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

(11) **EP 3 369 678 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.09.2018 Bulletin 2018/36

(51) Int Cl.:
B65D 88/54 *(2006.01)* ***B65D 88/12*** *(2006.01)*

(21) Application number: **18159663.6**

(22) Date of filing: **02.03.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **03.03.2017 IT 201700024162**

(71) Applicant: **Ni.Ka.Mi. Corp. P.te Ltd. (Singapore)**
179934 Singapore (SG)

(72) Inventor: **CARINA, Norberto**
179934 Singapore (SG)

(74) Representative: **Maccalli, Marco et al**
Maccalli & Pezzoli S.r.l.
Via Settembrini, 40
20124 Milano (IT)

(54) **STRUCTURE FOR ROOF OF A CONTAINER, ROOF AND CONTAINER THEREWITH**

(57) A structure (**115**) for roof (**110**) of a container (**100**) for the intermodal transport of products is proposed. The container (**100**) comprises a casing (**105**) delimiting a cavity adapted to house the products to be transported. The structure (**115**) comprises:
at least two openings for accessing said cavity, and
at least two doors (**205_n**) each one associated with a respective one of said at least two openings and each one comprising a first (**205_{ASn}**) and a second (**205_{ADn}**) hinged doors opposite to each other, each door being selectively operable between an opened position that allows insertion from above of the products to be transported into the cavity through the respective opening, and a closed position that prevents insertion of the products into the cavity and exposure thereof to impurities and atmospheric agents during the transport.

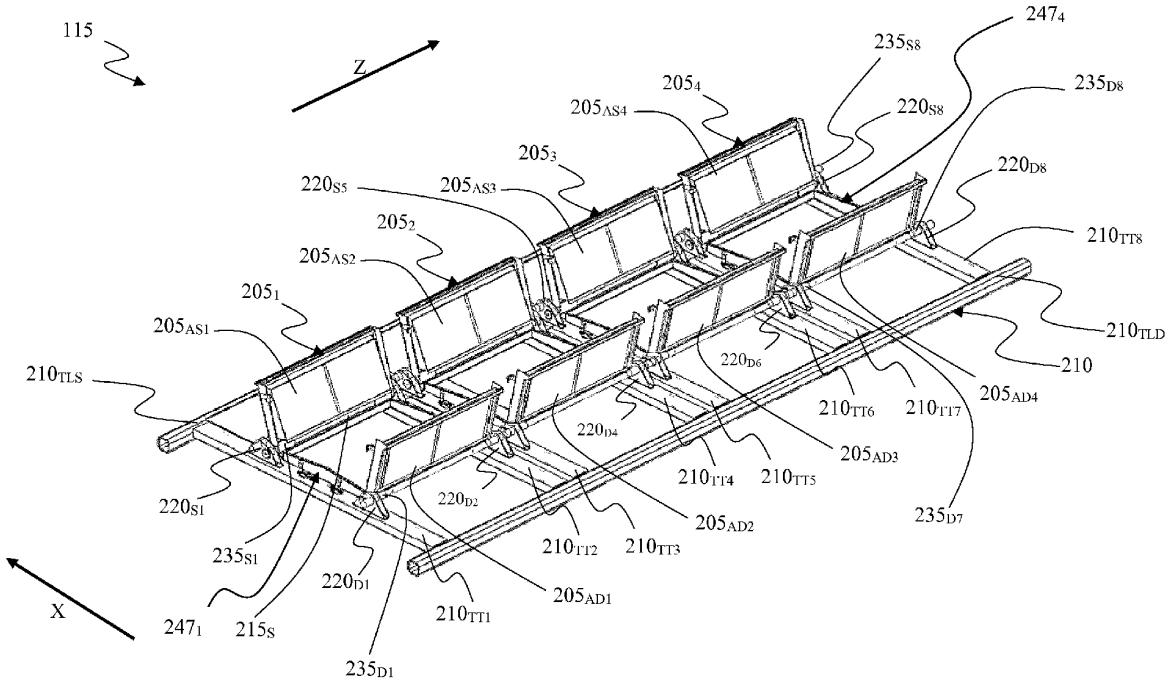

Figure 2A

EP 3 369 678 A1

Description

Field of the Invention

[0001] The present invention generally relates to the transport field. In particular, the present invention refers to an intermodal transport unit (container). More particularly, the present invention relates to a structure for a roof of a container.

Background art of the invention

[0002] Intermodal transport provides that products to be transported are placed at the factory or the warehouse of a shipper in a specific intermodal transport unit, or container, in which the products are located until they reach the final destination.

[0003] The intermodal transport usually takes place by means of two or more transport means (such as trucks, semitrailers, railway wagons, or ships).

[0004] Although the use of containers allows avoiding intermediate handling of the products therein (thus ensuring a lower risk of damage to the products and a higher transport speed), the use of the containers is not currently advantageous for certain types of products, especially for granular products.

[0005] In fact, conventional containers are typically equipped with inlet and outlet doors positioned on opposite vertical side walls of the container, whereby the insertion of granular products into the container cannot ensure the maximization of the volume occupation.

[0006] For this reason, granular products are typically transported on conventional trucks, until reaching port stations (where they are loaded into proper tanks intended to be transported by ships). The transport by trucks, and the subsequent transfer into the tanks, exposes the products to impurities (such as dirt and smog) and to atmospheric agents (such as rain, ice and snow), which affect the quality of the products.

[0007] These issues are exacerbated in cases where the (granular) products to be transported comprise loose food products - for example, grains (for example, cereals such as oats, spelled, wheat, corn, millet, barley, rice and rye) and salt.

[0008] To overcome these drawbacks, in the state of the art three container solutions mainly exist, which have in common the possibility of inserting the products from above.

[0009] In a first solution, the container is open at the top (open top container), and is typically covered at the top by a tarpaulin that replaces the rigid roof.

[0010] In a second solution, the container comprises a roof that can be opened entirely.

[0011] In a third solution, the container comprises a roof having a single inlet opening (which can be opened and closed selectively by a door), wherein the inlet opening is equipped with flow sensors.

Summary of the Invention

[0012] The Applicant has noticed that the containers known in the art are not satisfactory in terms of costs and efficiency, and do not lend themselves to be used for the loading and transport of certain types of products (for example, loose food products such as grains - cereals such as oats, spelled, wheat, corn, millet, barley, rice and rye - and salt).

[0013] In this regard, the Applicant has noticed that the open top container solution is not advisable for the transport of food products (which would be exposed to impurities and to atmospheric agents), and involves high logistic and transport costs (in fact, due to the their relative fragility, open top containers should be placed on top of a container stack).

[0014] Furthermore, the Applicant has noticed that the solution of container with roof that can be opened entirely needs (due to the heaviness of the roof and its difficult accessibility by an operator) a mechanized system for opening and closing the roof, which leads to non-negligible losses in terms of time (in fact, for moving the container and the mechanized system several tens of minutes are needed) and in terms of costs.

[0015] In addition, the Applicant has noticed that the solution of container with roof having a single inlet opening does not allow the distribution of the products uniformly inside the container. In fact, in order to ensure a correct operation of the flow sensors, the inlet opening has a relatively small size, whereby the container, during the insertion of the products, should be continuously moved (in different directions) in the attempt of distributing them. In any case, this procedure, besides causing considerable difficulties for moving the container, is not reliable (due to the non-predictability of the dynamics of distribution of moving granular products) and typically involves an inefficient occupation of the container volume. The Applicant has also noticed that the relatively small size of the inlet opening does not allow an operator to safely access the container, for example in order to manually redistribute the products loaded therein.

[0016] The Applicant has devised a roof for a container (and a corresponding container) capable of overcoming these, as well as other, drawbacks.

[0017] In particular, one or more aspects of the present invention are set out in the independent claims, with advantageous features of the same invention that are indicated in the dependent claims, whose text is hereby incorporated verbatim by reference (with any advantageous feature provided with reference to a specific aspect of the present invention that applies mutatis mutandis to every other aspect thereof).

[0018] More specifically, an aspect of the present invention proposes a structure for roof of a container for the intermodal transport of products. The container comprises a casing delimiting a cavity adapted to house the products to be transported. The structure comprises:

at least two openings for accessing said cavity, and at least two doors each one associated with a respective one of said at least two openings, each door being selectively operable between an opened position that allows insertion from above of the products to be transported into the cavity through the respective opening, and a closed position that prevents insertion of the products into the cavity and exposure thereof to impurities and atmospheric agents during the transport.

[0019] According to an embodiment of the present invention, each one of said at least two doors comprises a first and a second hinged doors opposite to each other.

[0020] According to an embodiment of the present invention, said first and second hinged doors comprise each one a guiding member on a surface of the hinged door that, in the closed position, faces the cavity. Advantageously, in the opened position of the first and second hinged doors, said guiding member act as a hopper for guiding the products into the respective opening.

[0021] According to an embodiment of the present invention, the hinged door comprises a first end in correspondence of the opening when the hinged door is in the open position, and a second end opposite to the first end; preferably, the guiding member extends from said surface of the hinged door at a first distance from a first portion of the hinged door delimited by said first end, and at a second distance, lower than the first distance, from a second portion of the hinged door delimited by the second end.

[0022] According to an embodiment of the present invention, the structure further comprises a plurality of crossbars for supporting said at least two doors.

[0023] According to an embodiment of the present invention, the structure further comprises a hinging structure for hinging said at least two doors to said crossbars thereby allowing to operate individually each one of said at least two doors between the opened position and the closed position.

[0024] According to an embodiment of the present invention, the structure further comprises at least one stop member for stopping said at least two doors in the opened position at a predetermined aperture angle.

[0025] According to an embodiment of the present invention, in the closed position the first hinged door forms an overlapping abutment with the second hinged door.

[0026] According to an embodiment of the present invention, the first and second hinged doors comprise each one a respective gutter member extending vertically from a surface of the first and second hinged doors that, in the closed position, is external to the cavity. Preferably, the gutter member of the second hinged door is adapted to overlap to the gutter member of the first hinged door so as to form a labyrinth that prevents the inlet of impurities and atmospheric agents into the cavity.

[0027] According to an embodiment of the present invention, the structure further comprises at least one locking system for locking said at least two doors in the closed position.

[0028] According to an embodiment of the present invention, in the closed position said at least two doors abut on abutment portions of said crossbars. Preferably, at least one between said at least two doors and said abutment portions comprises at least one gasket.

[0029] Another aspect of the present invention proposes a structure for roof of a container for the intermodal transport of products. The container comprises a casing delimiting a cavity adapted to house the products to be transported. The structure comprises at least two openings for accessing said cavity, and at least two doors each one associated with a respective one of said at least two openings and each one comprising a first and a second hinged doors opposite to each other. Each door is selectively operable between an opened position that allows insertion from above of the products to be transported into the cavity through the respective opening, and a closed position that prevents insertion of the products into the cavity and exposure thereof to impurities and atmospheric agents during the transport. The first and second hinged doors comprise each one a respective gutter member extending along a vertical direction substantially orthogonal to a first surface of the first and second hinged doors that, in the closed position, is external to the cavity, the gutter member of the second hinged door being adapted to overlap to the gutter member of the first hinged door. The structure comprises at least one abutment portion, in the closed position a second surface of the first and second hinged doors that, in the closed position, faces the cavity, abutting on said at least one abutment portion. The overlapping of the gutter member of the second hinged door to the gutter member of the first hinged door and the abutment of the second surface of the first and second hinged doors on the at least one abutment portion form a labyrinth that prevents the inlet of impurities and atmospheric agents into the cavity.

[0030] According to an embodiment of the present invention, the structure further comprises first and second cover elements adapted to cover a respective hinged door and the respective gutter member at, respectively, first and second sides thereof, along said vertical direction.

[0031] According to an embodiment of the present invention, said first and second hinged doors comprise each one a guiding member on the second surface of the hinged door. In the opened position of the first and second hinged doors the guiding members of the first and second hinged doors act as a hopper for guiding the products into the respective opening. The at least one abutment portion comprises at least one transversal abutment portion extending orthogonally to said vertical direction, each transversal abutment portion being adapted to abut, in the closed position of the first and second hinged doors, on the second surface of a pair of first and second hinged doors at a respective one of said

first and second sides.

[0032] According to an embodiment of the present invention, each transversal abutment portion is adapted to abut on the second surface of the first and second hinged doors at the respective one of said first and second sides, by fitting into gaps between the first and second cover elements of the first and second hinged doors at the respective one of said first and second sides and the respective guiding members.

[0033] According to an embodiment of the present invention, each transversal abutment portion has a first part having a first slanting with respect to a horizontal plane on which the structure lays when mounted on the container, and a second part having, with respect to the horizontal plane, a second slanting opposite to the first slanting. Each pair of first and second hinged doors in the closed position identify, by abutment thereof on said first and second parts of the respective transversal abutment portions, an inverted-V profile of the closed position that allows draining of impurities and atmospheric agents by gravity.

[0034] According to an embodiment of the present invention, the hinged door comprises a first end in correspondence of the opening when the hinged door is in the open position, and a second end opposite to the first end. The guiding member extends from said surface of the hinged door at a first distance from a first region of the hinged door delimited by said first end, and at a second distance, preferably lower than the first distance, from a second region of the hinged door delimited by the second end. The at least one abutment portion comprises at least one longitudinal abutment portion extending orthogonally to the at least one transversal portion and to said vertical direction, each longitudinal abutment portion being adapted to abut, in the closed position of the first and second hinged doors, on the second surface of a respective one of said first and second hinged doors, in correspondence of the respective first region thereof.

[0035] According to an embodiment of the present invention, each gutter member is formed in a single piece with the respective hinged door.

[0036] According to an embodiment of the present invention, each first and second hinged door comprises, in correspondence of the second region thereof, a respective rod for providing mechanical strength. The gutter members of the first and second hinged doors are formed in a single piece with the respective rods.

[0037] Another aspect of the present invention proposes a roof for a container comprising said structure and an upper wall of the casing of the container.

[0038] A further aspect of the present invention proposes a container comprising said roof.

[0039] Thanks to the present invention, it is possible to obtain containers for the transport of granular products (for example, loose food products) having a total compatibility with the existing systems for moving the containers, with the current systems for loading and unloading the products, and with all the transport modes provided by the intermodal transport (thus avoiding the transshipment of products between different carriers - choke-point). Moreover, thanks to the present invention, it is possible to obtain containers that are suitable for stacking and that can also be used for the temporary storage of the products contained therein. In addition to the advantages of above, the present invention also involves, at the same time, low construction costs.

Brief description of the enclosed drawings

[0040] Embodiments of the present invention, as well as further features and the advantages thereof, will be better understood with reference to the following detailed description, given purely by way of non-limiting example, to be read in conjunction with the attached figures (in which corresponding elements are indicated by same or similar references and their explanation is not repeated for the sake of brevity). In this regard, it is expressly understood that the figures are not necessarily drawn to scale (with some details that may be exaggerated and/or simplified) and that, unless otherwise indicated, they are simply used to illustrate conceptually the described structures and procedures. In particular:

Figure 1A and **1B** show perspective views of a container according to an embodiment of the present invention;

Figure 2A is a perspective view of an access structure for a roof of the container according to an embodiment of the present invention;

Figures 2B-2C are detailed perspective views of the container roof in semi-closed and closed positions, respectively, according to an embodiment of the present invention;

Figures 2D-2E are perspective detail views of the container roof in open condition, according to an embodiment of the present invention, and

Figure 2F is a flat front view of the container roof (in open condition) according to an embodiment of the present invention.

Detailed Description of Preferred Embodiments of the Invention

[0041] With reference to the drawings, **Figures 1A** and **1B** show perspective views of an intermodal transport unit, or container **100,** according to an embodiment of the present invention. In the following, directional terminology (for example, upper, lower, front, rear, side) relating to the container **100** and components thereof refers to their orientation in the figures, which is exemplarily assumed as typical orientation of use thereof.

[0042] The container **100** is able to contain products to be transported. As will be apparent from the following description, the container is particularly advantageous for the transport of granular products - such as grains (including, for example, cereals such as oats, spelled,

wheat, corn, millet, barley, rice and rye) or salt. In any case, the container **100** is not limited to a specific type of products to be transported.

[0043] The container **100,** for example compliant with ISO ("International Organization for Standardization") standard, comprises a casing **105** that delimits a cavity (not visible) within which the products are housed/contained during their transport. Preferably, the casing **105** is parallelepiped in shape, and comprises a lower wall $\mathbf{105_B}$ (parallel to the plane defined by the **X-Z** axes), two opposite side walls parallel to each other $\mathbf{105_{S1}}$,$\mathbf{105_{S2}}$ (parallel to the plane defined by the **Y-Z** axes and, therefore, orthogonal to the lower wall $\mathbf{105_B}$), a front wall $\mathbf{105_F}$ (parallel to the plane defined by the **X-Y** axes), and a rear wall $\mathbf{105_R}$ parallel to the front wall $\mathbf{105_F}$. The lower $\mathbf{105_B}$, side $\mathbf{105_{S1}}$,$\mathbf{105_{S2}}$, front $\mathbf{105_F}$ and rear $\mathbf{105_R}$ walls may for example be made of a corrugated metal sheet (as shown) or of a flat metal sheet.

[0044] The casing **105** further comprises one or more fixing elements $\mathbf{105_{FIX}}$ (*e.g.,* as illustrated, one fixing element $\mathbf{105_{FIX}}$ in each corner of the casing **105**) adapted to be fixed to a lifting equipment (for example, forklifts, overhead travelling cranes, and cranes) for the transfer of the container **100** between the various transport modes or vehicles (for example, trucks, semitrailers, railway wagons, and ships), and to the fixing elements of other containers (for example, so as to enable the stacking of the containers onto one another).

[0045] According to an embodiment of the present invention, the container **100** comprises a roof **110** selectively operable between an open condition (shown in **Figure 1A**) that allows the insertion or charging from above of the products into the cavity, and a closed condition (shown in **Figure 1B**) that prevents the insertion of the products into the cavity and the exposure of the products to impurities (such as dirt and smog) and to atmospheric agents (such as rain, ice and snow) during the transport.

[0046] As can be seen in the figures, the roof **110** preferably comprises an upper wall $\mathbf{105_T}$ of the casing **105,** opposite to the lower wall $\mathbf{105_B}$, and a structure (hereinafter, access structure) **115** for selectively accessing the cavity (thereby allowing the insertion from above of the products into it).

[0047] Such a selective access is achieved by means of two or more doors (in the following, inlet doors), better discussed in the following, each one being selectively operable between an open position and a closed position - in the open position of the inlet door, the inlet door covering or uncovering a respective inlet opening defined by portions of the roof **110** not occupied by the upper wall $\mathbf{105_T}$. In this way, the roof **110** may take the open condition (in which all the inlet doors are in the open position), the closed condition (in which all the inlet doors are in the closed position), and a partially open condition (not shown, in which at least one inlet door is in the open position).

[0048] The upper wall $\mathbf{105_T}$ may for example be made of a corrugated metal sheet (in such a way as to give strength to the roof **110,** especially when, as better discussed below, the upper wall $\mathbf{105_T}$ is also used as a walking region) or, as illustrated, in a flat metal sheet (so as to simplify both its welding to the rest of the casing **105,** especially when the roof **110** according to the present invention is applied in replacement of upper walls of existing containers, and its cleaning).

[0049] In the illustrated embodiment, the container **100** comprises an additional door (hereinafter, outlet door) **120** (or more thereof, in alternative embodiments of the present invention) to allow the discharge of the products contained in the cavity. Preferably, the outlet door **120** allows the frontal exit or discharge of the products contained in the cavity, the outlet door **120** being for example formed on a front face of the casing **105** comprising the front wall $\mathbf{105_F}$ - in other words, the portion of the central face not occupied by the front wall $\mathbf{105_F}$ identifies an outlet opening selectively covered or uncovered by the outlet door **120.**

[0050] More preferably, the outlet door **120** is hinged to the bottom side of the front wall $\mathbf{105_F}$ by means of one or more (for example, two) hinges $\mathbf{120_H}$, so as to rotate about a rotation axis parallel to the **X** axis between an open position (visible in **Figure 1A**), in which the outlet door **120** uncovers the outlet opening thereby allowing the front discharge of the products from the cavity (such discharge being advantageously facilitated by the rear lifting of the container **100,** so that the inclination resulting from such lifting causes the products to exit due to gravity), and a closed position (visible in **Figure 1B**), in which the outlet door **120** covers the outlet opening thereby preventing the products from escaping from the cavity. Still more preferably, in the closed position of the outlet door **120,** the front wall $\mathbf{105_F}$ and the outlet door **120** are substantially coplanar (*i.e.,* they substantially lie on a same plane) and form, as a whole, the front face of the casing **105,** whereas in the open position of the outlet door **120,** the outlet door **120** abuts on (*i.e.,* on a portion of) the front wall $\mathbf{105_F}$, and is advantageously retained to it by means of suitable retaining elements, not shown (in such a way that, during the lifting of the container **100,** the outlet door **120** is firmly kept in the open position).

[0051] The sizes along the **X** axis (width) and along the **Y** axis (height) of the outlet door **120** (and, hence, of the outlet opening associated therewith) are not limitative for the present invention, in that they may be arbitrarily chosen based on specific design considerations - the width and the height of the outlet door **120** depending, for example, on the desired discharge flow rate of the products and on the degree of granularity of the products. According to a preferred embodiment of the present invention, the outlet door **120** (and, hence, the outlet opening associated therewith) has a height of about 40-50 cm (for example, in order to ensure a discharge flow rate of products such as grain or salt of about 200 tons per hour).

[0052] With reference also to **Figure 2A,** it shows a perspective view of the access structure **115** according to an embodiment of the present invention. For the sake

of exposition simplicity and clarity, **Figure 2A** will be discussed jointly with **Figures 2B-2C,** which are perspective views of the roof **110** in semi-closed and closed conditions, respectively, to **Figures 2D-2E,** which are perspective views of the roof **110** in open condition, and to the **Figure 2F,** which is a flat front view of the roof **110.**

[0053] The access structure **115** comprises a number *N* of inlet doors $\mathbf{205}_n$ (*n*=1,2, ..., *N,* with *N* = 4 in the example at issue), for example a succession of *N* inlet doors $\mathbf{205}_n$ aligned along a longitudinal direction parallel to the **Z** axis.

[0054] The use of a relatively large number of independently operable inlet doors $\mathbf{205}_n$ allows a distribution of the products uniformly within the cavity, and simplifies the moving operations of the container **100** during the insertion of the products (as opposed to the prior art solution in which the container has a roof with a single opening, which requires continuous movement of the container in all directions). In addition, each inlet door $\mathbf{205}_n$ can be selectively (*i.e.,* independently) operated in the open position or in the closed position by an operator, without the need of providing bulky and expensive mechanical systems (as it is instead in the prior art solution wherein the container has a roof that can be opened completely).

[0055] The selective opening of each inlet door $\mathbf{205}_n$ is particularly advantageous as it can be adapted to the degree of granularity of the products to be transported. For example, in the case in which the products to be transported comprise grains, all the inlet doors $\mathbf{205}_n$ are advantageously positioned in the open position; on the contrary, in the case in which the products to be transported comprises salt, only two inlet doors $\mathbf{205}_n$ (preferably, the central doors $\mathbf{205}_2$,$\mathbf{205}_3$) are advantageously positioned in the open position, so as not to generate accumulation zones in certain regions of the cavity. The selective opening of each inlet door $\mathbf{205}_n$ is further advantageous when the container **100,** during the insertion of the products, is lifted and inclined for redistributing the products inside it. In this scenario, in fact, as the inclination of the container **100** changes, a different inlet door $\mathbf{205}_n$ for the insertion of the products may be selected.

[0056] Preferably, as shown, each inlet door $\mathbf{205}_n$ has a pair of opposite hinged doors $\mathbf{205}_{\mathbf{AS}n}$,$\mathbf{205}_{\mathbf{AD}n}$ along a transversal direction parallel to the **X** axis, in order to prevent or selectively allow access to the cavity (as explained below) - in any case, alternative embodiments of the present invention, not shown, may provide that each inlet door $\mathbf{205}_n$, or at least a part thereof, has a single hinged door. Since, in the various figures, the hinged doors $\mathbf{205}_{\mathbf{AS}n}$,$\mathbf{205}_{\mathbf{AD}n}$ are, respectively, on the left and on the right of the observer, they will be denoted from here on by left hinged door $\mathbf{205}_{\mathbf{AS}n}$ and right hinged door $\mathbf{205}_{\mathbf{AD}n}$, respectively (when it will be necessary to distinguish them from each other).

[0057] Advantageously, each hinged door $\mathbf{205}_{\mathbf{AS}n}$,$\mathbf{205}_{\mathbf{AD}n}$ can be selectively (that is, independently) operated in the open position or in the closed position by an operator. The selective opening of each hinged door $\mathbf{205}_{\mathbf{AS}n}$,$\mathbf{205}_{\mathbf{AD}n}$ is advantageous when, for example, it is necessary that the inside of the container **100** is not excessively exposed during the insertion of the products. For example, in the presence of rain or other atmospheric agents that are potentially detrimental to the correct storage of the products, it may be convenient to open and close one single hinged door $\mathbf{205}_{\mathbf{AS}n}$,$\mathbf{205}_{\mathbf{AD}n}$ at a time.

[0058] Preferably, although not necessarily, the hinged doors $\mathbf{205}_{\mathbf{AS}n}$,$\mathbf{205}_{\mathbf{AD}n}$ are made of steel or other metal material.

[0059] The access structure **115** further comprises a frame **210** having a plurality of crossbars (for example, made of steel or other metal material) for supporting / sustaining the inlet doors $\mathbf{205}_n$ and the upper wall $\mathbf{105}_\mathbf{T}$ (as explained shortly) and to give mechanical stiffness to the casing **105.** The mechanical stiffness of the casing **105** determined by the provision of the crossbars allows avoiding buckling of the container **100** during its moving, for example during the lifting aimed at giving the inclination that is required to facilitate the frontal outlet of the products through the outlet opening or to redistribute the products inside the container **100.** The mechanical stiffness of the casing **105** determined by the provision of the crossbars also allows avoiding damages to the access structure **115** when the products (especially heavy products, such as stones), during their insertion or charging into the cavity, escape from product inflowing and hit the upper wall $\mathbf{105}_\mathbf{T}$**.** In the illustrated embodiment, the frame **210** comprises a pair of crossbars $\mathbf{210}_{\mathbf{TLS}}$,$\mathbf{210}_{\mathbf{TLD}}$ extending along the longitudinal direction (so that they will be indicated in the following by longitudinal crossbars), and spaced apart from each other along the transverse direction by a distance corresponding to the width of the casing **105** (*i.e.*, to the width of the lower wall $\mathbf{105}_\mathbf{B}$). In the following, consistently with the used directional terminology, the longitudinal crossbars $\mathbf{210}_{\mathbf{TLS}}$,$\mathbf{210}_{\mathbf{TLD}}$ will also be indicated by left longitudinal crossbar $\mathbf{210}_{\mathbf{TLS}}$ and right longitudinal crossbar $\mathbf{210}_{\mathbf{TLD}}$**,** when it will be necessary to distinguish them from each other.

[0060] As visible in **Figures 1A** and **1B,** the top wall $\mathbf{105}_\mathbf{T}$ is positioned substantially between the left longitudinal crossbar $\mathbf{210}_{\mathbf{TLS}}$ and the left hinged doors $\mathbf{205}_{\mathbf{AS}n}$, and between the right longitudinal crossbar $\mathbf{210}_{\mathbf{TLD}}$ and the right hinged doors $\mathbf{205}_{\mathbf{AD}n}$, the upper wall $\mathbf{105}_\mathbf{T}$ thus acting as a walking region to allow an operator to walk on it (for example, for opening the inlet doors $\mathbf{205}_n$ and/or carrying out the operations necessary to allow the lifting of the container **100**). In the exemplary considered embodiment in which the inlet doors $\mathbf{205}_n$ are arranged substantially centrally with respect to the width of the frame **210** (and, hence, of the container **100**), the upper wall $\mathbf{105}_\mathbf{T}$ defines two identical walking regions (*i.e.,* a left walking region defined by the portion of the upper wall $\mathbf{105}_\mathbf{T}$ between the left longitudinal crossbar $\mathbf{210}_{\mathbf{TLS}}$ and the left hinged doors $\mathbf{205}_{\mathbf{AS}n}$, and a right walking region between the right longitudinal crossbar $\mathbf{210}_{\mathbf{TLD}}$ and the right hinged doors $\mathbf{205}_{\mathbf{AD}n}$**).** As will be understood, ac-

cording to the distribution of the inlet doors $\mathbf{205}_n$, different walking regions can be obtained (which, in any case, are not limiting for the present invention).

[0061] In the illustrated embodiment, the frame **210** further comprises a number *I* of crossbars $\mathbf{210}_{TTi}$ (*i* = 1, 2, ..., *I*) extending transversely to the longitudinal crossbars $\mathbf{210}_{TLS}$,$\mathbf{210}_{TLD}$, *i.e.* along the transverse direction, between the left longitudinal crossbar $\mathbf{210}_{TLS}$ and the right longitudinal crossbar $\mathbf{210}_{TLD}$ (reason why in the following the crossbars $\mathbf{210}_{TTi}$ will be indicated by transversal crossbars), and spaced apart from each other along the longitudinal direction according to number, size and mutual distance of the inlet doors $\mathbf{205}_n$. Therefore, the upper wall $\mathbf{105}_T$ (*i.e.,* the right and left walking regions) and the transversal crossbars $\mathbf{210}_{TTi}$ delimit inlet openings (each associated with a respective inlet door $\mathbf{205}_n$), so that the inlet doors $\mathbf{205}_n$ in the open position uncover the respective inlet openings (thereby allowing the insertion of the products into the cavity through them), and the inlet doors $\mathbf{205}_n$ in the closed position, by abutting on the respective transversal crossbars $\mathbf{210}_{TTi}$ (*i.e*., on abutment portions associated therewith, as discussed in the following), cover the respective inlet openings (thereby preventing the insertion of the products into the cavity through them). The fact that the inlet doors $\mathbf{205}_n$, in the closed position, abut on the respective transversal crossbars $\mathbf{210}_{TTi}$ is advantageous in terms of mechanical stiffness and stability, as opposed to, for example, US3720328, which instead shows doors abutting directly on roof wall portions surrounding the openings (thus significantly weakening the whole structure).

[0062] In the exemplary considered embodiment in which the access structure **115** comprises four inlet doors $\mathbf{205}_n$ having same size and being substantially equidistant from each other along the longitudinal direction, eight transversal crossbars $\mathbf{210}_{TTi}$ (*i.e., I* = 8) are provided. The arrangement of the transversal crossbars $\mathbf{210}_{TTi}$ (and in particular their mutual distance along the longitudinal direction) depends on the size of the inlet openings along the longitudinal direction. In fact, the hinged doors $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ of a same inlet door $\mathbf{205}_n$ are preferably fixed, at ends thereof, to a respective pair of transversal crossbars $\mathbf{210}_{TTi}$ (for example, by means of brackets, as discussed below), so that the distance between two transversal crossbars $\mathbf{210}_{TTi}$ associated with a same pair of hinged doors $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ (for example, the transversal crossbars $\mathbf{210}_{TT3}$ and $\mathbf{210}_{TT4}$ associated with the pair of hinged doors $\mathbf{205}_{AS2}$,$\mathbf{205}_{AD2}$) depends on the length of the hinged doors. In addition, in the embodiment herein considered in which the hinged doors $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ are arranged in succession aligned along the longitudinal direction, each transversal crossbar $\mathbf{210}_{TTi}$ associated with a hinged door $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ (with the exception of the first transversal crossbar $\mathbf{210}_{TT1}$ and of the last transversal crossbar $\mathbf{210}_{TT8}$) is adjacent to the transversal crossbar $\mathbf{210}_{TTi}$ associated with a previous or a following hinged door in succession (see, in this respect, the pairs of adjacent transversal crossbars $\mathbf{210}_{TT2}$,$\mathbf{210}_{TT3}$, $\mathbf{210}_{TT4}$,$\mathbf{210}_{TT5}$ and $\mathbf{210}_{TT6}$,$\mathbf{210}_{TT7}$).

[0063] As visible in particular in **Figure 2A,** the access structure **115** preferably comprises a hinging structure for hinging the inlet doors $\mathbf{205}_n$ to the crossbars (preferably, as illustrated, to the transversal crossbars $\mathbf{210}_{TTi}$).

[0064] According to the exemplary illustrated embodiment, such hinging structure comprises hinging elements (*e.g.,* hinging pins) arranged along the longitudinal direction, for hinging the hinged doors $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$. More preferably, in the exemplary embodiment herein assumed in which each inlet door $\mathbf{205}_n$ has two hinged doors $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$, the hinging structure comprises a pair of hinging pins $\mathbf{215}_S$,$\mathbf{215}_D$ for hinging the left hinged doors $\mathbf{205}_{ASn}$ and the right hinged doors $\mathbf{205}_{ADn}$, respectively (hereinafter, consistently with the used directional terminology, these hinging pins will be indicated by left hinging pin **215s** and right hinging pin $\mathbf{215}_D$, when it will be necessary to distinguish them from each other), so as to allow the hinged doors $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ to rotate about their respective hinging pins $\mathbf{215}_S$,$\mathbf{215}_D$ between the open position and the closed position. The use of a single left hinging pin **215s** for hinging at the same time all the left hinged doors $\mathbf{205}_{ASn}$, and a single right hinging pin $\mathbf{215}_D$ for hinging at the same time the right hinged doors $\mathbf{205}_{ADn}$ is an advantageous implementation that descends from the specific (but exemplary) embodiment herein considered in which the inlet doors $\mathbf{205}_n$ (and, hence, the respective hinged doors $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$) are aligned along the longitudinal direction. In any case, as will be appreciated, in alternative embodiments of the present invention (not shown), each group of left hinged doors $\mathbf{205}_{ASn}$ and/or each group of right hinged doors $\mathbf{205}_{ADn}$ may be hinged to respective hinging pins (in a further embodiment, each hinged door $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ may be hinged to a different hinging pin).

[0065] In the illustrated embodiment, as can be better appreciated in **Figures 2D** and **2E,** each hinged door $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ comprises, at an end thereof, one or more (for example, two) hollow cylindrical portions, or hinges, $\mathbf{205}_{CSj}$,$\mathbf{205}_{CDj}$ (*j* = 1,2, ..., *J,* with *J* = 2*N* in the example at issue) adapted to receive the hinging pins $\mathbf{215}_S$,$\mathbf{215}_D$, respectively, so as to hinge the hinged door $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ to the hinging pin $\mathbf{215}_S$,$\mathbf{215}_D$ (in **Figure 2D** being for example visible the hinges $\mathbf{205}_{CD1}$,$\mathbf{205}_{CD2}$ of the right hinged door $\mathbf{205}_{AD1}$ with the right hinging pin right $\mathbf{215}_D$ received between them, and in **Figure 2E** being for example visible the hinges $\mathbf{205}_{CS1}$,$\mathbf{205}_{CS2}$ of the left hinged door $\mathbf{205}_{AS1}$ with the left hinging pin **215s** received between them).

[0066] In order to obtain an effective rotatable coupling of the hinged door $\mathbf{205}_{ASn}$,$\mathbf{205}_{ADn}$ (*i.e.,* of the respective hinges $\mathbf{205}_{CSj}$,$\mathbf{205}_{CDj}$) to the hinging pin $\mathbf{215}_S$,$\mathbf{215}_D$, the hinging pins $\mathbf{215}_S$,$\mathbf{215}_D$ and the hinges $\mathbf{205}_{CSj}$,$\mathbf{205}_{CDj}$ are advantageously made of a metal material (*e.g.,* steel) with a reduced friction coefficient (so as to require no, or substantially no, lubrication). According to alternative embodiments of the present invention, the hinging pins

215_S,215_D are made of a metal material having self-lubricating properties (said self-lubricating properties being preferably obtained by incorporating in the hinging pins 215_S,215_D solid lubricants components capable of gradually releasing the lubricant in the fluid state, for example as a result of the friction with the respective hinges 205_{CSj},205_{CDj}).

[0067] The access structure **115** preferably comprises a plurality of brackets 220_{Sj},220_{Dj} (for example, made of stainless steel or other metal material) to fix the hinging pins 215_S,215_D to the frame **210.** More preferably, the access structure **115** comprises a bracket 220_{Sj},220_{Dj} in the vicinity of each hinge 205_{CSj},205_{CDj} (hereinafter, consistent with the used directional terminology, such brackets will be indicated by left bracket 220_{Sj} and the right bracket 220_{Dj}, when it will be necessary to distinguish them from each other). Therefore, in the preferred embodiment herein considered, the access structure **115** comprises $J = 2N$ left brackets 220_{Sj} and $J = 2N$ right brackets 220_{Dj} (*i.e.*, two left brackets 220_{Sj} and two right brackets 220_{Dj} for each inlet door 205_n).

[0068] As visible in the figures, each bracket 220_{Sj},220_{Dj} has a hole or slot **225** for the passage of the (respective) hinging pin 215_S,215_D through it. In the exemplary embodiment herein considered in which a single left hinging pin 215_S is provided for hinging the left hinged doors 205_{ASn} simultaneously, and a single right hinging pin 215_D is provided for hinging the right hinged doors 205_{ADn} simultaneously, the left brackets 220_{Sj} (and the respective slots **225**) are advantageously aligned with each other along the longitudinal direction (so as to allow the passage of the left hinging pin **215s** through the respective slots **225**) and the right brackets 220_{Dj} (and the respective slots **225**) are also aligned with each other along the longitudinal direction (so as to allow the passage of the right hinging pin 215_D through the respective slots **225**).

[0069] Advantageously, as shown, each left bracket 220_{Sj} is fixed to a respective transversal crossbar 210_{TTi}, and each right bracket 220_{Dj} is fixed to a respective transversal crossbar 210_{TTi} properly spaced apart from the left bracket 220_{Sj} on the same transversal crossbar 210_{TTi} - each bracket 220_{Sj},220_{Dj} (or at least a part thereof) being preferably fixed to a respective traversal crossbar 210_{TTi} by gluing or by suitable fixing means (such as screws), not shown, or being integral with it.

[0070] Thus, a left bracket 220_{Sj} and a right bracket 220_{Dj} are fixed to each transversal crossbar 210_{TTi}, the left bracket 220_{Sj} and the right bracket 220_{Dj} being spaced from each other along the transverse direction according to the size of the inlet openings. In fact, as can be better appreciated in **Figure 2A,** the distance between the left brackets 220_{Sj} and the right brackets 220_{Dj} on the same transversal crossbar 210_{TTi} determines the distance between the hinging pins 215_S,215_D (and, consequently, of the hinged doors 205_{ASn},205_{ADn} hinged thereto) and therefore the size of the inlet openings along the transversal direction.

[0071] According to the exemplary considered embodiment, and as visible in **Figures 2A, 2D** and **2E,** the access structure **115** further comprises one or more stop members for stopping the inlet doors 205_{ASn} (or at least a part thereof) in the open position at a predetermined aperture angle. Preferably, such stop members comprise a pair of stop tubular elements (or pins) 235_{Sj},235_{Dj} in correspondence of each hinge 205_{CSj},205_{CDj} (hereinafter, consistently with the used directional terminology, these stop pins will be indicated by left stop pin 235_{Sj} and right stop pin 235_{Dj}, when it will be necessary to distinguish them from each other). Therefore, in the preferred embodiment herein considered, the access structure **115** comprises $J=2N$ left stop pins 235_{Sj} and $J=2N$ right stop pins 235_{Dj} (*i.e.,* two left stop pins 235_{Sj} and two right stop pins 235_{Dj} for each inlet door 205_n).

[0072] The stop pins 235_{Sj},235_{Dj} are preferably fixed to the transversal crossbar 210_{TTi}, more preferably by means of the brackets 220_{Sj},220_{Dj}. For this purpose, as illustrated, each bracket 220_{Sj},220_{Dj} has a further hole or slot **230** for the passage of the stop pin 235_{Sj},235_{Dj} through it.

[0073] Advantageously, as illustrated, the slot **230** of each bracket 220_{Sj},220_{Dj} is arranged, along the transversal direction, at a distance from the slot **225** of the same bracket 220_{Sj},220_{Dj} such that the hinged doors 205_{ASn},205_{ADn}, by rotating toward the open position, abut on the respective stop pins 235_{Sj},235_{Dj} (which will prevent the further rotation of the hinged doors 205_{ASn},205_{ADn}) at a proper aperture angle relative to the **Y** axis (the stop pins 235_{Sj},235_{Dj} thus acting as mechanical limit switch for the hinged doors 205_{ASn},205_{ADn}, respectively). In other words, the stop pins 235_{Sj},235_{Dj} stop the rotation of the hinged doors 205_{ASn},205_{ADn}, respectively, to an aperture angle determined by the distance of the stop pins 235_{Sj},235_{Dj} from the respective hinged doors 205_{ASn},205_{ADn} (*i.e.,* the distance of the stop pins 235_{Sj},235_{Dj} from the hinging pins 215_S,215_D) along the transversal direction.

[0074] The aperture angle is not limitative for the present invention, as it may be arbitrarily chosen based on specific design considerations - the aperture angle being for example sufficiently large to ensure that each hinged door 205_{ASn},205_{ADn} is kept firmly in the open position (for example, in such a way as to prevent an operator on the walking region from accidentally impacting on a hinged door 205_{ASn},205_{ADn}, which would determine the undesired rotation of the hinged door 205_{ASn},205_{ADn} back to the closed position), but sufficiently low to avoid such an encumbrance that would prevent an operator to safely operate along the walking region. The aperture angle is preferably between 10° and 60°, more preferably it is between 15° and 45°, still more preferably it is between 20° and 40° - in the exemplary illustrated embodiment, the aperture angle is approximately of 30°.

[0075] In the considered embodiment, the aperture angle is fixed, since each bracket 220_{Sj},220_{Dj} is exemplary

provided with a single slot **230** for the passage of the stop pin $\mathbf{235_{Sj}}$,$\mathbf{235_{Dj}}$. In any case, according to alternative embodiments of the present invention, not shown, each bracket $\mathbf{220_{Sj}}$,$\mathbf{220_{Dj}}$ may be provided with one (or more) additional slots to adjust the position of the stop pins $\mathbf{235_{Sj}}$,$\mathbf{235_{Dj}}$ with respect to the hinging pins $\mathbf{215_S}$,$\mathbf{215_D}$ and, hence, the aperture angle of the hinged doors $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$.

[0076] In the considered embodiment, each hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ is associated with a different pair of stop pins $\mathbf{235_{Sj}}$,$\mathbf{235_{Dj}}$ (so as to be able to adjust the aperture angle of each hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ independently).

[0077] Anyway, in alternative embodiments of the present invention, not shown, each group of left hinged doors $\mathbf{205_{ASn}}$ and/or each group of right hinged doors $\mathbf{205_{ADn}}$ may be associated with a respective stop pin (and, therefore, to a respective aperture angle). Alternatively, similarly to what has been discussed for the hinging pins $\mathbf{215_S}$,$\mathbf{215_D}$, the use of a single left stop pin for stopping (simultaneously) the rotation of the left hinged doors $\mathbf{205_{ASn}}$ at the same aperture angle, and a single right stop pin for stopping (simultaneously) the rotation of the right hinged doors $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ at the same aperture angle may be provided.

[0078] As visible in particular in **Figures 2D-2F,** each hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ (or, in alternative embodiments, a subset thereof) advantageously comprises a guiding member (hereinafter, guide) **240** on a surface $\mathbf{205S_{ASn}}$,$\mathbf{205S_{ADn}}$ of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ that, in the closed position, faces the cavity (hereinafter, inner surface). Preferably, each guide **240** protrudes in a slanted or inclined manner from the inner surface $\mathbf{205S_{ASn}}$,$\mathbf{205S_{ADn}}$ of the respective hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$, so that, as can be better appreciated in **Figure 2F,** the guides **240** associated with each inlet door $\mathbf{205_n}$ act as a hopper for the products loaded from above, directing (*i.e.,* channeling) them into the inlet openings.

[0079] In fact, the guides **240** that protrude in slanted or inclined manner from the inner surface $\mathbf{205S_{ASn}}$,$\mathbf{205S_{ADn}}$ of the respective hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ when the respective hinged doors $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ are in the open position identify chutes that delimit a passage for the products to be loaded, such passage narrowing from top to bottom, thus regulating the flow of the products loaded from above.

[0080] In particular, as visible in **Figure 2F,** each guide **240** extends from the inner surface $\mathbf{205S_{ASn}}$,$\mathbf{205S_{ADn}}$ of the respective hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ at a first distance from a first or lower region of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ in correspondence of a lower end of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ (*i.e.* the end that, when the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ is in the open position, is in correspondence of or proximal to the respective inlet opening), and at a second distance, preferably lower than the first distance, from a second or upper region of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ in correspondence of an upper end opposite to the lower end (*i.e.* the end that, when the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ is in the open position, is distal to the respective inlet opening). In the exemplary illustrated embodiment, the lower and upper regions of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ are very close to the lower and upper ends thereof, respectively, however alternative embodiments of the present invention (not shown) may be envisaged in which the lower and upper regions of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ are more or less distant from the respective lower and upper ends, respectively.

[0081] In this way, the guides **240** of each pair of hinged doors $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ progressively narrow a mouth identified by such hinged doors $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ in the open position at the predetermined aperture angle, such that the products under loading are efficiently directed or channeled towards the respective inlet opening and do not accumulate outside it; in fact, in absence of the guides **240,** an amount of products could accumulate below the lower region of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ (for example in correspondence of the hinges $\mathbf{205_{CSj}}$,$\mathbf{205_{CDj}}$ and/or of the hinging pins $\mathbf{215_S}$,$\mathbf{215_D}$), whereby no hopper function would be envisaged.

[0082] Therefore, the fact that the guides **240** associated with each inlet door $\mathbf{205_n}$ act as a hopper for the products loaded from above is advantageous in terms of time and cost efficiencies, as opposed to, for example, the above cited US3720328, which instead shows an external hopper to control the flow of the products into the cavity (thus involving high costs and high times due to the need of the external hopper).

[0083] Preferably, as shown in **Figure 2C,** each hinged door (or, in alternative embodiments, a subset thereof) forms, in the closed position, an overlapping abutment with the other hinged door of the same door $\mathbf{205_n}$, so as to reduce the interstices or gaps between them. According to the exemplary (but not limiting) illustrated embodiment, each hinged door (for example, the left hinged door $\mathbf{205_{ASn}}$) comprises a gutter member **245s** extending vertically from an outer surface thereof opposite to the inner surface, and the other hinged door (for example, the right hinged door $\mathbf{205_{ADn}}$) comprises a gutter member $\mathbf{245_D}$ extending vertically from its outer surface and is adapted to overlap to the gutter member **245s.** In this way, the overlap between the gutter members $\mathbf{245_S}$,$\mathbf{245_D}$ forms a labyrinth that matter-of-factly and effectively prevents (or at least strongly reduces) the inlet of impurities and atmospheric agents into the cavity, especially from above of the inlet opening. Moreover, at least one gutter member, and preferably the gutter member that, upon overlapping, is more exposed to the external environment (the gutter member $\mathbf{245_D}$ in the example at issue), is advantageously provided with a slanted wall $\mathbf{245_{DL}}$ which allows draining impurities and atmospheric agents by gravity.

[0084] The gutter members $\mathbf{245_S}$,$\mathbf{245_D}$ are advantageously formed in a single piece with the left $\mathbf{205_{ASn}}$ and right $\mathbf{205_{ADn}}$ hinged doors. The gutter members $\mathbf{245_S}$,$\mathbf{245_D}$ may for example be formed in a single piece

with rods 246_S,246_D advantageously provided on the upper regions of the hinged doors 205_{ASn},205_{ADn}, respectively, and arranged for providing mechanical strength to the access structure **115.**

[0085] The access structure **115** preferably comprises at least one abutment portion, preferably one abutment portion 247_n for each pair of left 205_{ASn} and right 205_{ADn} hinged doors associated with a same opening, such that in the closed position the inner surface $205S_{ASn}$,$205S_{ADn}$ of the first 205_{ASn} and second 205_{ADn} hinged doors abuts on the respective abutment portion 247_n. The abutment of the inner surface $205S_{ASn}$,$205S_{ADn}$ of each pair of first 205_{ASn} and second 205_{ADn} hinged doors on the respective abutment portion 247_n forms a labyrinth that matter-of-factly and effectively prevents the inlet of impurities and atmospheric agents into the cavity, especially from a side of the inlet opening.

[0086] In order to further improve the labyrinth effect, especially at the side of the inlet opening, the access structure **115** may further comprise first 249_{1Sn},249_{1Dn} and second 249_{2Sn},249_{2Dn} cover elements adapted to cover a respective hinged door 205_{ASn},205_{ADn} and the respective gutter member 245_S,245_D at, respectively, first and second sides thereof (the first and second sides of each hinged door 205_{ASn},205_{ADn} essentially being the two parallel opposite sides of the hinged door 205_{ASn},205_{ADn} that extend along substantially the transversal direction when the hinged door 205_{ASn},205_{ADn} is in the closed position, and along substantially the vertical direction when the hinged door 205_{ASn},205_{ADn} is in the open position). **Figure 2E** shows the first 249_{1S1} and second 249_{2S1} cover elements covering the opposite first and second sides of the left hinged door 205_{AS1}, the first 249_{1D1} and second 249_{2D1} cover elements covering the opposite first and second sides of the right hinged door 205_{AD1}, the first cover element 249_{1S2} covering the first side of the left hinged door 205_{AS2}, and the first cover element 249_{1D2} covering the first side of the right hinged door 205_{AD2}, whereas **Figure 2C** shows the profile of the first sides of left and right hinged doors (and of the associated gutter members 245_S,245_D) without the respective cover elements covering them.

[0087] The overlapping between the gutter members 245_S,245_D and the abutment on the abutment portion 247_n (and, possibly, the presence of the cover elements) provide, as a whole, a combined labyrinth effect that matter-of-factly and effectively prevents the inlet of impurities and atmospheric agents into the cavity from the most critical directions (*i.e.*, from above and from sides of the inlet opening). This is a particularly preferred embodiment of the present invention, to such an extent that it is the intention of the Applicant that this aspect could form a separate subject matter independent from the hopper function achieved by means of the guides **240.**

[0088] According to the exemplary considered embodiment, each abutment portion 247_n is in the form of a frame surrounding the respective inlet opening, *i.e.* it comprises one or more (two, in the example at issue) transversal abutment portions 247_{T1n},247_{T2n}, extending along the transversal direction parallel to each other, and two or more (two, in the example at issue) longitudinal abutment portions 247_{LSn},247_{LDn} extending along the longitudinal direction parallel to each other. Preferably, the transversal 247_{T1n},247_{T2n}, and longitudinal 247_{LSn},247_{LDn} abutment portions are in the form of walls extending along the vertical direction from the upper wall 105_T of the casing **105.** More preferably, the transversal 247_{T1n},247_{T2n}, and longitudinal 247_{LSn},247_{LDn} abutment portions are in the form of walls each one extending along the vertical direction from a respective transversal 210_{TTi} and longitudinal 210_{TLS},210_{TLD} crossbar, the transversal 247_{T1n},247_{T2n} and longitudinal 247_{LSn},247_{LDn} abutment portions being for example formed in a single piece with the respective transversal 210_{TTi} and longitudinal 210_{TLS},210_{TLD} crossbars. Preferably, the transversal 247_{T1n},247_{T2n} and longitudinal 247_{LSn},247_{LDn}, abutment portions extend along the vertical direction to such an extent that they form a barrier preventing the inlet of impurities and atmospheric agents into the cavity from the sides of the inlet opening.

[0089] Each transversal abutment portion 247_{T1n},247_{T2n} is preferably adapted to abut, in the closed position of the left 205_{ASn} and right 205_{ADn} hinged doors, on the inner surface $205S_{ASn}$,$205S_{ADn}$ of the respective pair of left 205_{ASn} and right 205_{ADn} hinged doors, and particularly at a same respective side thereof (*i.e.,* with the transversal abutment portion 247_{T1n} that is adapted to abut on the inner surface of the respective pair of left 205_{ASn} and right 205_{ADn} hinged doors in correspondence of their first sides, and with the transversal abutment portion 247_{T2n} that is adapted to abut on the inner surface of the respective pair of left 205_{ASn} and right 205_{ADn} hinged doors in correspondence of their second sides). Even more preferably, as illustrated, each transversal abutment portion 247_{T1n},247_{T2n}, is adapted to abut on the inner surface of the left 205_{ASn} and right 205_{ADn} hinged doors (at the respective side) by fitting into gaps between the first 249_{1Sn},249_{1Dn} and second 249_{2Sn},249_{2Dn} cover elements and the respective guiding members **240** (for example, with the transversal abutment portion 247_{T11} that abuts on the inner surface of the left 205_{AS1} and right 205_{AD1} hinged doors by fitting into the gaps between the cover elements 249_{1S1},249_{1D1} and the guiding members **240,** and with the transversal abutment portion 247_{T12} that abuts on the inner surface of the left 205_{AS1} and right 205_{AD1} hinged doors by fitting into the gaps between the cover elements 249_{2S1},249_{2D1} and the guiding members **240**).

[0090] Therefore, the transversal abutment portions 247_{T1n},247_{T2n} and the cover elements 249_{1Sn},249_{1Dn}, 249_{2Sn},249_{2Dn} provide a further combined labyrinth effect against the inlet of impurities and atmospheric agents into the cavity from the sides of the inlet opening.

[0091] According to the exemplary considered embodiment, each transversal abutment portion 247_{T1n},247_{T2n} has a first part having a first slanting with respect to a

horizontal plane on which the access structure **115** lays when mounted on the container **100** (in other words, the horizontal plane being substantially a plane parallel to the upper wall $\mathbf{105_T}$ of the casing **105**), and a second part having, with respect to the horizontal plane, a second slanting opposite to the first slanting (see, for example, **Figures 2D, 2E** and **2F**). Therefore, each pair of left $\mathbf{205_{ASn}}$ and right $\mathbf{205_{ADn}}$ hinged doors in the closed position identify, by abutment thereof on said first and second parts of the respective transversal abutment portion $\mathbf{247_{T1n}}$,$\mathbf{247_{T2n}}$, an inverted-V profile of the closed position (see, for example, **Figure 2B**) that allows draining of impurities and atmospheric agents by gravity.

[0092] Each longitudinal abutment portion $\mathbf{247_{LSn}}$,$\mathbf{247_{LDn}}$ is preferably adapted to abut, in the closed position of the left $\mathbf{205_{ASn}}$ and right $\mathbf{205_{ADn}}$ hinged doors, on the inner surface $\mathbf{205S_{ASn}}$,$\mathbf{205S_{ADn}}$ of a respective one of the left $\mathbf{205_{ASn}}$ and second $\mathbf{205_{ADn}}$ hinged doors (*i.e.,* with the longitudinal abutment portion $\mathbf{247_{LSn}}$ that is adapted to abut on the inner surface $\mathbf{205S_{ASn}}$ of the left hinged door $\mathbf{205_{ASn}}$, and with the longitudinal abutment portion $\mathbf{247_{LDn}}$ that is adapted to abut on the inner surface $\mathbf{205S_{ADn}}$ of the right hinged door $\mathbf{205_{ADn}}$). Preferably, the longitudinal abutment portion $\mathbf{247_{LSn}}$,$\mathbf{247_{LDn}}$ is adapted to abut on the inner surface of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ in correspondence of the respective lower region thereof (*i.e.,* the region in correspondence of the lower end of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ that, when the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ is in the open position, is in correspondence of or proximal to the respective inlet opening).

[0093] According to the exemplary considered embodiment, and as best visible in **Figures 2B-2E,** the access structure **115** further comprises one or more locking systems (preferably, each one associated with a respective hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$) for locking the inlet doors $\mathbf{205_n}$ (or a part thereof) in the closed position (for example, so as to avoid accidental opening of the same, especially during the inclination of the container **100** for promoting the frontal outlet of the products through the outlet opening). More preferably, in the embodiment herein exemplary assumed in which each inlet door $\mathbf{205_n}$ has two hinged doors $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$, the access structure **115** comprises a locking system associated with each hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ (so that each hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ can be firmly locked in the closed position).

[0094] According to the exemplary (but not limiting) considered embodiment, each locking system comprises, for each hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$, a hook element $\mathbf{250_{GS}}$,$\mathbf{250_{GD}}$ integral with the respective hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ (the hook element $\mathbf{250_{GS}}$,$\mathbf{250_{GD}}$ being for example formed in a single piece with the respective hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$) and extending vertically from the inner surface of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ towards a respective crossbar $\mathbf{210_{TTi}}$ (for example, the crossbars $\mathbf{210_{TT1}}$,$\mathbf{210_{TT3}}$,$\mathbf{210_{TT5}}$,$\mathbf{210_{TT7}}$ for the hook elements $\mathbf{250_{GS}}$,$\mathbf{250_{GD}}$ of the hinged doors $\mathbf{205_{AS1}}$-$\mathbf{205_{AS4}}$,$\mathbf{205_{AD1}}$-$\mathbf{205_{AD4}}$, respectively), and a lever or latch element $\mathbf{250_{LS}}$,$\mathbf{250_{LD}}$ fixed on such transversal crossbar $\mathbf{210_{TTi}}$ so as to intercept and lock the respective hook element $\mathbf{250_{GS}}$,$\mathbf{250_{GD}}$. Preferably, although not necessarily, the lever element $\mathbf{250_{LS}}$,$\mathbf{250_{LD}}$ is adapted to be operated (for example, manually) by sliding along the transversal direction on the hook element $\mathbf{250_{GS}}$,$\mathbf{250_{GD}}$ (*i.e.*, on its arcuate portion), thereby preventing the movement (*i.e.,* the opening) of the hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ (as visible in **Figure 2B** for the lock system $\mathbf{250_{GS}}$,$\mathbf{250_{LS}}$ associated with the left hinged door $\mathbf{205_{AS1}}$).

[0095] As mentioned above, each inlet door $\mathbf{205_n}$, in the closed position, is adapted to abut on the respective transversal crossbar $\mathbf{220_{TTi}}$ (*i.e.,* on a respective abutment portion $\mathbf{247_n}$ thereof). According to the illustrated embodiment, and best visible in **Figure 2D,** in order to avoid direct contact of the inlet doors $\mathbf{205_n}$ on the abutment portions of the respective transversal crossbars $\mathbf{220_{TTi}}$ (in that, in the embodiments, such as the embodiment herein discussed, in which both the inlet doors $\mathbf{205_n}$ and the transversal crossbars $\mathbf{220_{TTi}}$ are made of steel or other metal material, the direct contact between them could give rise to interstices or gaps with resulting passage of impurities and atmospheric agents into the cavity through them), each hinged door $\mathbf{205_{ASn}}$,$\mathbf{205_{ADn}}$ (or at least a part thereof) comprises a perimeter gasket **255** on its inner surface, the gasket **255** being for example formed of an elastomeric material (such as polyurethane or silicone), of a plastic material, or of a natural material (such as leather or cork). Alternatively or, as exemplary illustrated, in addition, the access structure **115** comprises a seal **260** on the abutment portions $\mathbf{247_n}$ (or on at least part thereof, such as for example on one or more among the longitudinal and transversal abutment portions).

[0096] Naturally, in order to satisfy contingent and specific requirements, a person skilled in the art may apply to the solution described above many modifications and logical and/or physical variations. More specifically, although this solution has been described with a certain level of detail with reference to one or more embodiments thereof, it is clear that various omissions, substitutions and changes in the form and details as well as other embodiments are possible. In particular, various embodiments of the invention may be practiced even without the specific details (such as the numerical examples) set forth in the previous description to provide a more complete understanding thereof them; on the contrary, well-known features may have been omitted or simplified in order not to obscure the description with unnecessary details. In addition, it is expressly intended that specific elements and/or method steps described in relation to any embodiment of the exposed solution may be incorporated in any other embodiment as a normal design choice.

Claims

1. Structure **(115)** for roof **(110)** of a container **(100)** for the intermodal transport of products, the container **(100)** comprising a casing **(105)** delimiting a cavity adapted to house the products to be transported, wherein the structure **(115)** comprises:

   at least two openings for accessing said cavity, and
   at least two doors **(205_n)** each one associated with a respective one of said at least two openings and each one comprising a first **(205_{ASn})** and a second **(205_{ADn})** hinged doors opposite to each other, each door being selectively operable between an opened position that allows insertion from above of the products to be transported into the cavity through the respective opening, and a closed position that prevents insertion of the products into the cavity and exposure thereof to impurities and atmospheric agents during the transport,
   characterized in that
   said first **(205_{ASn})** and second **(205_{ADn})** hinged doors comprise each one a guiding member **(240)** on a surface **($205S_{ASn}$,$205S_{ADn}$)** of the hinged door **(205_{ASn},205_{ADn})** that, in the closed position of the hinged door, faces the cavity, in the opened position of the first **(205_{ASn})** and second **(205_{ADn})** hinged doors said guiding member **(240)** acting as a hopper for guiding the products into the respective opening.

2. Structure **(115)** according to claim 1, wherein the hinged door **(205_{ASn},205_{ADn})** comprises a first end in correspondence of the respective opening when the hinged door **(205_{ASn},205_{ADn})** is in the open position, and a second end opposite to the first end, the guiding member **(240)** extending from said surface **($205S_{ASn}$,$205S_{ADn}$)** of the hinged door **(205_{ASn},205_{ADn})** at a first distance from a first region of the hinged door **(205_{ASn},205_{ADn})** delimited by said first end, and at a second distance, lower than the first distance, from a second region of the hinged door **(205_{ASn},205_{ADn})** delimited by the second end.

3. Structure **(115)** according to claim 1 or 2, further comprising a plurality of crossbars **(210_{TTi})** for supporting said at least two doors **(205_n).**

4. Structure **(115)** according to claim 3, further comprising a hinging structure **(215_S,215_D,220_{Sj},220_{Dj})** for hinging said at least two doors **(205_n)** to said crossbars **(210_{TTi})** thereby allowing to operate individually each one of said at least two doors **(205_n)** between the opened position and the closed position.

5. Structure **(115)** according to any of the preceding claims, further comprising at least one stop member **(235_{Sj},235_{Dj})** for stopping said at least two doors **(205_n)** in the opened position at a predetermined aperture angle.

6. Structure **(115)** according to any of the preceding claims, wherein in the closed position the first hinged door **(205_{ASn})** forms an overlapping abutment with the second hinged door **(205_{ADn}).**

7. Structure **(115)** according to any of the preceding claims, wherein the first **(205_{ASn})** and second **(205_{ADn})** hinged doors comprise each one a respective gutter member **(245_S,245_D)** extending vertically from a surface of the first **(205_{ASn})** and second **(205_{ADn})** hinged doors that, in the closed position, is external to the cavity, the gutter member **(245_D)** of the second hinged door **(205_{ADn})** being adapted to overlap to the gutter member **(245s)** of the first hinged door **(205_{ASn})** so as to form a labyrinth that prevents the inlet of impurities and atmospheric agents into the cavity.

8. Structure **(115)** according to any of the preceding claims, further comprising at least one locking system **(250_{GS},205_{GD},250_{LS},205_{LD})** for locking said at least two doors **(205_n)** in the closed position.

9. Structure **(115)** according to any claim from 2 to 8, wherein in the closed position said at least two doors **(205_n)** abut on abutment portions **(247_n)** of said crossbars **(210_{TTi}),** and wherein at least one between said at least two doors **(205_n)** and said abutment portions comprises at least one gasket **(255,260).**

10. Roof **(110)** for a container **(100)** for the intermodal transport of products, the container **(100)** comprising a casing **(105)** delimiting a cavity adapted to house the products to be transported, the roof comprising the structure **(115)** according to any of the preceding claims and an upper wall **(105_T)** of the casing **(105)** of the container **(100).**

11. A container **(100)** for the intermodal transport of products, the container **(100)** comprising the roof **(110)** according to claim 10.

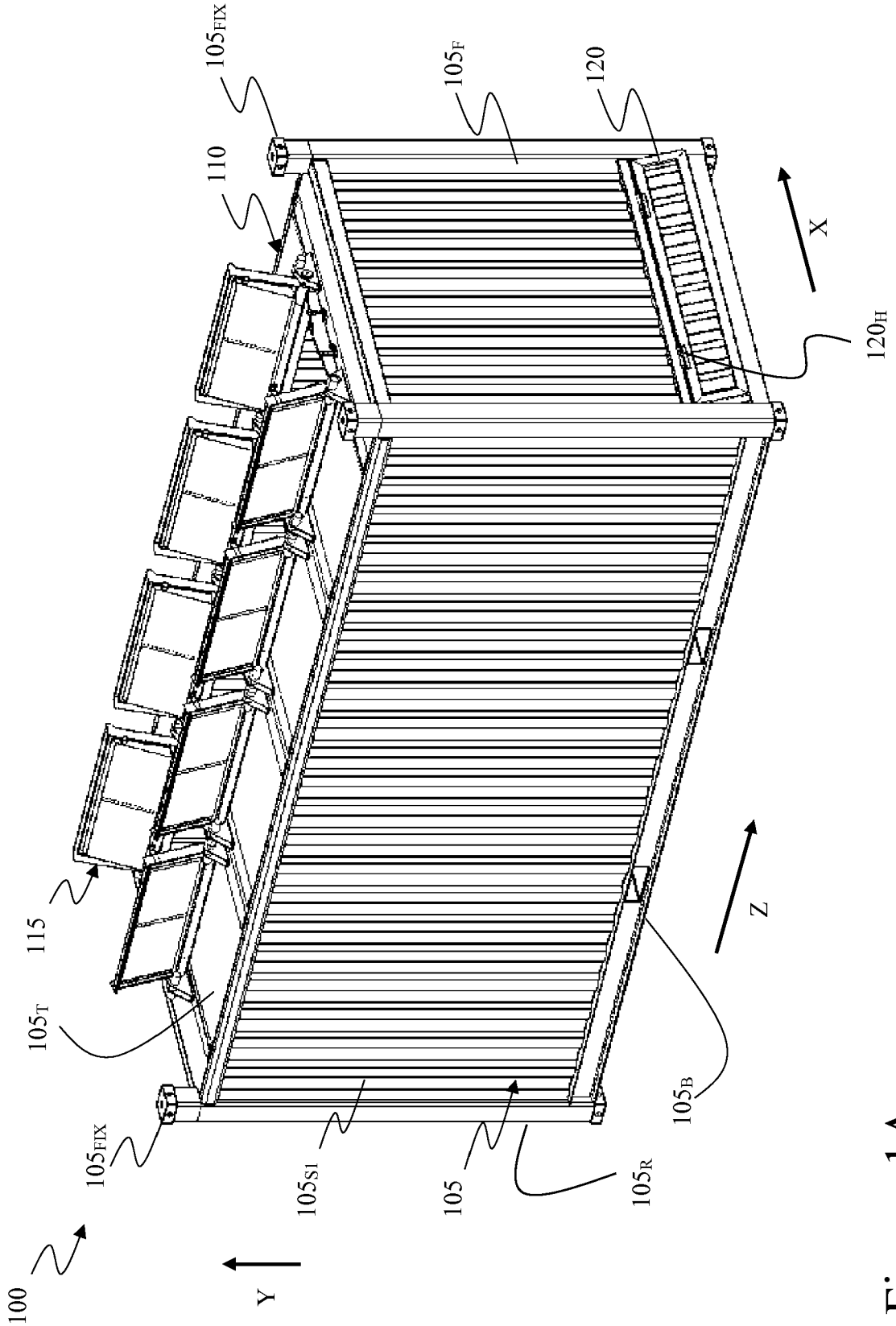
100
105FIX
105S1
105
105R
105B
105T
105FIX
115
110
105F
120
120H
X
Y
Z

Figure 1A

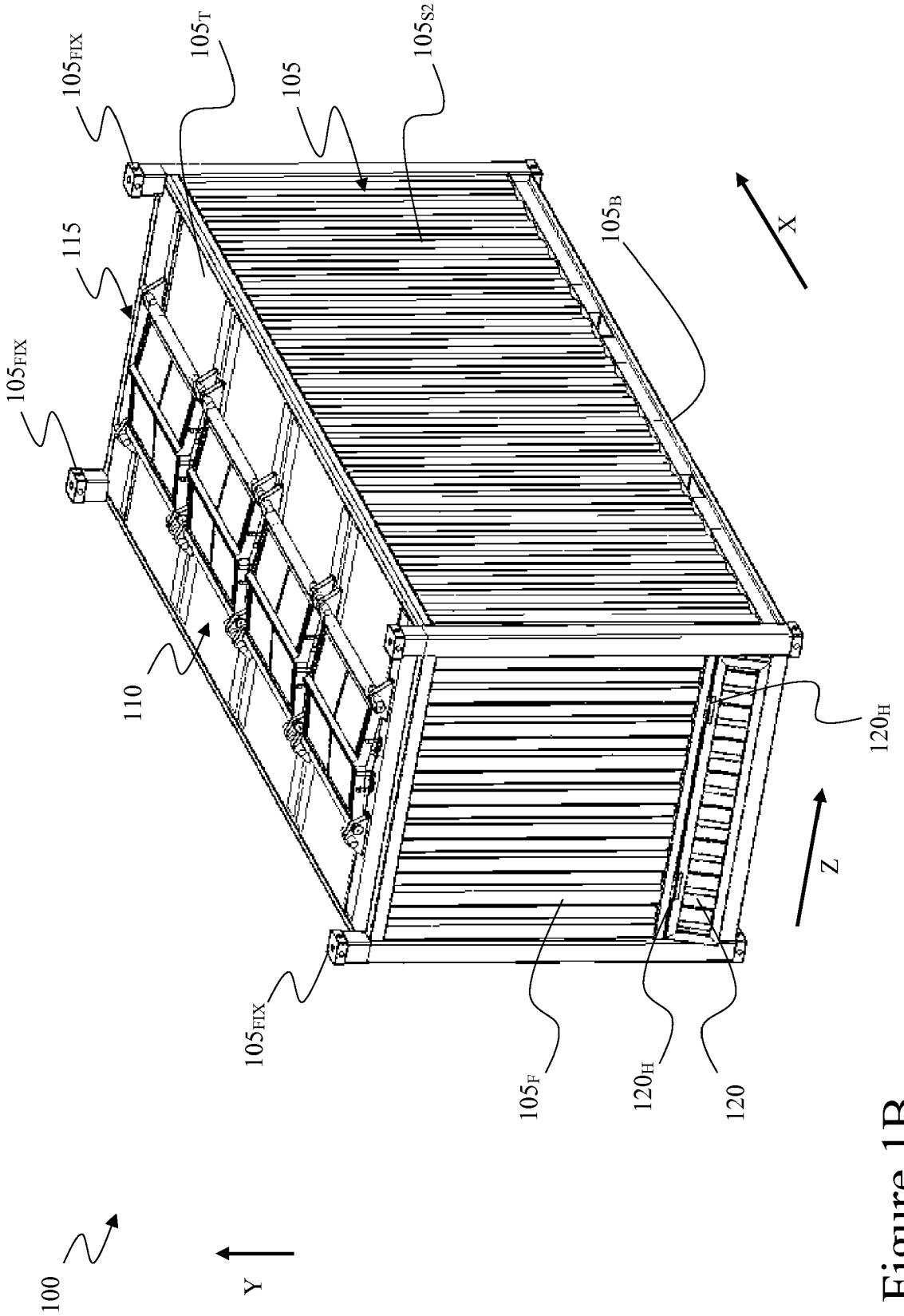
100
Y
105FIX
105T
105
105S2
115
105FIX
105B
X
110
120H
Z
105FIX
105F
120H
120

Figure 1B

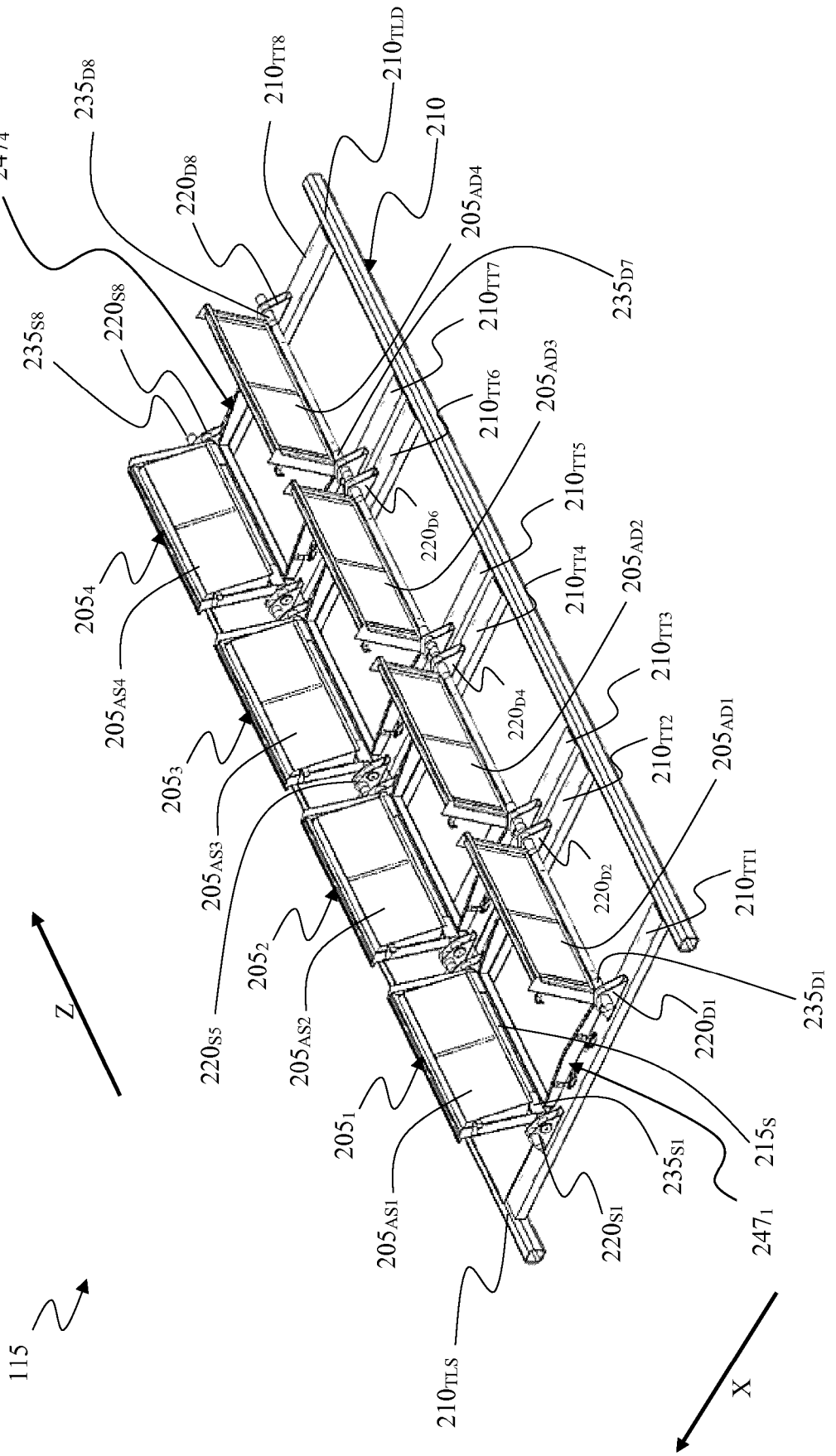
247_4
235_{D8}
210_{TT8}
210_{TLD}
220_{D8}
210
205_{AD4}
235_{S8}
220_{S8}
210_{TT7}
235_{D7}
205_{AD3}
210_{TT6}
205_4
210_{TT5}
220_{D6}
205_{AS4}
210_{TT4}
205_{AD2}
205_3
220_{D4}
210_{TT3}
205_{AS3}
210_{TT2}
205_{AD1}
205_2
220_{D2}
210_{TT1}
220_{S5}
205_{AS2}
220_{D1}
235_{D1}
205_1
215_S
235_{S1}
205_{AS1}
220_{S1}
247_1
210_{TLS}
115
Z
X

Figure 2A

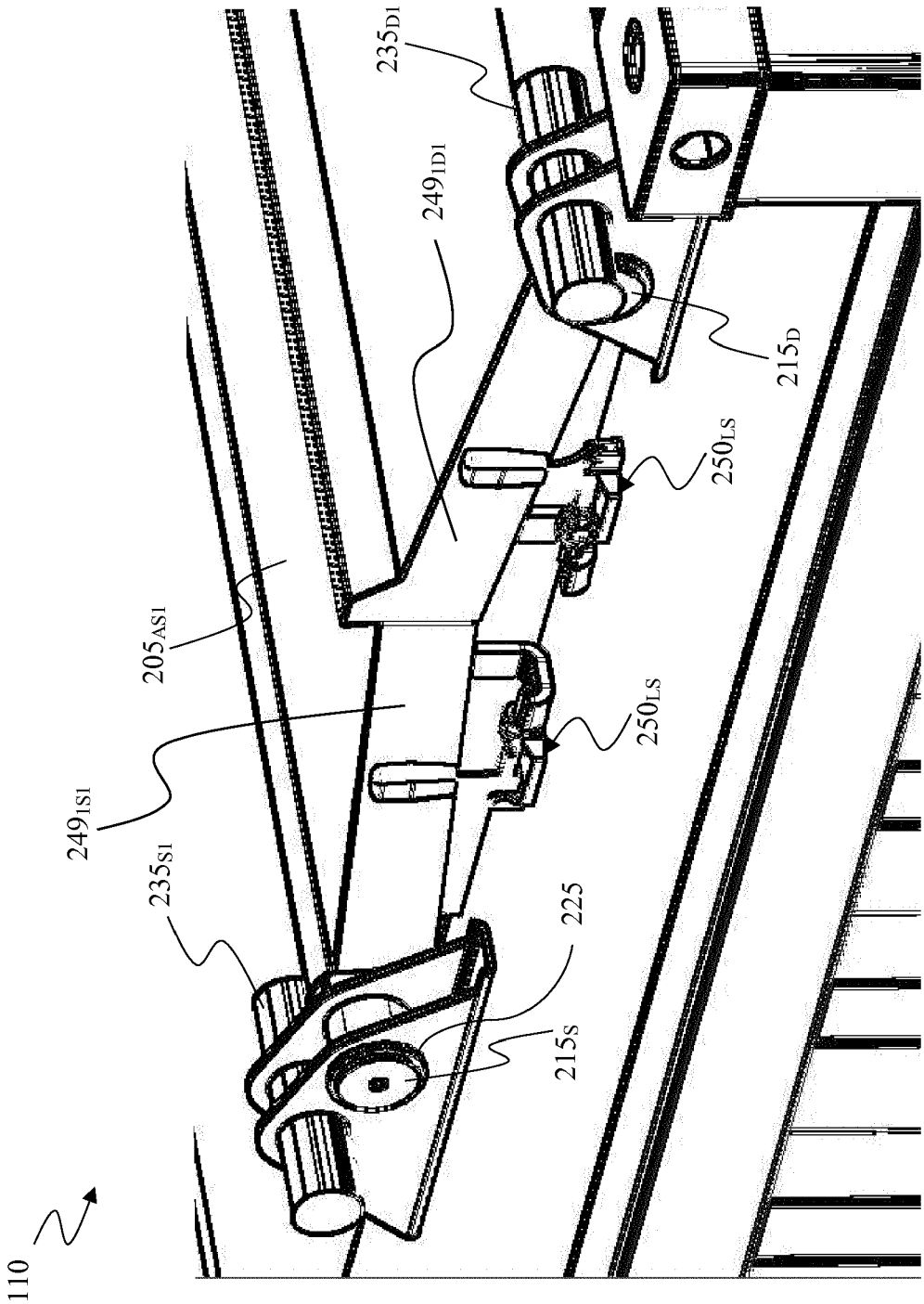
110
235D1
249ID1
215D
250LS
205AS1
249IS1
250LS
235S1
225
215S

Figure 2B

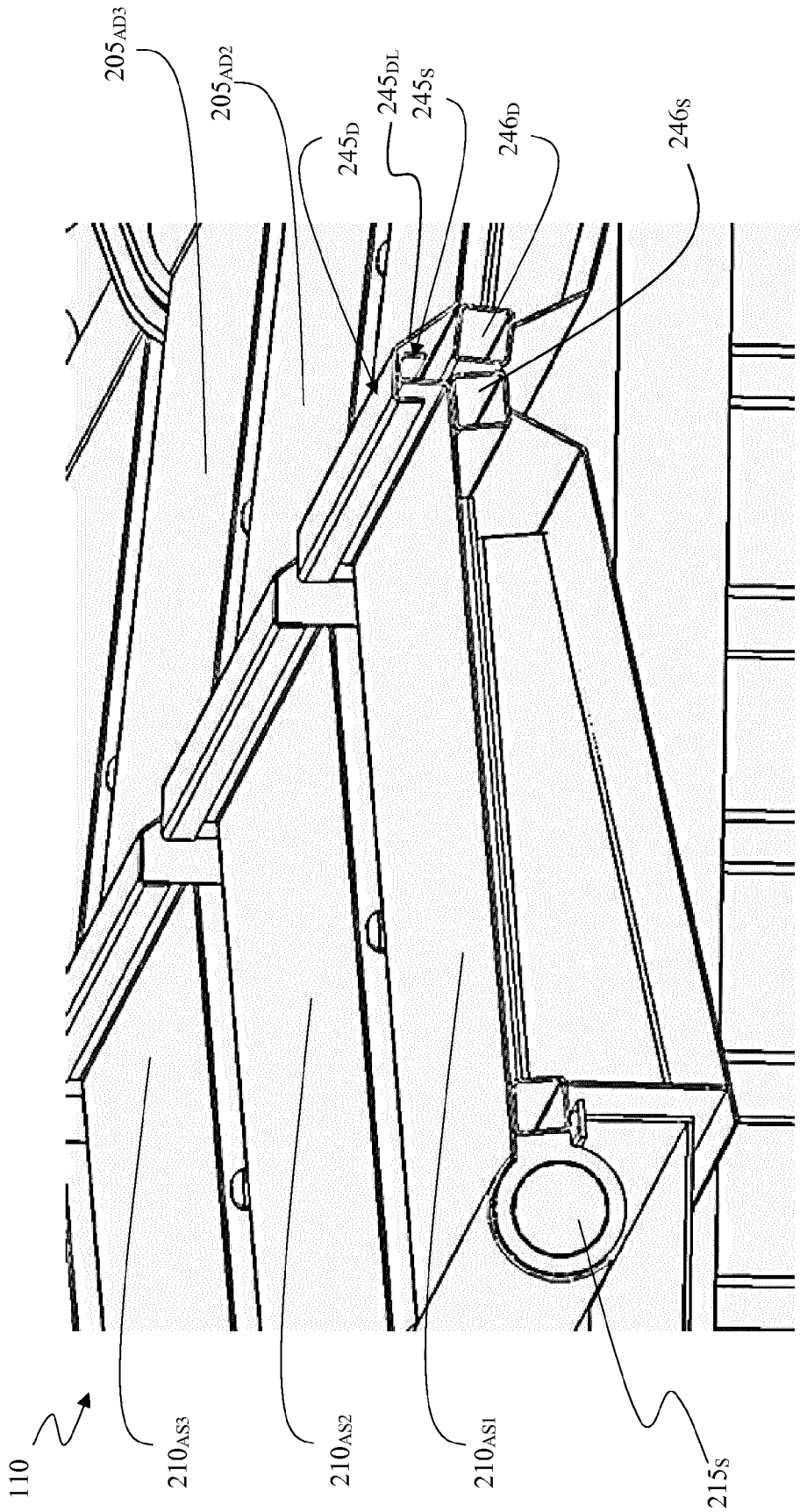
205_{AD3}
205_{AD2}
245_D
245_{DL}
245_S
246_D
246_S
110
210_{AS3}
210_{AS2}
210_{AS1}
215_S

Figure 2C

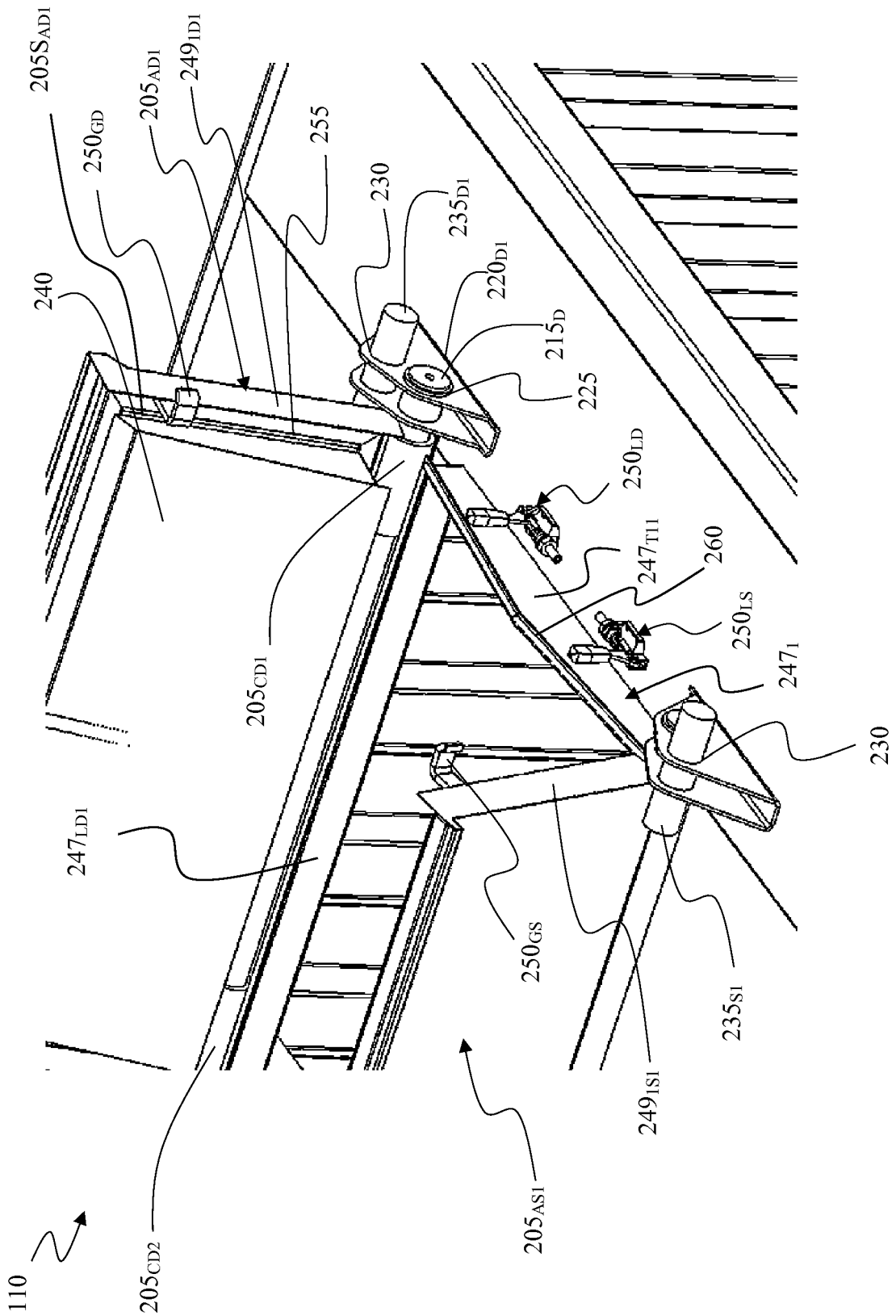
110
205CD2
205AS1
205CD1
247LD1
250GS
249IS1
235S1
247T11
250LD
260
250LS
247I
230
225
215D
220D1
235D1
230
255
249ID1
205AD1
250GD
205AD1
240

Figure 2D

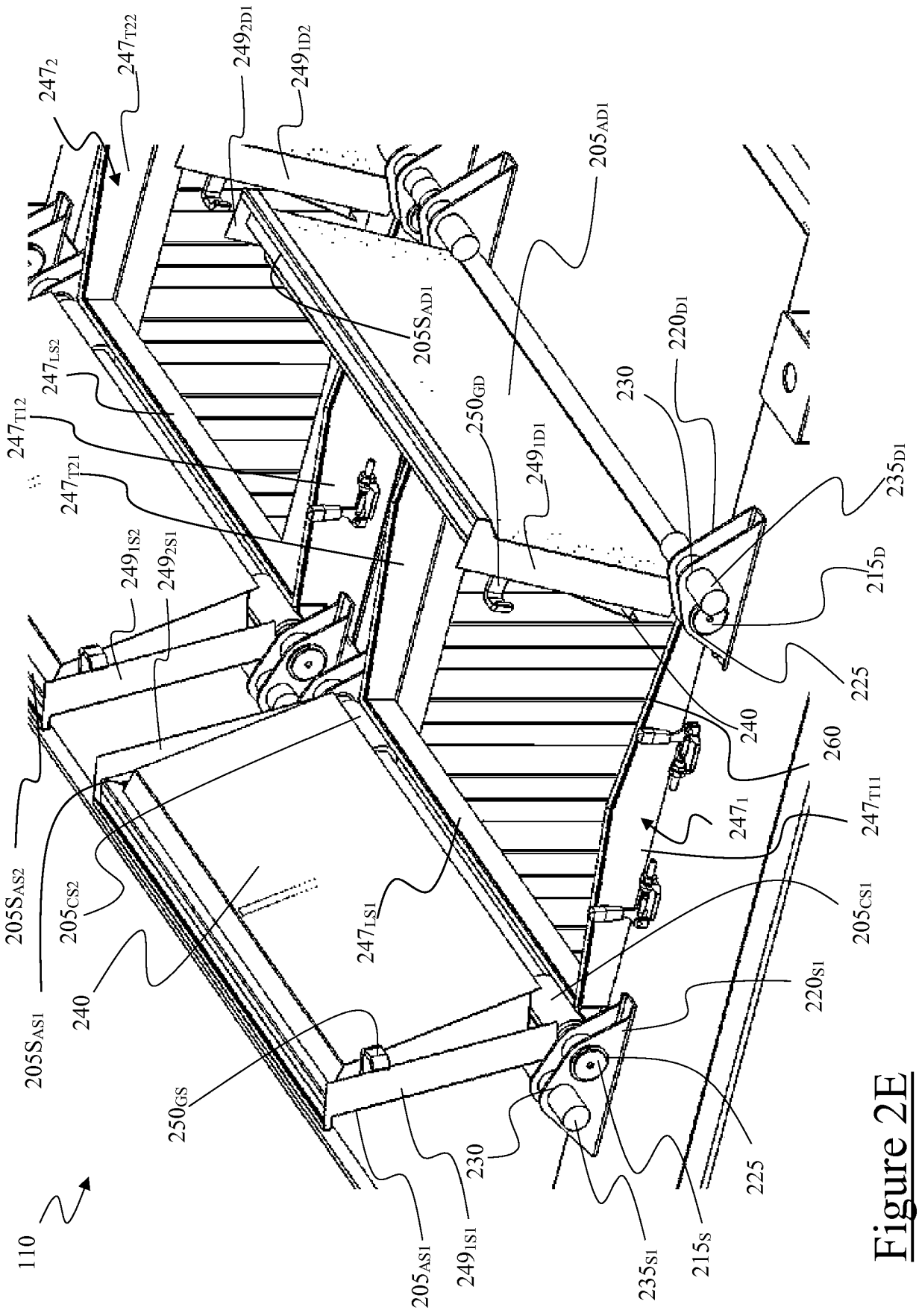
247_2
247_{T22}
249_{2D1}
249_{1D2}
$205S_{AD1}$
205_{AD1}
247_{LS2}
247_{T12}
247_{T21}
249_{1S2}
249_{2S1}
250_{GD}
249_{1D1}
230
220_{D1}
235_{D1}
215_D
225
240
260
247_1
247_{T11}
$205S_{AS2}$
205_{CS2}
$205S_{AS1}$
240
247_{LS1}
205_{CS1}
220_{S1}
250_{GS}
230
225
110
205_{AS1}
249_{1S1}
235_{S1}
215_S

Figure 2E

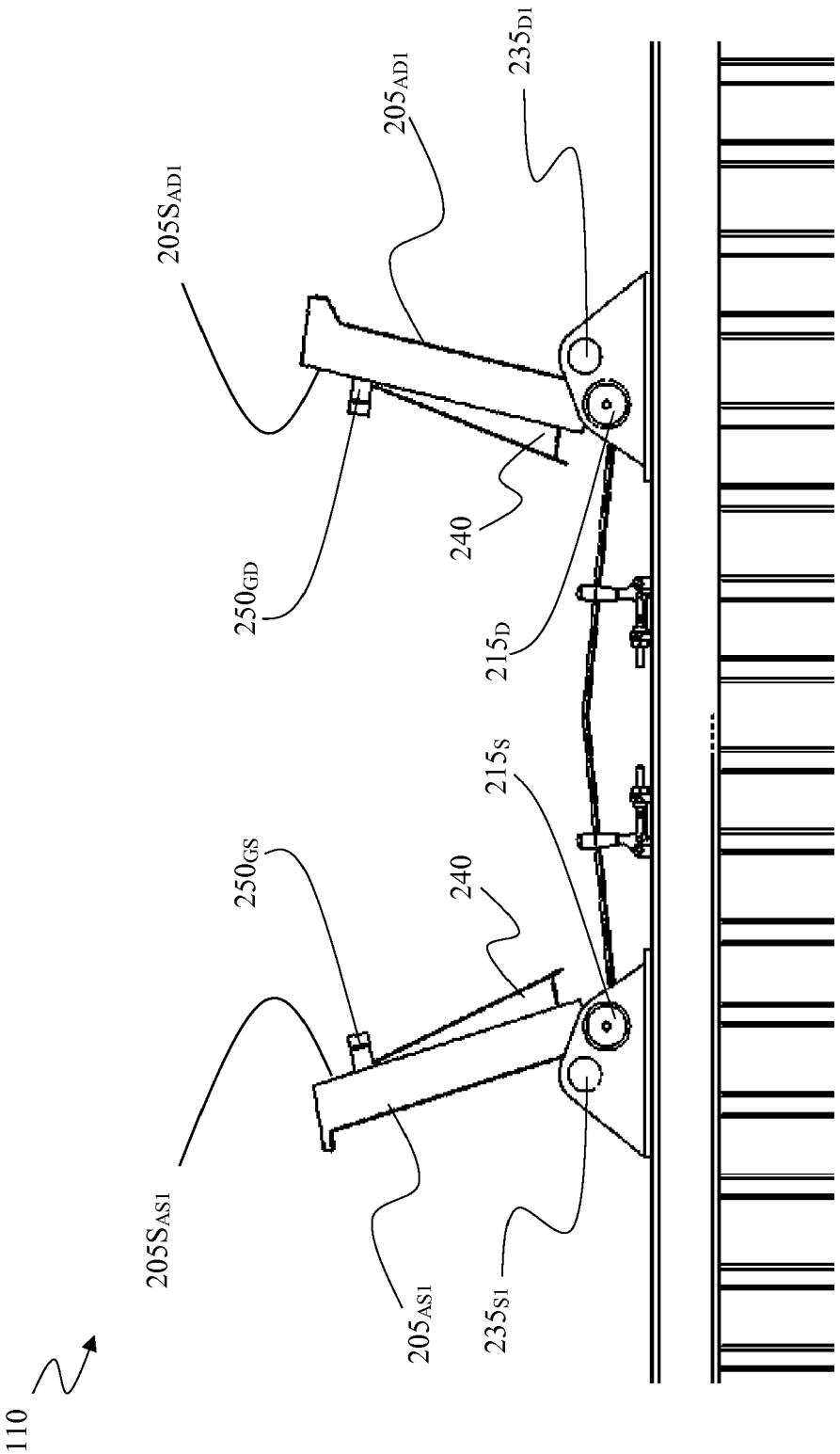
110
205S_AS1
205_AS1
235_S1
250_GS
240
215_S
250_GD
240
215_D
205S_AD1
205_AD1
235_D1

Figure 2F

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 15 9663

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	US 3 720 328 A (MACKENZIE H) 13 March 1973 (1973-03-13) * column 2, lines 43-58 * * column 3, lines 43-54 * * figures 1, 2, 4 *	1-11	INV. B65D88/54 B65D88/12
A	WO 2007/053997 A1 (CHINA INT MARINE CONTAINERS [CN]; LIU SHIJIAN [CN]) 18 May 2007 (2007-05-18) * figures 1, 2, 9 *	1,6,7	
A	US 5 884 794 A (CALHOUN WALLACE E [US] ET AL) 23 March 1999 (1999-03-23) * column 4, line 11 - column 6, line 14 * * column 8, lines 23-48 * * figures 1-3 *	1,8,9	
A	CN 200 981 743 Y (DEYI LIU [CN]) 28 November 2007 (2007-11-28) * figures 1-3 *	1,8,9	
			TECHNICAL FIELDS SEARCHED (IPC) B65D B60P B61D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 July 2018	Piolat, Olivier

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)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 15 9663

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.

11-07-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3720328 A	13-03-1973	NONE	
WO 2007053997 A1	18-05-2007	NONE	
US 5884794 A	23-03-1999	NONE	
CN 200981743 Y	28-11-2007	NONE	

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3720328 A **[0061] [0082]**