Abstract: The present invention relates generally to a container load-positioning tube and liner assembly which provides for a method of positioning and holding a folded liner (4) in a vertical position within the dram or container (2) prior to product loading and during product loading.
Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(H))
1. TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to a container load-positioning tube and liner assembly which provides for a method of positioning and holding a folded liner in a vertical position within the container or drum prior to product loading and during product loading and discharging.

2. BACKGROUND OF THE INVENTION

Containers such as steel drums and tanks or the like are typically used to transport or ship products or materials of various forms such as solid, granular and liquid products. However, the use of drums and other similar containers presents a possibility of contamination to occur particularly if the containers are made of metal which is susceptible to rust, corrosion and flaking off of the protective inner liner from abuse or mishandling and even leaking. Further, the cost of reusing steel or plastic moulded drums and similar containers is generally high due to environmental concerns for the proper disposal of the residue in the empty drums and disposal of the wash water used in reconditioning the drums. High-end liquid products such as food-grade and pharmaceutical grade products are normally restricted from being shipped in reconditioned or second hand drums. To address the drawbacks of contamination and leakages of the product contained in the containers, liners made of inert material such as thermal plastics are employed within the containers to form a protective covering preventing contact between the product and the walls of the containers. Conventionally the containers that are used to transport liquid products or materials are either open-topped containers with a removable top or closed top containers that are provided with a small bung and vent hole for the liquid product that are to be transported to be filled into. In a
closed drum container as disclosed in US Patent 3,377,766 a method is disclosed where the liner is in the form which may be inserted into a drum through the small bung hole and thereafter readily air-inflated into contact with the interior walls of the drum and the liquid product to be transported are subsequently filled into the inflated liner located within the closed container. However as the bung hole is relatively small in closed containers and the liner being larger than the standard drum opening inserting the liner (although in its folded deflated form) through the sharply threaded bung hole will certainly damage the liner. Further as the liner has to be very thin in order for it to be folded down to a size smaller than the bung hole to facilitate insertion, the liner is therefore susceptible to tear or damage not only during insertion through the bung hole but also by any interior imperfection in the steel drum such as rust or roughness of the surface. Being thin the liner is also susceptible to tear by the weight of the product or material as the products and materials flow in. Further the use of air to inflate the liner before liquid products or materials are filled in will inevitably add contaminants to the product or material that is eventually filled into the drum for shipment or transportation. In the case of open topped drums and similar containers with, removable tops the use of a thin-wall liner is also problematic in that the liner must be inflated properly. Lay-flat liners must be supported and adjusted to prevent the corners from being trapped as the product or liquid flows in as there is currently no form of control when the product or material is filling into the liner to ensure that a proper footprint on the floor of the drum is developed thereby facilitating an optimum fill as without the proper control the product or material entering the liner will be subjected to free fall and in the case of liquids, splashing and foaming will result due to such free fall. The prevention of free fall is also to ensure that the product does not override any part of the liner folds with the product itself thereby trapping some of the liner under the product thus creating an incomplete fill and this could rupture the liner from loading forces. For the drum to fill properly the liner must not be allowed to twist or be pushed out of a vertical position by liquid product as it flows into the liner, otherwise the corners or side
walls will become trapped by the liquid and thereby the liner will be out of position for a proper loading. This will result in less that a total fill and even rupture of the liner.

Improvements on positioning of the drum liner have focused on the manner in which the liner is mated to the opening or bung hole in the lid of the drum as the insertion of the liner in the drum is critical for proper functioning of the package during filling and shipment. These have been disclosed in several patents such as US Patent No. 5,222,620, 3,167,210, 3,409,201 and 5,046,634. Briefly US Patent No. 5,222,620 discloses a drum liner locking and locating apparatus that is provided for securing a drum liner to a drum. The drum liner apparatus primarily comprises a fitting, a liner, and a non-releasable securing means. The fitting is passed through an opening in the lid of a drum before the lid is attached to the drum. The fitting can only be passed through the opening so that the liner is in a position that the liner can expand to the full size of the drum. After the fitting is in place, the non-releasable securing means fastens the fitting to the drum raising the drum liner to the top of the drum. Consequently, to remove the drum liner, the top of the drum must be removed hence destroying the drum and prohibiting reconditioning or reuse of the drum. US Patent No. 3,167,210 discloses a device for securing the filler neck of a container liner to the periphery of an opening in the container through which the filler neck protrudes that prevents the neck of a flexible liner from being accidentally withdrawn when the container is subjected to mechanical shock whilst US Patent No. 3,409,201 discloses a plastic liner with its neck that projects outwardly through an opening in the top of the drum provided with a series of circumferentially disposed lugs having top cam surface permitting progressive flexing of the lugs when the neck is inserted through the drum opening for securely engaging surfaces on the said drum adjacent the opening so as to prevent the liner from falling into the drum interior and to effectively prevent leakages of liquid product during filling. US Patent 5,046,634 discloses a drum
liner assembly focusing on a fitting that mates with a specially cut hole on the lid of the drum capable of preventing twisting of liner in the drum.

However the above prior arts have centered on the plastic liner fitting and its attachment to the drum top and if positioning of the drum liner for filling is addressed at all, it is by means of the air inflation method which is unsatisfactory as described above.

It is therefore desirable that the present invention provides a container load-positioning tube and liner assembly for use in steel and plastic and other type semi-open end drums or open end drums provided with at least a load bridge across the top of the drum to support the container load-positioning tube and liner assembly during filling to alleviate the above said drawbacks by having a load-positioning tube assembly and staging sleeve that are capable of directing the liquid products to the bottom of the container but preventing free fall or direct impact of the products or materials on the bottom of the container as the products are filling in whilst able to cause the liner to gradually open due to the hydraulic pressure exerted by the rising product or materials to develop a proper footprint on the floor of the drum thereby ensuring an optimum fill while at the same time reducing the carbon footprint of recycling steel, plastic and other type drums and containers.

3. SUMMARY OF THE INVENTION

Accordingly, it is the primary aim of the present invention to provide a container load-positioning tube and liner assembly that is capable of providing a proper opening of liner and filling sequence inside the container to achieve optimum fill.

It is yet another object of the present invention to provide a container load-positioning tube and liner assembly capable of reducing the carbon footprint of recycling the said container.
It is yet another object of the present invention to provide a container load-positioning tube and liner assembly that is capable of holding the folded liner in a vertical position within the container so that it is able to unfold in stages as the product is loaded.

It is another object of the present invention to provide a container load-positioning tube and liner assembly that is capable of directing the products to the bottom of the container but at the same time preventing direct impact of the products on the floor of the container bottom due to free fall.

It is another object of the present invention to provide a container load-positioning tube and liner assembly that is capable of minimising splashing and foaming caused by free-fall loading which degrades oxygen sensitive products or can even cause separation of water-based emulsifications.

It is yet another object of the present invention to provide a container load-positioning tube and liner assembly that is able to develop a proper footprint on the floor of the container for an optimum fill.

It is yet another object of the present invention to provide a container load-positioning tube and liner assembly that is capable of exploiting the loading product's hydraulic force to gradually cause the opening of the liner as it is being filled by the rising product thus eliminating prior air-inflation technique of opening the plastic liner.

It is further another object of the present invention to provide a container load-positioning tube and liner assembly that is capable of minimizing contamination due to direct contact with the inner walls of the container and through air from prior air-inflation of the liner thereby is suitable where product safety is of utmost importance.
Yet another object of the present invention is to provide a container load-positioning tube and liner assembly that is easily installed in the containers and will not be easily shaken out of pre-load position during transport from the liner installation location to the final product loading location which may be many miles and many days later.

Another object of the present invention to provide a container load positioning tube and liner assembly that is capable of being used in collapsible and reusable plastic containers thus saves energy and cost in recycling and is advantageous for the environment.

It is yet another object of the present invention to provide a container load-positioning tube and liner assembly that is capable of being used in steel containers thus eliminating the conventional one-way shipment using steel containers provided with internal hard linings for food grade products.

Yet a further object of the present invention is to provide a container load-positioning tube and liner assembly that allows optimum discharge of the contents of the container and eliminates residue as the liner is removed from the container when emptied.

It is yet a further object of the present invention to provide a container load-positioning tube and liner assembly that is capable of allowing a bigger liner having a larger dimension than that of the container interior to ensure that the liner is resting on and supported by the outer walls of the container in a non-tension state when the liner is completely filled.

It is another object of the present invention to provide a container load-positioning tube and liner assembly that is capable of preventing instances of the product overriding any part of the liner folds with the product itself which causes the trapping of some parts of the liner under the product thus creating an incomplete fill and could rupture the liner from loading forces.
Yet another object of the present invention is to provide a container load-positioning tube and liner assembly that is capable of eliminating the use of adhesives or other chemicals to hold or adhere the liner to the container side walls thus eliminating any instances or form of chemical contamination.

Yet another object of the present invention is to provide a container load-positioning tube and liner assembly that is capable of facilitating optimum discharge and minimises residue as the liner is removed from the container when empty, turned upside down and fully drained of product or materials.

Other and further objects of the invention will become apparent with an understanding of the following detailed description of the invention or upon employment of the invention in practice.

According to a preferred embodiment of the present invention there is provided,

A container (2) for storing and transporting product comprising;

at least an opening on the container top;

at least a liner (10) for placement into the said container (2);

characterized in that the opening on the container top allows a hanger plate (6) to be provided;

further characterized in that at least a container load-positioning tube and liner assembly (4) is provided on the hanger plate (6) of the container (2) to control the unfolding of the liner (10) in stages as the product is loaded into the container.
In another aspect there is provided,

A method of constructing a container load-positioning tube and liner assembly comprising steps of:

- laying flat a liner (10) provided with at least liner fitting (12);
- inserting at least a load-positioning tube assembly (8) into the liner (10) through the said liner fitting (12);
- attaching a vacuum hose (16) to the attaching part (8B) of the load-positioning tube assembly (8) when the load-positioning tube assembly (8) is fully inserted into the liner (10);
- vacuum-folding the said liner (10);
- tightly folding the top and bottom of the vacuum-folded liner (10) along the side parallel to the load-positioning tube assembly (8);
- inserting the folded upper body section of the liner (10) with at least an upper staging sleeve (14A);
- inserting the folded bottom section of the liner (10) with at least a lower staging sleeve (14B).

In another aspect there is provided,

A method of effectively filling up the container (2) with products using a container load-positioning tube and liner assembly (4) to control the unfolding of the liner (10) comprising steps of:

- attaching a container load-positioning tube and liner assembly (4) to a hanger plate (6) prior to securing the said hanger plate (6) to a container (2) having an opening on top;
filling up the liner (10) with products from a product loading hose (18) through the load-positioning tube (8A);

gradually causing the unfolding of the bottom section of the liner (10) in stages as the lower staging sleeve (14B) opens due to increasing hydraulic pressure from the rising product;

gradually causing the unfolding of the mid-section of the body liner (10) in stages as the upper staging sleeve (14A) opens due to increasing hydraulic pressure from further rising product;

gradually causing the unfolding of the upper section of the body liner (10) in stages as the upper staging sleeve (14A) completely opens due to increasing hydraulic pressure from further rising product to a complete fill.

4. BRIEF DESCRIPTION OF THE DRAWINGS

Other aspect of the present invention and their advantages will be discerned after studying the Detailed Description in conjunction with the accompanying drawings in which:

FIG. 1 is a see-through view of a semi-open container from the side showing the container load-positioning tube and liner assembly attached to the hanger plate within the container.

FIG. 2 is a plan view of a liner provided with a liner fitting being laid flat.

FIG. 3 illustrates the side view of the load-positioning tube assembly and its several components.

FIG. 4-A to 4-D illustrates the plan view, side view, top perspective view and bottom perspective view of the attaching part of the load-positioning tube assembly.
FIG. 5 shows the said anti-vacuum basket that is attached to the other end of the load-positioning tube.

FIG. 6-A to 6-D illustrates the bottom view, side view, top perspective view and bottom perspective view of the liner fitting.

FIG. 7 illustrates the manner and sequence in which the attaching part is inserted into the liner fitting and snap-locked in place and views from the top and bottom after the attaching part is snap-locked to the liner fitting.

FIG. 8-A to 8-F shows the assembly and folding steps for completing the container load-positioning tube and liner assembly.

FIG. 9 is a complete container load-positioning tube and liner assembly.

FIG. 10 illustrates a hanger plate.

FIGS. 11-A and 11-B shows the container load-positioning tube and liner assembly (without liner) being attached to the hanger plate and an enlarged view respectively.

FIGS. 12-A to 12-E show see-through views of a semi-open container from the side illustrating the various stages of opening of the folded liner.

FIGS. 13-A, 13-B and 13-C illustrate see-through views of a tilted semi-open container from the side showing the discharge of products from the container.

5. DETAILED DESCRIPTION OF THE DRAWINGS

Throughout this document, unless otherwise indicated to the contrary, the terms "comprising", "consisting of" and the like are to be construed as non-exhaustive, or in other words, as meaning "including, but not limited to".
In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the invention. However, it will be understood by those of ordinary skill in the art that the invention may be practiced without these specific details. In other instances, well known methods, procedures and/or components have not been described in detail so as not to obscure the invention.

The invention will be more clearly understood from the following description of the embodiments thereof, given by way of example only with reference to the accompanying drawings which are not drawn to scale.

Referring to FIG. 1 there is shown a see-through view of a semi-open container (2) from the side showing the container load-positioning tube and liner assembly (4) attached to the hanger plate (6) of the container (2). The container load-positioning tube and liner assembly (4) comprises at least a load-positioning tube (8), a liner (10), at least a liner fitting (12) and at least a staging sleeve (14). Although the container (2) has been described and illustrated as a semi-open top container, other containers having a fully opened top or a closed container are possible as long as such containers are capable of allowing the installation of the said hanger plate (6) provided with the container load-positioning tube and liner assembly (4).

FIG. 2 shows a plan view of a liner (10) provided with a liner fitting (12) laid flat on the floor. The liner (10) is a standard single or multi-wall flexible liner and is provided with a liner fitting (12) for the insertion and attachment of the load-positioning tube assembly (8). The liner fitting (12) as illustrated in detail in FIG. 6A to 6-D will be further described below.

FIG. 3 is a view from the side of the load-positioning tube assembly (8). The load-positioning tube assembly (8) is an elongated hollow tube (8A) provided with at least an attaching part (8B) on one end and at least an anti-vacuum basket (8C) on the other end.
FIGS. 4-A to 4-D show several views of the attaching part (8B) namely the
plan view, side view, top perspective view, and bottom perspective view of the
attaching part (8B). The attaching part (8B) comprises a connecting member (9A)
integrally provided with at least a protrusion (9B) for alignment with the liner
fitting (12E) [refer to FIG 6-C] and a stem (9C) provided with a plurality of ports
(9D) for assisting in discharge of product. At least a male engaging member (9E)
is provided on the stem (9C) where the port (9D) is situated. The male engaging
member is for snap-locking with the liner fitting (12). The said male engaging
member (9E) is preferably tooth-like in shape for engagement with the
liner fitting female engaging member (12D) provided on the base of the
receiving part (12B) of the liner fitting (12) [This will be described further in the
paragraphs hereinafter appearing and illustrated in FIG.6A-6D]. The connecting
member (9A) is preferably hexagonal in shape to abut the receiving part (12B) of
the liner fitting (12) which is of the same shape. The shape of the connecting
member (9A) may take other configurations as long as they follow the shape of
the interior of the liner fitting (12). The said connecting member (9A) has a
central hole (9F) that is provided with internal threads (9G) to facilitate a closure
(15) or the like to be provided. The said ports (9D) function to facilitate the full
discharge of the products when the container (2) reaches its destination. FIG. 5
shows an anti-vacuum basket (8C) that is attached to the other end of the
elongated tube (8A). The anti-vacuum basket (8C) has holes (11) that function to
allow product to flow in and prevent a vacuum forming at the bottom of the liner
(10) during discharge.

FIG. 6-A to 6-D illustrates the bottom view, side view, top perspective
view and bottom perspective view of the liner fitting (12). The liner fitting (12)
comprises a circular flange (12A) abutting a receiving part (12B) which functions
to receive the connecting member (9A) of the attaching part (8B) of the load-
positioning tube (8). The receiving part (12B) of the liner fitting has a centrally
located opening (12C) (hereinafter referred to as "liner fitting opening") which
serves as a bung hole and a plurality of female engaging member (12D)
circumferentially provided at its base (hereinafter referred to as "base liner fitting female engaging member). The base liner fitting female engaging members (12D) that are provided on the base of the receiving part (12B) serves to allow the male engaging member (9E) located at the stem (9C) of the attaching part (8B) where the ports (9D) are situated to be snap-locked into it thereby securing the engagement of the connecting member (9A) into the liner fitting opening (12C). The said liner fitting opening or bung hole (12C) is preferably hexagonal in configuration to complement the shape of the connecting member (9A) of the attaching part (8B) which is also advantageously hexagonal in shape.

Whilst the said liner fitting opening (12C) has been described and illustrated as being hexagonal in shape, other shapes are also possible as long as the shape complements the connecting member (9A) of the of the attaching part (8B) to allow a snug fit. There is also provided at least a groove (12E) on the inner circumferential surface of the liner-fitting opening (12C) to allow the said protrusion (9B) on the connecting member (9A) to abut (See FIG. 7). The number of grooves (12E) provided on the liner fitting opening (12C) corresponds to the number of protrusions (9B) on the connecting member (9A) so as to enable the connecting member (9A) of the attaching part (8B) and the receiving part (12B) of the liner fitting (12) to fit snugly. The liner fitting opening (12C) is heat welded to the said liner (10). The liner fitting (12) is now ready to accept insertion of the load-positioning tube assembly (8) through it into the liner (10) as shown in FIGS. 8 and 9. The liner fitting (12) is also designed to be attached to a hanger plate (6) which is in turn fixed to the container (2) and will be described below. FIG. 7 illustrates the manner and sequence in which the attaching part (8B) is inserted into the liner fitting (10) and snap-locked in place. The attaching part (8B) of the load-positioning tube assembly (8) is inserted into the liner fitting opening (12C) of the receiving part (12B) with the connecting member (9A) of the attaching part (8B) being inserted first. The hexagonal shaped connecting member (9A) of the attaching part (8B) then gets lodged into the hexagonal shaped receiving part (12B) of the liner fitting (12) and the male engaging member (9E) located on the stem (9C) of the attaching part (8B) where
the ports (9D) are situate is snap-locked into the base liner fitting female engaging member (12D) of the receiving part (12B) thereby causing the connecting member (9A) of the attaching part (8B) to be secured to liner fitting opening (12C). A sealing member (9F) preferably an O-ring (14) is employed to seal the connection between the connecting member (9A) and the liner fitting (12) to enhance the engagement. The advantage of having a hexagonal shape is that the said shape is able to prevent the liner (10) that has been attached to the attaching part (8B) from rotating as a closure (15) is screwed to shut the central hole (9F) of the load-positioning tube (8) or unscrewed to open it.

The load-positioning tube assembly (8) when inserted into the liner (10) acts as a backbone for the folded liner (10) maintaining it in its "as packed" folded pattern and also maintaining it in an upright position when attached to the hanger plate (6) thus enabling the liner (10) to gradually unfold in stages as the product is filling up the liner (10). More importantly the load-discharge tube (8A) directs product to the bottom of the container (2) but at the same time prevents the product that is being filled into the liner (10) from directly impacting the bottom of the container due to free fall. In this manner the load-discharge tube (8) prevents bouncing splashing and foaming from free flow loading which degrades oxygen sensitive products or causes hard impact on the floor of the container which can cause separation in water based emulsified products and cause problems for later production processes.

FIG. 8-A to 8-F shows the steps in constructing the container load positioning tube and liner assembly in pictorial form. The load-positioning tube assembly (8) is inserted into the liner (10) through the liner fitting (12) in the first step (Step 1). When fully inserted into the liner (10) a vacuum hose (16) is attached to the load-positioning tube assembly (8) at its attaching part (8B) in the second step (Step 2). In the third step (Step 3) the liner (10) is vacuum folded to minimize the liner bag size. Subsequently in the fourth step (Step 4) the top and bottom of the folded liner (10) is tightly folded alongside and parallel to the load-positioning tube (8A) to facilitate the insertion into staging sleeves (14).
Staging sleeves (14) are slipped over the vacuum folded liner (10) to keep the folded liner (10) in an "as packed" folded form. Preferably two independent thin walled plastic staging sleeves (14A) (14B) with longitudinal perforations to allow controlled opening of the sleeves (14A) (14B) are installed. Whilst the use of two staging sleeves namely an upper staging sleeve (14A) and a lower staging sleeve (14B) are described and illustrated to be inserted over the folded liner (10), it is to be understood that the use of one single perforated staging sleeve to insert over the entire length of the vacuum folded liner (10) is possible as what is advantageous is that the said staging sleeve is able to open up gradually to guide the opening of the folded liner (10). The load-positioning tube (8A) with the top vacuum-folded liner neatly tucked in is then inserted into the upper staging sleeve (14A) in the fifth step. The load-positioning tube (8A) with the bottom vacuum-folded liner (10) neatly tucked in is then inserted into the lower staging sleeve (14B) in the sixth step. The completed container load-positioning tube and liner assembly (4) is illustrated in FIG. 9 and is ready for attachment to the hanger plate (6) of the container (2).

The staging sleeves (14) have perforations provided longitudinally to open up when required to release the folded liner (10). The folded liner (10) with the staging sleeves (14) in place is then vacuum-sealed again into a shipping tube (not shown) and is ready for use. The shipping tube functions to keep the components intact during transportation from the assembly place to the loading destination. To use the container load-positioning tube and liner assembly (4) at the loading destination, the shipping tube is removed and the container load-positioning tube and liner assembly (4) is then attached to the hanger plate (6) which is in turn provided on the container top. The container load-positioning tube and liner assembly (4) snap locks into the hanger plate (6) and product is loaded and the liner (10) is filled. The liner (10) is capped when full and the container (2) is ready for shipping.
FIGS. 10, 11-A and 11-B illustrate a hanger plate (6) and the said container load-positioning tube and liner assembly (4) being attached to the hanger plate (6). The hanger plate (6) has a hanger plate opening (6A) provided with a plurality of hanger plate male engaging members (6B) for the liner fitting female engaging members provided on the sides of the receiving part (12B) [hereinafter referred to as "the side liner fitting female engaging members (12F)] to snap lock into the hanger plate (6). The hanger plate (6) with the liner fitting (12) provided with a container load-positioning tube and liner assembly (4) so attached is then fastened to the container top by known fastening means. The product can now be loaded through the central opening (9F) of the connecting member (9A) of the attaching part (8B) comprised in the load-positioning tube assembly (8) and the liner (10) is filled with products. Upon complete filling up of products into the container liner (10) the load-positioning tube assembly (8) is capped by a closure (15).

The position of the liner bottom is crucial for an optimum load and is determined by the initial loaded product establishing the correct foot print (16) on the floor of the container (2). Once the proper position is achieved that is the liner bottom matches the container bottom to establish a proper foot print (16) an optimum fill is certain. This desired result is accomplished by at least a staging sleeve (14) which circumferentially envelope the folded liner (10).

FIGS. 12-A to 12-E, show see-through views of a semi-open container (2) from the side illustrating the various stages of opening of the folded liner (10). The staging sleeves (14) hold the folded liner (10) in position around the load-positioning tube (8A) which controls the flow of incoming products to facilitate the positioning of the liner bottom to the container bottom which is the beginning of a proper fill. The liner bottom position is determined by the first loaded product and is critical to complete a proper loading. As the incoming product flows into the container (2) from the product loading hose (18) as illustrated in FIG. 12-A, 12-B and 12-C, the lower staging sleeve (14B) will open up at the perforated part to allow the liner (10) to unfold and expand as the
hydraulic pressure from the product increases to gradually allow the product fed through the load-discharge tube (8) to flow sideways to fill up the container (2). The upper staging sleeve (14A) retains the liner (10) in proper load position during the loading process when the lower staging sleeve (14B) opens. As more incoming product is filled into the container (2) the upper staging sleeve (14A) starts to gradually open up at the lower perforated part to allow the middle body section of the liner (10) to unfold and expand in stages thereby ensuring the product does not trap the side walls of the liner (10) [Refer to FIG. 12-D]. The gradual opening of the upper staging sleeve (14A) also controls the opening of the top section of the liner (10) as the product completely fills up ensuring the liner (10) is not in stress from product trapping at the corners or side walls (Refer to FIG. 12-E) The invention as disclosed herein therefore uses the hydraulic pressure exerted by the rising product to open the folded liner (10) in stages as product flows into the container (2). In this manner a proper footprint (16) is developed on the floor of the container (2) thereby ensuring an optimum fill. The invention does not use air to inflate the liner (10). This elimination of outside air makes the invention much more sanitary and less susceptible to outside contamination than current "inflate before loading" methods.

Just as optimum fill of the container (2) is desired, optimum discharge of the products from the container (2) at their destination is equally desired to prevent wastage. Hence an efficient mechanism to facilitate optimum discharge is required.

There are two basic methods of discharging liquid products from drums. One is to pump it out. The pump out method changes the load-positioning tube (8A) to a discharge tube. As product is pumped out of the drum, the liner (10) collapses around the load-positioning tube assembly (8) and insures a maximum discharge. Removal of the hanger plate (6) and load-positioning tube assembly (8) allow for an optimum discharge by inverting the liner (10) and load-positioning tube assembly (8) and draining out residual product. The second method is to hold the drum or container in a horizontally tilted position and
discharge the product a portion at a time through a valve inserted into the bung of the drum or container.

Referring now to FIG. 13-A to 13-C there are shown see-through views of a horizontally tilted semi-open container (2) from the side showing the discharge of products from the container (2) through a valve inserted in the bung valve. The load-positioning tube assembly (8) has strategically placed ports (9D) circumferentially on the ends adjacent to the attaching part (8B) that facilitates discharge of product in stages when the container (2) is discharged in a horizontal position. Similarly as in the filling in of the liner (10), the horizontal position allows gradual discharging of the products capable of preventing the corners of the liner (10) from being folded over itself thereby trapping the product or liquid within the liner (10). The load-positioning tube assembly (8) further provides for optimum discharge and minimizes residue as the liner (10) is removed from the container (10) when empty and turned upside down and fully drained of product.

While the preferred embodiment of the present invention and their advantages have been disclosed in the above Detailed Description, the invention is not limited thereto but only by the scope of the appended claim.
WHAT IS CLAIMED:

1. A container (2) for storing and transporting product comprising;
   at least an opening on the container top;
   at least a liner (10) for placement in the said container (2);
   characterized in that
   the opening on the container top allows a hanger plate (6) to be provided;
   further characterized in that
   at least a container load-positioning tube and liner assembly (4) is provided on the hanger plate (6) to control the unfolding of the liner (10) in stages as the product fills up.

2. A container (2) for storing and transporting product as in Claim 1 further characterized in that the said container load-positioning tube and liner assembly (4) comprises at least a load-positioning tube (8), a liner (10); at least a liner fitting (12) and at least a staging sleeve (14) provided over the liner (10).

3. A container (2) for storing and transporting product as in Claim 1 wherein the load-positioning tube assembly (8) comprises an elongated tube (8A) provided with an attaching part (8B) at one end and an anti-suction basket (8C) at the other end.

4. A container (2) for storing and transporting product as in Claim 1 or 3 wherein the said attaching part (8B) of the load-positioning tube assembly (8) comprises a connecting member (9A) integrally provided with at least a protrusion (9B) and a stem (9B) provided with a plurality of ports (9D).
5. A container (2) for storing and transporting product as in Claim 1, 3 or 4 wherein male engaging member (9E) is located at the stem (9B) of the attaching part (8B) where the ports (9D) are situated.

6. A container (2) for storing and transporting product as in Claim 1 or 3 wherein a plurality of holes (11) are provided on the anti-vacuum basket (8C) of the load discharge tube assembly (8).

7. A container (2) for storing and transporting product as in Claim 1 or 2 wherein the said liner fitting (12) comprises a circular flange (12A) abutting a receiving part (12B) that has a liner fitting opening (12C) and is provided with a plurality of base liner fitting female engaging member (12D) circumferentially provided at its base.

8. A container (2) for storing and transporting product as in Claim 1 or 7 wherein the liner fitting opening (12C) is provided with at least a groove (12E) to accommodate the said protrusion (9B).

9. A container (2) for storing and transporting product as in Claim 1, 7 or 8 wherein the liner fitting opening (12C) is heat welded to the liner (10).

10. A container (2) for storing and transporting product as in Claim 1, 4 or 7 wherein the said connecting member (9A) and the receiving part (12B) are hexagonal in shape.

11. A container (2) for storing and transporting product as in Claim 1, 4 or 7 wherein the connecting member (9A) of the attaching part (8B) of the load-positioning tube assembly (8) is connected and secured to the receiving part (12B) of the liner fitting (12) by means of engagement of the male engaging member (9E) located on the said attaching part (8B) to the base liner fitting female engaging member (12D).
12. A container (2) for storing and transporting product as in Claim 1 or 2 wherein the said liner (10) is vacuum-folded.

13. A container (2) for storing and transporting product as in Claim 1 or 2 wherein at least a sleeve (14) is longitudinally provided to the body of the folded liner (10).

14. A container (2) for storing and transporting product as in Claim 1 2 or 13 wherein at least an upper sleeve (14A) is provided to the upper body section of the folded liner (10).

15. A container (2) for storing and transporting product as in Claim 1 2 or 13 wherein at least a lower sleeve (14B) is provided to the bottom body section of the folded liner (10).

16. A container (2) for storing and transporting product as in Claim 1 wherein the said hanger plate (6) is provided with a hanger plate opening (6A) having male engaging members (6B) provided on its circumferential surface.

17. A container (2) for storing and transporting product as in Claim 1 or 11 wherein the receiving part (12B) of the liner fitting (12) provided with the attaching part (8B) of the said load-positioning tube assembly (8) is inserted through the hanger plate opening (6A) where the hanger plate male engaging member (6B) engages the side liner fitting female engaging member (12F).

18. A container (2) for storing and transporting product as in Claim 1, 11 or 17 wherein said engagement is by means of snap-lock engagement.
19. A method of constructing a container load-positioning tube and liner assembly (4) comprising steps of:
   laying flat a liner (10) provided with at least liner fitting (12);
   inserting at least a load-positioning tube assembly (8) into the liner (10) through the said liner fitting (12);
   attaching a vacuum hose (16) to the attaching part (8B) of the load-positioning tube assembly (8) when the load-positioning tube assembly (8) is fully inserted into the liner (10);
   vacuum-folding the said liner (10);
   tightly folding the top and bottom of the vacuum-folded liner (10) along the side parallel to the load-positioning tube assembly (8);
   inserting the folded upper body section of the liner (10) with at least an upper staging sleeve (14A);
   inserting the folded bottom section of the liner (10) with at least a lower staging sleeve (14B).

20. A method of effectively filling up the container (2) with products using a container load-positioning tube and liner assembly (4) to control the unfolding of the liner (10) comprising steps of:
   attaching a container load-positioning tube and liner assembly (4) to a hanger plate (6) prior to securing the said hanger plate (6) to a container (2) having a top opening;
   filling up the liner (12) with products from a product loading hose (18) through the load-positioning tube (8A);
   gradually causing the unfolding of the bottom section of the liner (10) in stages as the lower staging sleeve (14B) opens due to increasing hydraulic pressure from the rising product;
   gradually causing the unfolding of the mid-section of the body liner (10) in stages as the upper staging sleeve (14A) opens due to increasing hydraulic pressure from further rising product;
gradually causing the unfolding of the upper section of the body liner (10) in stages as the upper staging tube (14A) completely opens due to increasing hydraulic pressure from further rising product to allow a complete fill.
## A. CLASSIFICATION OF SUBJECT MATTER

### B65D 77/06(2006.01), B65D 25/18(2006.01), B65D 25/38(2006.01), B65D 33/36(2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D 77/06; B65D 3/16; B65D 35/28; B65B 3/04; B65B 1/04; B65D 25/38

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

- Korean utility models and applications for utility models
- Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: container, liner

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>US 0516348SA A (HERMANN; FRANCIS) 17 November 1992 See the abstract, column 5 lines 1 - 43, claims 7,8, figures 1-4</td>
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* Further documents are listed in the continuation of Box C.  

**X** document defining the general state of the art which is not considered to be of particular relevance  

**E** earlier application or patent but published on or after the international filing date  

**L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)  

**O** document referring to an oral disclosure, use, exhibition or other means  

**P** document published prior to the international filing date but later than the priority date claimed  

**T** later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  

**Y** document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  

**Y** document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art  

"&" document member of the same patent family  

### Date of the actual completion of the international search

11 DECEMBER 2012 (11.12.2012)

### Date of mailing of the international search report

12 DECEMBER 2012 (12.12.2012)

Name and mailing address of the ISA/KR  

Korean Intellectual Property Office  
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea  
Facsimile No. 82-42-472-7140

Authorized officer  

LEE, Se Young  
Telephone No. 82-42-481-5410

Form PCT/ISA/210 (second sheet) (July 2009)
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.☐ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2.☐ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3.☒ Claims Nos.: 5, 8-11, 14-15, 17-18 because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

1.☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2.☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3.☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4.☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
☒ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
☐ No protest accompanied the payment of additional search fees.
### INTERNATIONAL SEARCH REPORT

Information on patent family members

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Form PCT/ISA/210 (patent family annex) (July 2009)