CONVERTIBLE HOPPER VEHICLE

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ABSTRACT

A carrier unit adapted to be converted into a bulk material container generally including a container having a floor, the floor having at least one floor section movable to a selected position providing a surface inclined toward an opening in the floor formed by the removal and positioning of the floor section into the selected position, a pair of wall units disposed within the container, movable between storage positions and operative positions on opposite sides of the floor section to cooperate with the floor section in the selected position and portions of the interior walls of the container to define a compartment, and a flexible liner for holding bulk material, mountable in the compartment, the flexible enclosure having an inlet for charging bulk material thereinto and at least one outlet cooperating with the floor opening for communicating the interior of the flexible liner with the exterior of the container.

22 Claims, 6 Drawing Figures
CONVERTIBLE HOPPER VEHICLE

This invention relates to a carrier unit and more particularly to a carrier unit normally adapted to carry general cargo which is convertible into a bulk material carrier.

In the transportation industry, it has been the customary practice to utilize separate types of carrier units for transporting general cargo and bulk materials. More recently, efforts have been made to devise multi-purpose carrier units which are adapted to carry either general cargo or bulk material. It has been found, however, that such convertible carrier units in the prior art have not been entirely satisfactory from the viewpoint of simplicity, cost of manufacture and operating performance.

Accordingly, it is the principal object of the present invention to provide the novel carrier unit.

Another object of the present invention is to provide a novel carrier unit which is adapted to carry either general cargo or bulk materials.

A further object of the present invention is to provide a novel carrier unit normally adapted to carry general cargo which is convertible into a bulk material carrier.

A still further object of the present invention is to provide a novel convertible carrier unit adapted to carry either general cargo or bulk materials, which is adapted to facilitate the loading and unloading of bulk materials.

Another object of the present invention is to provide a novel convertible carrier unit adapted to carry either general cargo or bulk material which is adapted to be loaded and unloaded with bulk material by gravity feed.

A further object of the present invention is to provide a novel convertible carrier unit for transporting either general cargo or bulk material which can be constructed by simple modification of conventional carrier units.

A still further object of the present invention is to provide a novel convertible carrier unit adapted to carry exclusively general cargo or a combination of bulk materials and general cargo.

Another object of the present invention is to provide a novel convertible carrier unit adapted to carry general cargo, bulk material or a combination of general cargo and bulk material which is simple in design, comparatively inexpensive to manufacture, and easy to convert for carrying different forms of cargo.

Other objects and advantages of the present invention will become more apparent to those persons having ordinary skill in the art to which the present invention pertains, from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view of an embodiment of the invention, having portions thereof broken away;
FIG. 2 is a vertical cross-sectional view of the embodiment illustrated in FIG. 1;
FIG. 3 is an enlarged cross-sectional view taken along line 3,3 in FIG. 2;
FIG. 4 is a view similar to the view shown in FIG. 3, illustrating a component thereof in an alternate position;
FIG. 5 is a partial, longitudinal sectional view of the embodiment illustrated in FIGS. 1 through 4, illustrating the embodiment in a condition for receiving general cargo; and
FIG. 6 is a cross sectional view taken along line 6,6 in FIG. 5.

Briefly described, the present invention relates to a carrier unit adapted to be converted into a bulk material carrier generally including a container having a floor, the floor having at least one floor section movable to a selected position providing a surface inclined toward an opening in the floor formed by the removal and positioning of the floor section into the selected position, at least on wall unit disposed within the container, movable between a storage position and an operative position adjacent to the floor section to cooperate with the floor section in the selected position and portions of the interior walls of the container to define a compartment and a flexible liner for holding bulk material, mountable in the compartment formed by the floor section, the wall unit and the container walls, the flexible enclosure having an inlet for charging bulk material thereinto and at least one outlet cooperable with the floor opening for communicating the interior of the flexible liner with the exterior of the container. In such a structure, when the wall unit is secured in its storage position and the floor section remains as a floor component, the container may be utilized to transport general cargo, and when the floor section is disposed in the selected position, the wall unit is disposed in its operative position adjacent the floor section, and the flexible liner is mounted within the compartment, the container may be utilized to transport bulk material within the flexible liner disposed within the compartment formed by the floor section, the wall unit and the interior walls of the container.

In the preferred embodiment of the invention, a plurality of floor sections are provided which are positionable against side walls of the container, a pair of wall units are provided having panels cooperating with the floor sections to form the compartment for the flexible liner, the container is provided with at least one hopper communicable with the interior of the compartment formed by the movable floor sections, the wall units and the interior walls of the container, and the flexible enclosure is provided with an expanded configuration adapted to conform to the configuration of the compartment, and a portion extendable through the floor opening into the hopper, which includes the outlet thereof.

Referring to the drawings, there is illustrated an embodiment of the invention. Generally, the embodiment includes a chassis 10, a container 11 mounted on the chassis, a pair of wall units 12 and 13 disposed within the container and movable longitudinally thereof, and a flexible liner 14 mounted within the container between the wall units 12 and 13. The chassis 10 consists of an elongated frame assembly 15 including a pair of longitudinally disposed structural beams 16 and 17 and plurality of transversely disposed structural members 18, supported at its rear end on a wheel unit 19, and when not connected to a tractor unit for transit, is supported at a point forward of the wheel unit by a pair of conventional support legs 20 and 21. The container mounted on the frame assembly supported on the wheel unit as illustrated, forms a trailer unit which can be connected to a conventional tractor unit for transporting cargo within the container. It further is contemplated, however, that the container 11 with the wall units 12 and 13 and the flexible liner 14 disposed therein may be mounted on a truck chassis or a rail car,
or may be utilized as an independent unit for mounting on different forms of transportation units as is conventional in the field of containerization.

The container 11 is provided with a floor 22 rigidly secured to the frame assembly 15 of the chassis, side walls 23 and 24, a top wall 25 and front end wall 26 providing an open rear end which may be closed with a conventional door unit 27. The top wall 25 is formed with a plurality of longitudinally spaced access openings 28 having upwardly projecting, annular loading conduits 29 provided with access doors 30.

As best illustrated in FIGS. 1 and 6, the floor 22 of the container is provided with a plurality of floor sections 31 through 36 which are hingedly connected along their outer edges to the floor 22 and are swingable outwardly so that the inner edges thereof engage the side walls 23 and 24 to provide surfaces inclined toward an opening 37 formed when the floor sections are disposed in their operative positions as illustrated in FIGS. 1 through 4. The hinge connections of the floor sections lie along the parallel side edges of the opening 37, and the floor sections consist of identical rectangular configurations so that when the floor sections are disposed in their operative positions, the inclined surfaces thereof lie in a pair of planes converging towards the opening 37.

Depending from the frame assembly 15 of the chassis is a plurality of hoppers 38 which communicate at their upper ends with the interior of the container through opening 37, and which also communicate through lower outlet ends with a longitudinally disposed discharge conduit 39 having a rearwardly disposed outlet 40 which may be operatively connected to a pneumatic conveying system for unloading bulk material within the container as will later be described.

Referring to FIGS. 1, 3 and 4, the wall unit 12 consists of a rectangular panel member 41 mounted on a pair of spaced, vertical peripheral frame members 42 and 43, and a pair of spaced, horizontal peripheral frame members 44 and 45. The panel 41 is provided with additional strength and rigidity by means of a plurality of vertical rib members 46 through 51 which are disposed between the peripheral frame members 41 and 43 and interconnect the frame members 44 and 45.

The wall unit 12 is provided at the upper end thereof with a pair of transversely spaced roller units 52 and 53 which ride on a pair of longitudinally disposed guide tracks 54 and 55 secured to the top wall 25 of the container adjacent the side walls 23 and 24, for supporting the wall unit and moving it longitudinally within the container between a storage position as illustrated in FIGS. 5 and 6 and an operative position as illustrated in FIGS. 1 through 4. The wall unit is maintained in the operative position adjacent the opening 37 by means of a pair of latching bolts 56 and 57 disposed in the frame member 45 and extendable into holes provided in the floor 22 forward of the front end of the opening 37.

Mounted on the rear face of the wall unit 12 is a panel 58 which may be moved between a storage position as illustrated in FIGS. 4 and 5 and an operative position as illustrated in FIGS. 1, 2 and 3. The panel 58 is provided with an edge 59 disposed parallel to the floor 22, which is hingedly connected to the panel 41, a pair of converging side edges 61 disposed adjacent the side walls 23 and 24 of the container, a pair of converging side edges 62 and 63 which are engageable with the inclined surfaces provided by the floor sections 31 and 32 when the panel 58 and the floor sections 31 and 32 are in their operative positions as illustrated in FIG. 1, and a transverse edge 64 which is engageable with the floor 22 of the container adjacent the front edge of the opening 37 when the panel 58 is in the operative position. The panel 58 further is provided with a plurality of transversely spaced reinforcing ribs 65 which are receivable in vertical openings 66 in panel 41 when the panel 58 is in the retracted storage position as illustrated in FIG. 4.

The wall unit 13 is similar in construction to the wall unit 12 and is movable between a storage position as illustrated in FIG. 5 and 6 and an operative position as illustrated in FIGS. 1, 2 and 3. The wall unit 13 includes a rectangular panel 67 mounted on a pair of transversely spaced, vertical peripheral frame members 68 and 69, and a pair of vertically spaced, horizontal peripheral frame members 70 and 71. In addition to the frame members 68 through 71, the panel 67 is provided with a plurality of vertically disposed reinforcing frame members 72 through 77 which interconnect the peripheral frame members 68 and 69. The wall unit 13 further is provided with a pair of roller units 78 and 79 at the upper end thereof which ride on guide tracks 54 and 55 to support the wall unit and permitted it to be moved between its storage and operative positions. A pair of latch bolts 80 and 81 are provided in the lower frame member 71 which are receivable in holes adjacent the rear end of the opening 37 to secure the wall unit 13 in its operative position as best illustrated in FIG. 2.

The front face of the panel 67 is provided with a hinged panel 82 which is similar in construction to the hinged panel 58 connected to the wall unit 12. As best shown in FIG. 2, when the wall unit 13 and the panel 82 are disposed in their operative positions the free transverse edge of the panel 82 will engage the floor 22 adjacent the rear edge of the opening 37, and the converging side edges thereof will engage the inclined surfaces of the floor sections 34 and 35, with the parallel side edges thereof disposed adjacent the side walls 23 and 24 of the container. The panel 82 is movable between an operative position as illustrated in FIG. 2 and an inoperative or storage position as illustrated in FIG. 5.

When the floor sections 31 through 36 are in their open, operative positions, the wall units 12 and 13 are in their operative positions adjacent the front and rear edges of opening 37, and the panels 58 and 82 are swung downwardly as illustrated in FIGS. 1 and 2, such components, in cooperation with portions of side walls 23 and 24, and top wall 25 of the container, define a compartment 83 having a rectangularly shaped upper section and a funnel-shaped lower section communicating through the opening 37 with the interior of the hoppers 38. The flexible liner 14 in its expanded condition is provided with a configuration which substantially conforms to the configuration to the compartment 83. More specifically, the liner 14 includes a top panel 84 adapted to lie adjacent the top wall 25, a side panel 85 adapted to lie adjacent the side wall 23 and rest at its lower end on the inclined surfaces provided by the floor sections 32, 34 and 36, a side panel 86 adapted to lie adjacent side wall 24 and rest at its lower end on the inclined surfaces provided by the floor sections 31, 33 and 35, a front end panel 87 adapted to lie adjacent to panel 41 of wall unit 12 and rest at its lower end on the inclined surface provided by the panel 58,
and a rear end panel 88 adapted to lie adjacent the panel 67 of wall unit 13 and rest at its lower end on the panel 82. The lower end of the flexible liner may simply be open to communicate with the interior of the hoppers 38 through the opening 37 or may be provided with projecting portions extending through the opening 37 into the hoppers 38.

The flexible liner 14 is supported within the compartment by means of a plurality of transversely disposed hanger rods 89 which extend through tunnel loops 90 provided on top panel 84 of the liner, each of which are provided with rollers 91 and 92 at the ends thereof which ride on a pair of transversely spaced guide tracks 93 and 94 disposed adjacent the guide tracks 54 and 55. The front and rear liner panels 87 and 88 are provided with tunnel loops 93 and 94 at the upper ends thereof which are adapted to receive therethrough hanger rods 95 and 96 which are rigidly mounted on the upper ends of the panels 41 and 67 of wall units 12 and 13. The side panels of the liner further are supported by a plurality of straps 97 provided at the upper ends thereof which receive the ends of the hanger rods 89 therethrough. The lower portions of the side and end panels of the liner are maintained adjacent the side walls of the container and the wall units by means of a plurality of straps 98 which may be secured to suitable hooks provided in the side walls of the container and the panels 41 and 67 of the wall units. The upper panel 84 of the liner also is provided with a plurality of longitudinally spaced flexible conduit sections 99 which are registerable with and adapted to extend into the annular loading conduits 29 of the top wall of the container when the liner is in its expanded condition, as illustrated in FIG. 2. Each of the conduits is provided with an opening in the upper end thereof which may be closed with an interlocking fastener or zipper 100.

When it is desired to utilize the container unit as described to transport general cargo, the floor sections 31 through 36 are swung downwardly into the positions as illustrated in FIG. 6, flush with the container floor 22, to close the opening 37, the panels 58 and 82 of the wall units are swung upwardly and secured against the panels 41 and 67, and the wall units 12 and 13 are rolled forwardly to the positions as illustrated in FIG. 5 and secured therein by means of the latch bolts 80 and 81 which are received in registerable holes in the container floor, so that the flexible liner 14 is supported from the hanger rods 89 and is disposed in folds between the wall units. With the various components of the carrier unit thus positioned, various types of cargo can be loaded into the container through the rear access doors.

Whenever it is desirable, however, to convert the carrier unit for transporting bulk material, the wall units 12 and 13 are detached from their storage positions, moved forwardly to the positions as illustrated in FIGS. 1 through 4, and secured therein by means of the latch bolts 56, 57, 80 and 82. The positioning of the wall units as described will cause the flexible liner 14 to expand so that it will be suspended from the hanger rods disposed adjacent the top wall of the container, and substantially will extend from one wall unit to the other with the conduit sections 99 being substantially registered with the annular conduits 29. A workman would then move the lower ends of the liner away from the side walls and rods units and swing the floor sections 31 through 36 outwardly into their operative positions as illustrated in FIGS. 1 through 4. After the floor sections have been positioned, the panels 58 and 82 are swung downwardly into position also as illustrated in FIGS. 1 through 6. With the compartment 83 thus formed, the side and end panels of the liner are secured to the side walls of the container and the wall units by means of the straps 98. Thus, the flexible liner will be in its expanded condition having a configuration conforming to the configuration of the compartment 83 with the lower open end thereof communicating with the interior of the hoppers 38 through the opening 37. The lower ends of the side and end panels of the liner will rest on the floor sections 31 through 36 and the panels 58 and 82, so that the lower end of the liner will be formed as a funnel for directing bulk material deposited therein through the opening 37 into the hoppers 38.

The panels 41 and 67 of the wall units are provided with doors 101 and 102 which provide access to the compartment 83 and also the container space between the wall unit 12 and the front end wall 26. It is contemplated that workmen assembling the unit for carrying bulk materials will utilize such access doors to move the floor sections 31 through 36 and the panels 58 and 82 into position and also to position the liner and secure it to the container walls and the wall units. The end walls of the liner also may be provided with closable openings to permit access to the interior of the liner so that any additional adjustments to the liner can be made. With the components thus assembled, the workmen may then exit through the rear opening of the container and close the rear access doors so that the unit will be ready to be loaded with the bulk material. This may be accomplished simply by opening the access doors 30, reaching down and pulling the sections 99 upwardly through the annular mountings 29, opening the sections 99 and inserting therein a chute or conduit for loading the bulk material into the liner. The bulk material can be loaded into the liner either by gravity feed or by a force feed method utilizing a pneumatic conveying system or the like. After the liner has been fully loaded, the liner is secured and the access doors are closed so that the carrier unit is then ready to be transported to its destination. It will be appreciated that when the liner is loaded, the bulk material will flow downwardly through the opening 37 into the hoppers 38 and eventually fill the entire liner.

When the carrier unit has been moved to its destination and it is desired to unload it, this may be accomplished simply by connecting the discharge end 40 of the conduit 39 with a suitable conveying system, to draw the bulk material out of the unit. It will be appreciated that when a vacuum is applied to the conduit 39, bulk material within the liner will be caused to move downwardly through the hoppers 38 into the conduit 39, and be drawn outwardly through the discharge opening 40 into the conveying system. It further will be appreciated that the inclined surfaces provided by the floor sections 31 through 36 and panels 58 and 82 will facilitate the gravity flow of the material within the liner into the hoppers 38 and the conduit 39, so that all of the bulk material within the liner will be removed quickly and efficiently.

After the bulk material has thus been unloaded and it is desired to convert the carrier unit so that it again will be adapted to carry general cargo, the pneumatic conveying system is detached from the conduit 39, and
workmen enter the compartment 83 through the rear access doors of the container and access door 102 to detach the lower ends of the liner from the container walls and the wall units 12 and 13. As soon as this has been accomplished, the workmen next swing the panels 58 and 59 upwardly and secure them against the panels 41 and 67, and swing the floor sections 31 through 36 downwardly to close the opening 37. The latch bolts 56, 57, 80 and 81 are then lifted to their unatched positions, the workmen exit through the access door 102 and then proceed to push the wall unit 13 forwardly so that the wall units with the liner disposed in folds between them are moved to the storage position as illustrated in FIG. 5. The latch bolts 80 and 81 are then dropped into position to secure the wall units in the storage position. At such time, the carrier unit will be in condition for loading general cargo in the conventional manner.

Although it is preferred that the flexible liner 14 be permanently installed within the container between the wall units 12 and 13, it would be possible to utilize a removable, flexible liner or to secure the flexible liner within the compartment in any manner suitable in an unsecured manner. It further is contemplated that in lieu of providing a pair of wall units which are movable longitudinally within the container between storage and operable positions, such wall units may be hingedly connected to one or more walls and swung between storage and operative positions. By way of example, the wall units 12 and 13 could be hingedly connected to the top wall whereby the units can be swung upwardly and secured to the top wall for storage, and swung downwardly with the lower ends thereof secured to the floor, into their operative positions.

Referring to FIG. 2, it will be noted that when the carrier unit is assembled for carrying bulk material in the liner disposed within the compartment 83, there is provided a forwardly disposed compartment 103 between the front end wall 26 and the wall unit 12, and a rearwardly disposed compartment 104 between the wall unit 14 and the rear access doors. It is contemplated that by providing suitable access doors for the compartment 103, such compartments may be utilized for carrying general cargo while bulk material is carried in the liner within the compartment 83.

From the foregoing detailed description, it will be evident that there are a number of changes, adaptations, and modifications of the present invention which come within the province of those skilled in the art. However, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof as limited solely by the claims appended hereto.

We claim:

1. A carrier unit adapted to be converted into a bulk material carrier comprising a container having a floor, said floor having at least one floor section movable to a selected position providing a surface inclined toward an opening in said floor formed by the removal and positioning of said floor section into said selected position, at least one substantially vertically disposed wall unit disposed within said container, movable longitudinally between a storage position and an operative position adjacent said floor section to cooperate with said floor section in said selected position and portions of the interior walls of said container to define a compartment, and a flexible liner for holding bulk material, mountable in said compartment, said flexible liner having an inlet for charging bulk material thereinto and at least one outlet cooperating with said floor opening for communicating the interior of said flexible liner with the exterior of said container whereby when said wall unit is secured in its storage position and said floor section remains as a floor component, said container may be utilized to transport general cargo and when said floor section is disposed in said selected position, said wall unit is disposed in its operative position adjacent said floor section, and said flexible liner is mounted within said compartment, said container may be utilized to transport bulk material within said flexible liner disposed within said compartment.

2. A carrier unit adapted to be carried to be converted into a bulk material carrier according to claim 1 wherein said flexible liner is provided with an expanded configuration adapted to conform to the configuration of said compartment.

3. A carrier unit adapted to be converted into a bulk material carrier according to claim 1 wherein said container includes a hopper communicable with the interior of said container.

4. A carrier unit adapted to be converted into a bulk material carrier according to claim 3 wherein said flexible liner is provided with a portion extendable through said floor opening into said hopper, which includes said outlet.

5. A carrier unit adapted to be converted into a bulk material carrier according to claim 1 wherein said container is supported on at least one wheel unit.

6. A carrier unit adapted to be converted into a bulk material carrier according to claim 1 wherein flexible liner is supported on carrier means movable selectively into a storage position in said container and an operable position within said container.

7. A carrier unit adapted to be converted into a bulk material carrier according to claim 1 wherein said container includes a hopper communicable with the interior of said container, and wherein said flexible liner is supported on carrier means movable selectively into a storage position in said container and an operative position within said compartment, said flexible liner has an expanded configuration adapted to conform to the interior configuration of said compartment, and said flexible liner is provided with a portion extendable through said floor opening into said hopper, which includes said outlet.

8. A carrier unit adapted to be converted into a bulk material carrier according to claim 7 wherein said container is supported on at least one wheel unit.

9. A carrier unit adapted to be converted into a bulk material carrier according to claim 1 which includes two wall units movable longitudinally between storage positions and operative positions adjacent said floor section to cooperate with said floor section in said selected position and portions of the interior walls of said container to define said compartment.

10. A carrier unit adapted to be converted into a bulk material carrier according to claim 9 wherein said flexible liner is supported on carrier means and is disposed between said wall units.

11. A carrier unit adapted to be converted into a bulk material carrier comprising a container including a floor, a pair of opposite side walls and end walls, at least one pair of floor sections hingedly connected to said floor and swingable laterally so that the longitudinal
free edges thereof engage and rest against said side walls to provide a pair of opposed surfaces inclined toward an opening formed upon swinging said floor sections laterally into engagement with said side walls, a pair of substantially vertically disposed wall units movable longitudinally from a storage position to positions adjacent said floor sections to provide a compartment defined by said wall units, said floor sections in their open positions, said side walls and said top wall, and a flexible liner for holding bulk material, mountable in said compartment, said flexible liner having an inlet for charging bulk material thereinto and at least one outlet cooperate with said floor opening for communicating the interior of said flexible liner with the exterior of said container.

12. A carrier unit adapted to be converted into a bulk material carrier according to claim 11 including panels disposable in said compartment between said opened floor sections providing additional surfaces inclined toward said opening thus defining a compartment having a lower funnel section.

13. A carrier unit adapted to be converted into a bulk material carrier according to claim 12 wherein said additional panels are hingedly connected along transverse edges to said wall units and are provided with converging side edges engageable with said floor sections in the open positions for forming said funnel section.

14. A carrier unit adapted to be converted into a bulk material carrier according to claim 11 wherein said flexible liner is provided with an expanded configuration adapted to conform to the interior configuration of said compartment.

15. A carrier unit adapted to be converted into a bulk material carrier according to claim 11 wherein said flexible liner is provided with a portion extendable through said floor opening.

16. A carrier unit adapted to be converted into a bulk material carrier according to claim 15 wherein said flexible liner is provided with a portion extendable through said floor opening into said hopper, which includes said outlet.

17. A carrier unit adapted to be converted into a bulk material carrier according to claim 11 wherein said carrier is supported on at least one wheel unit.

18. A carrier unit adapted to be converted into a bulk material carrier according to claim 11 wherein said flexible liner is supported on carrier means disposed between said wall units and is movable therewith selectively into a storage position in said container and an operable position in said compartment.

19. A carrier unit adapted to be converted into a bulk material carrier according to claim 11 wherein said container includes a hopper communicable with the interior of said compartment through said floor opening, and wherein said flexible liner is supported on carrier means disposed between said wall units and is movable selectively into a storage position in said container and an operable position within said compartment, said flexible liner is provided with an expanded configuration adapted to conform to the interior configuration of said compartment, and said flexible liner is provided with a portion extendable through said floor opening into said hopper, which includes said outlet.

20. A carrier unit adapted to be converted into a bulk material carrier according to claim 19 wherein said container is supported on at least one wheel unit.

21. A carrier unit adapted to be converted into a bulk material carrier according to claim 11 including first means disposed within said container for supporting said wall units and guiding said units between said storage and operative positions, and second means disposed within said container for supporting said liner and guiding said liner between said storage position and said operative position.

22. A carrier unit adapted to be converted into a bulk material carrier according to claim 21 wherein said first means comprises a pair of longitudinally extending, transversely spaced guide tracks and rollers secured to said wall units supported on said guide tracks and movable along the length thereof, and said second guide means consists of a pair of longitudinally extending, transversely spaced guide tracks and a plurality of transversely extending hanger rods movable along said guide tracks on which said liner is suspended.

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