



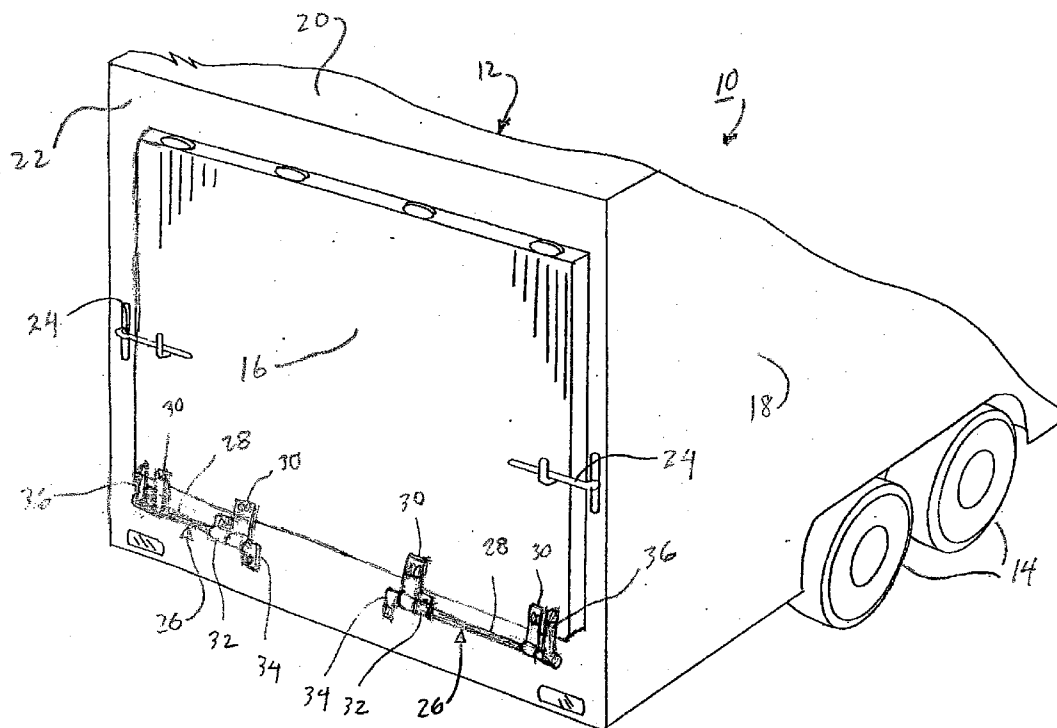
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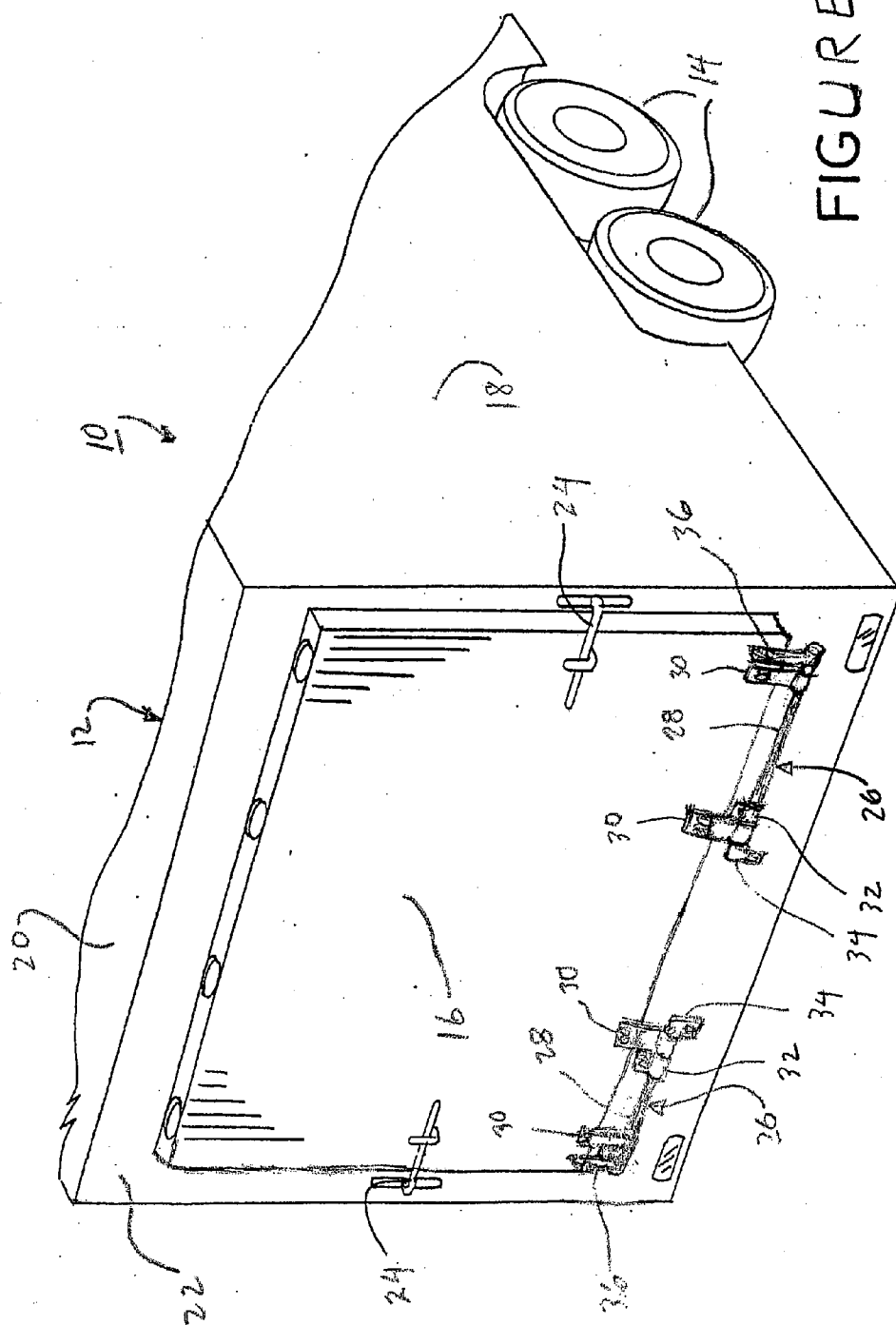
(19) **United States**(12) **Patent Application Publication**  
**Brenneman et al.**(10) **Pub. No.: US 2007/0262107 A1**(43) **Pub. Date: Nov. 15, 2007**(54) **CARGO CARRIER HAVING A DOOR WITH  
A LIFT-ASSISTING HINGE APPARATUS****Publication Classification**(76) Inventors: **Ryan Brenneman**, White Pigeon, MI  
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**Evan Bontrager**, Goshen, IN (US)(51) **Int. Cl.**  
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INDIANAPOLIS, IN 46204-5137 (US)**(57) **ABSTRACT**

A cargo carrier incorporates at least one hinge assembly that permits the controlled opening and closing of the cargo carrier door. The hinge assembly includes a torsion bar that has one end fixed with respect to the cargo carrier floor and the other end fixed with respect to the door. One end of the torsion bar rotates with respect to the other end when the door is opened or closed. The door is of sufficient weight that controlled opening and closing of the door is not possible without the aid of the hinge assembly. The door is also allowed to open sufficiently such that the end of the door opposite the hinge can contact the ground thereby forming a ramp.

(21) Appl. No.: **11/745,274**(22) Filed: **May 7, 2007****Related U.S. Application Data**(63) Continuation-in-part of application No. 10/911,841,  
filed on Aug. 5, 2004, now Pat. No. 7,213,860.



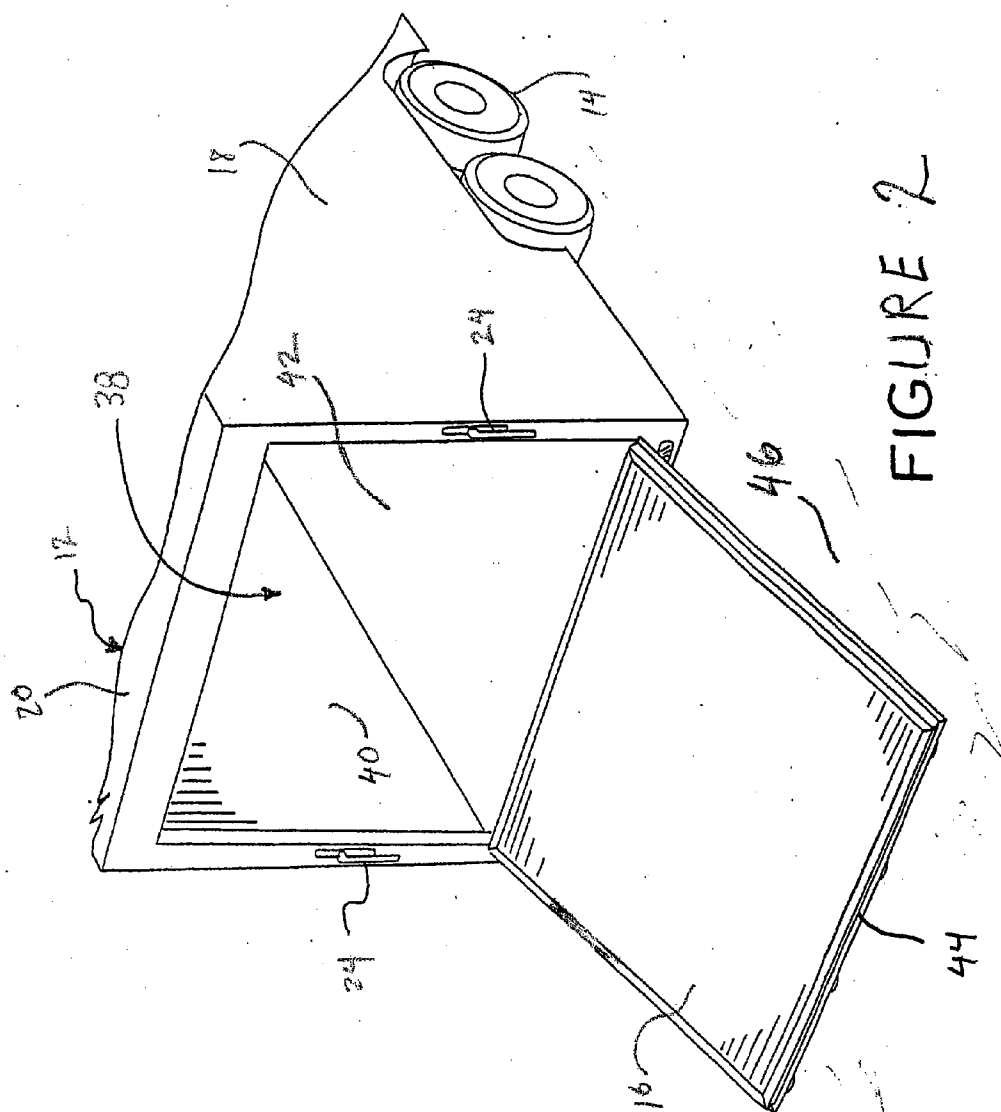
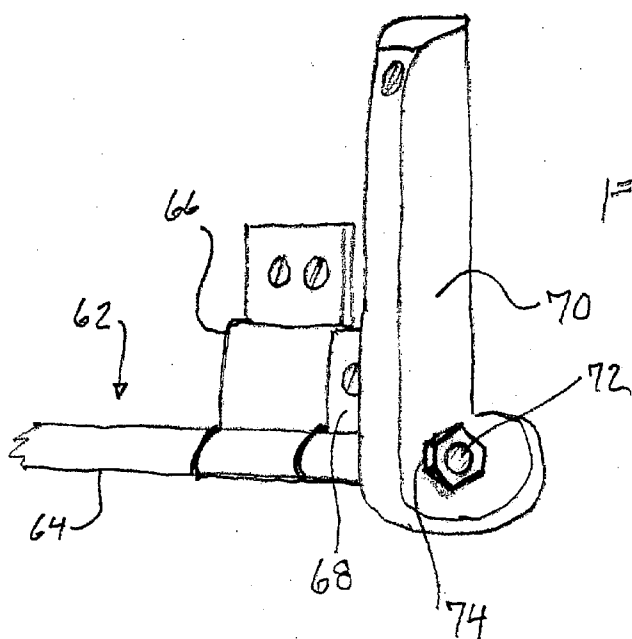
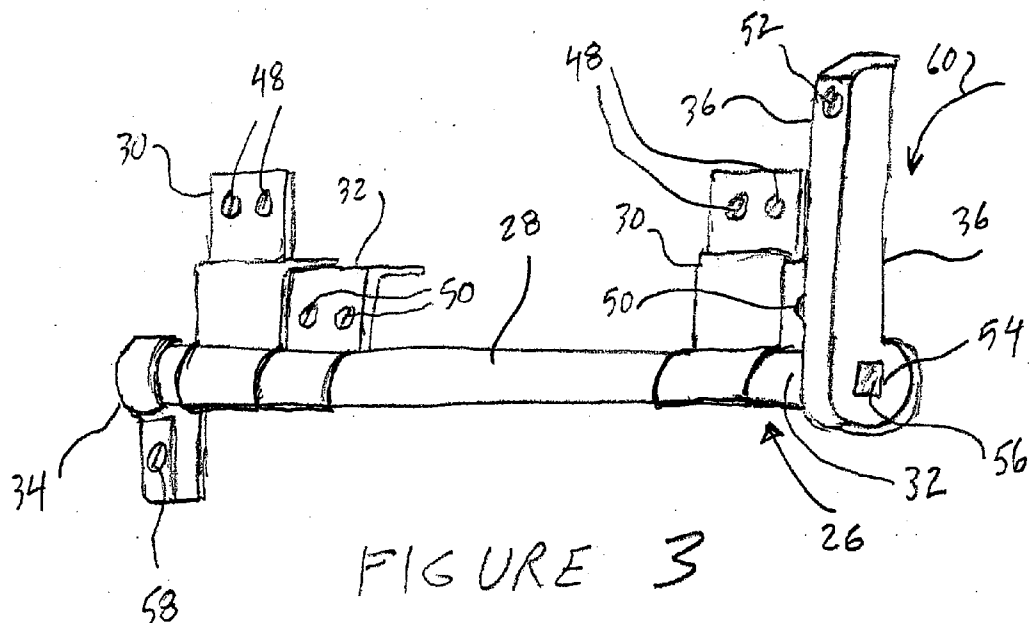


FIGURE 2



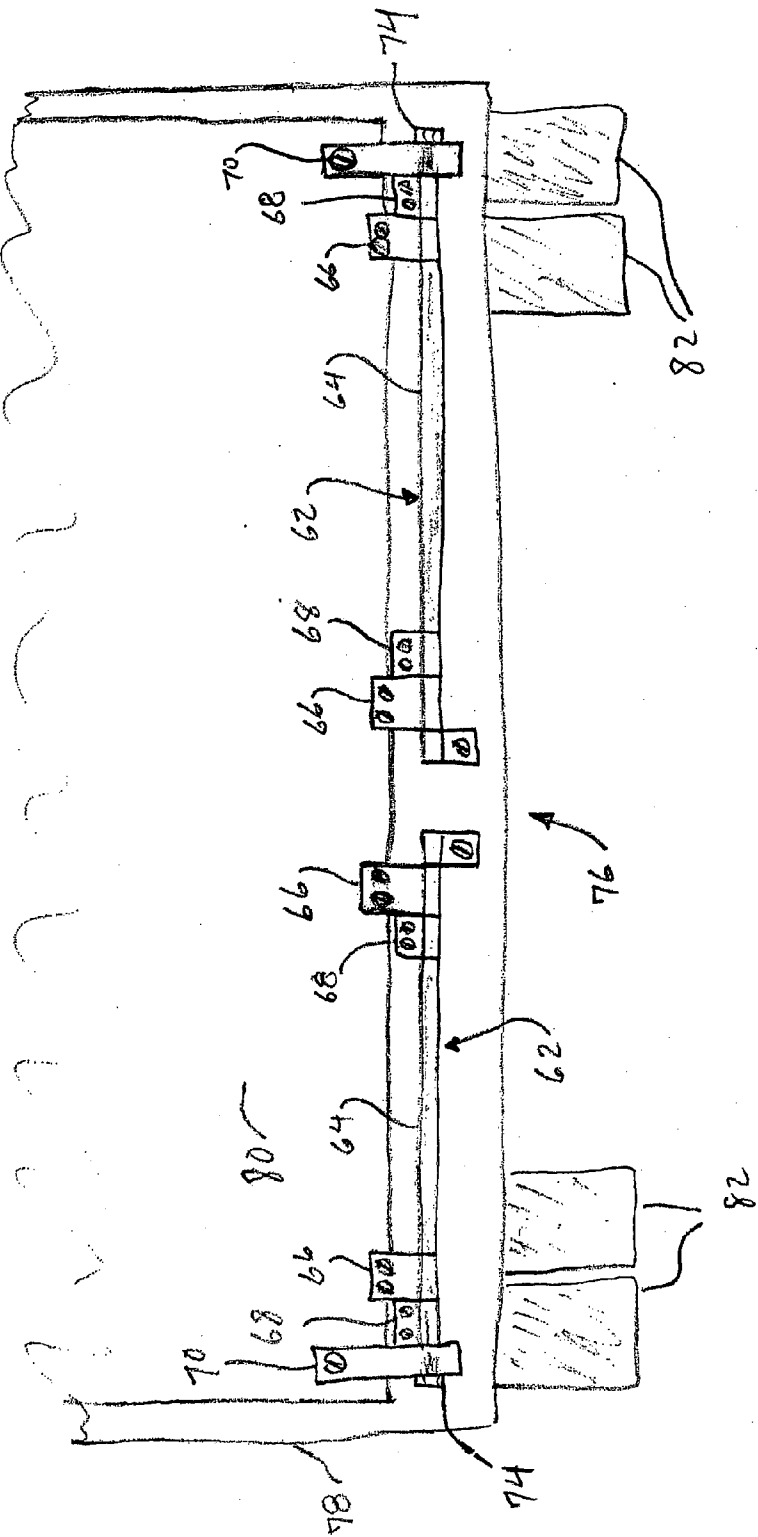


FIGURE 5

## CARGO CARRIER HAVING A DOOR WITH A LIFT-ASSISTING HINGE APPARATUS

### REFERENCE TO RELATED APPLICATION

[0001] The present application is a continuation-in-part of application Ser. No. 10/911,841 filed Aug. 5, 2004, which is hereby incorporated by reference in its entirety.

### BACKGROUND

[0002] The use of a door as a ramp that opens from the back of a transport device or trailer and utilizes struts and/or cables for support is known. Door and ramp combinations that are strong enough to hold the weight of vehicles are typically themselves very heavy, therefore requiring cables or other mechanisms to assist in the opening or closing of the door. In lightweight trailers, such as those that carry mowers, the weight of the ramp is often reduced by utilizing a permeable ramp that not only reduces the amount of material in the door to thereby reduce weight, but also allows air to travel through the door to lower the aerodynamic drag of the trailer while in motion. Such ramps are not suitable to use as a cargo carrier or enclosure door, due to the lack of sufficient protection for the cargo.

[0003] A cargo carrier, such as that used by a commercial shipper to transport loads over some distance, requires a method of unloading. Many cargo carriers, such as semi-tractor trailers, utilize loading docks at the cargo pickup and delivery points. In those instances, a ramp or other unloading device is not necessary because of the elevated nature of the loading dock. When delivering or picking up cargo with respect to small business or individuals, a loading dock is often not available. As such, lift gates are often attached to the back of a vehicle to allow the unloading of heavy cargo. A lift gate is normally a hydraulically operated mechanism that is powered from the electrical system of the vehicle to elevate or lower cargo between the vehicle floor and the ground. Other solutions include ramps that are stored beneath the truck body which are pulled out and then connected to the end of the truck, thereby allowing a ramped surface for the loading and unloading of cargo. As these ramps are typically positioned and stowed by hand, the weight of the ramp will limit the size and carrying capacity of the ramp, making these ramps also not suitable for use as a door for the truck or cargo carrier.

[0004] What is needed is a cargo carrier door and ramp combination that provides suitable protection for the enclosed cargo, yet can be lowered without the necessity of cables, struts, or hydraulics to counterbalance the weight of the door.

### SUMMARY

[0005] The present disclosure includes a cargo carrier or enclosure having a floor and a number of walls. A door is mounted to the floor via a hinge assembly. The hinge assembly includes at least one torsion bar that has one end mounted in fixed relation to the cargo carrier floor and the other end mounted in fixed relation to the door. Opening the door loads the torsion bar to counterbalance the weight of the door. The door is able to be opened so that the end of the door away from the hinge assembly extends below the floor surface plane, thereby forming a ramp.

[0006] Further objects, embodiments, forms, benefits, aspects, features and advantages of the present disclosure may be obtained from the description, drawings, and claims provided herein.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The above-mentioned and other features and advantages of this disclosure, and the manner of attaining them, will become more apparent and the disclosure will be better understood by reference to the following description of embodiment of the disclosure taken in conjunction with the accompanying drawings, wherein:

[0008] FIG. 1 is a perspective view of a cargo carrier constructed in accordance with an embodiment of the disclosure.

[0009] FIG. 2 is a perspective view of the cargo carrier shown in FIG. 1, illustrating a door and ramp combination in an open position.

[0010] FIG. 3 is a perspective view of a door and ramp hinge assembly constructed in accordance with an embodiment of the disclosure.

[0011] FIG. 4 is a perspective view of a portion of a door and ramp hinge assembly similar to that shown in FIG. 3, illustrating another embodiment of the disclosure.

[0012] FIG. 5 is a rear elevational view of a cargo carrier constructed in accordance with an embodiment of the disclosure.

[0013] Corresponding reference characters indicate corresponding parts throughout the several views. The examples set out herein illustrate one or more embodiments of the disclosure, and such examples are not to be construed as limiting the scope of the disclosure in any manner.

### DETAILED DESCRIPTION

[0014] Referring now to FIG. 1, there is shown a cargo carrier 10 having a body 12, wheels 14, and a door 16. Cargo carrier 10 may incorporate an engine and drive train, or it may be trailerable for use in connection with a tractor cab or other type of tow vehicle. Cargo carrier body 12 illustratively includes one or more walls, such as side wall 18, a roof 20, and back wall or frame 22. Door 16 is illustratively shown as being held in a closed position by latches 24, although other means of retaining door 16 may of course be used.

[0015] In accordance with an aspect of the disclosure, door 16 is shown as mounted to cargo carrier body 12 by one or more hinge assemblies 26. FIG. 1 illustrates the use of two hinge assemblies 26, but greater or lesser numbers of hinge assemblies may be used in accordance with the size and weight of door 16. As will be described in greater detail below, each of hinge assemblies 26 illustratively include a torsion bar or rod 28, door hinges 30, body mounts 32, torsion bar mount 34, and torsion bar lever arm 36.

[0016] FIG. 2 illustrates cargo carrier 10 with door 16 in an opened position. In this view, the interior 38 of body 12 is visible. In addition to sidewall 18 and roof 20, the opposite sidewall 40 and floor 42 can be seen. As can also be seen in FIG. 2, the distal end 44 of door 16 that is located opposite hinge assemblies 26 is permitted to extend below the plane

of floor 42 until end 44 comes into contact with the ground 46, or with whatever surface on which cargo carrier 10 is located. In this manner, door 16 becomes a functional ramp for loading cargo or materials onto or off cargo carrier 10. Although FIGS. 1 and 2 shown door 16 being mounted to rear wall or frame 22, it is understood that door 16 may be mounted directly to the end of floor 42 and configured such that door 16, when in a closed position, forms a sufficiently strong environmental as well as a security seal with side-walls 18 and 40, and roof 20.

[0017] FIG. 3 illustrates in detail a representative hinge assembly 26 of the type shown in FIG. 1. Door hinges 30 and body mounts 32 each incorporate a cylindrical sleeve through which cylindrical torsion bar or rod 28 passes and can freely rotate within. Door hinges 30 are illustratively mounted to a cargo carrier door, such as door 16 for example, via bolts 48 (the heads of which are shown in FIG. 3). Body mounts 32 are mounted to cargo carrier body 12, for example, via bolts 50, the heads of which can be seen in FIG. 3. Torsion bar lever arm 36 is illustratively mounted to the cargo carrier door 16, for example, via bolt 52. Lever arm 36 is also shown as incorporating a square recess or hole 54, which receives a machined end 56 of torsion bar 28. Torsion bar mount 34, illustratively mounted to carrier body 12 via bolt 58, also incorporates a square or non-circular recess or hole (not shown) that receives a machined end of torsion bar 28 in a manner similar to that of lever arm 36. By capturing the ends (e.g., end 56) of torsion bar 28 by torsion bar mount 34 and torsion bar lever arm 36, torsion bar 28 will twist when the cargo carrier door, e.g., door 16, is opened since lever arm 36 will rotate in the direction of arrow 60 with respect to torsion bar mount 34. The load placed on torsion bar 28 due to the opening of the cargo carrier door will act to counterbalance the weight of the door, thereby allowing the door to be opened and closed without the need for additional cables or lifting mechanisms.

[0018] Torsion bar or bars 28 may be constructed of a variety of known materials and alloys, e.g., spring steel, having length and diameters chosen to meet the requirements of the particular door or cargo carrier implementation. As a few non-limiting examples, a larger or heavier door, such as may be required for a large cargo carrier or to accommodate heavy ramp loads, may require multiple hinge assemblies 26, or longer or larger diameter torsion bars 28. A smaller cargo carrier, or a door that does not require a great deal of ramp strength, may be able to operate with only one hinge assembly, or with shorter or smaller diameter torsion bars or rods. It is important to implement a torsion bar or rod system that does not overstress the torsion bars, in order to avoid torsion bar breakage or loss of torsion force over time.

[0019] FIG. 4 illustrates a portion of a torsion bar hinge assembly 62 having a torsion bar 64, a door mount 66, a body mount 68, and a torsion bar lever arm 70. Hinge assembly 62 is mounted to a cargo carrier in a manner similar to that of hinge assembly 26. In FIG. 4, lever arm 70 incorporates a hole (not shown) for receiving the threaded end 72 of torsion bar or rod 64 of hinge assembly 62. A nut or similar fastener 74 is illustratively threaded onto end 72 of torsion bar or rod 64. Prior to tightening fastener 74, torsion bar 64 may be pre-loaded or pre-unloaded to increase or decrease the counterbalancing force applied by torsion bar 64 when opening or closing the associated cargo carrier

door. In this way, accommodation for aging and wear of hinge assembly components can be made, for example.

[0020] FIG. 5 shows a possible representative implementation of hinge assemblies 62 in association with a cargo carrier 76. Cargo carrier 76 illustratively includes a cargo body 78, door 80, and wheels 82.

[0021] Door 16 and door 80 may be manufactured of a variety of materials suitable for the required ramp strength as well as being within the necessary weight range accommodated by hinge assemblies 26 and 62. In one embodiment, door 16 or door 80 may be a composite door that includes one or more laminated layers, e.g., lauan or other types of plywood, with or without internal supports, e.g., metal or wooden beams or braces, and with or without internal filler material, e.g., foam. The outer surface of the door may be coated with a non-slip material, e.g., rubber or glass-reinforced polyester.

[0022] While the disclosure has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiments have been shown and described and that all changes, modifications and equivalents that come within the spirit of the disclosure provided herein are desired to be protected. The articles "a", "an", "said" and "the" are not limited to a singular element, and may include one or more such elements.

What is claimed is:

1. A cargo carrier comprising:

a body incorporating a floor and a plurality of walls; and

a door disposed orthogonal to said floor and to at least one of said walls, said door coupled to said body via at least one hinge assembly, wherein said at least one hinge assembly comprises a torsion bar having a first end mounted to said body and having a second end mounted to said door such that the opening or closing of said door rotates said second end of said torsion bar with respect to said first end.

2. The cargo carrier of claim 1, wherein said hinge assembly permits said door to be opened such that the edge of said door distal to said hinge assembly extends below the plane of said floor thereby forming a ramp.

3. The cargo carrier of claim 1, wherein the weight of said door does not permit controlled opening or closing of said door without the assisting force of said torsion bar.

4. The cargo carrier of claim 1, wherein said hinge assembly further comprises a fastener cooperating with one of said first or second ends of said torsion bar to maintain said torsion bar in a pre-loaded condition when said door is in a closed position.

5. The cargo carrier of claim 1, wherein said hinge assembly further comprises a fastener cooperating with one of said first or second ends of said torsion bar to maintain said torsion bar in a pre-unloaded condition when said door is in a closed position.

6. The cargo carrier of claim 5, wherein said one of said first or second ends of said torsion bar are threaded and wherein said fastener is threaded onto said one of said first or second ends.