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(56) Documents Cited:
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DE 102009032565 A1 **JP 2004189005 A**

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(54) Title of the Invention: **Multiple deck cargo container**
 Abstract Title: **A cargo container for use in a multiple deck aircraft loading vehicle**

(57) A cargo container comprising a generally horizontal floor 6, a generally horizontal movable roof 5 and a generally horizontal floating platform 7 capable of supporting cargo. The roof 5 is vertically movable relative to the floor 6 to vary the height of the cargo container and the floating platform 7 is independently movable relative to the floor 6. Preferably the floor 7 is provided with two side walls 18 to form a U-shape in cross-section and the roof is also preferably provided with two side walls 17 to form a U-shape in cross-section. Optionally the floating platform 7 is provided with an interconnecting hatch and ladder (Figure 5). The cargo container may be mounted on a vehicle body with an interposing scissor lift to allow the container to be raised and lowered. A method is also disclosed of loading the container including lowering the floating platform 7 to abut the floor 6, loading items via an entrance before raising the platform 7 to provide a working space between platform 7 and floor 6.

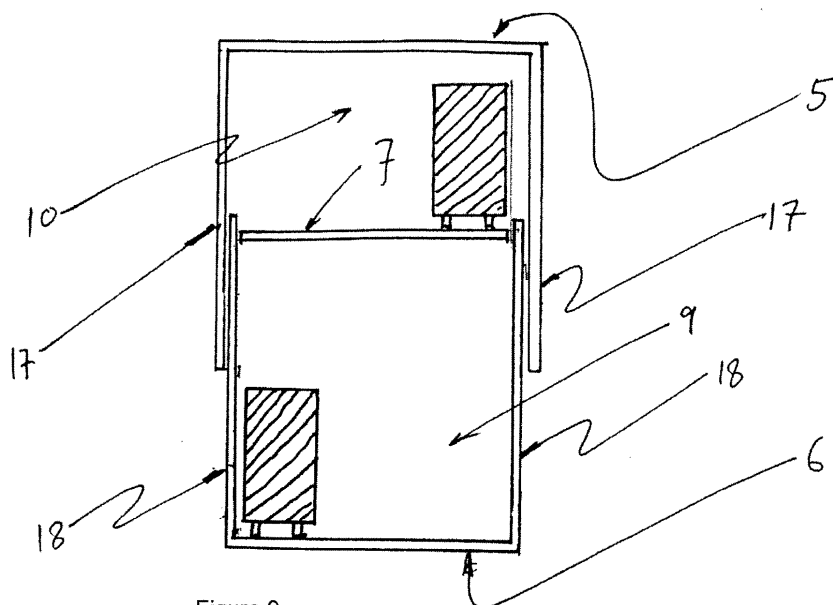
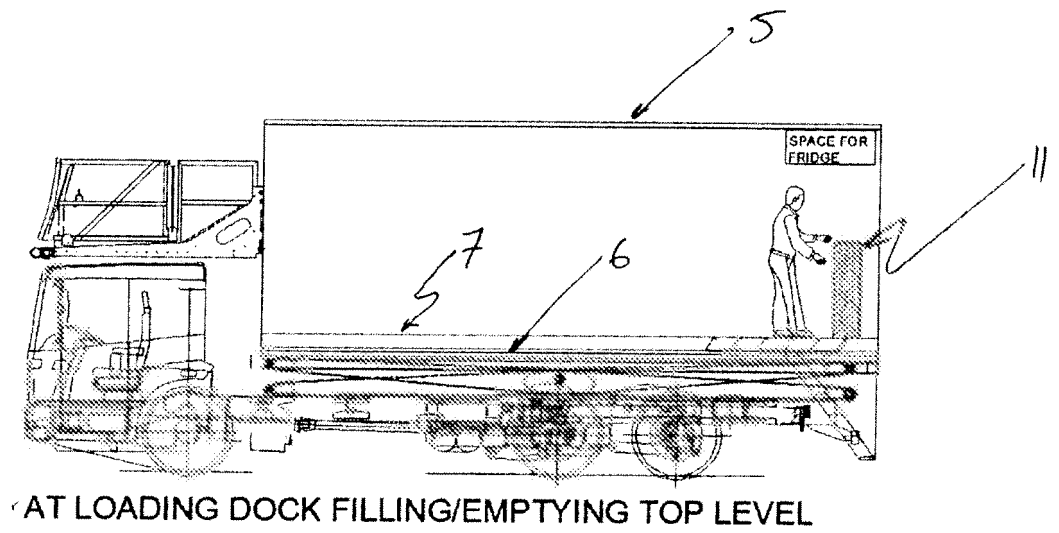
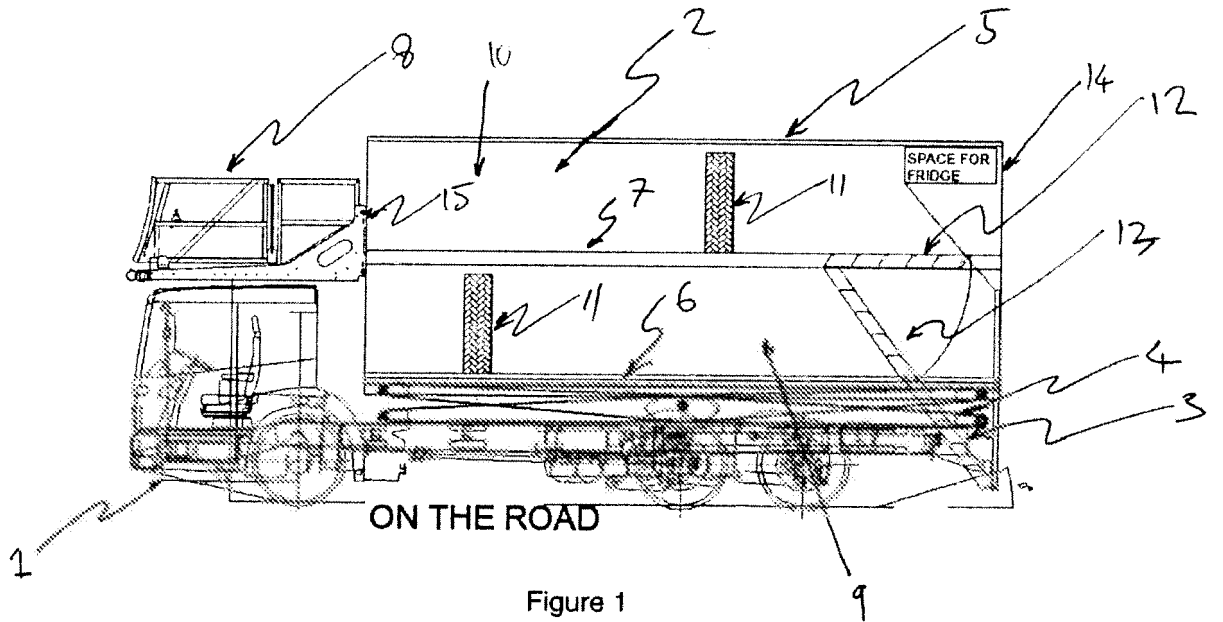
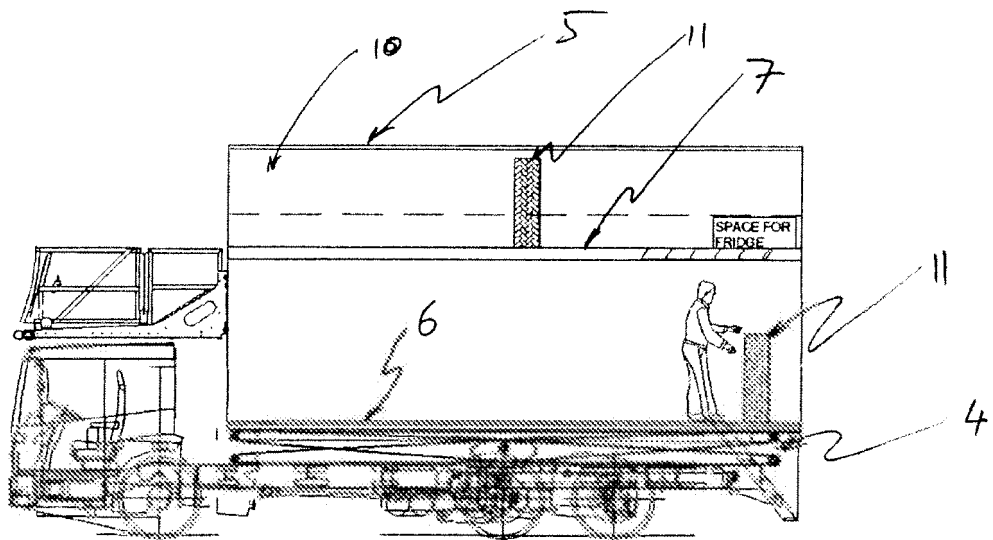


Figure 9





AT LOADING DOCK FILLING/EMPTYING BOTTOM LEVEL

Figure 3

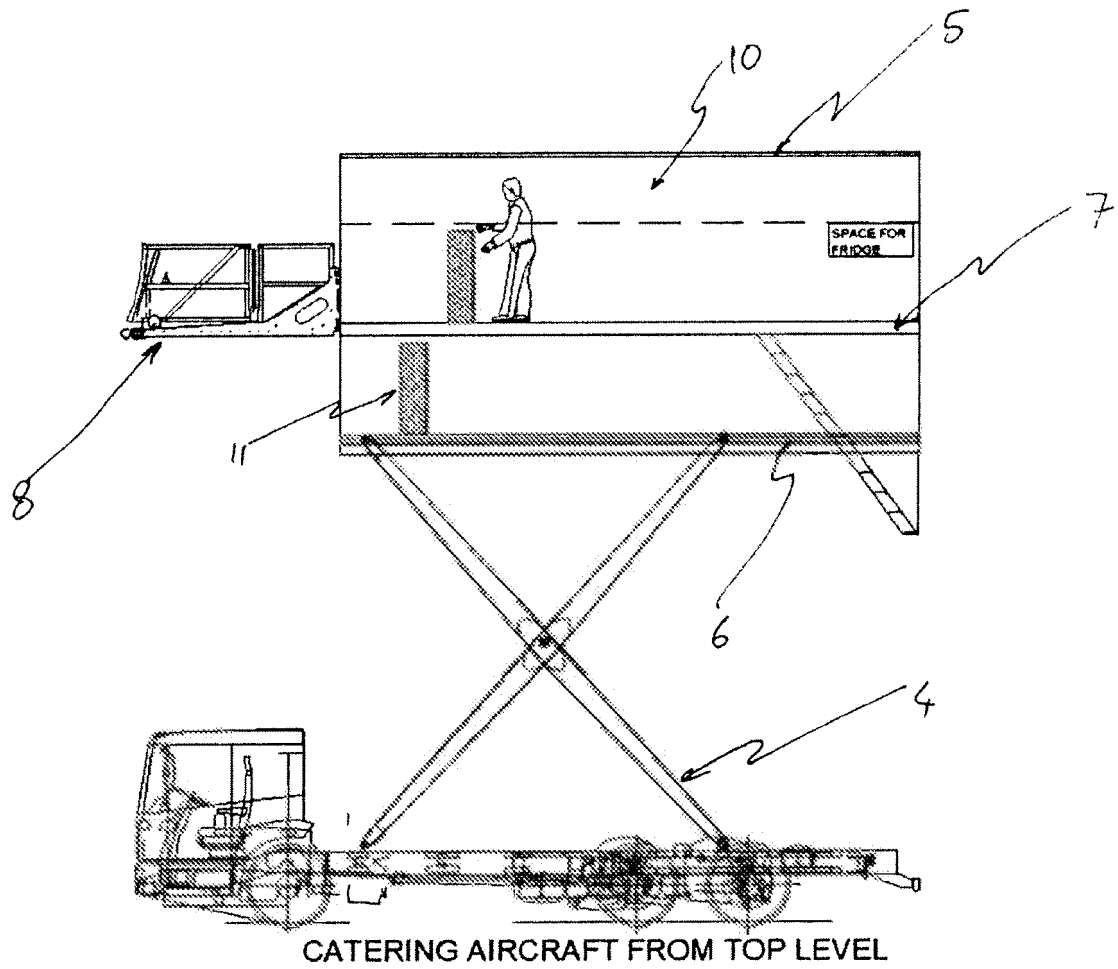
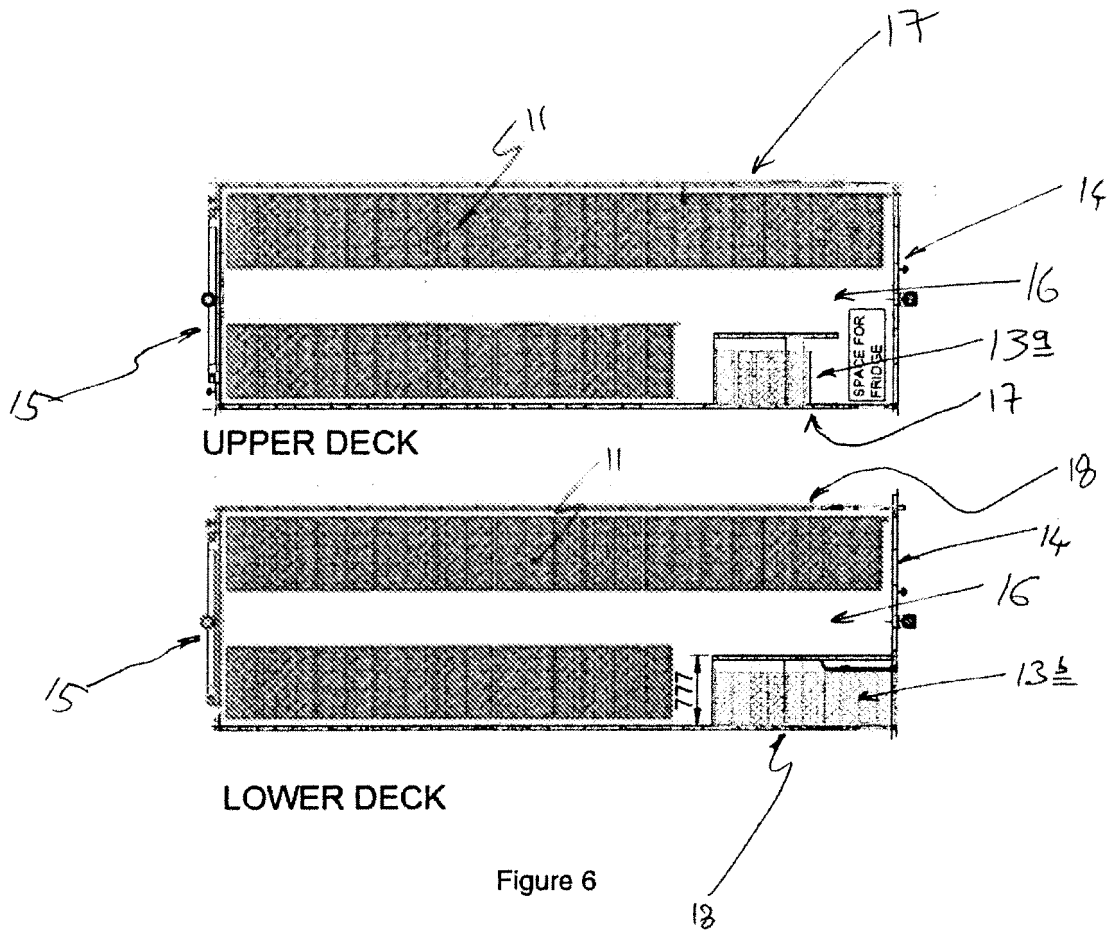


Figure 5



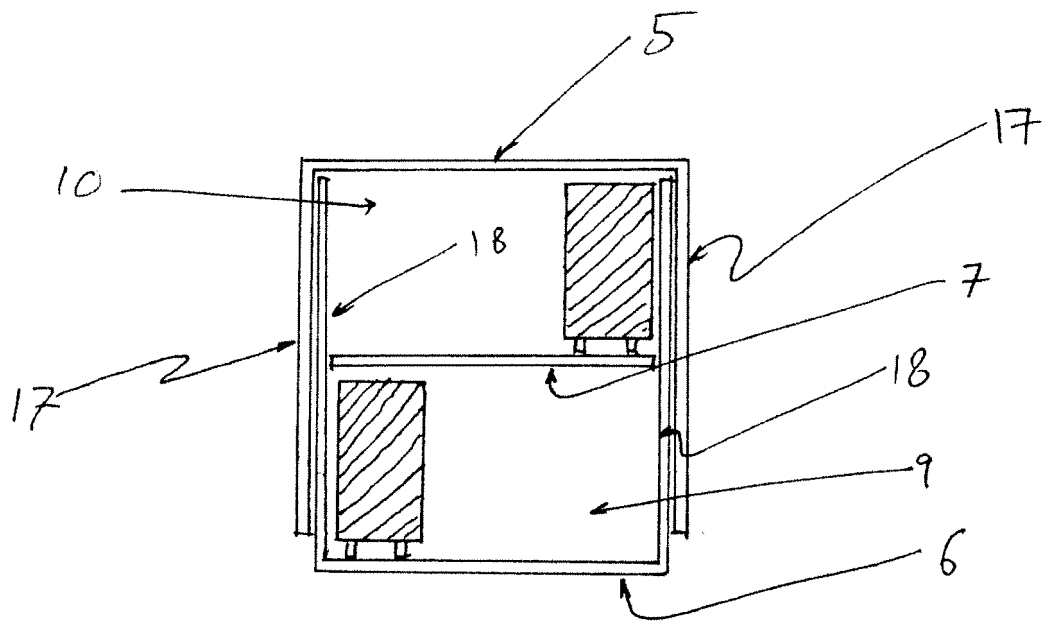


Figure 7

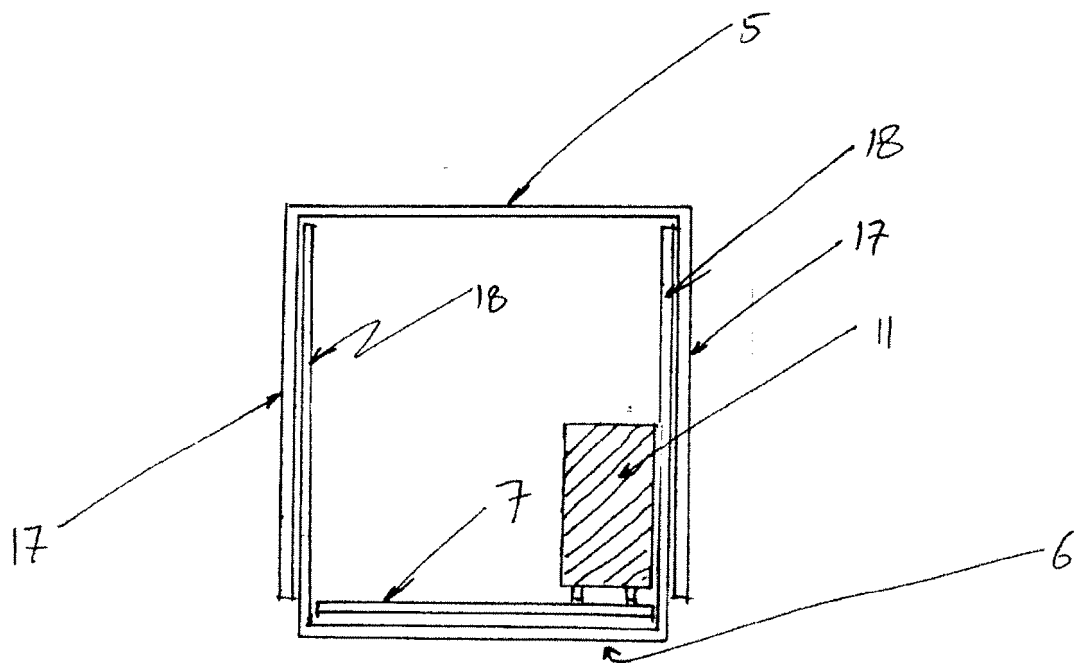


Figure 8

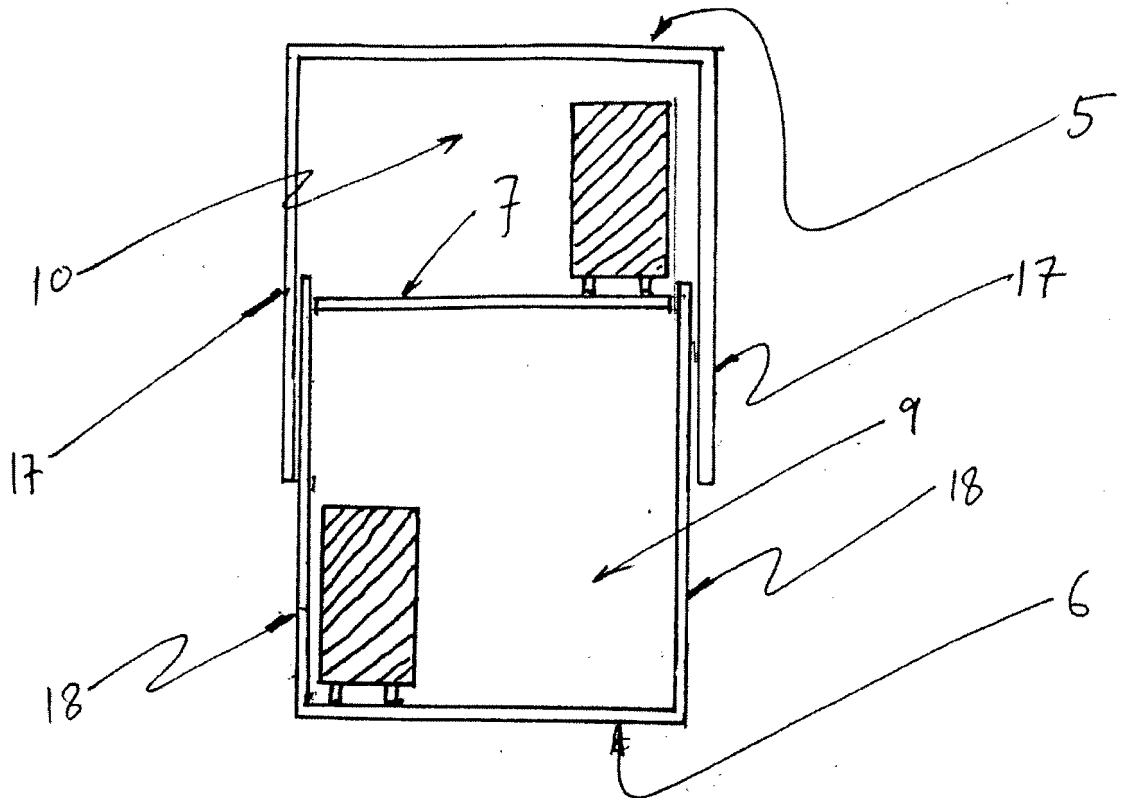


Figure 9

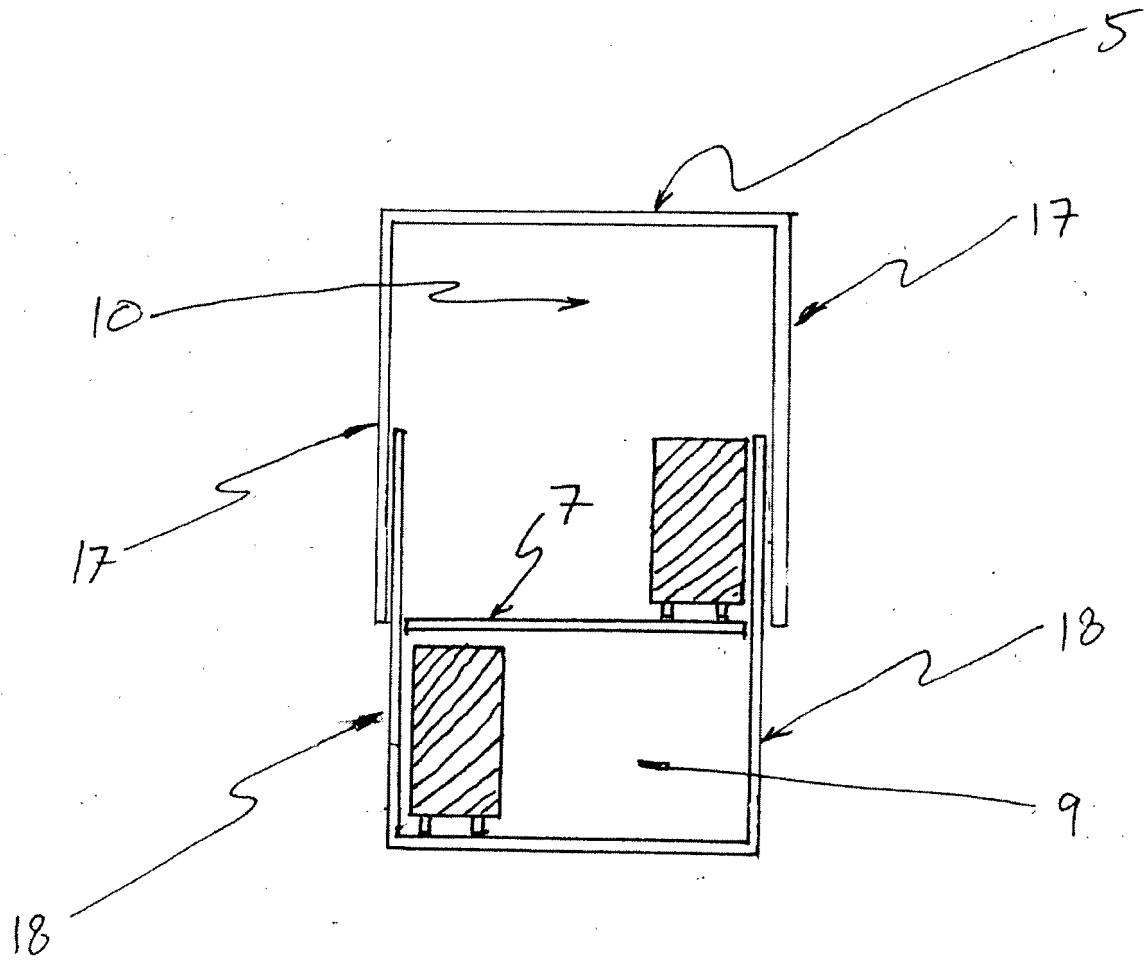


Figure 10

Multiple Deck Cargo Container

The invention provides a multiple decked cargo container, suitable for use *inter alia* in aircraft catering operations. The container comprises a floating deck and vertically
5 moveable roof, to allow for an increased load carrying capacity via two vertically stacked storage areas, whilst meeting height restrictions and providing sufficient headroom for ground crew to access the interior of the container. The invention also provides vehicles comprising such containers, methods of loading and unloading
10 such containers and methods of loading and unloading aircraft utilising such containers.

Background

In the air freight industry, loaders are used to load cargo onto an aircraft and also to unload cargo from the aircraft. Such loaders are generally self-propelled vehicles with a load bed that is either capable of elevation from ground level to a position
15 adjacent to the cargo bay door of an aircraft, or have a conveyor belt or other suitable lifting means for raising the cargo to the height of the cargo bay.

A particular type of loader is an aircraft catering vehicle. Aircraft catering vehicles are designed to allow rapid transfer of catering trolleys and other supplies to and from aircraft as part of the preparation of aircraft for flight (turnround). They typically
20 consist of a van body mounted on a standard vehicle (e.g. truck) chassis. The van body is raised up to the aircraft door by a scissor lift mechanism. Access to and from the aircraft door is via a platform, which is often fitted with an extending section (bridge or bridge plate).

Current aircraft catering vehicles suffer from a number of drawbacks. For example,
25 the much larger size of aircraft in use today means that they carry a far larger number of passengers, meaning that a greater number of catering trolleys must be loaded and unloaded at every turnround. This either necessitates servicing of one aircraft with multiple aircraft catering vehicles, which is inefficient in terms of capital costs and fuel consumption, or multiple loading and unloading visits by a single
30 aircraft catering vehicle, which is also inefficient in terms of fuel consumption and

causes undesirable delay. For these reasons, an aircraft catering vehicle having a higher load capacity in terms of the number of catering trolleys is desirable.

However, the physical size of aircraft catering vehicles is constrained by a number of factors.

- 5 In principle, it is possible to increase the width of the body of the vehicle. However, because of the need for aircraft catering vehicles to travel on public highways, they must comply with local legislation which limits the width of goods vehicles to below 2.55 metres in most European countries. Additionally, the majority of airports have width restrictions which apply to vehicles travelling airside. Finally, a wider bodied
10 vehicle would require specialist bespoke chassis to be manufactured at significant cost making the vehicle un-economic.

- Increasing the length of the vehicle is also an option. Existing vehicles are circa 9 metres in length. There is significant scope for building longer trucks, potentially up to 18.45m in length. However, airports generally require that vehicles have a turning
15 circle of less than 33 feet (10 metres). This would require any vehicle much larger than 9 metres to be articulated with rear steering axles. Articulated vehicles are not permitted to engage with aircraft doors to load/unload them as there is deemed to be a risk of damaging the aircraft.

- The final option would be to increase the height of the vehicle. Although there is no
20 specific height requirement dictated about vehicles operating on an airfield, from a practical view point, the presence of bridges and other obstacles dictates an overall height of 4 metres or less in order to allow the vehicle to move around the airport uninhibited. Additionally, for the vehicle to have applications outside of the UK, typically regulations in other jurisdictions mandate that vehicles must not exceed 4
25 metres in height. A further problem with high vehicles is that the centre of gravity becomes elevated, meaning that the stability of the vehicle is reduced.

An additional constraint imposed on aircraft catering vehicles is that there be a suitable working height for operatives to enter the loading area to load and unload catering trolleys.

- 30 The present invention seeks to address these and other problems of the prior art.

Summary of the Invention

According to a first embodiment, the invention provides a cargo container comprising:

- a generally horizontal floor capable of supporting cargo,
- 5 a generally horizontal movable roof,
- a generally horizontal floating platform capable of supporting cargo disposed between the base and the roof,
- side walls, end walls and at least one entrance for allowing loading and unloading of cargo,
- 10 wherein the roof is vertically movable relative to the floor so as to vary the height cargo container
- and the floating base is independently vertically movable relative to the floor.

In a second embodiment, the invention provides a mobile vehicle comprising a cargo container according to the first embodiment.

- 15 In a third embodiment, the invention provides a method of loading and unloading a cargo container according to the first embodiment.

In a fourth embodiment, the invention provides a method of loading and unloading an aircraft utilising a mobile vehicle according to the second embodiment.

Brief Description of the Figures

- 20 Figure 1 is a sectional view of truck comprising a cargo container according to an embodiment of the invention, showing the cargo container configured for road transit.
- Figure 2 is a sectional view of truck comprising a cargo container according to an embodiment of the invention in a configuration allowing for loading/unloading of the second cargo storage area.
- 25 Figure 3 is a sectional view of truck comprising a cargo container according to an embodiment of the invention in a configuration allowing for loading/unloading of the first cargo storage area.

Figure 4 is a sectional view of truck comprising a cargo container according to an embodiment of the invention, showing an aircraft being catered from the first cargo storage area.

5 Figure 5 is a sectional view of truck comprising a cargo container according to an embodiment of the invention, showing an aircraft being catered from the second cargo storage area.

Figure 6 is a plan view of the first and second cargo storage areas of a cargo container according to the invention.

10 Figure 7 is an alternative sectional view of truck comprising a cargo container according to an embodiment of the invention, showing the cargo container configured for road transit.

Figure 8 is an alternative sectional view of truck comprising a cargo container according to an embodiment of the invention in a configuration allowing for loading/unloading of the second cargo storage area.

15 Figure 9 is an alternative sectional view of truck comprising a cargo container according to an embodiment of the invention in a configuration allowing for loading/unloading of the first cargo storage area.

20 Figure 10 is an alternative sectional view of truck comprising a cargo container according to an embodiment of the invention, showing an aircraft being catered from the first cargo storage area.

Detailed Description

25 The present invention allows for an increased cargo capacity compared with known aircraft catering vehicles. The vertically moveable roof and floating deck allow for two loads of catering trolleys (or other cargo) to be stored and transported, stacked one over the other.

The cargo container comprises a generally horizontal floor capable of supporting cargo, a generally horizontal movable roof, a generally horizontal floating platform capable of supporting cargo disposed between the base and the roof, sidewalls and at least one entrance for allowing loading and unloading of cargo, wherein the roof is

vertically movable relative to the floor so as to vary the height cargo container and the floating base is independently vertically movable relative to the floor.

The cargo container is provided with side walls which define the left and right sides of the container, which is preferably of generally rectangular parallelepiped form, conventional with cargo containers. In a preferred embodiment, the side walls are comprised of two sections. The floor is provided with two first side walls, and the floor and first side walls together are generally U-shaped in cross-section. Roof is also provided with two second side walls, and roof and second side walls together are generally inverted U-shaped in cross-section. The floor and first side walls (18) slidably engage within roof and second side walls. Roof and second side walls form a canopy over the floor, first side walls, and the interior of the container together with any cargo. The first and second side walls are dimensioned such that they always form a continuous side wall irrespective of the degree of elevation of the roof.

The cargo container is provided with at least one entrance for allowing loading and unloading of cargo. The entrance may be at any suitable point on the container, but preferably is incorporated into one of the end walls. The entrance is preferably closable, and can be of any type known in the art, preferably a door, pair of doors, roller shutter or folding gate. A roller shutter is preferred.

In a preferred embodiment, the cargo container is provided with two entrances for allowing loading and unloading of cargo. Preferably, each end wall is provided with such an entrance. More preferably, one entrance is adapted for loading and unloading cargo at a loading dock, and the other entrance is adapted for loading and unloading cargo at an aircraft.

In a preferred embodiment, the cargo container is provided with a loading gantry external to the container. The loading gantry is affixed to the end wall of the cargo container which comprises an entrance. The loading gantry is of a conventional type known in the field of cargo loading containers, having a loading platform and safety rails, and is adapted to engage with a cargo door in the fuselage of an aircraft, such that cargo can be transferred between the hold of the aircraft and the interior of the cargo container.

Preferably, the loading gantry is vertically moveable with respect to the end wall, such that the loading platform is capable of forming a continuous, substantially level surface together with either the floor or the floating platform, depending on which cargo storage area is being used to cater the aircraft. The loading gantry is suitably
5 moved via an electric motor or pneumatic or hydraulic lifts.

It may be convenient or desirable to provide the cargo container with a refrigerator, such as when food or other perishable items are being transported.

It may be convenient or desirable to provide access means to allow ground crew to enter the cargo container. A ladder is a preferred access means. The ladder
10 suitably connects with a hatch, optionally closable, provided in the floor of the cargo container.

It may be convenient or desirable to provide access means to allow ground crew to move between the first and second cargo storage areas. An interconnecting ladder is a preferred access means. The interconnecting ladder suitably connects with an
15 interconnecting hatch, optionally closable, provided in the floating deck of the cargo container. In a preferred embodiment, the interconnecting ladder is stowable to allow the floating deck to fully descend to abut the floor. This is suitably achieved by having the interconnecting ladder pivotally attached to the floating deck at one side of the interconnecting hatch.

In a first configuration, the roof is fully lowered and the floating deck positioned approximately midway between the roof and the floor. The overall height of the cargo container is at a minimum, and suitable for moving the container around the airport or on a public highway. In this configuration, the roof preferably closely abuts the cargo in the second cargo storage area. Likewise, the floating deck preferably
25 closely abuts the cargo in the first cargo storage area.

In a preferred embodiment, the cargo container is adapted for the storage and loading/unloading of airline catering trolleys. Such trolleys, used for the storage and refrigeration of meals prepared on the ground, are of a standard size and are
30 invariably mounted on coasters to allow for their manoeuvring onto, off of and around the aircraft. The overall height of such catering trolleys is 1030 mm; thus, cargo containers of the invention adapted for the transportation of catering trolleys have a

typical floor to floating deck height of at least 1030 mm when in the first (collapsed) configuration. Preferably, the floor to floating deck height is between 1050 and 1200 mm. Likewise, in this configuration, the floating deck to roof height is at least 1030 mm. Preferably, the floor to floating deck height is between 1050 and 1200 mm.

- 5 In an alternative embodiment, the cargo container can be adapted to receive other types of air freight, such as unit load devices (ULDs). In this case, the standard height of the cargo is 1630 mm, which would dictate a floor to floating deck height of at least 1630 mm, such as between 1650 and 2000 mm. Likewise, in this embodiment, the floating deck to roof height is at least 1630 mm in the first
10 configuration. Preferably, the floor to floating deck height is between 1650 and 2000 mm.

In a second configuration, the roof is fully lowered, and the floating deck is also fully lowered such that it abuts or substantially abuts the floor. This allows for cargo (e.g. catering trolleys) to be loaded and unloaded via a loading dock or other suitable
15 structure.

In a third configuration, the floating deck is raised relative to the floor. This serves to increase the available headroom in the first cargo storage area and allows for personnel to access the storage area and load/unload the cargo.

In a fourth configuration, the roof is raised relative to the floor and the floating deck.
20 This serves to increase the available headroom in the second cargo storage area and permits personnel to access the storage area and load/unload the cargo. This allows personnel to safely and conveniently access the contents of the second cargo storage area. In this configuration, the roof is preferably at least 1.8 metres above the floating deck, taking into account the average height of a human being.

25 Likewise, in the third configuration, the floating deck is preferably at least 1.8 metres above the floor.

Various means are known in the art to move the roof and floating deck in a vertical direction. Examples of such means are pneumatic cylinders, hydraulic cylinders or mechanical hoists.

30 In a further embodiment, the invention provides a mobile vehicle comprising a cargo container according to the first embodiment. Such a vehicle can be self-propelled, or

can be otherwise moveable, such as by towing. Preferably, the cargo container is mounted on the bed of a conventional ground service vehicle, such as a truck.

Preferably, the cargo container is mounted on a lift provided on the bed of the mobile vehicle such that the entire cargo container can be raised or lowered. Various
5 means are known in the art for the raising and lowering of cargo containers, including hydraulic and pneumatic lifts, mechanical lifts. A preferred means is a scissor lift. A scissor lift makes use of linked, folding supports in a criss-cross "X" pattern, known as a pantograph (or scissor mechanism). The upward motion is achieved by the application of pressure to the outside of the lowest set of supports,
10 elongating the crossing pattern, and propelling the cargo container vertically.

The various moving elements of the cargo container and vehicle are preferably controlled electronically. The controls are suitably situated in the cab of the vehicle.

With reference to the Figures –

A mobile vehicle comprising a cargo container according to the invention is shown in
15 section in Figure 1. A standard truck chassis (1) having a cab, three axles and a truck bed (3) supports a cargo container (2) mounted on truck bed (3) via a scissor lift (4). Cargo container (2) comprises a generally horizontal movable roof (5) defining the top of the container (2), generally horizontal base (6) defining the bottom of the container, and floating platform (7) disposed between and substantially parallel
20 to the roof (5) and base (6). The cargo container is provided with a loading gantry (8) suitable for engaging with the cargo hatch of an aircraft, and via which cargo may be loaded and unloaded onto an aircraft. The loading gantry (8) is vertically moveable relative to the body of the cargo container, and communicates with first (9) and second (10) cargo storage areas by way of a roller shutter which forms front wall
25 (15). Base (6) and the floating platform (7) define a first cargo storage area (9), and floating platform (7) and roof (5) define a second cargo storage area (10). The first (9) and second (10) cargo storage areas carry a plurality of catering trolleys (11); only one representative trolley is shown for the sake of clarity. The first (9) and second (10) cargo storage areas are connected by an access hatch (12). Access
30 ladder (13), has a collapsible upper section and a lower section extending outside of the container to allow entry of personnel. Rear wall (14) is formed by a roller shutter which permits access to the first (9) and second (10) cargo storage areas.

The mobile vehicle comprising a cargo container according to the invention shown in figure 1 is configured for conveying a load of catering trolleys by road, for example between a loading dock and an aircraft. Roof (5) is fully lowered, floating deck (7) sits approximately mid-way between roof (5) and floor (6). The height of the first (9) and second (10) cargo storage areas is just sufficient to provide clearance for catering trolleys (11). Rear (14) and front (15) roller shutters are closed. Scissor lift (4) is fully lowered such that the cargo container sits close to truck bed (3). Gantry (8) is positioned towards the top of the container to allow clearance for the cab of the truck.

10 The cargo container of Figure 1 is shown in alternative section in Figure 7. Floor (6) is provided with two first side walls (18), and the floor (6) and first side walls (18) together are generally U-shaped in cross-section. Roof (5) is provided with two second side walls (17), and roof (5) and second side walls (17) together are generally inverted U-shaped in cross-section. The floor (6) and first side walls (18) 15 slidably engage within roof (5) and second side walls (17). Roof (5) and second side walls (17) form a canopy over the floor (6), first side walls (18), first (9) and second (10) cargo storage areas, together with the catering trolleys. With roof (5) fully lowered, first side walls (18) and second side walls (17) substantially overlap.

Figure 2 shows a mobile vehicle comprising a cargo container configured for loading 20 the second cargo storage area (10) at a loading dock. The scissor lift (4) is in the fully lowered position. Floating deck (7) is fully lowered and abuts floor (6). The roof (5) is fully lowered, that is in the same position as shown in Figure 1. The lowered position of the floating deck (7) increases the height of the second cargo storage area (10) sufficient to provide a convenient working space for ground crew to load and unload catering trolleys (11) via the rear roller shutter (14), which is open to 25 allow access between the second storage area (10) and the loading dock (not shown). The floating deck (7) is positioned at a height above the ground such that it is substantially level with the loading dock, allowing for catering trolleys (11) to be wheeled on and off. The upper section of access ladder (13), is pivoted and lies 30 horizontal, substantially parallel and contained within access hatch (12). In this configuration, the cargo container is shown in alternative section in Figure 8.

Figure 3 shows a mobile vehicle comprising a cargo container configured for loading the first cargo storage area (9) at a loading dock. Scissor lift (4) is in the fully lowered position. The roof (5) is vertically raised to the maximum extent relative to the floor (6). The floating deck (7) is also raised to the maximum extent relative to the floor (6). The raised height of the floating deck increases the height of the first cargo storage area (9) sufficient to provide a convenient working space for ground crew to load and unload catering trolleys (11) via the rear roller shutter (14), which is open to allow access between the first storage area (9) and the loading dock (not shown). The height of the second cargo storage area (10) is just sufficient to provide clearance for catering trolleys (11), which have previously been loaded. The floor (6) is positioned at a height above the ground such that it is substantially level with the loading dock, allowing for catering trolleys (11) to be wheeled on and off. The upper section of ladder (13) has been stowed to provide working area for the ground crew to load and unload catering trolleys.

The cargo container of Figure 3 is shown in alternative section in Figure 9. With roof (5) fully raised relative to floor (6), first side walls (18) and second side walls (17) partially overlap to preserve an enclosed working environment within first (9) and second (10) cargo storage areas.

Figure 4 shows a mobile vehicle comprising a cargo container catering an aircraft from the first cargo storage area (9). The roof (5) is vertically raised to the maximum extent relative to the floor (6). The floating deck (7) is also raised to the maximum extent relative to the floor (6). Gantry (8) is deployed towards the bottom of the cargo container, such that the base of the gantry (8) forms a substantially continuous platform with the floor (6). Front roller shutter (15) is open to allow for catering trolleys to be loaded and unloaded. Scissor lift (4) is in a raised position, such that the gantry (8) is at an appropriate level to engage with a cargo hatch provided in the fuselage of an aircraft being catered. Rear roller shutter (14) remains closed to ensure that ground crew do not accidentally fall from the cargo container.

Figure 5 shows a mobile vehicle comprising a cargo container catering an aircraft from the second cargo storage area (10). The roof (5) is vertically raised to the maximum extent relative to the floor (6). The floating deck (7) sits in a position such that it just provides clearance above the catering trolleys in the first cargo storage

area. Gantry (8) is deployed towards the middle of the cargo container, such that the base of the gantry (8) forms a substantially continuous platform with the floating deck (7). Front roller shutter (15) is open to allow for catering trolleys to be loaded and unloaded. Scissor lift (4) is in a raised position, such that the gantry (8) is at an
5 appropriate level to engage with a cargo hatch provided in the fuselage of an aircraft being catered. Rear roller shutter (14) remains closed to ensure that ground crew do not accidentally fall from the cargo container.

Figure 6 is a plan view of the first (lower) and second (upper) cargo storage areas of a cargo container, showing a full load of catering trolleys. Catering trolleys (11) are
10 arranged in two parallel rows on each cargo storage area, with a gangway (16) in between to allow ground crew to move around the cargo container. Upper (13a) and lower (13b) sections of ladder allow ground crew to move between the cargo storage areas and the outside of the cargo container. The sides of the first (lower) cargo storage area are defined by first side walls (18). The sides of the second (upper)
15 cargo storage area are defined by second side walls (17). Rear roller shutter (14) defines the rear of both first (lower) and second (upper) cargo storage areas. Front roller shutter (15) defines the front of both first (lower) and second (upper) cargo storage areas.

CLAIMS

1. A cargo container comprising:
 - a generally horizontal floor capable of supporting cargo,
 - a generally horizontal movable roof,
 - 5 a generally horizontal floating platform capable of supporting cargo disposed between the base and the roof,
 - side walls, end walls and at least one entrance for allowing loading and unloading of cargo,
 - wherein the roof is vertically movable relative to the floor so as to vary the
 - 10 height of the cargo container,
 - and the floating base is independently vertically movable relative to the floor.
2. A cargo container according to claim 1, wherein
 - the floor is provided with two first side walls, the floor and first side walls together forming a generally U-shaped cross-section,
 - 15 the roof is provided with two second side walls, the roof and second side walls together forming a generally inverted U-shaped in cross-section,
 - wherein the floor and first side walls slidably engage within the roof and second side walls.
3. A cargo container according to claim 1 or 2 wherein an entrance is provided in
- 20 an end wall.
4. A cargo container according to claim 3 wherein entrances are provided in both end walls.
5. A cargo container according to claim 3 or 4 wherein the entrance or entrances are closable by means of a roller shutter.

6. A cargo container according to any preceding claim provided with a gantry adapted to engage with a cargo door of an aircraft slidably mounted on an end wall.
- 5 7. A cargo container according to any preceding claim wherein the floating deck is provided with an interconnecting hatch, and an interconnecting ladder which is stowable.
8. A movable vehicle comprising a cargo container as defined in any one of claims 1 to 7.
- 10 9. A movable vehicle according to claim 8 wherein the cargo container is mounted on the vehicle body via an interposing lift, allowing the cargo container to be raised and lowered.
10. A movable vehicle according to claim 9 wherein the interposing lift is a scissor lift.
- 15 11. A method of loading a cargo container as defined in any one of claims 1 to 7 comprising the steps of
 - i. lowering the moveable deck such that it generally abuts the floor;
 - ii. loading cargo items onto the floating deck via at least one entrance;
 - iii. raising the floating deck and roof to provide a working space between the floating deck and the floor;
 - 20 iv. loading cargo items onto the floor via at least one entrance;
 - v. lowering the floating deck and roof.
12. A method of loading and/or unloading cargo from a moveable vehicle as defined in any one of claims 9 or 10 into an aircraft comprising steps of
 - 25 i. raising the roof and floating deck relative to the floor so as to provide a working space between the floor and the floating deck;
 - ii. elevating the lift so as to bring the floor generally into alignment with a cargo hatch provided in the fuselage of an aircraft;

- iii. loading and/or unloading cargo items between the cargo container and the aircraft from the floor of the cargo container via at least one entrance;
- iv. lowering the floating deck relative to the floor so as to provide a working space between the floating deck and the roof;
- v. lowering the lift so as to bring the floating deck generally into alignment with a cargo hatch provided in the fuselage of an aircraft; and
- vi. loading and/or unloading cargo items between the cargo container and the aircraft from the floating deck of the cargo container via at least one entrance.

5

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Application No: GB1311763.5

Examiner: Mr Patrick Phillips

Claims searched: 1 - 12

Date of search: 23 December 2013

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 - 3, 5, 8	DE 102009032565 A1 (THEIS) Figures particularly Figure 4a and WPI Abstract (a/n 2011-A65867).
X	1, 3, 5, 8	WO 2013/095096 A1 (VAN ECK) Figures.
X	1, 3, 5, 8	DE 202009009485 U (THEIS) Figures and WPI Abstract (a/n 2010-C95110).
X	1, 8	JP 2004189005 A (CHIKUHO) Figures and WPI Abstract (a/n 2004-493377).

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X:

Worldwide search of patent documents classified in the following areas of the IPC

B60P; B64F; B65D

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
B60P	0001/64	01/01/2006
B60P	0001/02	01/01/2006
B64F	0001/32	01/01/2006