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Mixed Cargoes Transportation

FIELD OF INVENTION

This invention relates to a method of transporting a mixture of cargoes in a single haul. In particular, this invention relates to the transfer of a mixture of discrete and flowable cargoes in one haul by road, rail, sea or air.

BACKGROUND

Cargoes for transportation or transfer may be packed in cartoons; cans, bottles, etc. which are then re-packed into cartoons or on pallets; whilst flowable cargoes, whether they are solids, granular, powders or fluids, are handled using tank-type containers, for eg., IMO 1 tank containers. The present transport means tend to carry cargoes of similar types during each haul. This often creates inefficiencies during transportation in that once a cargo is unloaded at a delivery station, the transport means often return to the supply station empty, or the transport means are empty before being loaded with goods at a supply station.

In an example of a syrup manufacturing plant, sugar is brought in by dry bulk carriers, the manufactured syrup is supplied out by wet bulk carriers or in bottles packed in cartoons or on pallets and loaded onto lorries or trailers. Each of these transport means would arrive at the plant loaded with raw materials or leave the plant with manufactured syrup for distribution. Each transport means would then leave the plant emptied of the raw materials or arrive back to the plant emptied of its goods. Thus, there is a need to minimise a transport means being empty during its return trip.

SUMMARY

This invention provides an apparatus and method for transporting a mixture of cargoes in a single haul. According to an embodiment of the present invention, the apparatus comprises a frame with at least an inlet port and at least an outlet port; and one or more cargo bags connected to the frame, each said cargo bag is foldable with an inlet of each cargo bag in register with one at least inlet port on the frame and an outlet of the cargo bag in register with one at least outlet port on the frame; wherein each cargo bag is



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operable for containing, transporting and discharging a bulk or flowable cargo and the space in the frame that is above or below a folded cargo bag is operable for transporting other discrete cargoes in each haul.

In another embodiment of the present invention, the method comprises connecting an inlet of a cargo bag to an inlet port of the frame; closing all outlets of the cargo bag; filling the cargo bag with a bulk or flowable material at a supply station for transportation; discharging the materials in the cargo bag from its outlet through an outlet port of the frame at a delivery station and retracting the cargo bag into its folded position to complete one transport haul; and loading other discrete or pre-packed cargoes above or below the space of the empty and folded cargo bag or loading another bulk or flowable cargo into an or the empty cargo bag for another transport haul.

In yet another embodiment of the present invention, the method further comprises lifting the body of the cargo bag near the end of a cargo discharging operation so that the tapering section is extended to achieve a cleaner discharge of the cargo contents.

In an embodiment of the cargo bag, the cargo bag comprises an inlet, an inlet sleeve, an upper end of a body connected to the inlet, a tapering section connected to a lower end of the body, an outlet connected to the tapered end of the tapering section and an outlet sleeve. In another embodiment, the cargo bag comprises a closure means at each of the inlet and outlet sleeves. In another embodiment, the cargo bag is formed with folds like those of an accordion. In another embodiment, the folds of the cargo bag are reinforced with harness fabric strips. Rings/hooks may be provided on the harness fabric strips.

In yet another embodiment of the present invention, a bag extension and retract systems are provided; such as; pulleys and line systems (for one example only) are provided to extend or retract a cargo bag. Ropes/chains may be used to connect the rings/hooks provided on the body and/or tapering sections of a cargo bag to attachment rings or hooks on a line of the pulley system.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further described by way of non-limiting examples with references to the accompanying figures, in which:

FIG. 1 illustrates a cross-section of a frame according to an embodiment of the present invention;

FIG. 2A illustrates a cross-section of a frame fitted with a cargo bag according to another embodiment of the present invention;

FIG. 2B illustrates a longitudinal section of a frame with cargo bags (filled/retracted) and discrete cargoes according to the present invention;

FIGs. 3A-3D illustrate various cargo bags according to other embodiments of the present invention;

FIGs. 4A-4B illustrate the construction of the cargo bag according to the present invention;

FIGs. 5A-5D illustrate the various stages of filling of the cargo bag of the present invention; FIGs. 5E-5J illustrate the various stages of unloading of the cargo from the cargo bag of the present invention;

FIGs. 6A-6D illustrate side views of a pulley and line system according to the present invention;

FIGs. 6E-6H illustrate embodiments of the pulley and line system operable to connect with the body and tapering section of the cargo bag; and

FIG 6I illustrates the positions of a combined embodiment of pulley and line systems, each system operable to connect separately with the body and tapering section of a cargo bag.

DESCRIPTION

FIG. 1 shows a sectional view of a frame 10 for transporting a mixture of cargoes according to the present invention. Each frame 10 is made up of two vertical quadrilateral frame formed with four members and the two quadrilateral frames are joined by four longitudinal members at the corners of the quadrilateral frames to form a parallelepiped. Additional beams may be provided in each of the six surfaces formed by the members of the frame 10. In one embodiment of the frame 10, the frame 10 is sized and dimensioned to suit the carriage bed of a lorry, trailer or train carriage. In another embodiment of the frame 10, the frame 10 is sized and dimensioned as a standard freight container for transfer on regular container trailers and through container ports and container ships. In another embodiment of the frame, the frame 10 is sized and dimensioned as an air-freight container.

In one embodiment of the frame, each frame 10 has lifting pockets 12 on its members for use with forks of a forklift or hooks of a hoist. In another embodiment of the frame, the frame 10 is in the form of a standard freight container and has corner castings 13 in addition to lifting pockets 12.

In one embodiment of the frame, the frame 10 has all sides open. In another embodiment of the frame, the frame 10 has panels 14 on all sides. The panels 14 may be fixed, removable, slidable or hinged. Through some of these panels 14, one or more inlet ports 14a and outlet ports 14b are provided. Some of the remaining panels may form front or rear doors. Preferably, the inlet ports 14a are through the top panels, whilst the outlet ports 14b are through the bottom panels and/or side/front/rear panels. Preferably, the inlet/outlet ports are provided with covers. In another embodiment of the frame, the front/rear doors and/or the opening at the side panels can also serve as the outlet port. In another embodiment of the frame, the inside of the frame 10 is compartmentalised by divider panels 16. The divider panels 16 may be fixed, removable, slidable or hinged.

In one embodiment of the frame, the frame 10 is retrofitted or built onto the chassis of a lorry/trailer/train. In another embodiment, the frame 10 is removably attached to the chassis of a lorry/trailer/train.

FIG. 1 also shows one cargo bag 20 retracted and suspended from an upper part of the frame 10 and discrete cargos are placed on the bottom panel (a substantially flat floor) of frame 10. Preferably the bottom floors of frame 10 are constructed using panels with stronger strength. At least one holder 40 can be provided to hold the cargo bag 20 in its folded/collapsed state. The holder 40 can be selected from the following: bar/s; rope/s; chain/s; plate/s and any combinations thereof. Besides keeping the cargo bag 20 in its collapsed position a plate-type holder 40 also helps to cover and protect the cargo bag 20.

FIG. 2A shows the body 26 of one cargo bag 20 is in its collapsed state whereas the tapering section 28 is in its extended state.

As shows in FIGs. 2A, 2B The body 26 of each cargo bag 20 may be about 2 m by about 2.5 m in cross-sectional area and about 2.5 to about 3m in length in its extended or filled state. With these dimensions, a standard 20-footer freight container can accommodate three such cargo bags 20 arranged in one row along the long dimension of the container, whilst a 40-footer freight container can accommodate six such cargo bags 20 in a similar manner. Each cargo bag 20 may be substantially square or rectangular in cross-section. However, other shapes such as polygonal or round are also possible.

In one embodiment of the cargo bag 20, each cargo bag 20 has an inlet end 22, an outlet end 24 and an accordion-type of collapsible body 26 between the inlet and outlet ends 22, 24. In another embodiment of the cargo bag 20, each inlet end or outlet end has an opening sleeve 22a, 24a, which preferably has accordion-type of folds. In another embodiment of the cargo bag 20, each opening sleeve 22a, 24a is provided with a closure means 30. The closure means 30 is provided to prevent loss or contamination of the materials contained in the cargo bag 20.

The inlet sleeves 22a and outlet sleeves 24a can be of any shape. As an example, the inlet or outlet sleeve 22a, 24a is round and has a diameter of about 50 cm.

In another embodiment of the cargo bag, the closure means 30 may be a zipper. In another embodiment, the closure means 30 is simply a string for tying the sleeve closed.

In another embodiment of the cargo bag 20, the inlet sleeve 22a has a safety relief valve 39 after the closure means 30. The safety relief valve 39 is to allow the vapour pressure above a liquid cargo to release, for example, when the vapour pressure builds up as the environmental temperature increases during the day.

As shown in FIGs. 2A and 3A-3D, the free end of the inlet sleeve 22a has an attachment member 23 for attaching the inlet sleeve 22a to the upper part of the frame 10. The inlet sleeve 22a is in register with the inlet port 14a, which opens through a top panel 14. Similarly, the outlet sleeve 24a has a similar attachment member 23 for attaching the outlet sleeve 24a to the lower part of the frame 10. The outlet sleeve 24a is in register with the outlet port 14b, which opens through a bottom panel 14. In addition, each inlet port 14a and outlet port 14b has an openable cover 15a, 15b (refer to FIG. 1). In one embodiment, the inlet port 14a, inlet cover 15a, outlet port 14b and outlet cover 15b are disposed within the outer dimensions of the frame 10, thus allowing the frames 10 to be stackable one on top of another. In addition, each outlet port 14b has an inside cover 25 (refer to FIG. 1) over each outlet port 14b such that the bottom panel of the inside cover form a substantially flat floor.

As can also be seen in FIG. 2A, the upper part of the frame 10 also has a set of pulleys and line system 44 (marked 44b1 and 44b2 as shown in FIG. 2A is one of the examples of system 44). The pulleys and line system 44 is provided to effect and guide the vertical movement of the cargo bag 20 as the cargo bag 20 is extended. In addition, the pulleys and line system 44 is provided to effect and form the tapering section 28 of the cargo bag, such that a cleaner discharge of cargo out from the cargo bag 20 could be achieved, it is also provided to retract the cargo bag 20 to its folded position after its content has been discharged. In addition, another set of pulleys and line system 44a (not shown) may be provided at the lower part of the frame 10 for extending the cargo bag from its collapsed upper position to a lower position. In another embodiment, the pulley and line systems

44, 44a cooperate to extend and retract the cargo bag 20 (The various stages to extend and retract the cargo bag 20 are shown in FIGs 5A-5J and 6A-6D).

FIGs. 3A-3C show various embodiments of the cargo bag 20. Each embodiment of the cargo bag 20 has a lower tapering section 28 connecting the body 26 to the outlet sleeve 24a. The tapering section 28 is about 2.5 to about 3m long in its extended state. Both the body 26 of the cargo bag and the tapering section 28 have the accordion-type of folds to allow the entire cargo bag 20 to be extended and collapsed. The tapering section 28 helps to ensure that a cargo is emptied when the body 26 of the cargo bag 20 is at its final stages of being retracted. This will become clearer when the operation of the cargo bag 20 is described.

FIG. 3D shows another embodiment of the cargo bag. As shown in FIG. 3D, the cargo bag 20 has an outlet sleeve 24a in the shape of a 60 -degree elbow. Again the lower part of this cargo bag 20 has a tapering section 28 between the body 26 and the outlet sleeve 24a. In another variation the elbow can also be a 90-degree elbow or elbow of other bending angle/s. The elbow-shaped designs are ideal for discharge through outlet port/s on the front/rear/side panels and/or by opening the doors on the front/rear/side panels and/or through the opening on those frame that come without side panels.

In some embodiments of the cargo bag 20/20a, the attachment member 23 is optional.

FIG. 4A shows a cargo bag 20 of the present invention. As shown in FIG. 4A, each cargo bag 20 is made of two layers 21a, 21b. In one embodiment, the outer layer 21a is a high-strength fabric. The inner layer 21b is an impermeable layer, such as a thermoplastic layer. In one embodiment, the inner layer 21b and the outer layer 21a are laminated to each other. Alternatively, the inner layer 21b may be coated onto the inside surface of the outer layer 21a. In addition, the inner and/or outer surfaces of the outer layer 21a may be coated with a waterproofing layer. In another embodiment of the cargo bag 20, both the outer and inner layers 21a, 21b are made of high-strength fabrics and are sew to each other along spaced apart lines.

As shown in FIG. 4A, the the accordion-type body 26 and tapering section 28 are reinforced with horizontal strips 31 and vertical strips 32 of harness fabric sew onto the outer layer 21a of the cargo bag 20.

As can be seen in FIG. 4A, rings 34 are provided at the cross-junctions of the horizontal and vertical harnesses 31, 32. The rings 34 are suitable for connection to the pulleys and line systems 44, 44a for lowering or retracting the cargo bag 20, 20a. The rings/hooks 34 at the top of the body 26 are used to hang the cargo bag 20, 20a beneath the top panel 14 or ceiling of the frame 10.

In another embodiment of the cargo bag 20, also as shown in FIG. 4A, the inner layer 21b is laminated or sew on the outer layer along spaced apart lines, pockets are formed between the outer and inner layers 21a, 21b of the cargo bag 20. Some of these pockets are inserted with rigid bars 36. The rigid bars 36 may be made of metal, plastic or wood and they help to reduce bulging of the cargo bag 20, 20a in areas between the lamination lines and reinforcement harnesses 31, 32.

In another embodiment of the cargo bag 20, also shown in FIG. 4A, the cargo bag has additional inflatable rings 49 attached to the inner layer 21b. The inflatable rings 49 may be inflated during a cargo discharge operation to help break or dislodge the cargo material that may stick to each other and/or onto the inner layer 21b. In yet another embodiment of the cargo bag, vibrators 42 are also provided. The vibrators 42 may be attached to the outer layer 21a.

FIG. 4B shows another embodiment of the cargo bag 20, 20a. As shown in FIG. 4B, the outer and inner layers 21a, 21b of the cargo bag 20, 20a are connected to each other by means of rivets 35. In another embodiment of the cargo bag 20, 20a, the outer and inner layers 21a, 21b are connected to each other by means of peg and socket buttons.

As shown in FIGs 5A to 5D, prior to a filling operation, the inlet port cover 15a and closure mean 30 at the inlet sleeve 22a will be opened whereas the outlet sleeve 24a of a cargo bag 20 is closed by means of the outlet closure means 30 and when the holder 40 is

released the cargo bag 20 is lowered by means of gravity/with the aid of the pulley and line system, such that the lower portion of the body and the tapering section of the cargo bag 20 is lowered down onto the lower part of frame 10. Preferably by this operation the outlet sleeve 24a of the cargo bag 20 registers with an associated outlet port 14b of the frame 10. The pulley and line systems 44b2 keeps the tapering section folded as the lower portion of body 26 of the cargo bag 20 is extended downward to the lower part of the frame 10. The door/s on the front/rear/side panels, the inside cover 25 and outlet port cover 15b can be opened to check that the lower portion of body 26 of the cargo bag 20 is extended down to the lower part of frame 10 and the attachment member 23 of the outlet sleeve 24a of the cargo bag 20 is connected to the outlet port 14b, thereafter, the doors/outlet port covers 15b can be closed and the inside cover 25 is temporary kept aside. The cargo bag 20 is then ready for filling with a bulk or flowable cargo through the upper inlet port 14a and inlet sleeve 22a. The cargo collects inside the cargo bag 20 as more and more cargo fills the cargo bag 20. The filling operation may continue until the bag/s is full to its capacity and the closure means 30 at the inlet sleeve 22a and the inlet port cover 15a can be closed and the frame 10 is ready for delivery.

In a variation, when the bag/s is full to its capacity, the inlet port cover 15a can be closed whereas the closure means 30 at the inlet sleeve 22a can remain opened.

As shown in FIGs 5E to 5J, after the frame 10 is transferred from a supply station to a delivery station, the outlet port 14b is opened and outlet sleeve 24a is connected to a discharge means, such as a conduit or hopper 90 for one example only to accept the cargo material. Once the discharge means is connected, the outlet closure means 30 is opened and the cargo material flows out of the cargo bag by means of gravity and/or with the aid of a discharge equipment. Near the end of a discharge operation, the upper pulleys and line system 44b1 is activated to lift up the lower portion of the body 26 of the cargo bag 20. As the lower portion of the body 26 of the cargo bag 20 is being lifted up, the tapering section 28 of the cargo bag is also extended. At the same time, the taper of the tapering section 28 allows the cargo bag 20 to achieve a cleaner discharge. Thus, the cargo bag 20 of the present invention provides for a more complete or cleaner discharge of the cargo material during each transfer. The extension of the tapering

section 28 will be clearer with a later description of the pulley and line system 44 using FIGs 6A-6D.

In a variation, the inlet port cover 15a/the closure means 30 can also be opened during discharging cargo material out from the cargo bag 20.

After the discharge of cargo out from the cargo bag 20 has been completed and if cargo bag 20 is requires to be retracted and keep at its folded position, the pulley and line system 44b2 will be activated to lift up the lower portion of the tapering section 26 until the cargo bag 20 retracted to its folded position and the holder 40 will be used to hold the cargo bag 20 at its folded position. The covers 25/15a/15b can be closed and the space below the folded cargo bag 20 could be use for other discrete cargos.

In a variation, if cargo bag 20 is requires to fill with another bulk or flowable cargo after the discharge of cargo out from the cargo bag 20 has been completed, then with the tapering section 28 still at its extended position and with the outlet of the cargo bag 20 still registered with the outlet port 14b; the lower portion of body 26 of the said cargo bag 20 can be re-lowered down to the lower part of frame 10 and by closing the closure means 30 on the outlet sleeve 24a and the outlet port covers 15b, another bulk or flowable cargo can start to fill into said cargo bag 20 again through the inlet port 14a and the inlet sleeve 22a.

In yet another variation, the lower portion of body 26 of cargo bag 20 may be lowered down by means of gravity/with the aid of the upper pulley and line system 44 or lower pulley and line system 44a, with the tapering section 28 preceding the lower portion of body 26.

A cargo bag 20 may be re-used for transfer of the same/compatible cargo type. For example, a cargo bag after unloading corn at an animal feed factory may be loaded with manufactured animal feed from the factory. If a different cargo type is not compatible with the earlier cargo type, the used cargo bag may be replaced with another cargo bag

and the used cargo bag may be sent for cleaning when necessary or that just emptied cargo bag can also be cleaned for immediate used.

In an alternative embodiment of the cargo bag, the cargo bag 20a has a common inlet and outlet sleeve, a tapering section 28a joining the common sleeve to a body 26a. The cargo bag 20a is suitable for both loading and unloading of a bulk or flowable cargo from a lower part of the frame 10. Again, the tapering section 28a helps to ensure full discharge of a cargo when the lower portion of body 26a of the cargo bag 20a is pulled up and the tapering section 28a is extended near the end of a discharge operation.

As can be seen in FIGs. 1 and 2B, after a cargo is discharged at an unloading station, such as a raw material at a manufacturing plant, the cargo bag 20 is retracted to an upper part of the frame 10. The lower part of the frame 10 is then available to accommodate other types of cargo to be delivered from the present station, such as cartoons of manufactured goods from the plant. At the same time, a cargo bag 20, 20a within the same frame 10 may be filled with another bulk or flowable cargo for delivery from the present/nearby manufacturing plant/supply station/s. In this way, different types of cargo, whether they are in bulk or pre-packed, can be transported in a frame 10 of the present invention in each haul.

In another embodiment of the present invention, it is possible to arrange an upper bag with elbow outlet sleeve and a bottom fill cargo bag 20a in each compartment of the frame 10. When the bottom fill bag 20a is not in use, other types of discrete cargoes can be placed, for example, on the top of a plate-type holder 40 over the collapsed bottom fill bag 20a after the upper cargo bag is emptied of its content, or the upper cargo bag is re-used/replaced to load another cargo. For bottom fill cargo bag 20a, the plate-type holder 40 can be installed adjacent to the lower part of frame 10 but above the retracted/folded cargo bag 20a, such that beside protecting cargo bag 20a, it can also use as a supporting platform for discrete cargo to be placed on its top.

FIGs. 6A-6D show the side views of an embodiment of a pulley and line system 44b. FIGs. 6E-6I show plan views of the pulley and line system 44b. As shown in FIG. 6A,

the pulley and line system 44b has two separate systems 44b3, 44b4 cooperating with each other. As shown in FIG. 6A, the rings 34 attached to the lower portion of the body 26 of the cargo bag 20 are connected to the pulley and line system 44b3 whilst the rings 34 attached to the lower part of the tapering section 28 are connected to the other pulley and line system 44b4. The pulley and line systems 44b3, 44b4 are shown displaced for clarity purposes.

When the lower portion of the body 26 of the cargo bag 20 is to be lowered down, both the pulley and line system 44b3, 44b4 on each side of the cargo bag 20 turns in the same direction and cooperate with the pulley and line systems on the other side of the cargo bag. As can be seen from FIG. 6B, the lower portion of the body 26 of the cargo bag 20 is lowered down to the floor of the frame 10, with the tapering section 28 remaining folded. The cargo bag 20 is then ready to accept a cargo material.

After the outlet sleeve 24a of a cargo bag 20 is opened and the cargo content is allowed to unload to a discharge equipment, the lower portion of the body 26 of the cargo bag 20 is lifted by the pulley and line system 44b3 by rotating in a reverse direction. The pulley and line system 44b4 remains un-activated, resulting in the tapering section 28 of the cargo bag 20 being extended or unfolded. Consequently, the taper of the tapering section 28 ensures more complete discharge of the cargo contents. The cargo bag 20 in this position is shown in FIG. 6C.

In order to retract the tapering section 28 to its folded position after cargo is discharged from the cargo bag 20, the pulley and line system 44b4 can be activated to rotate in the reverse direction. FIG. 6D shows the tapering section 28 of the cargo bag 20 being retracted upward until its folded/storage position at the upper part of the frame 10.

FIG. 6E shows a top, plan view of an embodiment of the pulley and line system 44b. For clarity purposes, only pulley and line system 44b1 is shown. As shown in FIG. 6E, a drive 60 is provided to rotate two sets of spaced-apart drive pulleys 62a, 62b disposed at the upper corners of a cargo compartment. The drive pulleys 62a, 62b are linked by a shaft 64.

Similarly, on the opposite side of the cargo bag 20 is disposed a set of driven pulleys 66a, 66b linked by another shaft 64. However, driven pulley 66a is coupled to a direction inverter 70. The direction inverter 70 is linked by a belt/chain 72 to the drive pulley 62a such that the drive pulleys 62a, 62b and driven pulleys 66a, 66b cooperate to extend or retract the cargo bag 20 as desired.

FIG. 6F shows another embodiment of the pulleys and line system 44c. As shown in FIG. 6F, a central drive pulley 62 is provided on a shaft 64 and two lengths of ropes/chains are connected from an attachment ring 74 on the line system to separate lower corners of the body 26 of the cargo bag 20. Similar arrangements of a central driven pulley 66 on a shaft 64 and two lengths of ropes/chains connected from an attachment ring 74 on the opposite line system to separate lower corners of the body 26 of the cargo bag 20 are also provided. The two pulleys and line systems 44c are again linked by a belt/chain 72 and direction inverter 70 as in the previous embodiment.

FIG. 6G shows a variation of the embodiment of the pulleys and line system 44c shown in FIG. 6F. Instead of two lengths of ropes/chains attached to the separate lower corners of the body 26 of the cargo bag 20 from each drive/driven pulley 62, 66, FIG. 6G shows only one length of rope/chain from each pulley 62, 66 is connected to each side at the lower portion of the tapering section 28.

FIG. 6H shows yet another embodiment of the pulleys and line system 44d. As shown in FIG. 6H, a double output drive 60a is provided. In this embodiment, a pulley is disposed at each of the four corners of the cargo compartment. Each drive 60a output shaft is connected to a drive pulley 62, which in turn is connected to a driven pulley 66 by a series of universal joints 80. Four lengths of ropes/chains separately connected to the four lower corners of the body 26 of the cargo bag 20 are separately connected to the respective line systems of each drive/driven pulley.

FIG. 6I shows the lower portion of the body 26 and the tapering section 28 are connected to the respective pulleys and line systems 44b1, 44b2.

While pulley and line systems 44, 44a have been used and described as an example for extending and retracting the cargo bag 20, other systems, such as, belt and pulleys; chain and pulleys; chain hoist; lead screws and nuts, ball screws and nuts, fluids cylinders, and any combinations of these can also be used.

With the present invention, the frame 10 allows a mixture of cargoes to be transported to and from a station/s by maximising the effective use of space in the frame 10 and minimise/avoidance of a transport means being empty before or after delivery, thereby improving the efficiency of prior art transportation or transfer of goods and cargoes.

While a few embodiments of the apparatus and a method of using the apparatus have been described and illustrated, it is understood that many changes, modifications and variations to the principles of the present invention could be made without departing from the scope of the invention. For example, the pulley and line system 44/44a, . . . in each compartment may be inter connected, and are driven by a common drive by means of selector device such as clutches for one example only.

CLAIMS:

1. An apparatus for transport of a mixture of cargoes comprising:
a frame; and
one or more cargo bags attached to the frame, with each said cargo bag being foldable;
wherein each cargo bag is operable for containing, transporting and discharging a bulk or flowable cargo and the space in the frame that is above or below a folded/retracted cargo bag is operable for transporting other discrete cargoes in each transport haul.
2. An apparatus according to claim 1, wherein each cargo bag comprises an inlet, an outlet and a body between the inlet and the outlet.
3. An apparatus according to claim 1 or 2, wherein the outlet of the cargo bag comprises two or more outlets.
4. An apparatus according to any one of the preceding claims, wherein each inlet or outlet of the cargo bag further comprising a sleeve.
5. An apparatus according to claim 4, wherein the sleeve further comprising a closure means.
6. An apparatus according to any one of claims 2-5, wherein the cargo bag further comprising a tapering section between the body and outlet(s).
7. An apparatus according to claim 6, wherein the body and the tapering section of the cargo bag is foldable like that of an accordion.
8. An apparatus according to any one of claims 2-7, wherein the frame further comprises an inlet port and the inlet of the cargo bag is in register with the inlet port.

9. An apparatus according to any one of claims 2-8, wherein the frame further comprises one or more than one outlet port and the outlet of the cargo bag is in register with the outlet port.
10. An apparatus according to any one of the preceding claims, further comprising a bag extension and retract system.
11. An apparatus according to claim 10, wherein the bag extension and retract system is selected from the following systems: lines and pulleys; belts and pulleys; chains and pulleys; chain hoist; lead screws and nuts; ball screws and nuts; fluid cylinders; and any combinations thereof.
12. A method for transporting a mixture of cargoes in a frame, the method comprising:
 - supporting a cargo bag and an inlet of a cargo bag by the frame;
 - closing all outlets of the cargo bag;
 - filling the cargo bag through its inlet with a bulk or flowable material at a supply station for transportation;
 - discharging the materials in the cargo bag from its outlet at a delivery station and retracting the cargo bag into its folded position to complete one transport haul; and
 - loading other discrete or pre-packed cargoes above or below the space of the emptied and folded cargo bag or loading another bulk or flowable cargo into an empty or the emptied cargo bag for another transport haul.
13. A method according to claim 12, wherein each cargo bag comprises a body between the inlet and the outlet.
14. A method according to claim 12 or 13, wherein the outlet of the cargo bag comprises two or more outlets.
15. A method according to any one of claims 12-14, wherein each inlet or outlet of the cargo bag comprises a sleeve.

16. A method according to claim 15, wherein the sleeve further comprises a closure means to prevent loss or contamination of the materials in the cargo bag.
17. A method according to any one of claims 13-16, wherein the cargo bag further comprises a tapering section between the body and the outlet.
18. A method according to claim 17, wherein the body and the tapering section of the cargo bag is foldable like that of an accordion.
19. A method according to any one of claims 12-18, wherein the frame further comprises an inlet port and the inlet of the cargo bag is in register with the inlet port.
20. A method according to any one of claims 12-19, wherein the frame further comprises one or more than one outlet port and the outlet of the cargo bag is in register with the outlet port.
21. A method according to any one of claims 12-20, wherein the frame further comprising a bag extension and retract system.
22. A method according to claim 20 or 21, wherein lowering a cargo bag comprises lowering a lower portion of the body and tapering section of the cargo bag by the bag extension and retract system onto a lower part of the frame such that the outlet(s) of the cargo bag is/are in register with the corresponding outlet(s) of the frame.
23. A method according to claim 21 or 22, wherein discharging the materials contained in a cargo bag comprises lifting a lower portion of the body of the cargo bag by the bag extension and retract system near the end of the discharging operation so that the tapering section is extended to achieve a cleaner discharge of the materials.
24. A method according to any one of claims 21-23, wherein the bag extension and retract system is selected from the following systems: lines and pulleys; belts and pulleys;

chains and pulleys; chain hoist; lead screws and nuts; ball screws and nuts; pneumatic cylinders; and any combinations thereof.

25. A method according to claim 24, wherein the bag extension and retract system comprises two systems.

26. A method according to claim 25, wherein the bag extension and retract system cooperates with the other system to extend or retract a bag.

27. A method according to any one of claims 12-26, wherein loading another bulk or flowable cargo comprises replacing a (used) cargo bag with a clean cargo bag and loading the clean cargo bag.