LOW-PROFILE SHIPPING SYSTEM

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ABSTRACT

A low-profile shipping system for shipping an object without a pallet includes a shipping crate configured to surround the object being shipped. The shipping crate is configured to substantially enclose the object being shipped. The shipping crate defines a first passageway and a second passageway. The first passageway and the second passageway are adapted to receive a fork of a forklift. The low-profile shipping system also includes a shipping rail attached to the inside of the shipping crate at a location above the first passageway and the second passageway. The shipping rail is adapted to support the weight of the object and the shipping crate while the object is being transported by forklift.
LOW-PROFILE SHIPPING SYSTEM

FIELD OF THE INVENTION

[0001] This disclosure relates generally to a low-profile shipping system for transporting large heavy objects without the use of a pallet.

BACKGROUND OF THE INVENTION

[0002] Typically, large heavy objects, such as superconducting magnets, are transported in crates that have either external integrated pallets or are set on pallets. The pallets provide a stiff platform suitable for lifting the heavy object and the pallets are also used to secure the crate during transportation. It is typically necessary to use a thick pallet when moving a heavy object to ensure that the pallet has enough stiffness and strength to support the heavy object and the crate. For example, a typical pallet used to transport a superconducting magnet may be 6 to 8 inches in thickness.

[0003] There are several problems with using a conventional crate and pallet to ship large heavy objects. Since the pallet is necessary to both move and secure the crated object, the thickness of the pallet poses an issue at every step of the transportation process. For example, when shipping large heavy objects by air, the cargo aircraft has fixed dimensions. If the combination of the pallet and crate exceed the available height of the aircraft, then a larger aircraft or an alternate method of transportation must be used. Additionally, not all airports can handle the large aircraft. Therefore, additional shipping methods, such as truck or rail, must be used to get the object to its final destination. The need to use large aircraft for transportation adds both to the transportation costs and to the total time to deliver the object. In the case of a superconducting magnet, the additional shipping time results in additional cost due to the increased boil-off of the liquid cryogen, such as liquid helium, used to cool the magnet. It is much cheaper to fill a superconducting magnet with liquid helium at the manufacturer’s facility as opposed to at the installation site. Therefore, increasing the transportation time for certain goods, such as superconducting magnets, may result in substantially higher costs. For these and other reasons, there is a need for a new low-profile shipping system for the transportation of large heavy objects such as superconducting magnets.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a schematic representation of a low-profile shipping system in accordance with an embodiment; and

[0010] FIG. 2 is a schematic representation of a perspective view of a low-profile shipping system in accordance with an embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0011] In the following detailed description, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific embodiments that may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the embodiments, and it is to be understood that other embodiments may be utilized and that logical, mechanical, electrical and other changes may be made without departing from the scope of the embodiments. The following detailed description is, therefore, not to be taken as limiting the scope of the invention.

[0012] FIG. 1 is a schematic representation of a low-profile shipping system 10 in accordance with an embodiment. The low-profile shipping system 10 includes a shipping crate 11 and one or more shipping rails (36, 38) (shown in FIG. 2). The shipping rails (36, 38) will be described in more detail hereinafter. The shipping crate 11 includes a bottom panel 12, a top panel 14, a front panel 16, a rear panel 18 (shown in FIG. 2), a first side panel 20, and a second side panel 22. The front panel 16, the rear panel 18, the first side panel 20 and the second side panel 22 may all be attached to the bottom panel 12 in a substantially perpendicular manner. The shipping crate 11 may be made from plywood reinforced with 2x4s according to an embodiment. The shipping crate 11 may be constructed from different materials according to other...
embodiments. The bottom panel 12 is generally rectangular in shape according to an embodiment. The bottom panel 12 may be shaped to have a plurality of openings 13. Each of the plurality of openings 13 is adapted to allow the passage of a securing member, such as a cable or a strap, from either the one or more shipping rails (36, 38) or from the heavy object being transported directly to the vehicle used for transporting the heavy object. According to an embodiment, there may be two openings on the side of the bottom panel 12 that is adjacent to the front panel 16 and two openings on the side of the bottom panel 12 that is adjacent to the rear panel 18. According to other embodiments, one or more of the plurality of openings adapted to pass a securing member may be located on the front panel 16, the rear panel 18, the first side panel 20 or the second side panel 22.

[0013] The front panel 16 may be shaped to partially define a first pair of ports 23. According to the embodiment shown in FIG. 1, the bottom panel 12 is also shaped so as to help define the first pair of ports 23. The rear panel 18 (shown in FIG. 2) is shaped so as to define a second pair of ports 25 (shown in FIG. 2). A first passageway 26 is defined between one of the first pair of ports 23 and one of the second pair of ports 25. A second passageway 28 is defined between the other of the first pair of ports 23 and the other of the second pair of ports 25. The first passageway 26 and the second passageway 28 pass completely through the shipping crate 11 according to an embodiment. The first passageway 26 and the second passageway 28 are both positioned within 4 inches from a bottom surface 30 of the low-profile shipping system 10 according to an embodiment. According to other embodiments, the first passageway 26 and the second passageway 28 may be positioned at higher locations on the shipping crate. The first passageway 26 and the second passageway 28 are both configured to receive a fork from a forklift in order to move the low-profile shipping system 10.

[0014] FIG. 2 is a schematic representation of a perspective view of the low-profile shipping system 10 shown in FIG. 1. Common reference numbers will be used between FIG. 1 and FIG. 2. In order to better illustrate the interior of the low-profile shipping system 10, FIG. 2 shows the low-profile shipping system 10 without the front panel 16 (shown in FIG. 1). It should be appreciated by those skilled in the art, that the low-profile shipping system 10 will include a front panel 16 according to most embodiments.

[0015] FIG. 2 more clearly illustrates the construction of the low-profile shipping system 10 in accordance with an embodiment. The first side panel 20 may have a top surface 32 that is not parallel to the bottom surface 34. For example, the top surface 32 may be angled or curved so as to more closely conform to the object being transported in the low-profile shipping system 10. The second side panel 22 may have a top surface that is the same shape as the top surface 32 of the first side panel 20.

[0016] The low-profile shipping system 10 also includes a first shipping rail 36 and a second shipping rail 38. The low-profile shipping system 10 may also include a first block 39, a second block 40, a third block 41, and a fourth block 42. The first block 39 and the third block 41 are attached to a first pair of spacers 43. The second block 40 and the fourth block 42 are attached to a second pair of spacers 44. In accordance with an embodiment, the first pair of spacers 43 are attached to the bottom panel 12. The first block 39 is attached to one of the first pair of spacers 43 via a plate 45. The plate 45 allows for a user to easily adjust the height of the block, and therefore the first rail 36, with respect to the bottom panel 12. The second block 40, the third block 41, and the fourth block 42 may also be mounted with a plate in a manner similar to that described for the first block 39. According to the embodiment shown in FIG. 2, the blocks (39, 40, 41, 42) use a plate, such as the plate 45, for mounting on one side and are mounted to either the first side panel 20 or the second side panel 22 on the other side.

[0017] Referring to FIG. 1 and FIG. 2, the first pair of spacers 43, the first block 39 and the third block 41 further define the first passageway 26. The first passageway 26 passes all the way through the shipping crate 11. The second pair of spacers 44, the second block 40, and the fourth block 42 further define the second passageway 28, which also passes all the way through the shipping crate 11. According to an embodiment, the first pair of ports 23 (shown in FIG. 1), the second pair of ports 25 and the blocks (39, 40, 41, 42) may all help define a passageway with a generally constant height and width. However, according to other embodiments, the height and width of the passageway may be variable. For example, the height and width of the first pair of ports 23 and the second pair of ports 25 may be greater than the height defined by the blocks (39, 40, 41, 42). In other words, the first pair of ports 23 and the second pair of ports 25 may define a larger opening than that defined by the blocks (39, 40, 41, 42). The passageways (26, 28) pass all the way through the shipping crate 11 in accordance with the embodiment shown in FIGS. 1 and 2.

[0018] According to an embodiment, the first shipping rail 36 and the second shipping rail 38 may each be made from steel. The shipping rails (36, 38) shown in FIG. 2 are L-shaped in cross-section, but materials with different cross-sections may also be used. The shipping rails (36, 38) are configured to be attached to an object (not shown) that is to be shipped using the low-profile shipping system 10. The shipping rails (36, 38) are adapted to be rigidly attached to the object such as by bolts through a plurality of bolt holes 46. As discussed previously, it may be advantageous to first bolt the first shipping rail 36 and the second shipping rail 38 to the object and then to secure the shipping rails (36, 38) to the bottom panel 12 by way of one or more plates 45 and spacers (43, 44). According to other embodiments, the shipping rails (36, 38) may connect to a different portion of the shipping crate 11. For example, the shipping rails (36, 38) may connect to one or more of the bottom panel 12, the front panel 16, the rear panel 18, or the top panel 14.

[0019] As was previously discussed, the plurality of openings 13 are adapted to allow a securing member (not shown) such as a cable or strap to pass through. The plurality of openings 13 allows the securing member (not shown) to secure the shipping rails (36, 38) or the heavy object directly to the bed of a vehicle used for transportation. For example, by running the securing member from either the first shipping rail 36 or the second shipping rail 38 directly to the vehicle, both the object and the low-profile shipping system 10 may be attached to the transportation vehicle with greater security. Those skilled in the art will appreciate that securing the object to a vehicle via a shipping rail is much more secure than packing the object in a conventional crate, securing the crate to a pallet, and then attaching the pallet to the vehicle via straps. By attaching the object via the shipping rails (36, 38) the object is much less likely to move around and put additional strain on the shipping crate 11.

[0020] Referring now to both FIG. 1 and FIG. 2, as previously described, the first passageway 26 and the second pas-
sageway 28 are both shaped to receive the fork of a fork lift. Once the fork of the forklift is inserted into the first passageway 26 and the second passageway 28, the blocks (39, 40, 41, 42) provide a load path to the shipping rails (36, 38). According to an embodiment, the shipping rails (36, 38) are long enough to at least partially overlap the first passageway 26 and the second passageway 28. This helps to transfer the weight of the object (not shown) from the shipping rails (36, 38) to the fork of the forklift. Since the low-profile shipping system 10 is shaped to define two passageways (26, 28) and because the shipping rails (36, 38) support the weight of the object, it is not necessary to use a pallet when using the low-profile shipping system 10 to transport the object.

We claim:
1. A low-profile shipping system for shipping an object without a pallet comprising:
   a shipping crate configured to surround the object being shipped, said shipping crate comprising:
   a front panel shaped to at least partially define a first pair of ports, said first pair of ports being adapted to receive a fork from a forklift; and
   a rear panel shaped to at least partially define a second pair of ports, said second pair of ports being adapted to receive the fork from the forklift; and
   a shipping rail attached to the inside of the shipping crate, said shipping rail being adapted for attachment to the object being shipped.

2. The low-profile shipping system of claim 1, wherein the shipping rail is configured to be engaged by the forklift in order to lift the object and the shipping crate.

3. The low-profile shipping system of claim 1, further comprising a second shipping rail attached to the inside of the shipping crate, said second shipping rail being adapted for attachment to the object being shipped.

4. The low-profile shipping system of claim 3, wherein both the shipping rail and the second shipping rail are configured to be engaged by the forklift in order to lift the object and the shipping crate.

5. The low-profile shipping system of claim 1, wherein the shipping rail is further adapted to be attached to a magnet of a magnetic resonance imaging system.

6. The low-profile shipping system of claim 1, wherein the front panel of the shipping crate is shaped to define an opening that is adapted to receive a securing member for the purpose of connecting the shipping rail or the object directly to a vehicle.

7. A low-profile shipping system for shipping an object without a pallet comprising:
   a shipping crate configured to substantially enclose the object being shipped, said shipping crate being shaped to define a first passageway and a second passageway, said first passageway and said second passageway being adapted to receive a fork of a forklift; and
   a shipping rail attached to the inside of the shipping crate at a location above the first passageway and the second passageway, said shipping rail being adapted to support the weight of the object and the shipping crate while the object is being transported by the forklift.

8. The low-profile shipping system of claim 7, wherein the shipping crate comprises a bottom panel.

9. The low-profile shipping system of claim 8, further comprising a block secured to the bottom panel and the shipping rail, said block further defining the first passageway.

10. The low-profile shipping system of claim 9, further comprising a second block secured to the bottom panel and the shipping rail, said second block further defining the second passageway.

11. The low-profile shipping system of claim 9, wherein the first passageway and the second passageway are both positioned within 4 inches from a bottom surface of the shipping crate.

12. The low-profile shipping system of claim 7, wherein the shipping crate is further configured to enclose a magnet of a magnetic resonance imaging system.

13. A low-profile shipping system for shipping an object without a pallet comprising:
a shipping crate configured to substantially enclose the object being shipped, said shipping crate comprising:
a generally rectangular bottom panel;
a first pair of spacers attached to the bottom panel;
a second pair of spacers attached to the bottom panel;
a first block attached to the first pair of spacers, said first block and said first pair of spacers collectively defining a first passageway;
a second block attached to the second pair of spacers, said second block and said second pair of spacers collectively defining a second passageway, wherein said first passageway and the second passageway are both adapted to receive a fork from a forklift; and
a shipping rail attached to both the first block and the second block, said shipping rail being adapted to be attached to the object being shipped.

14. The low-profile shipping system of claim 13, further comprising a third block attached to the first pair of spacers and a fourth block attached to the second pair of spacers.

15. The low-profile shipping system of claim 14, further comprising a second shipping rail attached to both the third block and the fourth block, said second shipping rail being adapted to be attached to the object being shipped.

16. The low-profile shipping system of claim 15, wherein the first shipping rail and the second shipping rail are both adapted to transfer the weight of the object and the shipping crate to the forklift while the low-profile shipping system is being transported by the forklift.

17. The low-profile shipping system of claim 13, further comprising a front panel attached to the bottom panel, said front panel shaped to define a first pair of ports, wherein one of said first pair of ports is aligned with the first passageway and the other of said first pair of ports is aligned with the second passageway.

18. The low-profile shipping system of claim 16, further comprising a rear panel attached to the bottom panel, said rear panel shaped to define a second pair of ports, wherein one of said second pair of ports is aligned with the first passageway and the other of said second pair of ports is aligned with the second passageway.

19. The low-profile shipping system of claim 16, wherein the first block is mounted to at least one of the first pair of spacers via a plate that allows for adjustment in a vertical direction.

20. The low-profile shipping system of claim 13, wherein the bottom panel defines an opening that is adapted to receive a securing member for the purpose of connecting the shipping rail or the object directly to a vehicle.