the air conditioning system located behind said wall. In the embodiment, the said wall defines a cavity for guiding air from the cargo space to the air conditioning unit or vice versa.

[0030] FIG 3 shows a schematic perspective drawing of the front part of the embodiment, e.g. similar to FIG 2. In one embodiment, e.g. as shown, the container 100 comprises a battery 9 for feeding the air conditioning unit, a generator (not specifically indicated), especially a diesel powered generator, for charging the battery at least partly, and a fuel tank 20 for supplying the generator with fuel. In one embodiment, e.g. as shown, the container 100 comprises a battery 9 for feeding the air conditioning unit 7 and/or starting the generator. In one embodiment, the battery is arranged to be charged by the generator.

[0031] In one embodiment, e.g. as shown, the fuel tank 20 comprises an L-shape, wherein the battery 9 is accommodate in a cavity formed by the L-shape. This, in combination with the suspended air conditioning unit 7, may provide a maximum capacity to the fuel tank 20 while allowing the placement of a battery 9, and without sacrificing cargo space.

[0032] In one embodiment, the container 100 as described herein, or otherwise, comprises a clock and a controller arranged for controlling the generator in order to charge the battery 9 at least partly at a moment when a predetermined time interval has lapsed since the last

time the battery is charged at least partly. Alternatively, or in addition, the container 100 comprises a voltage sensing device and a controller arranged for controlling the generator in order to charge the battery at least partly at a moment when is determined that the terminal voltage of the battery has dropped below a predetermined minimum voltage threshold value. Alternatively, or in addition, the container further comprises a receiver 21 and a controller arranged for controlling the generator in order to charge the battery at least partly based on a control signal received by said receiver.

[0033] In another or further aspect of the disclosure, the figure may illustrate a method for transporting cargo, especially temperature sensitive cargo, by means of a freight container. In one embodiment, the method comprises providing a freight container, preferably a container 100 as described herein, said container being provided with at least an air conditioning unit 7, preferably a cooling and/or heating unit, a battery 9, and a generator, especially a diesel powered generator. In another or further embodiment, the method comprises sensing an air property of air inside the container, especially the temperature of air inside the container. In another or further embodiment, the method comprises determining whether said air property needs to be altered by examining whether the sensed air property is below a predetermined bottom threshold value and/or above a predetermined top threshold value. In another or further embodiment, the method comprises altering said air property when the value of the sensed air property is below said predetermined bottom threshold value, such as to bring said air property above said predetermined bottom threshold value, or altering said air property when the sensed value of the air property is above said predetermined top threshold value, such as to bring said air property below said predetermined top threshold value. In another or further embodiment, the method comprises at least partly charging the battery 9 by means of the generator at a moment when there is no need to alter the air property of the air inside 25 the container.

[0034] In one embodiment, the step of charging the battery 9 at a moment when there is no need to alter the air property of the air inside 25 the container is initiated when a predetermined time interval has lapsed, e.g. when a predetermined time interval has lapsed since the last time the battery 9 is charged at least partly.

[0035] In one embodiment, the step of charging the battery 9 at a moment when there is no need to alter the air property of the air inside the container 100 is initiated when it is determined that the terminal voltage of the battery has dropped below a predetermined minimum voltage threshold value.

[0036] In one embodiment, the freight container 100 is provided with a receiver 21, e.g. on a top side 2 of the container as shown in FIG 6. For example the step of charging the battery 9 at a moment when there is no need to alter the air property of the air inside the container can be initiated by means of a control signal received by said receiver of the freight container.

[0037] In one embodiment, the method comprises the step of altering the air property of the air inside the container while the battery is charged at the moment when the air property does not need to be altered.

[0038] In one embodiment, the method comprises the step of at least partly charging the battery by means of the generator at a moment when there is a need to alter the air property of the air inside the container.

[0039] FIG 4 shows a schematic front view of an embodiment of the embodiment, e.g. similar to FIG 2 and 3. In the embodiment shown, the container 100 comprises on the front side 1, an air conditioning unit 7, a fuel tank 20, and a battery 9. The fuel tank 20 may be held fixed by belts 22.

[0040] FIG 5 shows a schematic view of the side 8 of an embodiment of the container 100, e.g. similar to FIGs 2-4. As visible in this view, the container 100 comprises an air conditioning unit 7 at or near the ceiling 2 of the container. The fuel tank 20 is arranged at the front side. As shown, the fuel tank 20 may be protected by extended corners 6. Also shown in this figure is the floor 3 at the bottom 4 of the container.

[0041] FIG 6 shows a schematic view of the top 2 of the embodiment, e.g. similar to FIGs 2-5. The top view shows for example a roster 11, which may function as an outlet for the air conditioning unit (not visible here). Also shown on the top side is an optional transceiver 21, which may be used for receiving instructions and/or sending a status/location of the container or air conditioning unit. Finally, the top view shows an optional solar panel 10, which may be used to power equipment in the container. For example, the solar panel 10 may be used to charge the battery (not shown here).

[0042] FIG 7 shows a schematic perspective view of an embodiment of a fuel tank 20, e.g. as used in FIGs 2-6. The L-shape of the tank 20 may be advantageous to accommodate equipment, e.g. a battery. In the embodiment shown, the fuel tank 20 comprises a number of holes or tubes extending into the fuel tank. These may be advantageous e.g. to prevent or diminish slushing of the fuel inside the tank.

[0043] For the purpose of clarity and a concise description, features are described herein as part of the same or separate embodiments, however, it will be appreciated that the scope of the invention may include embodiments having combinations of all or some of the features described. Alternative, or in addition to providing a cooling function, the air conditioning unit may also provide heating when necessary. Alternatively, or in addition, the air conditioning unit may also provide other environmental control, e.g. humidity control. For example, while embodiments were shown for a specifically arranged air conditioning unit, also alternative ways may be envisaged by those skilled in the art having the benefit of the present disclosure for achieving a similar or equivalent function and result.

[0044] E.g. components such as the air conditioning

unit, generator, battery, and/or fuel tank may be combined or split up into one or more alternative components. The various elements of the embodiments as discussed and shown offer certain advantages, such providing an air conditioned cargo space having maximizes capacity. Of course, it is to be appreciated that any one of the above embodiments or processes may be combined with one or more other embodiments or processes to provide even further improvements in finding and matching designs and advantages. It is appreciated that this disclosure offers particular advantages to transport of temperature sensitive cargo, and in general can be applied for any application wherein a maximum storage capacity for a climate controlled cargo container is desired.

[0045] While the present systems and methods have been described in particular detail with reference to specific exemplary embodiments thereof, it should also be appreciated that numerous modifications and alternative embodiments may be devised by those having ordinary skill in the art without departing from the scope of the present disclosure. For example, embodiments wherein devices or systems are disclosed to be arranged and/or constructed for performing a specified method or function inherently disclose the method or function as such and/or in combination with other disclosed embodiments of methods or systems. Furthermore, embodiments of methods are considered to inherently disclose their implementation in respective hardware, where possible, in combination with other disclosed embodiments of methods or systems. Furthermore, methods that can be embodied as program instructions, e.g. on a non-transient computer-readable storage medium, are considered inherently disclosed as such embodiment.

[0046] Finally, the above-discussion is intended to be merely illustrative of the present systems and/or methods and should not be construed as limiting the appended claims to any particular embodiment or group of embodiments. The specification and drawings are accordingly to be regarded in an illustrative manner and are not intended to limit the scope of the appended claims. In interpreting the appended claims, it should be understood that the word "comprising" does not exclude the presence of other elements or acts than those listed in a given claim; the word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements; any reference signs in the claims do not limit their scope; several "means" may be represented by the same or different item(s) or implemented structure or function; any of the disclosed devices or portions thereof may be combined together or separated into further portions unless specifically stated otherwise. The mere fact that certain measures are recited in mutually different claims does not indicate that a combination of these measures cannot be used to advantage. In particular, all working combinations of the claims are considered inherently disclosed.

Claims

1. Freight container (100) for transporting cargo (5), especially temperature sensitive cargo, the container (100) comprising:

   a container body (24) enclosing a cargo space (25) for storing the cargo (5);
   an air conditioning unit (7) arranged for controlling a temperature and/or humidity in the cargo space (25);
   a generator for powering the air conditioning unit (7); and
   a fuel tank (20) for supplying the generator (33) with fuel, especially diesel;
   wherein at least part the air conditioning unit (7) is suspended above a cargo floor (3) of the cargo space (25) for allowing cargo to be placed on the cargo floor (3) below the said part of the air conditioning unit (7).

2. Freight container according to claim 1, wherein the air conditioning unit (7) is arranged at or near a front side (1) of the container (100) opposite a back side provided with one or more doors.

3. Freight container according to claim 1 or 2,
   wherein an outside of the container body (24) comprises a cavity (17) protruding inward into the container, and at least part of the air conditioning unit (7) is sticking out from the container body (24) and accommodated in the cavity (17),
   preferably wherein the cavity (17) is formed by an inward step of the container body (24) on the upper front side (1,2) of the container (100),
   more preferably wherein the cargo floor (3) extends below the step for allowing cargo (5) to be placed on the cargo floor (3) below the step.

4. Freight container according to any one of the preceding claims,
   wherein the air conditioning unit (7) is arranged at least partially above the fuel tank (20); and/or
   wherein the fuel tank (20) is arranged flat against an outer hull of the container; and/or
   wherein the generator is part of the air conditioning unit (7).

5. Freight container according to any one of the preceding claims, comprising a battery (9) for feeding the air conditioning unit (7) and/or starting the generator, wherein the battery is arranged to be charged by the generator, preferably wherein the fuel tank (20) comprises an L-shape and the battery (9) is accommodated in a cavity formed by said L-shape.

6. Freight container according to any one of the preceding claims, wherein said at least a part of the air

conditioning unit (7) is provided against a top side (2) of the container.

7. Freight container according to any one of the preceding claims,
wherein the container is an intermodal container or a so-called multimodal transport container, especially an ISO container; and/or
wherein at least the outer length of the freight container corresponds with the sizes and dimensions of a standard freight container, especially a 45 foot container; and/or
wherein the freight container is formed as a 45 foot container, preferably as a so-called 45 ft. pallet wide container; and/or
wherein the cargo floor (3) is at least 2.4 meter wide and at least 13.2 meter long, such as to accommodate at least 33 Euro-pallets; and/or
wherein the container is provided with first fitting blocks of which the mutual spacing corresponds to the mutual spacing of a 40 foot container and/or second fitting blocks or so-called corner fittings of which the mutual spacing corresponds to the mutual spacing of the outermost placed fitting blocks of a 45 foot container.

8. Freight container, according to any one of the preceding claims, further comprising a sensor, especially a temperature sensor, associated with the cargo space, and a controller for controlling the air conditioning unit (7), wherein said controller is arranged for determining whether an air property sensed by the sensor needs to be altered by examining whether the sensed air property is below a predetermined bottom threshold value and/or above a predetermined top threshold value, and for controlling the air conditioning unit such as to alter the air property accordingly.

9. Freight container, especially a container according to any one of the preceding claims, for transporting cargo, especially temperature sensitive cargo, comprising a cargo space (25) defining a cargo floor (3), and an air conditioning unit (7), preferably a cooling and/or heating unit, a battery (9) for feeding the air conditioning unit, a generator, especially a diesel powered generator, for charging the battery at least partly, and a fuel tank (20) for supplying the generator with fuel, wherein the container (100) further comprises a clock and a controller arranged for controlling the generator in order to charge the battery (9) at least partly at a moment when a predetermined time interval has lapsed since the last time the battery is charged at least partly, and/or wherein the container (100) further comprises a voltage sensing device and a controller arranged for controlling the generator in order to charge the battery at least partly at a moment when is determined that the terminal voltage of the battery has dropped below a predetermined minimum voltage threshold value, and/or wherein the container further comprises a receiver (21) and a controller arranged for controlling the generator in order to charge the battery at least partly based on a control signal received by said receiver.

10. Freight container, according to any one of the preceding claims, further comprising a separation wall being located at a distal end of the cargo floor and separating the cargo space at least partly from a second part of the air conditioning unit (7) located behind said wall, wherein said wall defines a cavity for guiding air from the cargo space to the air conditioning unit or vice versa.

11. Method for transporting cargo, especially temperature sensitive cargo, by means of a freight container, the method comprising:

providing a freight container, preferably a container (100) according to any one of the preceding claims, said container being provided with at least an air conditioning unit (7), preferably a cooling and/or heating unit, a battery (9), and a generator, especially a diesel powered generator;
sensing an air property of air inside the container, especially the temperature of air inside the container;
determining whether said air property needs to be altered by examining whether the sensed air property is below a predetermined bottom threshold value and/or above a predetermined top threshold value;
altering said air property when the value of the sensed air property is below said predetermined bottom threshold value, such as to bring said air property above said predetermined bottom threshold value, or altering said air property when the sensed value of the air property is above said predetermined top threshold value, such as to bring said air property below said predetermined top threshold value; and
at least partly charging the battery (9) by means of the generator at a moment when there is no need to alter the air property of the air inside (25) the container.

12. Method according to claim 11, wherein the step of charging the battery (9) at a moment when there is no need to alter the air property of the air inside (25) the container is initiated when a predetermined time interval has lapsed, e.g. when a predetermined time interval has lapsed since the last time the battery (9) is charged at least partly.

13. Method according to claim 11 or 12, wherein the step

of charging the battery (9) at a moment when there is no need to alter the air property of the air inside the container (100) is initiated when it is determined that the terminal voltage of the battery has dropped below a predetermined minimum voltage threshold value.

14. Method according to any one of claims 11 - 13, wherein the freight container further is provided with a receiver (21), and wherein the step of charging the battery (9) at a moment when there is no need to alter the air property of the air inside the container is initiated by means of a control signal received by said receiver of the freight container.

15. Method according to any one of claims 11 - 14, further comprising:

the step of altering the air property of the air inside the container while the battery is charged at the moment when the air property does not need to be altered; and/or
the step of at least partly charging the battery by means of the generator at a moment when there is a need to alter the air property of the air inside the container.

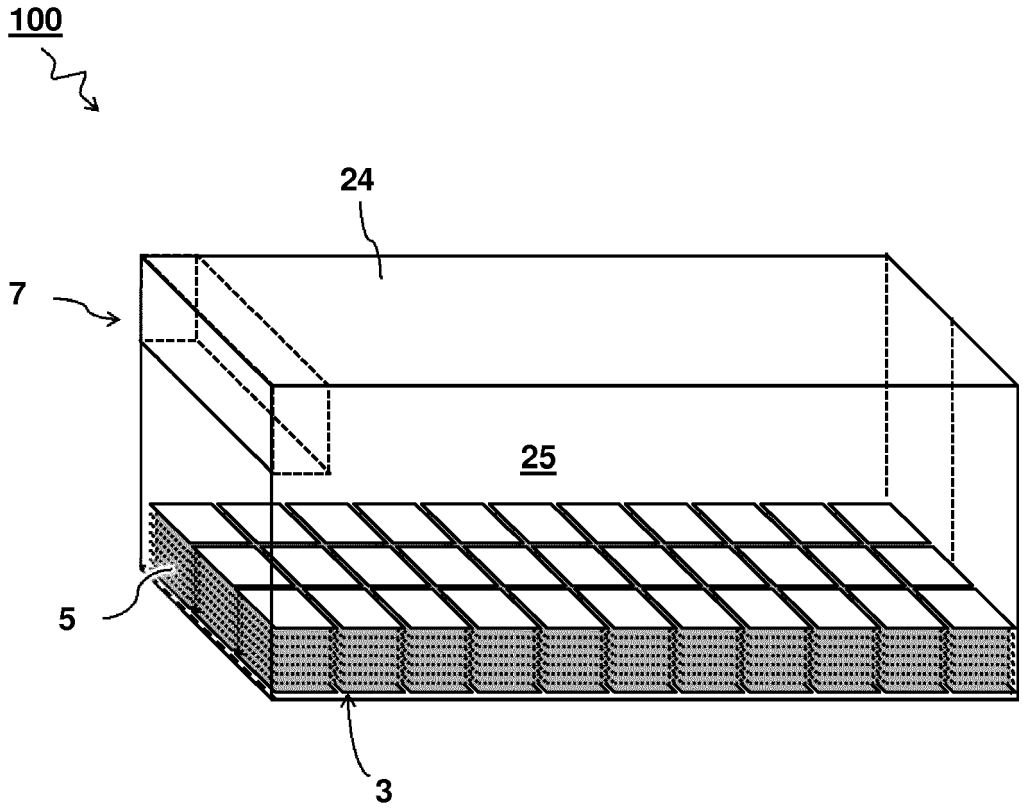

FIG 1

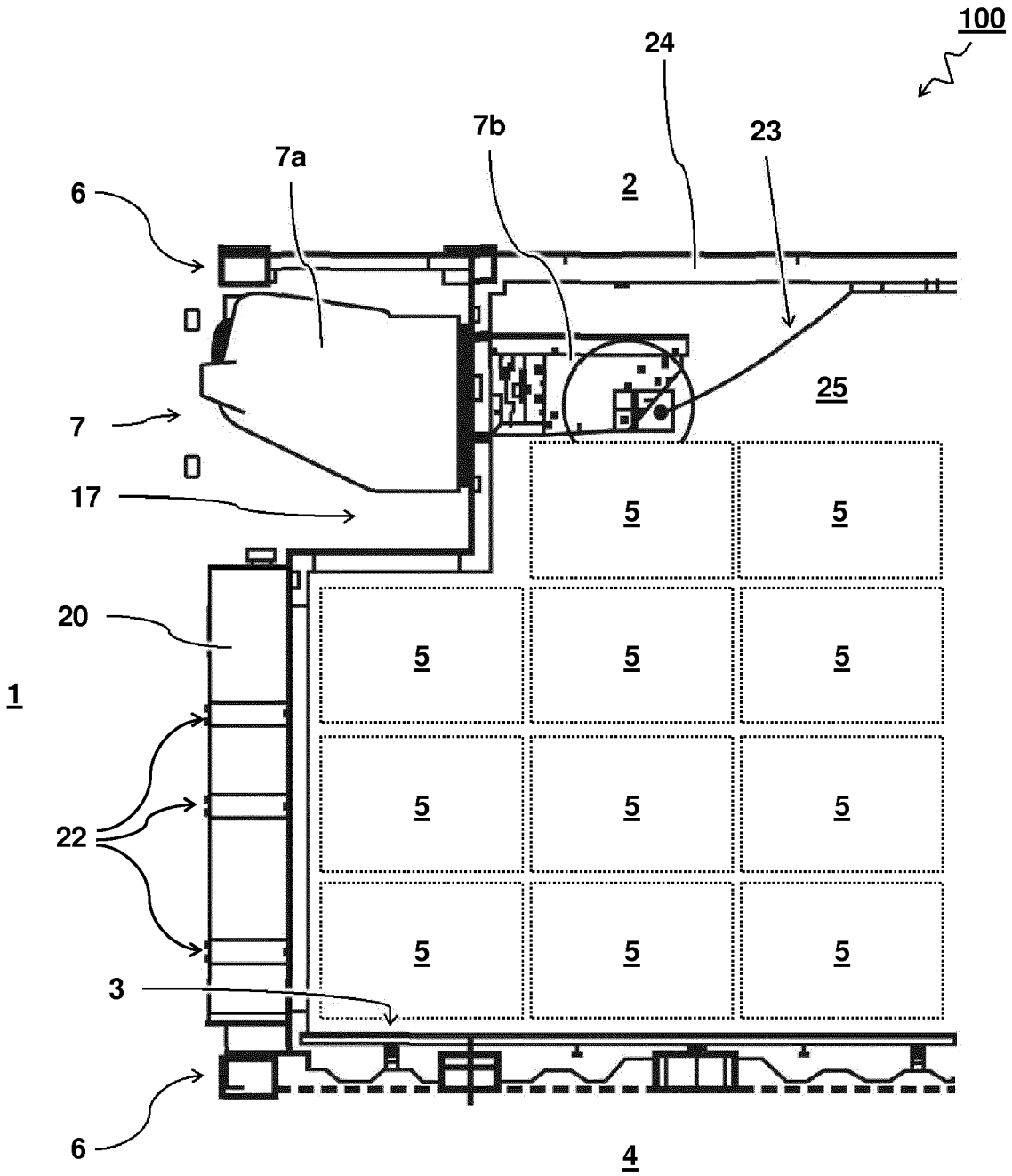

FIG 2

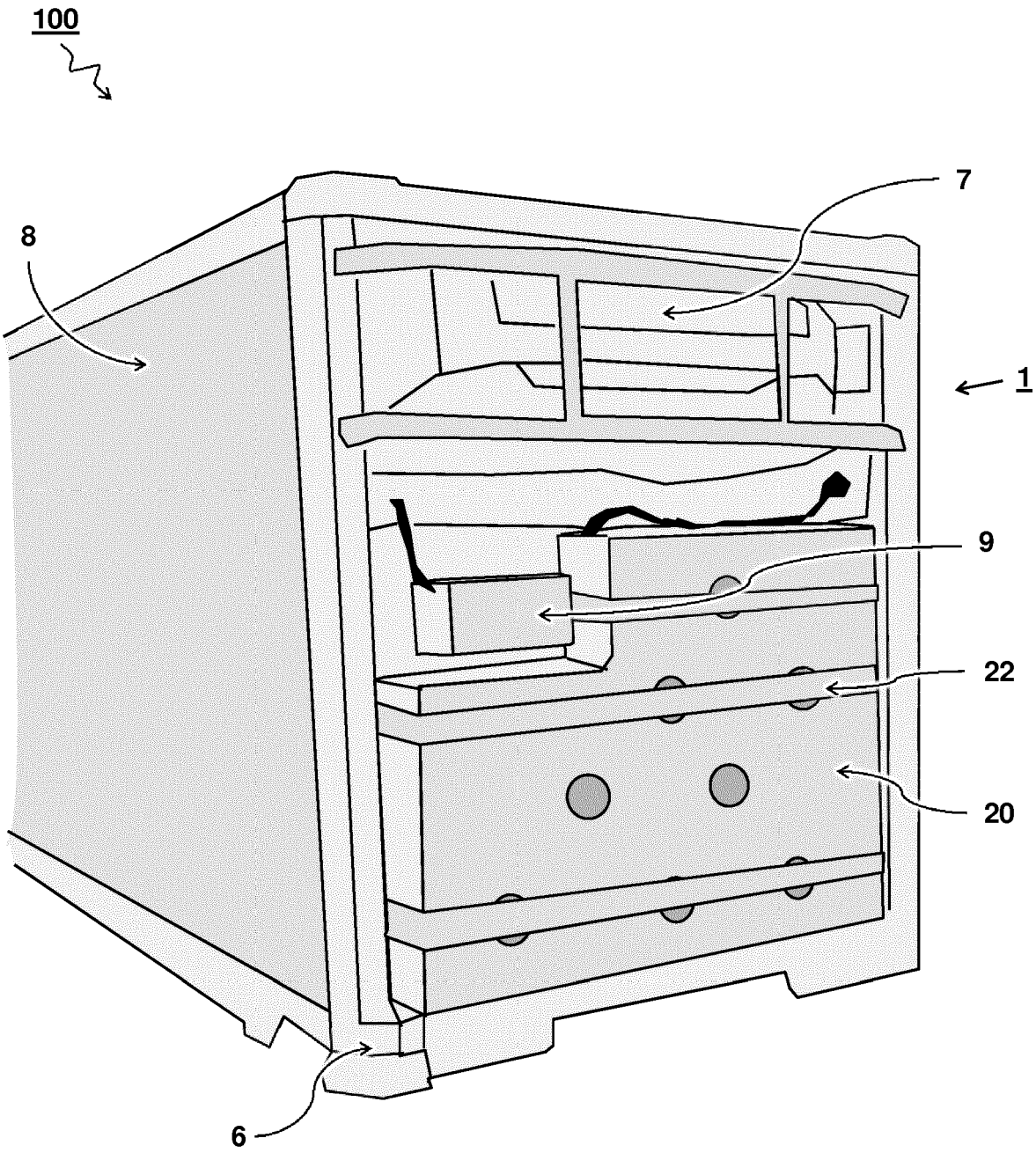

FIG 3

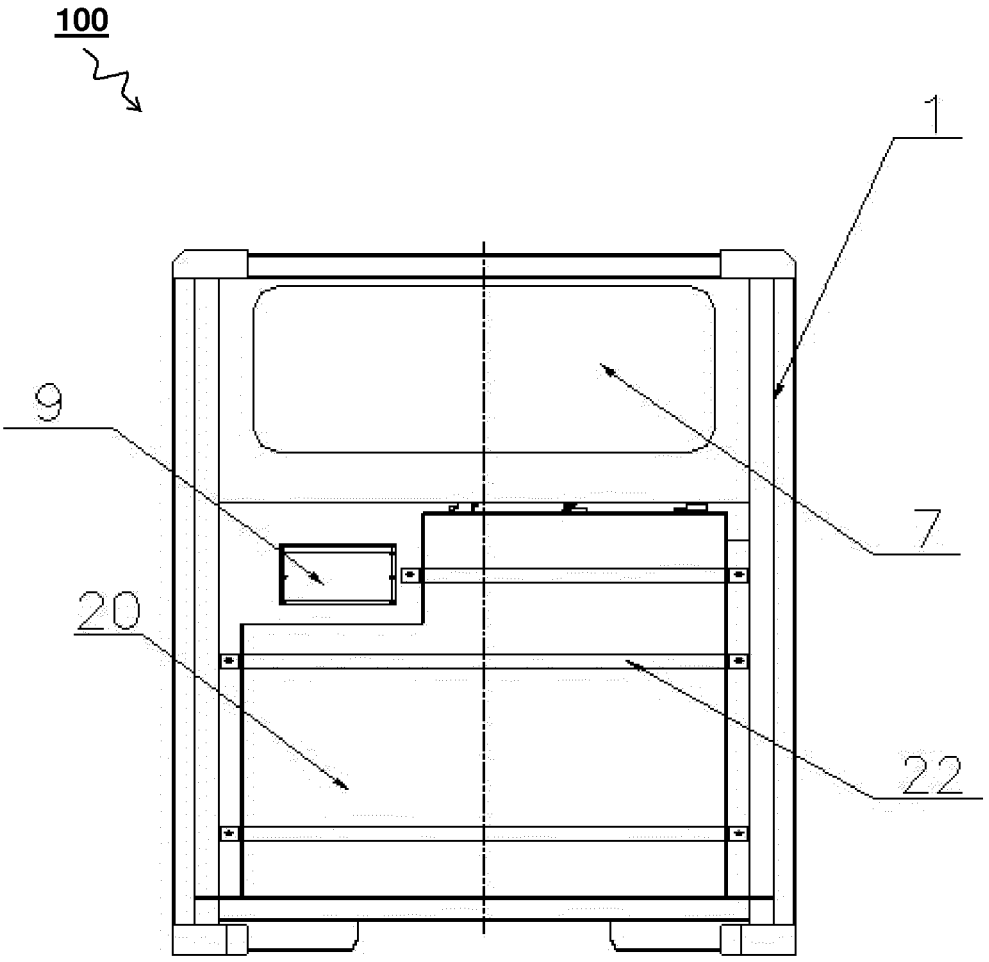

FIG 4

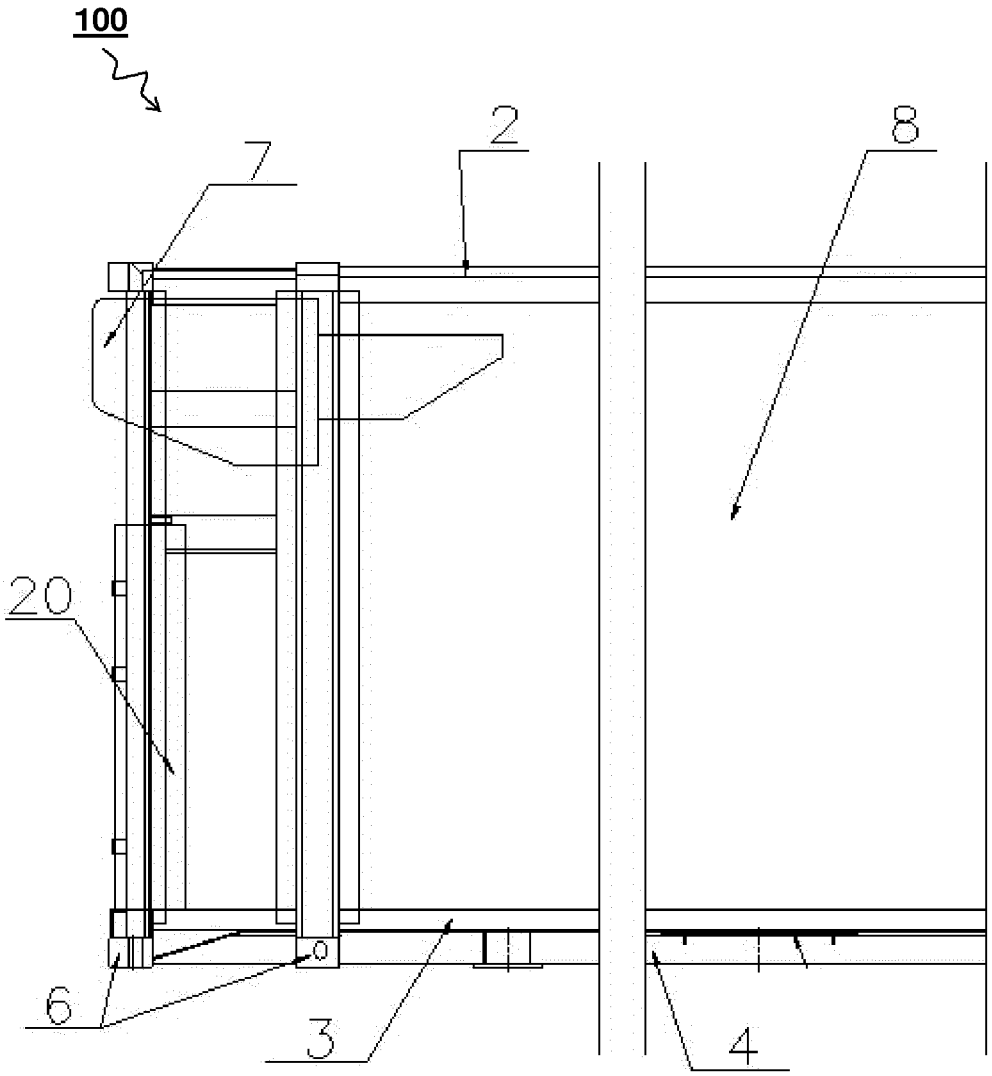

FIG 5

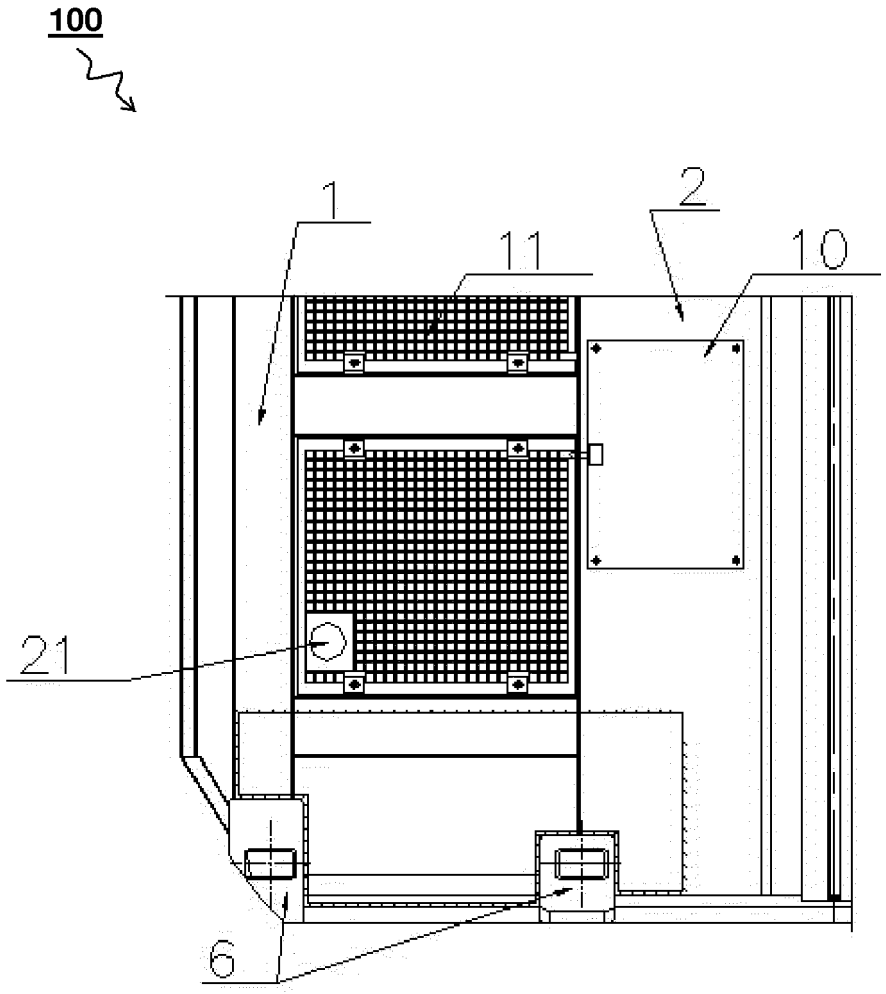

FIG 6

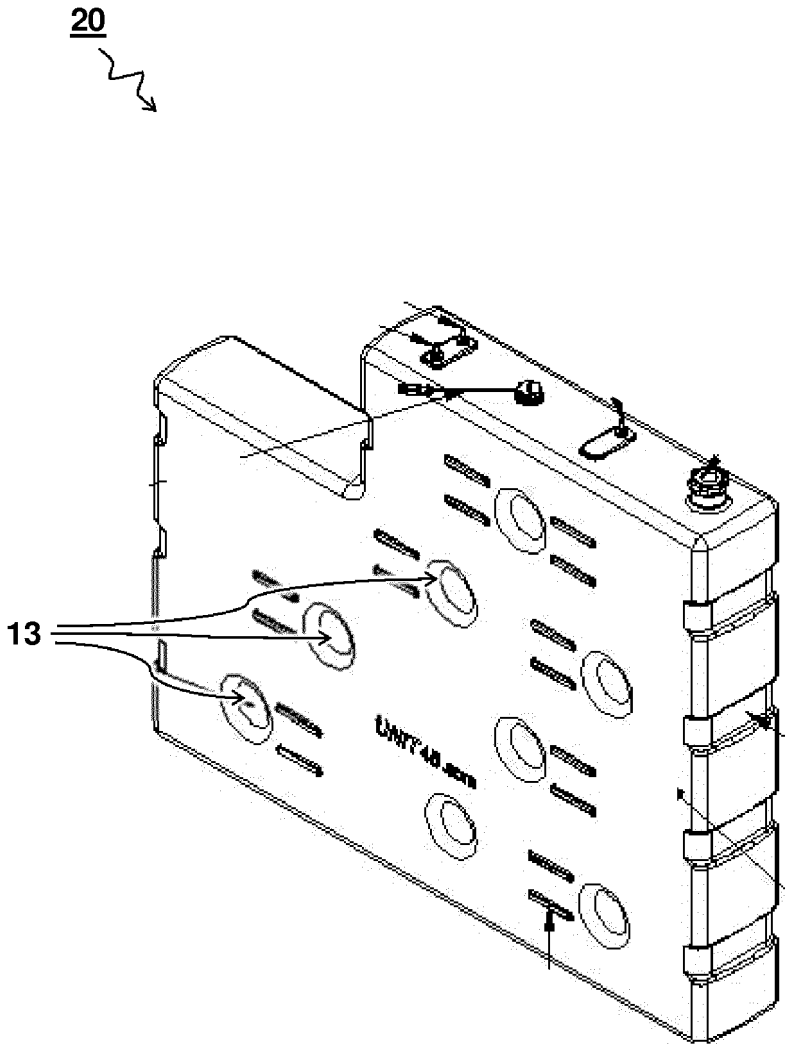

FIG 7

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 17 9507

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 Y	DE 10 2011 105475 A1 (MAN TRUCK & BUS AG [DE]) 27 December 2012 (2012-12-27) * the whole document *	1-8,10 1,4,5,7	INV. B65D88/74
X A	US 2 635 432 A (KLEIST HERMAN W) 21 April 1953 (1953-04-21) * the whole document *	1-6,8,10 7,9, 11-15	
Y	WO 92/20542 A1 (REEFCO MFG CORP [US]) 26 November 1992 (1992-11-26) * page 2, lines 20-22 * * page 6, line 15 - page 7, line 30; figure 1 *	1,4,5,7, 9	
X	WO 2011/056642 A2 (CARRIER CORP [US]; CHOPKO ROBERT A [US]; REASON JOHN R [US]; PERKOVICH) 12 May 2011 (2011-05-12) * paragraphs [0009] - [0011], [0019], [0020] *	9,11, 13-15	
X	US 2009/299534 A1 (LUDWIG BRADLEY M [US]) 3 December 2009 (2009-12-03) * paragraphs [0007], [0011], [0022] - [0030], [0033], [0042] *	9,11-15	TECHNICAL FIELDS SEARCHED (IPC) B65D F25D
Y	EP 2 689 944 A2 (MITSUBISHI HEAVY IND LTD [JP]) 29 January 2014 (2014-01-29) * the whole document *	9	
A	WO 2012/045132 A1 (GONCALVES DOS ANJOS NILSON [BR]) 12 April 2012 (2012-04-12) * abstract; figures 1-4 *	1	
A	WO 97/27128 A1 (FRIGOTAINER AB [SE]; LARSSON NILS [SE]; WESTERHOLM GOERAN [SE]) 31 July 1997 (1997-07-31) * the whole document *	1	
	-/--		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 January 2018	Leijten, René

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

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 17 9507

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	AU 2006 236 102 A1 (FCL INTERSTATE TRANSP SERVICES) 31 May 2007 (2007-05-31) * the whole document * -----	11-15	

TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 January 2018	Leijten, René

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

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 17 17 9507

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
European Patent Office
Office européen des brevets

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 17 17 9507

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 17 9507

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-01-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102011105475 A1	27-12-2012	NONE	
US 2635432 A	21-04-1953	NONE	
WO 9220542 A1	26-11-1992	AU 2004992 A	30-12-1992
		BR 9205988 A	02-08-1994
		CA 2108773 A1	14-11-1992
		EP 0585388 A1	09-03-1994
		FI 935005 A	12-11-1993
		JP H06507702 A	01-09-1994
		NO 934089 A	11-01-1994
		US 5187945 A	23-02-1993
		WO 9220542 A1	26-11-1992
WO 2011056642 A2	12-05-2011	EP 2494292 A2	05-09-2012
		US 2012210735 A1	23-08-2012
		US 2017100987 A1	13-04-2017
		WO 2011056642 A2	12-05-2011
US 2009299534 A1	03-12-2009	NONE	
EP 2689944 A2	29-01-2014	EP 2689944 A2	29-01-2014
		JP 6071300 B2	01-02-2017
		JP 2014025593 A	06-02-2014
WO 2012045132 A1	12-04-2012	BR MU9002187 U2	06-11-2012
		WO 2012045132 A1	12-04-2012
WO 9727128 A1	31-07-1997	AT 211455 T	15-01-2002
		AU 715348 B2	20-01-2000
		BR 9707186 A	23-03-1999
		CA 2243475 A1	31-07-1997
		CN 1213352 A	07-04-1999
		DE 69709909 D1	28-02-2002
		DE 69709909 T2	22-08-2002
		EP 0961742 A1	08-12-1999
		HK 1021966 A1	15-02-2002
		JP 2000504100 A	04-04-2000
		NO 983199 A	23-09-1998
		NZ 326927 A	28-01-2000
		RU 2177126 C2	20-12-2001
		US 6016664 A	25-01-2000
		WO 9727128 A1	31-07-1997
AU 2006236102 A1	31-05-2007	NONE	

EPO FORM P0459

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