ACCESS DOOR ASSEMBLY

Technical Field

The present disclosure generally relates to an access door assembly. More particularly, aspects of the present disclosure are directed to an access door assembly coupleable or coupled to a vehicle, such as trucks or trailers, for providing access into a container or container structure mounted or mountable on the vehicle.

Background

Vehicles such as trucks sometimes have an access door assembly attached or coupled to the rear or tail end of the truck to allow access into a cargo compartment. The truck can be a flatbed truck, or inclusive of a trailer unit, whereon a container may be mounted. In another example, the container can be directly mounted on the chassis of the truck. The container can be a freight container conforming to ISO standards, and comprises a rear entry door. The truck can have an additional access door assembly at the rear end of the truck to be used in conjunction with the rear entry door of the container. In some other configurations, a vehicle may be mounted with a cargo compartment such as one having a simple box-like structure with normal swing doors at the rear end. The swing doors may be opened to allow access into the cargo compartment.

In some common configurations, there is a container mounted on a truck, the container having a set of swing doors at the rear end. The truck further includes a rotatable tail door mounted to the chassis. As such, a user needs to operate and open both the tail door and the swing doors in order to access the container. When the tail door is in the closed position, i.e. a vertical position, and the swing doors are in the closed position, the platform of the tail door covers the swing doors of the container, thus preventing the swing doors from swinging outwards. In order to access the inside of the container, the tail door needs to be rotated outwards or downwards to an open position, i.e., a horizontal position. This removes the blockage of the swing doors, allowing the swing doors to be opened. A problem associated with this configuration is that it is time consuming to wait for the tail door

to be lowered down before enabling the swing doors to be opened for gaining access into the container.

Sometimes, cargo needs to be loaded into the container from a loading/unloading bay, and/or unloaded from the container to the bay. The loading/unloading bay is typically a raised platform, such that the platform of the bay is flush with or at the same horizontal level as the floor of the container or with the flatbed of the truck. To accomplish this loading and/or unloading, the truck needs to be reversed towards the bay area. If the truck does not have a tail door, the truck can be reversed until the container doors are proximate to the bay area, such that the container doors can be swung open, allowing personnel to step across from the platform bay into the container. If the truck has a tail door, the bay area will hinder the opening of the tail door and prevent access into the container. In this situation, the truck needs to be reversed until it is positioned a predetermined distance away from the bay area in order to allow the tail door to open. This requires an unnecessary amount of time and a certain level of trial and error for adjustment of the position of the truck with respect to the bay area.

Safety may also be compromised when personnel are loading goods onto the platform of the tail door when it is open, because the swing doors of the container could also be opened at the same time. The personnel may thus be prone to injuries caused by the container doors while they are on the tail door platform. In some countries, modifying the truck to include a tail door feature in addition to the doors of the container may be considered as an illegal modification. The inclusion of the rotatable tail door to be used in conjunction with the swing doors of the container also adds unnecessary extra load to the truck. Disadvantageously, this increases the loads on the axles of the truck and leads to higher fuel consumption.

Therefore, in order to address or alleviate at least one of the aforementioned problems and/or disadvantages, there is a need to provide an access door assembly for a vehicle, in which there are at least some improved features over the prior art.

Summary

According to a first aspect of the present disclosure, there is an access door assembly coupleable to a vehicle for providing access into a container structure mounted on the vehicle. The access door assembly comprises: a door frame housing comprising a linear guide, the door frame housing coupleable to the vehicle and configured for rotational displacement between an open position and a closed position for opening and closing, respectively, access into the container structure; and a set of doors disposed within the door frame housing, the set of doors configured for linear displacement along the linear guide of the door frame housing. The set of doors is linearly displaceable along the linear guide between an open configuration and a closed configuration for opening and closing, respectively, access into the container structure when the door frame housing is in the closed position.

According to a second aspect of the present disclosure, there is a container system comprising: a container structure mountable on a vehicle; and an access door assembly coupleable to the vehicle for providing access into the container structure. The access door assembly comprises: a door frame housing comprising a linear guide, the door frame housing coupleable to the vehicle and configured for rotational displacement between an open position and a closed position for opening and closing, respectively, access into the container structure; and a set of doors disposed within the door frame housing, the set of doors configured for linear displacement along the linear guide of the door frame housing. The set of doors is linearly displaceable along the linear guide between an open configuration and a closed configuration for opening and closing, respectively, access into the container structure when the door frame housing is in the closed position.

According to a third aspect of the present disclosure, there is a vehicle whereon a container structure is mountable, the vehicle comprising an access door assembly coupled to the vehicle for providing access into the container structure. The access door assembly comprises: a door frame housing comprising a linear guide, the door frame housing coupled to the vehicle and configured for rotational displacement between an open position and a closed position for opening and closing, respectively, access into the container structure; and a set of doors disposed within the door

frame housing, the set of doors configured for linear displacement along the linear guide of the door frame housing. The set of doors is linearly displaceable along the linear guide between an open configuration and a closed configuration for opening and closing, respectively, access into the container structure when the door frame housing is in the closed position.

An advantage of the present disclosure is that

An access door assembly for a vehicle according to the present disclosure is thus disclosed hereinabove. Various features, aspects, and advantages of the present disclosure will become more apparent from the following detailed description of the embodiments of the present disclosure, by way of non-limiting examples only, along with the accompanying drawings in which like numerals represent like components.

Brief Description of the Drawings

FIG. 1A to FIG. 1C are illustrations of an access door assembly according to an embodiment of the present disclosure.

FIG. 2A to FIG. 2C are illustrations of the access door assembly coupled to a vehicle, according to an embodiment of the present disclosure.

FIG. 3A to FIG. 3C are illustrations of a set of doors of the access door assembly coupled to the vehicle, according to an embodiment of the present disclosure.

FIG. 4A and FIG. 4B are alternative illustrations of the set of doors of the access door assembly coupled to the vehicle, according to an embodiment of the present disclosure.

Detailed Description

In the present disclosure, depiction of a given element or consideration or use of a particular element number in a particular FIG. or a reference thereto in corresponding descriptive material can encompass the same, an equivalent, or an analogous element or element number identified in another FIG. or descriptive

material associated therewith. The use of "/" in a FIG. or associated text is understood to mean "and/or" unless otherwise indicated. The recitation of a particular numerical value or value range herein is understood to include or be a recitation of an approximate numerical value or value range, for instance, within +/- 20%, +/- 15%, +/- 10%, +/- 5%, or +/- 0%. With respect to recitations herein directed to dimensional or numerical comparisons or equivalence, reference to the terms "generally," "approximately," or "substantially" is understood as falling within +/- 20%, +/- 15%, +/- 10%, +/- 5%, or +/- 0% of a representative / example comparison, or a specified or target value or value range; and reference to the term "essentially" is understood as falling within +/- 10%, +/- 5%, +/- 2%, +/- 1%, or +/- 0% of a representative / example comparison, or a specified or target value or value range.

As used herein, the term "set" corresponds to or is defined as a non-empty finite organization of elements that mathematically exhibits a cardinality of at least 1 (i.e., a set as defined herein can correspond to a unit, singlet, or single element set, or a multiple element set), in accordance with known mathematical definitions (for instance, in a manner corresponding to that described in *An Introduction to Mathematical Reasoning: Numbers, Sets, and Functions*, "Chapter 11: Properties of Finite Sets" (e.g., as indicated on p. 140), by Peter J. Eccles, Cambridge University Press (1998)). In general, an element of a set can include or be a system, an apparatus, a device, a structure, an object, a process, a physical parameter, or a value depending upon the type of set under consideration.

For purposes of brevity and clarity, descriptions of embodiments of the present disclosure are directed to an access door assembly for a vehicle, in accordance with the drawings in FIG. 1A to FIG. 4B. While aspects of the present disclosure will be described in conjunction with the embodiments provided herein, it will be understood that they are not intended to limit the present disclosure to these embodiments. On the contrary, the present disclosure is intended to cover alternatives, modifications and equivalents to the embodiments described herein, which are included within the scope of the present disclosure as defined by the appended claims. Furthermore, in the following detailed description, specific details are set forth in order to provide a thorough understanding of the present disclosure. However, it will be recognized by

an individual having ordinary skill in the art, i.e. a skilled person, that the present disclosure may be practiced without specific details, and/or with multiple details arising from combinations of aspects of particular embodiments. In a number of instances, well-known systems, methods, procedures, and components have not been described in detail as not to unnecessarily obscure aspects of the embodiments of the present disclosure.

In a representative or exemplary embodiment of the present disclosure, an access door assembly 100 is described hereinafter. FIG. 1A shows an isometric or perspective view of a closed configuration of the access door assembly 100; FIG. 1B shows an isometric or perspective view of an open configuration of the access door assembly 100; and FIG. 1C shows a rear view of the closed configuration of the access door assembly 100. In some embodiments, the access door assembly 100 is configured for coupling or coupleable to a vehicle or a truck, such that the access door assembly 100 is able to provide access into a container structure mounted on the vehicle.

The access door assembly 100 comprises a door frame or a door frame housing 102 that is coupleable to the vehicle. The door frame housing 102 may be coupled to the chassis of the vehicle or any other portion of the vehicle that provides sufficient structural integrity for the door frame housing 102. As such, the access door assembly 100 should also be made of a similar material, such as structural steel or materials with sufficient strength and structural integrity. The coupling of the door frame housing 102 to the vehicle is such that the door frame housing 102 is configured for rotational displacement or is rotatable between an open position and a closed position. When the door frame housing 102 is rotated to the open position, such as a horizontal position that is parallel to the floor of the container structure mounted on the vehicle, the access door assembly 100 becomes configured to provide / enable / open access into the container structure. When the door frame housing 102 is rotated to the closed position, such as a vertical position that is perpendicular to the floor of the container structure, the access door assembly 100 becomes configured to prevent / disable / close access into the container structure.

The door frame housing 102 includes a linear guide 104, such as a slide rail or a set of rollers, as would be readily known by a person having ordinary skill in the art. The linear guide 104 is disposed within the door frame housing such that it is along an edge of the door frame housing 102, as shown in FIG. 1A and FIG. 1B. In some embodiments, the linear guide 104 may be disposed only on one frame edge of the door frame housing 102, i.e. on the lower frame edge 106. Alternatively, there may be two linear guides 104, each disposed on parallel edges of the door frame housing 102, i.e. at the lower frame edge 106 and the upper frame edge 108.

The access door assembly 100 further includes a set of doors 110 disposed within the door frame housing 102. The set of doors 110 is configured for linear displacement along the linear guide 104 of the door frame housing 102. Accordingly, the set of doors 110 is able to displace linearly along the directions 112a and 112b. In various embodiments, the set of doors 110 comprises a plurality of door panels 114 rotatably joined together. The plurality of door panels 114 are separated into a left portion 114L and a right portion 114R. The left portion 114L is configured for linear displacement outwards along the direction 112a, and the right portion 114R is configured for linear displacement outwards along the direction 112b. Similarly, the left portion 114L is configured for linear displacement inwards along the direction 112b, and the right portion 114R is configured for linear displacement inwards along the direction 112a.

When the plurality of door panels 114 are displaced outwards, the set of doors 110 are linearly displaced along the linear guide 104 into an open configuration. In this open configuration as shown in FIG. 1B, the set of doors 110 becomes configured to provide / enable / open access into the container structure, even when the door frame housing 102 is rotated to the closed position. When the plurality of door panels 114 are displaced outwards, the set of doors 110 are linearly displaced along the linear guide 104 into a closed configuration. In this closed configuration as shown in FIG. 1A, the set of doors 110 becomes configured to prevent / disable / close access into the container structure, specifically when the door frame housing 102 is rotated to the closed position. Accordingly, whether the access door assembly 102 is able to open or close access into the container structure is dependent upon the

configurations of the door frame housing 102 and the set of doors 110, as elaborated in the table below.

Door Frame Housing 102	Set of Doors 110	Access into Container Structure
Open Position	Open Configuration	Open
Open Position	Closed Configuration	Open
Closed Position	Open Configuration	Open
Closed Position	Closed Configuration	Closed

Table 1

The plurality of door panels 114 of the set of doors 110 are rotatably joined or hinged together, such that the plurality of door panels 114 are foldable or can be compacted together. For example, as shown in FIG. 1B, when the left portion 114L and the right portion 114R of the plurality of door panels 114 are entirely displaced linearly outwards, i.e. in the set of doors 110 is in the open configuration, the door panels 114 in each portion (114L, 114R) can be folded or compacted together by way of rotation about their hinges 116. It would be readily apparent to the skilled person that the folding or compacting of any pair of door panels 114 can be towards or away from the front of the vehicle. The folding or compacting of the plurality of door panels 114 advantageously prevents the door panels 114 from extending laterally outwards beyond the sides of the container structure, which can pose potential risks to users of the access door assembly 100. The plurality of door panels 114, after being folded or compacted together, can be rotated about a lateral frame edge 118 of the door frame housing 102 such that the door panels 114 are parallel to the sides of the container structure. More particularly, the compacted door panels in the left portion 114L are rotatable about the left lateral frame edge 118L, and the compacted door panels in the right portion 114R are rotatable about the right lateral frame edge 118R. The rotation of the compacted door panels 114 to become parallel to the sides of the container structure advantageously minimizes the lateral footprint of or space utilized by the access door assembly 100.

Alternatively, instead of folding or compacting the plurality of door panels 114 together after they have fully extended outwards from the door frame housing 102, the plurality of door panels 114 can be folded or compacted during the linear displacement along the linear guide 104. Similarly, the folding or compacting of the door panels 114 occurs by rotation about the hinges 116. This process is similar to opening and closing of a multi-panel door in households. It would be readily understood by the skilled person on the implementation of suitable linear guides 104 for this particular embodiment.

In some other embodiments, the set of doors 110 may comprise two door panels 114, one panel representing the left portion 114L and the other panel representing the right portion 114R. As there is only one door panel 114 for each portion, i.e. left door panel 114L and right door panel 114R, there cannot be any folding or compacting of door panels 114. The left door panel 114L is configured for sliding outward along the direction 112a and then rotated about the left lateral frame edge 118L such that it is parallel to the sides of the container structure. Similarly, the right door panel 114R is configured for sliding outward along the direction 112b and then rotated about the right lateral frame edge 118R such that it is parallel to the sides of the container structure.

In a representative or exemplary embodiment of implementing the access door assembly 100 of the present disclosure, there is a vehicular system 10 comprising vehicle 200 whereon a container structure 202 is mounted or mountable. FIG. 2A to FIG. 2C illustrates various configurations of the access door assembly 100 coupled or attached to the vehicle 200 having a container structure 202 mounted thereon. The access door assembly 100 can be coupled to the chassis 204 of the vehicle 200, which can be a truck, trailer, or the like. The access door assembly 100 is configured to enable/open or disable/close access into the container structure 202 mounted on the vehicle 200. The container structure 202 can be a freight container conforming to ISO standards in terms of dimensions. It can also be essentially any other type of container of other design. In this embodiment, there are no rear doors in the container structure 202; the rear end 206 of the container structure 202 is open.

Thus, only the access door assembly 100 can be used to gain access into the container structure 202.

FIG. 2A illustrates the access door assembly 100 being in the closed position, i.e. vertical position, such that access into the container structure 202 is prevented / disabled / closed. FIG. 2B illustrates the access door assembly 100 being in a position between the closed and open positions, such as when the access door assembly 100 is being closed or opened during rotation about a rotational axis 208. FIG. 2C illustrates the access door assembly 100 being in the open position, i.e. horizontal position, such that access into the container structure 202 is provided / enabled / opened.

In various embodiments, a manufacturer or factory may produce a vehicle 200 that is mounted with the access door assembly 100 and the container structure 200. In other embodiments, a manufacturer or factory may produce a container system 20 that includes the container structure 200 and the access door assembly 100 for providing access thereinto. The container structure 200 and the access door assembly 100 are mountable on or coupleable to the vehicle 200.

In the representative or exemplary embodiment, with reference to FIG. 2A to FIG. 2C, the door frame housing 102, particularly the set of doors 110, comprises a handle or a plurality of handles 120 that allows a user to manually displace the set of doors 110. For example, the handle(s) 120 allows the user to linearly displace the plurality of door panels 114 outwardly and/or inwardly. The door frame housing 102 further includes slits or slots 122 that allow the plurality of door panels 114 to extend laterally outwards. More particularly, the door frame housing 102 includes a left slot 122L for allowing linear displacement of the left portion 114L, and a right slot 122R for allowing linear displacement of the right portion 114R. The slots 122 are disposed on the lateral frame edges 118, extending between the lower frame edge 106 and the upper frame edge 108.

The door frame housing 102 may also be lockable to the vehicle 200. Additionally or alternatively, the set of doors 110 may be lockable to the door frame housing 102

and/or the vehicle 200. The locking of the set of doors 110 and the door frame housing 102 advantageously prevents unwanted / unintended / accidental movement or displacement when the vehicle 200 is in motion, especially when travelling across undulating roads or rough terrains. The locking can be by way locking mechanisms such as hooks or latches. The locking mechanisms can also be long latch locks that are normally used with ISO freight containers. Any other (e.g., similar) manual or automated locking mechanism or means known to the skilled person can also be used in addition or in place of the aforementioned locking mechanisms. These locking mechanisms secure the various components of the access door assembly 100, and prevent the components from accidentally opening, particularly when the vehicle 200 is in motion across undulating roads or rough terrains.

For operation of the access door assembly 100, the vehicle 200 comprises a set of actuators 210. The actuators 210 can include or be hydraulic cylinders powered a separate hydraulic pump, and/or mechanical actuators powered by an electrical power generator. One end of the actuators 210 is secured directly onto the chassis 204 of the vehicle 200, while the other end is coupled to the access door assembly 100. More specifically, the access door assembly 100 includes mounting brackets 124 attached or welded to the door frame housing 102, the mounting brackets 124 being configured for coupling to the actuators 210. The set of actuators 210 is operable for actuating the door frame housing 102 about the rotational axis 208 between or from a closed / vertical position to an open / horizontal position. The coupling positions of the actuators 210 on the access door assembly 100 can be calculated by the skilled person based on the force exerted or applied by and/or upon the actuators 210, the dimensions and masses of the door frame housing 102 and the set of doors 110, and the position of the rotational axis 208.

In various embodiments, extension and retraction of the actuators 210 causes the door frame housing 102, together with the set of doors 110, to rotate about the rotational axis 208. The rotation of the door frame housing 102 and the set of doors 110 about the rotational axis 208 allows the door frame housing 102 to move between a closed / vertical position and an open / horizontal position, or any other position in between, in a controlled or controllable manner. In some embodiments,

the door frame housing 102 can also be configured to open beyond the horizontal position, such as until the door frame housing 102 contacts the ground or another external surface.

For example, the access door assembly 100 can be used for loading of cargo or goods from a raised bay area into the container structure 200. The access door assembly 100 may thus be operated to lower the door frame housing 102 to the open / horizontal position. The door frame housing 102 is opened such that the outer end 126 of the door frame housing 102 is proximate to the raised bay area. Preferably, the vehicle 200 is parked at a predetermined distance away from the raised bay area, with the bottom surface 128 of the door frame housing 102 being in contact with the floor of the raised bay area. The outer end 126 of the door frame housing 102 may be tapered or slanted to allow ease of movement of cargo or goods from the raised bay area onto the door frame housing 102. Referring to Table 1 above, the access door assembly 100 is opened for allowing access into the container structure 200 when the door frame housing 102 is in the open position and the set of doors 110 is in the closed configuration. The set of doors 110 in the closed configuration provides a floor area for allowing movement or transportation of cargo or goods from the raised bay area into the container structure. Although the access door assembly 100 may remain open for access into the container structure 200, it would be less feasible for loading of cargo if the door frame housing 102 is in the open position and the set of doors 110 is in the open configuration. Accordingly, as the set of doors 110 is being used for carrying the weight of cargo or goods during the loading process, the set of doors 110 is preferably structurally well-supported on the door frame housing 102, as readily understood by the skilled person.

The vehicle 200 may comprise a second set of actuators that is operable for adjusting the height of the door frame housing 102 when the door frame housing 102 has been opened into the open / horizontal position. In one example, a user can firstly open the access door assembly 100 by operating the actuators 210 to rotate the door frame housing 102 about the rotational axis 208. Once the door frame housing 102 is in the open / horizontal position after opening, the door frame housing 102 is typically substantially flush with or parallel to the inside floor 212 of the

container structure 202. The door frame housing 102 can be further lowered towards the ground or another external surface by operating the second set of actuators. In some embodiments, the set of actuators 210 can also be used for the lowering and rising of the door frame housing 102 relative to the ground while maintaining the door frame housing 102 in its horizontal position or orientation with respect to the ground. After the door frame housing 102 has been lowered to the ground, the user can then transport cargo or goods from the ground onto the door frame housing 102. Thereafter, the cargo or goods can be raised upwards by operating the second set of actuators and 126, possibly together with the user standing on the set of doors 110 in the closed configuration, before continuing to move the cargo or goods into the container structure 202.

In the representative or exemplary embodiment of implementing the access door assembly 100 with the vehicle 200, the access door assembly 100 is configured to provide access into the container structure 202, even when the door frame housing 102 is in the closed position. Table 1 above shows an example of such a configuration or arrangement, specifically when the set of doors 110 is in the open configuration and the door frame housing 102 is in the closed position. In this arrangement, the access door assembly 100 can be used for loading of cargo or goods from a raised bay area into the container structure 200. The vehicle 200 is parked close to the raised bay area, such that the access door assembly 100 is adjacent to the edge of the raised bay area.

FIG. 3A to FIG. 3C illustrates various configurations of the set of doors 110 of the access door assembly 100 when the door frame housing 102 is in the closed / vertical position. For reference, FIG. 2A illustrates the set of doors 110 being in the closed configuration, such that access into the container structure 202 is prevented / disabled / closed. FIG. 3A illustrates the set of doors 110 being in a semi-open configuration that is between the closed and open configurations, such as when the set of doors 110 is being closed or opened during linear displacement along the linear guide 104. FIG. 3B illustrates the set of doors 110 being in the open configuration, i.e. the plurality of door panels 114 are entirely extended laterally outwards, such that access into the container structure 202 is provided / enabled /

opened. Additionally, FIG. 3B also illustrates the plurality of door panels 114 being folded or compacted partially together about the hinges 116. FIG. 3C illustrates the plurality of door panels 114 being folded or compacted completely, and rotated outwardly about the lateral frame edges 118, such that the plurality of door panels 114 are parallel to the sides 214 of the container structure 202.

The rotation of the door panels 114 about the lateral frame edges 118 can occur manually, and/or can by actuated with any form of actuation, mechanical, and/or hydraulic means known to the skilled person. In various embodiments, the angle of rotation for the door panels 114 about the lateral frame edges 118 is between 0 and at least 90 to 180 degrees, and in multiple embodiments this angle of rotation is 0 to 270 degrees. The rotation of the door panels 114 up to 270 degrees allows the door panels 114 to be opened until they are substantially parallel to the sides 214 of the container structure 202. This advantageously allows the driver of the vehicle 200 to clearly see the rear of the vehicle 200 with the side-view mirrors. Moreover, this is important because of safety issues when the vehicle 200 is being reversed towards the raised bay area while the set of doors 110 is in the open configuration. It allows the driver to monitor any signs of danger and/or risk of collision with the raised bay area when reversing the vehicle 200.

In some other embodiments, as shown in FIG. 4A and FIG. 4B, the set of doors 110 comprises two door panels 114 – left door panel 114L and right door panel 114R. As such, there cannot be any folding or compacting of door panels 114. The left door panel 114L is configured for sliding leftwards along the linear guide 104 and the right door panel 114R is configured for sliding rightwards along the linear guide 104. FIG. 4A illustrates the left door panel 114L and the right door panel 114R being entirely displaced outwards, i.e. the set of doors 110 is in the open configuration. Referring to FIG. 4B, the left door panel 114L and the right door panel 114R are rotatable about the left lateral frame edge 118L and the right lateral frame edge 118R, respectively, such that the door panels 114 are parallel to the sides 214 of the container structure 202.

In accordance with representative or exemplary embodiments of the present disclosure, an advantage provided by the access door assembly 100 is that there is a access door assembly 100 that allows the set of doors 110 to displace linearly along the linear guide 104, and also allows the set of doors 110 to rotate downwards together with the door frame housing 102 about the rotational axis 208. There is thus a choice with respect to how the user can operate the access door assembly 100. For example, the user can open the access door assembly 100 by sliding or linearly displacing the set of doors 110 into the open configuration. This is usually used when loading cargo from a loading/unloading bay with a raised bay area or platform. The vehicle 200 will be reversed until the access door assembly 100 is proximate to the raised bay area, such that personnel can step across from the raised bay area to the floor 212 of the container structure 202 after opening the set of doors 110. The user can also choose to rotate the door frame housing 102 about the rotational axis 208 from the vertical / closed position to the horizontal / open position. This is usually used when loading cargo directly from the ground as described above. Alternatively, the opened door frame housing 102 can be used as a ramp for loading cargo into the container structure 202. The set of doors 110 in the closed configuration functions as the floor area of the ramp.

Therefore, a single access door assembly 100 can be used in the form of sliding doors (implemented by the open and closed configurations of the set of doors 110); and this single access door assembly 100 can also be used in a manner identical, essentially identical, or analogous to a conventional tail door described in the background, wherein the tail door can be lowered from a vertical / closed position to a horizontal / position (implemented by the open and closed positions of the door frame housing 102). Table 1 above lists out the various combinations of the open and closed arrangements of the door frame housing 102 and set of doors 110 that enable and disable access into the container structure 202. By integrating these functions together in a single access door assembly 100, users can quickly slide open the set of doors 110 of the access door assembly 100 for carrying cargo from a raised bay area or platform; lower down the door frame housing 102 to use it as a ramp for loading cargo from a raised platform into the container structure 202; and/or use the door frame housing 102 as a lift to raise cargo from the ground to the level of

the container's floor 212. This advantageously leads to significant time reduction in operating the access door assembly 100.

In various embodiments, the access door assembly 100 can form a weather seal with the rear end 206 of the container structure 202. Partiularly, when the door frame housing 102 is in the closed / vertical position, the door frame housing 102 contacts or abuts the rear end 206 of the container structure 202, forming a weather seal therebetween. Such a weather seal can be a rubberized seal between the frame edges of the access door assembly 100 and the container structure 202, or any other similar means known to the skilled person. The weather seal protects the container structure 202 from the external weather elements, especially when the container structure 202 is used for transporting fragile cargo or goods. If rain were to enter into the container structure 202, possibly due to a leakage of the weather seal, there could be potential damage to the cargo or goods stored inside the container structure 202.

The access door assembly 100 is coupled to the chassis 204 of the vehicle 200 by a set of actuators 210. The chassis 204 is the most structurally stable part of the vehicle 200 and keeps the access door assembly 100 securely mounted as a component of the vehicle 200. The access door assembly 100 can be mounted by means of a steel plate and non-permanent fasteners such as nuts and bolts into the chassis 204. The set of actuators 210 is positioned between this part of the chassis 204 and the access door assembly 100. The coupling connections to the set of actuators 210 are also through means of non-permanent fasteners described above. For example, the set of actuators 210 is coupled to the mounting brackets 124 of the access door assembly 100 by bolts and nuts. Alternatively, permanent means such as welding may also be used, as would be readily apparent and understood by the skilled person.

Some embodiments can also include a sensing system in the access door assembly 100 for preventing unwanted or undesirable simultaneous rotations or displacements of the access door assembly 100. For example, it was earlier mentioned that it is less feasible to operate the access door assembly 100 when the door frame housing

102 is in the open position and the set of doors 110 is in the closed configuration. The sensing system may thus be configured to provide an alert and/or prevent lowering of the door frame housing 102 to the open position when the set of doors 110 are already in the open configuration. There can be sensors and electrical circuitry installed on and/or around the set of doors 110 to detect the opening and closure thereof. Electrical circuitry connecting the set of actuators 210 and the door frame housing 102, as well as programming devices, can also be included for implementation of this sensing system. It will be apparent to the skilled person that variations and modifications for this sensing system are possible.

In the foregoing detailed description, embodiments of the present disclosure in relation to an access door assembly for a vehicle are described with reference to the provided figures. The description of the various embodiments herein is not intended to call out or be limited only to specific or particular representations of the present disclosure, but merely to illustrate non-limiting examples of the present disclosure. The present disclosure serves to address at least some of the mentioned problems and issues associated with the prior art. Although only some embodiments of the present disclosure are disclosed herein, it will be apparent to a person having ordinary skill in the art in view of this disclosure that a variety of changes and/or modifications can be made to the disclosed embodiments without departing from the scope of the present disclosure. The scope of the disclosure as well as the scope of the following claims is not limited to embodiments described herein.

Claims

1. An access door assembly coupleable to a vehicle for providing access into a container structure mounted on the vehicle, the access door assembly comprising:

a door frame housing comprising a linear guide, the door frame housing coupleable to the vehicle and configured for rotational displacement between an open position and a closed position for opening and closing, respectively, access into the container structure; and

a set of doors disposed within the door frame housing, the set of doors configured for linear displacement along the linear guide of the door frame housing,

wherein the set of doors is linearly displaceable along the linear guide between an open configuration and a closed configuration for opening and closing, respectively, access into the container structure when the door frame housing is in the closed position.

2. The access door assembly as in claim 1, wherein the set of doors comprises a plurality of door panels rotatably joined together.

3. The access door assembly as in claim 1, wherein the plurality of door panels are foldable together.

4. The access door assembly as in any one of claims 1 to 3, wherein the set of doors is further configured for rotating about a lateral frame edge of the door frame housing when the set of doors is in the open configuration.

5. The access door assembly as in claim 1, wherein the door frame housing is lockable to the vehicle.

6. The access door assembly as in claims 5 or 6, wherein the set of doors is lockable to at least one of the door frame housing and vehicle.

7. A container system comprising:

a container structure mountable on a vehicle; and

an access door assembly coupleable to the vehicle for providing access into the container structure, the access door assembly comprising:

a door frame housing comprising a linear guide, the door frame housing coupleable to the vehicle and configured for rotational displacement between an open position and a closed position for opening and closing, respectively, access into the container structure; and

a set of doors disposed within the door frame housing, the set of doors configured for linear displacement along the linear guide of the door frame housing,

wherein the set of doors is linearly displaceable along the linear guide between an open configuration and a closed configuration for opening and closing, respectively, access into the container structure when the door frame housing is in the closed position.

8. The container system as in claim 7, wherein the set of doors comprises a plurality of door panels rotatably joined together.

9. The container system as in claim 8, wherein the plurality of door panels are foldable together.

10. The container system as in any one of claims 7 to 9, wherein the set of doors is further configured for rotating about a lateral frame edge of the door frame housing when the set of doors is in the open configuration.

11. The container system as in claim 7, wherein the door frame housing is lockable to the vehicle.

12. The container system as in claims 10 or 11, wherein the set of doors is lockable to at least one of the door frame housing and vehicle.

13. The container system as in claim 7, wherein the container structure comprises a rear opening for providing access thereinto.

14. A vehicle whereon a container structure is mountable, the vehicle comprising:

an access door assembly coupled to the vehicle for providing access into the container structure, the access door assembly comprising:

a door frame housing comprising a linear guide, the door frame housing coupled to the vehicle and configured for rotational displacement between an open position and a closed position for opening and closing, respectively, access into the container structure; and

a set of doors disposed within the door frame housing, the set of doors configured for linear displacement along the linear guide of the door frame housing,

wherein the set of doors is linearly displaceable along the linear guide between an open configuration and a closed configuration for opening and closing, respectively, access into the container structure when the door frame housing is in the closed position.

15. The vehicle as in claim 14, wherein the set of doors comprises a plurality of door panels rotatably joined together.

16. The vehicle as in claim 15, wherein the plurality of door panels are foldable together.

17. The vehicle as in any one of claims 14 to 16, wherein the set of doors is further configured for rotating about a lateral frame edge of the door frame housing when the set of doors is in the open configuration.

18. The vehicle as in claim 14, wherein the door frame housing is lockable to the vehicle.

19. The vehicle as in claims 17 or 18, wherein the set of doors is lockable to at least one of the door frame housing and vehicle.

20. The vehicle as in claim 14, further comprising a set of actuators for coupling the access door assembly to the vehicle.

21. The vehicle as in claim 20, wherein the set of actuators is coupled to the vehicle's chassis.

22. The vehicle as in claims 20 or 21, wherein the set of actuators is powered by the vehicle's engine.