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(54) **A SUPPORT FOR FLEXIBLE INTERMEDIATE BULK CONTAINERS**

(57) A support for supporting a plurality of Flexible Intermediate Bulk Containers (FIBCs) on a truck or trailer bed,
wherein the FIBCs are positioned side-by-side in a row having longitudinal first side and a longitudinal second side, and
each FIBC is oriented with two corners at the first side of the row and the other two corners at the second side of the row:
- a support structure, and
- a plurality of loop holders attached to the support struc-

ture,

wherein the support structure is arranged to support each FIBC in an upright position, or fully expanded state, relative to a horizontal surface with the FIBC resting on the horizontal surface,

wherein the loop holders are configured to fix, or lock, the lifting loops of each FIBCs relative to the support structure, and

the support structure and the loop holders are configured to bias the lifting loops apart from one another.

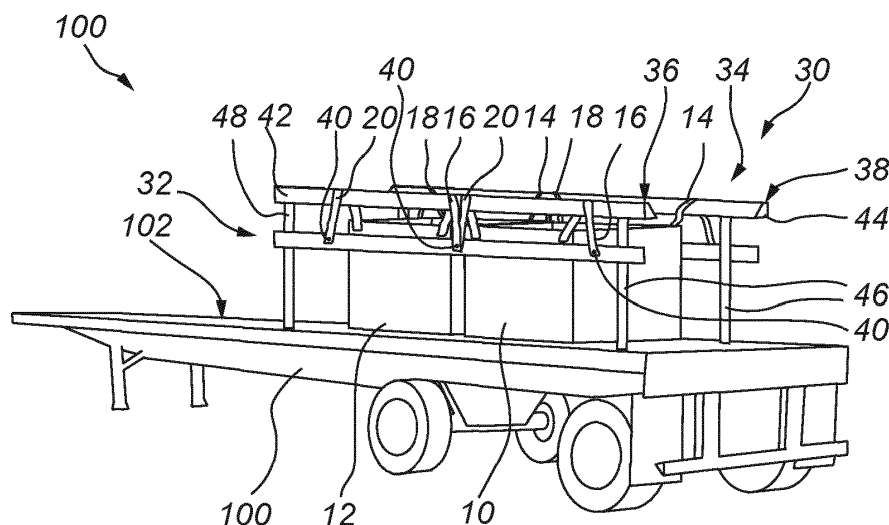


Fig. 1

Description

Technical field

[0001] The proposed technology relates generally to the field of Flexible Intermediate Bulk Containers and to filling of FIBC.

Background

[0002] Flexible Intermediate Bulk Containers (FIBC), also referred to as jumbo, bulk bag, big bag, super sack or tonne bag, are containers used for packaging and transporting flowable material, such as sand, fertilizer, gravel and more.

[0003] FIBC are usually made from thin woven strands of oriented polypropylene or polyethylene plastic. This provides for a container able to be filled with material having a weight of, normally, 1 metric ton, or 1000 kg, while the weight of the container is around 2-3 kg. FIBC normally measure around 110 cm in diameter or width and varies in height from 100 cm up to 200 cm.

[0004] A FIBC comprise a bottom, and a side wall. The side wall may be formed by four side panels connected, or joined, to the bottom. In addition, a FIBC may comprises four cross-corner lifting loops, or hooks, enabling a filled FIBC to be lifted and loaded to a vehicle for transport.

[0005] FIBCs may be filled manually or assisted by a machine such as a wheel or front loader. Manual filling is performed by a person, equipped with a spade or a shovel, removing material from a pile of material and depositing the material into the FIBC. Manual filling is time consuming.

[0006] Filling of FIBCs assisted by machine is usually performed at a filling station. The filling station comprises means for mounting the FIBC by the lifting loops, or hooks, under a funnel or a hopper. The hopper is activated, or the bottom of the funnel is opened, to allow for material from the hopper or funnel to flow into the FIBC. A problem with this solution is that FIBCs are filled one-by-one. In addition, the material must be transported from the pile to the filling station, and dumped, or tipped, into the funnel.

[0007] A solution to this problem is disclosed in US 5 004 022, in the form of a filling implement for a wheel loader wherein the bucket in the bottom comprises a funnel and an opening as well as means for attaching the lifting loops of a FIBC directly under the opening. After filling the bucket with material, the bucket is raised and the material in the bucket flows through the funnel and out the opening and deposits in the FIBC. A problem with this solution is that only one FIBC may be filled at a time as well as the high investment costs for acquiring the filling implement.

[0008] Accordingly, there is a need for an improved way of filling a plurality of FIBCs that reduces the time usage of the material loading machine, such as wheel or

front loader, and thus also reduces fuel, or energy, usage and costs, and is more environmentally friendly.

Object

[0009] The proposed technology aims at obviating the aforementioned disadvantages and failings of previously known devices, methods and systems for filling a plurality of FIBCs.

Summary

[0010] According to the proposed technology at least the primary object is attained by means of the initially defined support for supporting a plurality of Flexible Intermediate Bulk Containers (FIBCs) having the features defined in the independent claim. The primary objective is further attained by the use of the support for supporting a plurality of Flexible Intermediate Bulk Containers (FIBCs) arranged on a bed of a vehicle or trailer. Preferred embodiments of the proposed technology are further defined in the dependent claims.

[0011] According to a first aspect a support is provided for supporting a plurality of Flexible Intermediate Bulk Containers (FIBCs), each FIBC having four cross-corner lifting loops, or each FIBC having four corners and a lifting loop located at each corner, the corners of each FIBC jointly defines a rectangle at diagonal outward biasing of the lifting loops, wherein the FIBCs are positioned side-by-side in a row having longitudinal first side and a longitudinal second side, and each FIBC is oriented with two corners at the first side of the row and the other two corners at the second side of the row: a support structure, and a plurality of loop holders attached to the support structure, wherein the support structure is arranged to support each FIBC in an upright position, or fully expanded state, relative to a horizontal surface with the FIBC resting on the horizontal surface, wherein the loop holders are configured to fix, or lock, the lifting loops of each FIBCs relative to the support structure, and the support structure and the loop holders are configured to bias the lifting loops apart from one another.

[0012] This provides for the simultaneous filling of multiple FIBC from material in a wheel loader, or working machine, bucket. In addition, since the FIBCs are resting on the horizontal surface during filling, the support is not required to be mechanically designed, or dimensioned, to carry the full load of the material loaded into the FIBC. The support is thus less costly to manufacture and may be fixedly mounted to a transporting vehicle. This further reduces the time usage of the material loading machine since multiple FIBCs may be filled at once from one filled bucket. Worded differently, the FIBCs are already placed, or mounted, on the transporting vehicle or trailer bed, or transporting vehicle load supporting surface or structure, during filling. Thereby a separate step of loading filled FIBCs to the transporting vehicle is eliminated.

[0013] Each FIBC may comprise a bottom, or bottom

panel, and a wall. It is understood that the bottom and the wall are connected to form a holding space, or a bag. It is further understood that the wall of the FIBC is circumferential, or annular. It is further understood that the bottom panel is configured, or intended, to rest on a horizontal surface. Each FIBC has an opening facing upwards with the FIBC, or the bottom panel of the FIBC, resting on a horizontal surface. The wall may form a rim at the opening. It is further understood that the opening provides access to the holding space. The wall of the FIBC may be composed of four side panels joined together and facing in different directions. FIBCs comprising a wall formed by four sewn together panels, may be referred to as a four-panel FIBC. The side panels may have the same height relative to the bottom panel, or the horizontal surface.

[0014] The bottom of each FIBC may be positioned, on a truck or trailer bed or on a transport pallet, such as an EUR-pallet or EPA. The horizontal surface may thus be the truck or trailer bed, or a transport pallet.

[0015] It is further understood that the support is configured for use with FIBC having a containment volume, or is able to contain flowable material, of at least 0.8 cubic meters, more preferably at least 1 cubic meter. The FIBC may be filled with material having a weight of, normally, 1 metric ton, or 1000 kg, while the weight of the container is around 2-3 kg. FIBC normally measure around 110 cm in diameter or width and varies in height from 100 cm up to 200 cm. Depending on the material used for the FIBC, more than 1000kg, up to 1600 kg may be contained in a FIBC having an internal, or containment volume, of 1 cubic meter. The support may be dimensioned or designed for FIBC of different dimensions for holding material of different volume and density.

[0016] The support may be used with FIBC of different types, such as circular shaped FIBCs, or baffle type FIBC, but is particularly suitable for four-panel FIBCs.

[0017] The FIBC further comprises four cross-corner lifting loops, or each FIBC has four corners and a lifting loop located at each corner. The corners of each FIBC jointly defines a rectangle, or square, at diagonal outward biasing of the lifting loops. Worded differently, when the lifting loops are pulled outwardly in a plane parallel to the bottom, or horizontal plane, a rectangular or square opening is formed, at the opposite side of the bottom.

[0018] The FIBCs are positioned side-by-side in a row. The row of FIBS has a longitudinal first side and a longitudinal second side. The row of FIBS has a transverse first side and a transverse second side. The row of FIBC may thus be rectangular shaped. Each FIBC is oriented with two corners at the first longitudinal side of the row and the other two corners at the second longitudinal side of the row. Worded differently, two FIBC are positioned side-by-side, placed adjacent each other, forming the row of FIBC, wherein two corners of each row are arranged at the first longitudinal side of the row, and the other two corners of a row is placed and the second longitudinal side of the row.

[0019] A first FIBC is positioned next to, or adjacent, or neighboring, a second FIBC thus have a respective side facing each other.

[0020] The support comprises a support structure, and a plurality of loop holders attached to the support structure. The support structure supports the FIBC during filling by the loop holders preventing the FIBCs from collapsing, and in particular the side walls, or rim from collapsing, and enables the FIBCs to be fully filled with reduced material spillage. This is provided by the support structure being arranged to support each FIBC in an upright position, or fully expanded state, relative to the horizontal surface with the FIBC is resting on the horizontal surface. The loop holders are configured to fix, or lock, the lifting loops of each FIBCs relative to the support structure. The lifting loops of the FIBCs are thus being connected, or coupled, to the loop holders of the support structure, during filling of the FIBCs. Worded differently, during filling the supports acts to secure, or fixate, the FIBCs to the support structure by the loop holders being coupled to the lifting loops.

[0021] It is understood that the loop holders releasably fixes, or locks, the lifting loops relative to the support structure. Worded differently, the lifting loops may be released from the loop holders after filling of the FIBC. A filled FIBC is self-supporting allowing for the support structure to be removed after filling of a plurality of FIBCs. This is particularly beneficial when the support is mounted on a truck or trailer bed, for filling of FIBC on the truck or trailer bed. This removes the need for a separate step of loading of filled FIBC from the position they were filled to the truck or trailer bed.

[0022] After removal of the support structure from the truck or trailer bed, the support structure may be positioned on another vehicle for filling of another set of plurality of FIBCs. It is also understood that the support structure may rest on and be fixedly mounted to the horizontal surface, such as a truck or trailer bed.

[0023] It is understood that the plurality of loop holders may be composed of first loop holders and second loop holders, wherein the support structure may comprise a first side support positioned, or arranged to be positioned, on, or at, the first side of the row of FIBCs. The first side support may define, or form, a first rest surface that faces upward relative to the horizontal plane. The first rest surface may be located at or above, or arranged to be located at or above, the corners of the FIBCs at the first side of the row of FIBCs. The first loop holders may be attached to the first side support and may be located below the first rest surface.

[0024] The lifting loops may thus be routed, or extended, or pulled, over the first rest surface and fixated, or secured, to the loop holders, wherein the loop holders are arranged below the first rest surface. This results in friction forces between the first rest surface and the lifting loops and reduces forces acting on the loop holders from the FIBCs and material contained in the FIBCs. In addition, release of the lifting loops from the loop holders is

made simpler since an operator may use the body weight to pull down on the lifting loop to remove the a lifting eye of the lifting loop from the loop holder.

[0025] It is understood that the first rest surface may be continuous or discontinuous. Thus the first rest surface may have a length equal to the longitudinal first side or longitudinal second side of the row of FIBC. Alternatively, the first rest surface may be discontinuous and comprising a plurality of rest surfaces aligned in the longitudinal direction.

[0026] It is understood that the first loop holders and the first rest surface may be arranged such that each loop holder at the first side of the row of FIBCs engages the first rest holder when fixed to a first loop holder.

[0027] The relative positioning of the first loop holders contribute to an easier handling. The first rest surface may be convex transverse to the first side of the row of FIBCs. It is understood that an upward facing edge of a thin structure may be defined by narrow rest surface, such as the edge of a steel sheet. The first rest surface may be spaced apart, or arranged to be spaced apart, from the corners of the FIBCs at the first side of the row of FIBCs. For example, it may be spaced apart by more than 50 mm.

[0028] This is particularly advantageous if the first rest surface is located above or spaced apart from the corners of the FIBCs. The first side support may define, or form, a first side barrier extending from the first rest surface to a level relative to the horizontal plane that is at, or above, the corners of the FIBCs at the first side of the row of FIBCs. It is understood that the first side barrier is intended for, or configured to, guide material that is tipped outside the opening of the FIBCs into the FIBCs. In addition, the first side barrier may support the side wall at the opening from caving, or collapsing outwards when the FIBC has been overfilled. This prevents material spillage during handling and transport of an overfilled FIBC.

[0029] The first side barrier may be inclined in relation to the horizontal plane. The inclination may be an inclination angle, measured between the first side barrier and the horizontal plane. The inclination angle may be in the range of 15-90 degrees. The first side barrier may be adjustably arranged to the first side support, and the inclination angle may be adjustable to adjust for different sized FIBCs.

[0030] The first rest surface and/or the surface of the first side barrier may have a smooth surface to reduce wear on the lifting loops due to movement between the lifting loops and the first rest surface and/or first side barrier. Alternatively, the first rest surface and/or first side barrier may have a rough surface, or surface roughness, to promote friction and prevent movement between the lifting loops and surfaces during transport.

[0031] The first rest surface may be inclined in relation to the horizontal plane by an inclination angle. The inclination angle in relation to the horizontal plane may be in the range of 30-80 degrees. The inclination angle may preferably be in the range of 40-50 degrees.

[0032] It is understood that the first side support may comprise a first support beam that defines, or forms, the first rest surface. The first support beam may extend, or is arranged to extend, along the first side of the row of FIBCs. It is understood that the first support beam may extend horizontally, in a plane parallel to the horizontal surface. The first support beam may be an elongated beam, having an elongation length larger than the width or diameter of the beam cross section. It is further understood that the first support beam may define a continuous first rest surface. It is further understood that the first support beam may form the first side barrier. The first support beam may have a cross-sectional shape being triangular-, square-, rectangular-, circular-, "T"-, "I"-, or "U"-shaped. The cross-sectional shape may be hollow, comprising an internal hollow space, to reduce weight of the first support beam. The first support beam may be supported at the ends of the first support beam. For example, the first support beam may at a first end be coupled to the truck cab, or trailer, superstructure. The first support beam may additionally be supported in positions between the ends of the first support beam. The first support beam may be made from steel or aluminium. Alternatively, the first support beam may be a composite beam, made from a fiber reinforced composite material.

[0033] The first side support may comprise a first side wall positioned at or juxtaposed to, or arranged to be positioned at or juxtaposed to, the first side of the row of FIBCs.

[0034] The first side wall may define, or form, a planar first side surface facing the FIBCs. For example, the first side wall may be a planar steel sheet. It is understood that the first side wall, or the first side surface, may be arranged to bias, or engage, the side of each FIBC at the first side of the row of FIBCs at an expansion of the FIBC, for example when filling the FIBC. The first side wall may extend vertically and horizontally. It is described above that the first side support may comprise a first support beam that defines the first rest surface. Alternatively, the first side wall may define, or form, the first rest surface. It is further understood that the first side wall, or the first side surface, may form the first side barrier. For example, the first side wall may be manufactured from a sheet of steel, stamped or pressed to form the first rest surface and/or the first side barrier. Alternatively, the first side wall may be a wood, or plastic sheet. For example, the first side wall may be a fibrous board sheet.

[0035] It is understood that the first side wall, may support the sides of the FIBCs from the hydrostatic forces exerted by the material filled into the FIBCs, and prevent the sides of the FIBCs from expanding outwards. Worded differently, the first side wall may help the FIBC to maintain a shape of the side-panels that corresponds to the shape of the FIBC bottom panel and prevent barreling of the FIBC.

[0036] The support may further comprise a second side support. It is understood that the first side support and the second side support are spaced apart with the

row of FIBCs positioned between them, or that they are arranged spaced apart for placement of the FIBCs between them. The spacing between the first side support and the second side support, or between the first rest surface and the second rest surface may correspond to the width of the row of FIBCs, or to the width of a FIBC. Here, the width is understood as the transverse separation between the corners of the FIBCs at the first side of the row of FIBCs and the corners of the FIBCs at the second side of the row of FIBCs. For example, the spacing between the first side support and the second side support may be 100-130% of the width of a FIBC.

[0037] The support structure may further comprise a base for resting on the horizontal surface, and the first side support is pivotally connected to the base and configured to tilt outward relative to the row of FIBCs, or relative to the base.

[0038] The base may thus form, or define, a structure configured for being placed on the horizontal plane, such as the bed of a truck or a trailer. The base may be formed by a uniform structure such as a steel sheet, or may be formed by a plurality of structural elements joined, or connected together. For example, the base may be formed by a plurality of beams joined, or secured, together, wherein two longitudinal beams are joined with two transverse beams between the two longitudinal beams. Thereby a rectangular base may be formed. The first side support may be pivotally connected to the base. The first side support may thus be pivoted, outwardly, in relation to the base, and the FIBCs, around a pivot connection point, arranged between, or connecting, the first side support and the base. Pivoting the support structure outwardly in relation to the filled FIBC reduces the possibility of the filled FIBCs snagging, or getting caught by the structure when hoisted, or lifted, from the support.

[0039] The first side support may be pivotally connected to the base through the first side wall. Alternatively, the first side support may be pivotally connected to the base through one, or a plurality of beams.

[0040] The support structure may further comprise a first tilt lock arranged to releasably prevent the first side support from tilting relative to the row of FIBCs, or relative to the base. The first tilt lock enables the first side support to be locked in at least an upright position. The first tilt lock may be achieved by a cross beam connected to the oppositely, on the other side of the row of FIBC, arranged second side support. When the cross beam connects to both the first side support and the second side support, pivoting of one or both of the side supports outwardly, in relation to the row of FIBCs, is prevented. Alternatively, the pivot lock may fixate the first or second side support to the base. Alternatively, the cross beam may connect to the horizontal plane, the support is positioned on.

[0041] It is understood that the support structure may further comprise a base for resting on the horizontal surface, wherein the first side support is fixed to the base. Worded differently, the first side support may be fixed to the base. By fixed to the base, the side support is con-

nected to the base without being able to pivot in relation to the base. Thus, in this example the first side support is not able to pivot, and is securely, fixed to the base.

[0042] It is further understood that the support structure may comprise a second side support positioned, or arranged to be positioned, on, or at, the second side of the row of FIBCs, wherein the second side support defines, or forms, a second rest surface that faces upward relative to the horizontal plane, wherein the second rest surface is located at or above, or arranged to be located at or above, the corners of the FIBCs at the second side of the row of FIBCs, and wherein the second loop holders are attached to the second side support and located below the second rest surface. The support structure may thus comprise a second side support positioned, or arranged to be positioned, on, or at the second side of the row of FIBC. Worded differently, the support structure may comprise a first and a second side support. The second side support may be positioned, or arranged, at the opposite side of the row of FIBCs. The second side support may share properties and design with the first side support. The second side support may be pivotally, or fixatedly, connected to the same base the first side support is connected to.

[0043] The second side support may define, or form, a second side barrier extending from the second rest surface to a level relative to the horizontal plane that is at, or above, the corners of the FIBCs at the second side of the row of FIBCs.

[0044] The second side support may comprise a second support beam that defines, or forms, the second rest surface and extend, or is arranged to extend, along the second side of the row of FIBCs.

[0045] The second side support may comprise a second side wall positioned at or juxtaposed to, or arranged to be positioned at or juxtaposed to, the second side of the row of FIBCs.

[0046] The second side support may be pivotally connected to the base and configured to tilt outward relative to the row of FIBCs, or relative to the base. Thus, when the first and second side support may pivot, or tilt outwards, relative to the row of FIBCs, the first side support pivots in a direction opposite the direction the second side support pivots, or tilts outward.

[0047] The second side support may comprise a separate second tilt lock, corresponding to the structure of the first tilt lock but arranged to releasably fixate the second side support to the base, or the first side support.

[0048] The first or second tilt lock may be released by the removal of a fixating bolt, a cross sprint, or similar. When a row of FIBCs have been filled, the first and/or second tilt lock may be released to simplify the lifting, or hoisting, of a filled FIBC using a crane or similar lifting machine. By the first and/or second side support having been pivoted outwardly and away from the row of filled FIBCs, a filled FIBC may be lifted from the support with minimal risk from interference between the FIBC and the support.

[0049] Alternatively, the second side support may be pivotally connected to the base and configured to tilt outward relative to the row of FIBCs, or relative to the base, and the support structure may further comprise a joint tilt lock arranged to releasably prevent both the first side support and the second side support from tilting relative to the row of FIBCs, or relative to base.

[0050] For example, the joint tilt lock may be a rigid cross beam connected to the first side support and to the second side support, wherein the cross beam connects to the first side support and to the second side support at different levels relative to the horizontal surface. The cross beam may be pivotally connected to the first side support and releasably connected to the second side support. The cross beam may have a length that is smaller than the distance between the point at which it connects to the first side support and the horizontal surface.

[0051] The base of the support structure may comprise at least a part of the base that extends underneath at least a part of a FIBC, or the row of FIBCs. During filling, the weight from the material acting on the FIBC or FIBCs may thus help fixate the support structure to the horizontal surface, or truck or trailer bed, by the at least a part of the base extending underneath a FIBC, or the row of FIBCs. This removes the need for fixating, such as by bolting, the base to the horizontal surface, or truck or trailer bed, and allows filled FIBCs to be transported with the support without risk of the support structure shifting position or falling off. Thus, the support structure may be fixated to the truck or trailer bed only by the weight exerted by the filled FIBCs and by the weight of the structure itself.

[0052] The loop holders may be spring loaded or elastic. The loop holders may be adjustable and allow for some play during positioning of a FIBC in the support structure, and during filling. This reduces the risk of a lifting loop, snapping, or breaking, due to improper positioning of the lifting loop to the support structure, excess tension in the lifting loops from the load of the filling material in the FIBC. In addition, by providing loop holders that are spring loaded or elastic, FIBCs having different length lifting loops may be used, by the spring loaded or elastic loop holders allowing for improved adjustment. Additionally, the spring or elastic loop holder stretches and maintains the lifting loops stretched during transport. The loop holders may comprise, or be formed by, a first securing member fixedly mounted, or arranged, to the support structure and an intermediate elastic or spring loaded strap comprising an interface for interfacing with the lifting loop of a FIBCs and the first securing member. The intermediate elastic strap may be a rubber strap.

[0053] Further adjustment of the loop holders to FIBC lifting loops of varying length may be provided by arranging the loop holders with adjustable mounts to the support structure. For example, the loop holders may be positioned in one of a plurality of mounting positions on the support structure. Each position may correspond to an optimal, or best possible, position for a FIBC with a specific lifting loop length. Each of the plurality of positions

may thus correspond to a FIBC having a certain length of the lifting loops. Alternatively, the loop holders may comprise loop holders arranged on a linearly movable mechanism, wherein the linearly movable mechanism is fixed to the support, such as the side support, allowing for the loop holder to be moved in a vertical direction, transverse to the horizontal surface. Once a preferable position, or optimal position, is reached the linearly movable mechanism may be locked.

[0054] It is understood that the support structure may comprise at least one transverse barrier that extends between the first side member and the second side member and bridges, or covers at least a portion of a space between the first FIBC and second FIBC. It is understood that the first and second FIBCs may be placed, or positioned, onto a transporting pallet such as a EUR-pallet or EPAL. Each pallet may have a length of 1.2 m and two or more pallets may be placed side by side and a single FIBC may be placed onto each pallet. Each FIBC may be positioned centered on a pallet. The width of a FIBC may be about 1m. Thus a spaced may be formed between a first and a second FIBCs placed, or positioned centered on a respective transport pallet, wherein the transport pallets are placed side-by-side. The transverse barrier may comprise a top surface facing away from the pallets, or horizontal surface, and two barrier side surfaces, extending from the top surface to a level at, or above, the corners of the FIBCs at the first and second side of the row, formed by the two FIBCs. Thus the space between the FIBCs may be covered by the transverse barrier that helps to guide material being loaded into the first and second FIBC to prevent spillage.

[0055] The first transverse barrier side may be arranged at a first side of the transverse barrier top and the second transverse barrier side may be arranged at an opposite side of the transverse barrier top. The first and second transverse barrier side may be inclined in relation to the top surface, to guide material into each FIBC. After filling of FIBCs positioned on the pallets, the support structure may be removed. The FIBCs and pallets may thereafter be transported to customers locations wherein a FIBC with pallet may be lifted of the transporting vehicle.

[0056] According to a second aspect, use of the support according to any of the above examples of the first aspect is provided wherein the support structure is arranged on a bed of a vehicle or trailer.

[0057] Thereby, the FIBCs may be filled while positioned on a vehicle, such as the truck or trailer bed, reducing the need for a separate step of lifting already filled FIBC onto the vehicle or trailer bed.

Brief description of the drawings

[0058] A more complete understanding of the above-mentioned and other features and advantages of the proposed technology will be apparent from the following detailed description of preferred embodiments in conjunction with the appended drawings, wherein:

- Fig. 1 is a perspective view of a vehicle in the form of a trailer, comprising the support and two FIBC positioned, or arranged, to the support;
- Fig. 2A is a perspective view of a four-panel FIBC, and Fig. 2B is a top view of the four-panel FIBC in Fig. 2A;
- Fig. 3 is a perspective view of a circular bottom, or cylindrical FIBC;
- Fig. 4 is a perspective view of a support structure comprising side walls;
- Fig. 5 is a side view of a support structure comprising pivotally arranged side supports in a first state during filling of the FIBCs;
- Fig. 6 is a side view of the support structure in Fig. 4 after filling, showing one side support pivoted away from the FIBCs;
- Fig. 7A shows a partial and enlarged view of a first side support having an adjustable loop holder;
- Fig. 7B shows a cross sectional view along A-A in Fig. 7A;
- Fig. 8A shows a partial and enlarged view of a further adjustable loop holder;
- Fig. 8B shows a cross sectional view along B-B in Fig. 8A;
- Fig. 9 shows the support and two FIBC's, wherein each FIBC's is positioned onto a transport pallet and wherein the pallets are placed, or positioned, side-by-side.

Description of the drawings

[0059] Fig. 1 shows perspective view of a vehicle 100 in the form of a trailer 100, comprising the support and two FIBC 10, 12 positioned, or arranged, to the support structure 30. The vehicle is shown in the form of a trailer 100, configured to be coupled to, and pulled by a truck, or a hauler. The trailer 100 comprises a bed 102 defining a horizontal surface, or plane, 102 adapted, or configured, for placing a load onto. Fig. 1 further shows a support 30 or support structure 30 positioned on the bed 102 forming the horizontal plane 102. Positioned on the bed 102 of the trailer is also shown two Flexible Intermediate Bulk Containers (FIBC), a first FIBC 10 and a second FIBC 12. The first 10 and the second 12 FIBC are arranged adjacent, and next to each other, forming a row of FIBCs. The FIBCs 10, 12 are configured for being filled with, and to contain, a flowable bulk material to enable transport of the material. Each FIBC 10, 12 shown are of the same type, having the same size, or dimensions, and is adapted to contain the same volume of material. Each FIBC is shown to have a cube or cuboid shape, with a square or rectangular cross-section in a plane parallel the bed 102, or horizontal plane 102.

[0060] Each FIBC 10, 12 comprises four lifting loops 14, 16, 18, 20 arranged in a respective corner of each FIBC 10, 12. A first 14, a second 16, a third 18 and a fourth 20 lifting loop. The lifting loops 14, 16, 18, 20 are shown as being cross-corner lifting loops arranged even-

ly around the walls of the FIBC.

[0061] The support 30 is shown comprising a support structure 30 formed by a first 32 and a second side support 34. The first side support 32 is positioned, or arranged, at a first side of the row of FIBCs 10, 12. The second side support 34 is positioned, or arranged at a second side of the row of FIBCs 10, 12. Fig. 1 shows that the row of FIBCs 10, 12 defines two longitudinal sides and two transverse sides. The first and second side of the row of FIBCs are shown as being longitudinal sides. The first side support 32 defines, or forms, a first rest surface 36 that faces upwards in relation to the bed 102, or the horizontal plane 102. The second side support 34 defines, or forms, a second rest surface 38 that faces upwards in relation to the bed 102, or the horizontal plane 102. The first 36 and the second 38 side rest surface are located, or positioned, above the corners of the FIBCs. The first 36 and second 38 side rest surfaces are thus arranged at a height from the bed 102, being larger than the distance between the bed 102, and the corners of the FIBCs. Arranged on the first side support 32 are shown three loop holders 40. The loop holders 40, or first side loop holders 40, couple, or connects, to the lifting loops 16, 20 of the first and second FIBCs 10, 12 and fixates the lifting loops 16, 18 to the support structure 30. The second side support 34 comprises corresponding loop holders, or second side loop holders, to couple to, and fixate the lifting loops 14, 18 to the second side support 34.

[0062] Each lifting loop 14, 16, 18, 20 is positioned to extend, or run across, and come into contact with the first rest surface 36 or the second rest surface 38 when a FIBC is arranged to, or positioned to, the support structure 30. When each lifting loop is biased, or pulled, the corners of each FIBC will define a rectangle, or square opening of each FIBC, and the openings of the two FIBCs 10, 12 will be aligned. Thereby, both FIBCs 10, 12 may be filled from a single working vehicle bucket, with minimal spillage ending up in between the two FIBCs 10, 12.

[0063] Each lifting loop is fixed to a loop holder 40, and extends over the rest surfaces 36 or 38 of the support structure 30, and the weight of each FIBC 10, 12, before and after filling, exerts a biasing force on the corners of each FIBC 10, 12 and the opening of each FIBC forms a rectangular, or square shape.

[0064] The first side support 32 comprises a first support beam 42 that defines, or forms, the first rest surface 36. The first support beam 42 extends, or is arranged to extend, along the first side of the row of FIBCs 10, 12. The first support beam 42 is thus a longitudinally extending beam, extending in a direction shared with the longitudinal direction of the row of FIBCs 10, 12.

[0065] The second side support 34 comprises a second support beam 44 that defines, or forms, the second rest surface 38. The second support beam 44 extends, or is arranged to extend, along the second side of the row of FIBCs 10, 12. The first 42 and second 44 support beams extend in parallel.

[0066] Connected, or coupled, to each first 42 and second support 44 beam are shown two vertical support beams 46, 48. The vertical beams 46, 48 are further connected, or coupled, to the bed 102, or the horizontal plane 102. The vertical beams 48 thus support the first 32 and second 34 side support. The vertical beams 48 are fixed to the bed 102, or the horizontal plane 102.

[0067] Fig. 2A shows a FIBC 10 of a first type, and Fig. 3 shows an alternative FIBC for use with the support structure 30.

[0068] The FIBC shown in Fig. 2A is a four panel FIBCs 10 formed by a bottom 50, or bottom panel 50, joined with four side panels 52, 54, 56, 58. The four side panels 52, 54, 56, 58 form the walls of the FIBC 10. Opposite the bottom 50, the side panels 52, 54, 56, 58 define a FIBC opening 62 for filling or removal of bulk material from the FIBC 10. A rim 64 is defined by the circumferential edge formed at the opening by the side panels 52, 54, 56, 58. The four lifting loops 14, 16, 18, 20 are evenly spaced apart, or distributed, around the rim 64. Fig. 2A further shows that each lifting loop 14, 16, 18, 20 comprises a lifting eye 60. The lifting eyes 60 allows for the FIBC 10 to be positioned, and fixated, to the support structure 30. In addition, the lifting eyes 60 provides for lift points to hoist, or lift, a filled FIBC 10.

[0069] Fig. 2B shows a top-down view of the FIBC of Fig. 2A, wherein the lifting loops 14, 16, 18, 20 are outwardly biased, in a direction shown by dashed arrows. By being outwardly biased in diagonally outward directions, each corner of the FIBC jointly defines a rectangle, or rectangular rim, or opening 62 of the FIBC.

[0070] Fig. 3, shows an alternative FIBC 10' for use with the support structure. The FIBC 10' in Fig. 3 differs from the FIBC 10 shown in Fig. 2, in that the bottom 50' has a circular shape and that a wall 54' of the FIBC, is formed by one continuous length of sheet or fabric folded over and joined to itself along a seam 52' and further joined to the bottom 50'. In an unloaded state, the FIBC 10' will define a cylinder having a circular bottom shape. Opposite the bottom 50', the wall 54' defines a bag opening 62' for filling or removal of bulk material from the FIBC 10'. A rim 64' is defined by the circumferential edge formed at the opening 62' by the wall 54'. The four lifting loops 14, 16, 18, 20 are evenly spaced apart, or distributed, around the rim 64'.

[0071] Thereby, the lifting loops 14, 16, 18, 20 will define a rectangle, or square, opening 62', of the rim, when the lifting loops 14, 16, 18, 20 are biased diagonally outwards of the lifting loops 14, 16, 18, 20. Worded differently, when the lifting loops are pulled in the radially outwards direction of the circular bottom of the FIBCs, the rim 64' will form a square, or rectangular, opening 62'.

[0072] Fig. 4 shows a support structure 30 wherein the first side support 32 is connected, or joined, to a first base beam 70, and wherein the second side support 34 is connected, or joined, to a second base beam 72. The first 70 and the second 72 base beams form a support structure base configured to be placed on, or positioned, on

a truck or trailer bed 102, or horizontal plane 102. The base beams 70, 72 supports and maintains the support structure 30 and FIBCs 10, 12 in place on the horizontal plane 102. During use, the base rests on the horizontal surface 102, or truck or trailer bed 102.

[0073] The first side support 32, comprises a first support beam 78 that defines, or forms, the first rest surface 36. The first support beam 78 extends, along the first side of the row of FIBCs 10, 12. The first side support 32 defines, or forms, a first side barrier 74 that extends from the first rest surface 36 to a level relative to the horizontal plane that is at, or above, the corners of the FIBCs at the first side of the row of FIBCs. The first side barrier 74 is shown being inclined in relation to the bed 102 or horizontal plane 102. The inclination angle may be in the range of 15-90 degrees. The first side barrier 74 may be adjustably mounted providing for the inclination angle to be varied in the range. This allows to configure the first side barrier 74 for use with different sized FIBCs.

[0074] Fig. 4 shows that the first side support 32 comprises a first support beam 78 that defines, or forms, the first rest surface 36. The first support beam 78 extends, or is arranged to extend, along the first side of the row of FIBCs 10, 12. The first side support 32 comprises a first side wall 66. The first side wall 66 is positioned at or juxtaposed to, or arranged to be positioned at or juxtaposed to, the first side of the row of FIBCs. The first side wall 66 provides a constraint for the movement or shape change of a FIBC 10, 12 during filling. The first side wall 66 extends from, and connects, the first support beam 78 to the first base beam 70.

[0075] Correspondingly, the second side support 34, comprises a second support beam 80 that defines, or forms, the second rest surface 38. The second support beam 80 extends, along the second side of the row of FIBCs 10, 12. The second side support 34 defines, or forms, a second side barrier 76 that extends from the second rest surface 38 to a level relative to the horizontal plane 102 that is at, or above, the corners of the FIBCs at the second side of the row of FIBCs 10, 12. The second side barrier 76 is shown being inclined in relation to the bed 102 or horizontal plane 102. The inclination angle may be in the same range as the first side barrier, a range of 15-90 degrees. The second side barrier 76 may be adjustably mounted providing for the inclination angle to be varied in the range. This allows to configure the second side barrier 76 for use with different sized FIBC.

[0076] The first 70 and second 72 side wall prevent the FIBCs 10, 12 from moving or bulging out during filling of the FIBCs. The shape of the FIBC 10, 12 is thereby maintained, or substantially maintained, during filling. In addition, the side walls 66, 68 form a vertical support for the support beams 78, 80. Thus the support structure shown in Fig. 4 is free from vertical beams, such as shown in relation to Fig. 1. Fig. 4 shows that the lifting loops 14, 16, 18, 20 are fixed, or secured, to loop holders 40. The first side support 32 comprises four loop holder 40. The second side support 34 comprises four loop holders 40.

The loop holders 40 are attached, or mounted, to the side walls 66, 68. Alternatively, the loop holder 40 may be attached, or mounted, to the respective first 78 or second 80 support beam.

[0077] Fig. 5 shows a side view of a support structure 30' comprising pivotally arranged side supports 32', 34'. A base support beam 70' is arranged on a horizontal plane 102, or a bed 102. The base support beam 70' extends parallel with and contacts the horizontal plane 102. The first side support 32' is pivotally connected, or coupled, to the base support beam 70' at a first pivot, by a first pivot joint 94, or pivot connection 94. The second side support 34' is pivotally connected, or coupled, to the base support beam 70' at a second pivot, by a second pivot joint 96, or pivot connection 96.

[0078] The first side support 32' and the second side support 34' may thus pivot in relation to the base support beam 70'.

[0079] Arranged between the two side supports 32', 34', and between the two pivot joints 94, 96 is a first FIBC 10. The first FIBC 10 is positioned on to a part of the base support beam 70'. The base support beam 70' extends at least partly underneath the first FIBC 10. The weight of filled FIBC will thus exert a normal force on the base support beam 70' preventing the base support beam 70' from moving in the horizontal plane 102.

[0080] The first side support 32' comprises a first side wall 66 that extends between the pivot joint 74 and the first side support beam 78. The first side wall 66, and the second side wall 68, may also be formed by a vertical beam corresponding to the vertical beams 46, 48 of Fig. 1, or a combination of vertical beams and side walls.

[0081] Fig. 5 further shows that the first 32' and the second 34' side support defines, or forms, a respective first rest surface 36 and second rest surface 38. When the first FIBC 10 is positioned, or arranged on the support structure 30', the second lifting loop 16 extends along the first rest surface 36, over the top of the first support beam 78 and downwards, in a direction towards the horizontal plane 102, and is fixed to a first loop holder 40. In the example shown in Fig. 5, the first loop holder 40 is attached to the first side wall 66. The first loop holder 40 is shown in the form of a first hook 40. The first lifting loop 14 extends across, or transverse over, the second rest surface 38, transversely over the top of the second support beam 80, and downwards, in a direction towards the horizontal plane 102, and is fixed to a loop holder 40 arranged on the second side wall 68.

[0082] Fig. 5 also shows a tilt lock 82, or pivot lock 82, for preventing tilting, or pivoting of both the first and the second side support 32', 34'. The tilt lock 82 is thus a joint tilt lock 82 arranged to releasably prevent both the first side support 32' and the second side support 34' from tilting relative to the row of FIBCs 10, or relative to base 102. The joint tilt lock 82 comprises a tilt lock beam 84, pivotally connected to the first side support 32', or first side wall 66, by a tilt pivot joint 86 at a first end of the pivot tilt beam 84. The tilt lock beam 84 is on an

opposite end of the tilt pivot beam 84, connectable to a pivot beam locking latch 88. The latch 88 secures, or fixates, the end of the pivot beam 84 to the second side support 34', or second side wall 68 and prevents both pivoting of both the first side support 32', or first side wall 66, and the second side support 34, or second side wall 68.

[0083] Fig. 6 shows the joint tilt lock 82 being released, or disengaged, allowing the tilt lock beam 84 to pivot downwards to align transversely to the horizontal plane 102. This allows releasably both the first side support 32' and the second side support 34' to tilt relative to the row of FIBCs 10, or relative to base 102. Fig. 6 shows the second side support 34' tilted to a position aligned with the horizontal plane 102. Tilting is possible by the release of the joint tilt lock 82 as well as the release, and removal of the lifting loop 14 from the side support being tilted, in the example shown as the second side support 34'.

[0084] Fig. 7A shows a partial and enlarged view of a first side support 32 having an example adjustable loop holder. Fig. 7B shows a cross sectional along A-A of Fig. 7A.

[0085] Figs. 7 shows a first side support 32 with a first rest surface 36. Extending over the first rest surface 36 is a lifting loop 14. The lifting loop 14 is further attached, or securely fixed, to a loop holder 40. The loop holder comprises a plurality of threaded through holes 98, extending through the side wall 66, or support beam 78. The threaded through holes 98 are configured to interact with a threaded bolt 108. The bolt 108 extends through the lifting eye of the lifting loop 14 and threads into one of the threaded through holes 98. The threaded through holes 98 are arranged at different distances from the resting surface 36. Increasing the biasing force on the corners of a FIBC may be made by threading the bolt 108 to a threaded through hole further away from the rest surface 36.

[0086] Figs. 8A shows a partial and enlarged view of a first side support 32 with an alternative adjustable loop holder 40' of the example shown in Figs. 7. Fig. 8B shows a cross sectional along B-B in Fig. 8A. The loop holder is formed by a through bolt 108 threaded into a matching threaded through hole 98. The lifting eye of the lifting loop 14, is connected to the threaded bolt 108 by a rubber strap 110. The rubber strap 110 is thus flexible and elastic. The rubber strap 110 comprises at one end of the strap 110, a T-shaped end 112. Along the strap are arranged strap openings 114 adapted for threading the T-shaped end 112 through. Figs. 8 show a single threaded holes 98, however the arrangement may comprise a plurality of threaded holes 98 as shown in relation to Figs. 7, for increased adjustability. The example shown in Figs. 8 may be used with various rubber straps, of different lengths, elastic material, or non-elastic material. For example, the rubber strap 110 may instead of having a T-shaped end 112 and openings 114, have metallic hooks arranged at either end of the strap, that interface with the lifting loop 14 lifting eye and the threaded bolt 108.

[0087] Fig. 9 shows the support structure 30 and the two FIBC's 10, 12, wherein the first FIBC 10 is positioned onto a first transport pallet 120 and the second FIBC 12 is positioned onto a second transport pallet 122. Each transport pallet 120, 122 is shown as an EUR transport pallet, or EPAL. The support structure 30 is arranged to support each FIBC 10, 12 in an upright position, or fully expanded state, relative to the load carrying top surface 134, or surfaces 134 of the first and second transport pallet 120, 122. The upper surface 134, or surfaces 134 of the transport pallet 120, 122 thus forms a horizontal plane 134 with the FIBC 10, 12 resting on the horizontal plane 134. Each pallet 10, 12 is shown having two parallel longitudinal sides 128 and two parallel transverse sides 130. The pallet has a length along a longitudinal side 128 exceeding the width, along a transverse side 130 of the pallet 120, 122. For example, the length is 120 cm and the width is 80 cm. The pallets 120, 122 are placed, or positioned, side-by-side, with a transverse side 130 of the first pallet 120 facing a transverse side 130 of the second pallet 122. The first FIBC 10 is centered on the first pallet 120 and the second FIBC 12 is centered on the second pallet 122 and a space 132 is formed between the first FIBC 10 and the second FIBC 12. A transverse barrier 124 extends between the first side member 32 and the second side member 34 and bridges or covers at least a portion of the space 132 between the first FIBC 10 and second FIBC 12. The transverse barrier 124 has a top surface 124 facing away from the pallets 120, 122, or horizontal surface 134, and two barrier side surfaces 126, extending from the top surface 124 to a level at, or above, the corners of the FIBCs 10, 12 at the first and second side of the row, formed by the two FIBCs 10, 12.

[0088] The first transverse barrier side 126 is arranged at a first side of the transverse barrier top 124 and the second transverse barrier side 126' is arranged at an opposite side of the transverse barrier top 124. The first 126 and second 126' transverse barrier side are shown being inclined to guide material into each FIBC. After filling of the FIBCs 10, 12 positioned on the pallets 120, 122 the support structure 30 may be removed. The FIBCs 10, 12 and pallets 120, 122 may thereafter be transported to a customer location wherein a FIBC with pallet may be lifted of the transporting vehicle.

Item list

[0089]

10	First FIBC	50
10'	Circular bottom, or cylindrical FIBC	
12	Second FIBC	
14	First lifting loop	
16	Second lifting loop	
18	Third lifting loop	55
20	Fourth lifting loop	
30	Support structure	
32, 32'	First side support	

34, 34'	Second side support
36	First rest surface
38	Second rest surface
40	Loop holders
5 42	First support beam
44	Second support beam
48	Vertical support beams
50, 50'	FIBC bottom, or bottom panel
52, 54, 56, 58	FIBC side panels
10 52'	Seam
54'	Wall
60	FIBC lifting eyes
62, 62'	FIBC opening
64, 64'	FIBC Rim
15 66	First side wall
68	Second side wall
70	First base beam
70'	Base support beam
72	Second base beam
20 74	First side barrier
76	Second side barrier
78	First support beam
80	Second support beam
82	Tilt lock
25 84	Tilt lock beam
86	Tilt pivot joint
88	Pivot beam locking latch
94	First pivot, first pivot joint
96	Second pivot, second pivot joint
30 98	Threaded through holes
100	Vehicle, or trailer
102	Bed of trailer or truck, forms horizontal plane
108	Threaded bolt
35 110	Rubber strap
112	T-shaped strap end
114	Strap openings
120	First transport pallet
122	Second transport pallet
40 124	Transverse barrier top
126	First transverse barrier side
126'	Second transverse barrier side
128	Pallet longitudinal side
130	Pallet transverse side
45 132	Space
134	top surface 134, or surfaces 134 of the first and second transport pallet 120, 122

Claims

1. A support for supporting a plurality of Flexible Intermediate Bulk Containers (FIBCs) (10, 12), each FIBC having four cross-corner lifting loops (14, 16, 18, 20), or each FIBC having four corners and a lifting loop (14, 16, 18, 20) located at

each corner,
the corners of each FIBC jointly defines a rectangle at diagonal outward biasing of the lifting loops, wherein the FIBCs are positioned side-by-side in a row having longitudinal first side and a longitudinal second side, and each FIBC is oriented with two corners at the first side of the row and the other two corners at the second side of the row:

- a support structure (30), and
- a plurality of loop holders (40) attached to the support structure (30),

wherein the support structure (30) is arranged to support each FIBC (10, 12) in an upright position, or fully expanded state, relative to a horizontal surface (102, 134) with the FIBC resting on the horizontal surface (102, 134), wherein the loop holders are configured to fix, or lock, the lifting loops (13, 16, 18, 20) of each FIBCs relative to the support structure, and the support structure and the loop holders are configured to bias the lifting loops apart from one another.

2. The support according to claim 1, wherein

the plurality of loop holders is composed of first loop holders and second loop holders, the support structure comprises a first side support positioned, or arranged to be positioned, on, or at, the first side of the row of FIBCs, the first side support defines, or forms, a first rest surface that faces upward relative to the horizontal plane, the first rest surface is located at or above, or arranged to be located at or above, the corners of the FIBCs at the first side of the row of FIBCs, the first loop holders are attached to the first side support and located below the first rest surface.

3. The support according to claim 2, wherein the first side support defines, or forms, a first side barrier extending from the first rest surface to a level relative to the horizontal plane that is at, or above, the corners of the FIBCs at the first side of the row of FIBCs.

4. The support according to claim 2 or 3, wherein the first side support comprises a first support beam that defines, or forms, the first rest surface and extends, or is arranged to extend, along the first side of the row of FIBCs.

5. The support according to any of the claims 2 to 4, wherein the first side support comprises a first side wall positioned at or juxtaposed to, or arranged to

be positioned at or juxtaposed to, the first side of the row of FIBCs.

6. The support according to any of the claims 2 to 5, wherein the support structure further comprises a base for resting on the horizontal surface, and the first side support is pivotally connected to the base and configured to tilt outward relative to the row of FIBCs, or relative to the base.

7. The support according to claim 6, wherein the support structure further comprises a first tilt lock arranged to releasably prevent the first side support from tilting relative to the row of FIBCs, or relative to the base.

8. The support according to any of the claims 2 to 5, wherein support structure further comprises a base for resting on the horizontal surface, wherein the first side support is fixed to the base.

9. The support according to any of the claims 2-8, wherein the support structure comprises a second side support positioned, or arranged to be positioned, on, or at, the second side of the row of FIBCs, the second side support defines, or forms, a second rest surface that faces upward relative to the horizontal plane, the second rest surface is located at, or above, or arranged to be located at, or above, the corners of the FIBCs at the second side of the row of FIBCs, the second loop holders are attached to the second side support and located below the second rest surface.

10. The support according to claim 9, wherein the second side support is pivotally connected to the base and configured to tilt outward relative to the row of FIBCs, or relative to the base, and wherein the second side support defines, or forms, a second side barrier extending from the second rest surface to a level relative to the horizontal plane that is at, or above, the corners of the FIBCs at the second side of the row of FIBCs, and wherein the second side support comprises: a second support beam that defines, or forms, the second rest surface and extends, or is arranged to extend, along the second side of the row of FIBCs; and a second side wall positioned at or juxtaposed to, or arranged to be positioned at or juxtaposed to, the second side of the row of FIBCs.

11. The support according to claims 10, wherein the support structure further comprises a second tilt lock arranged to releasably prevent the second side support from tilting relative to the row of FIBCs, or relative to the base.

12. The support according to claim 9 or 10, wherein the

second side support is pivotally connected to the base and configured to tilt outward relative to the row of FIBC's, or relative to the base, and the support structure further comprises a joint tilt lock arranged to releasably prevent both the first side support and the second side support from tilting relative to the row of FIBC's, or relative to base. 5

13. The support according to claim 6, wherein at least a part of the base extends underneath at least a part of one FIBC in the row of FIBC's. 10

14. The support according to any preceding claim, wherein the loop holders are spring loaded or elastic and/or wherein the loop holders are adjustable and configured to couple FIBC's having lifting loops varying in length to the support structure. 15

15. Use of the support according to any of claim 1-14, wherein the support structure is arranged on a bed (102) of a vehicle or trailer. 20

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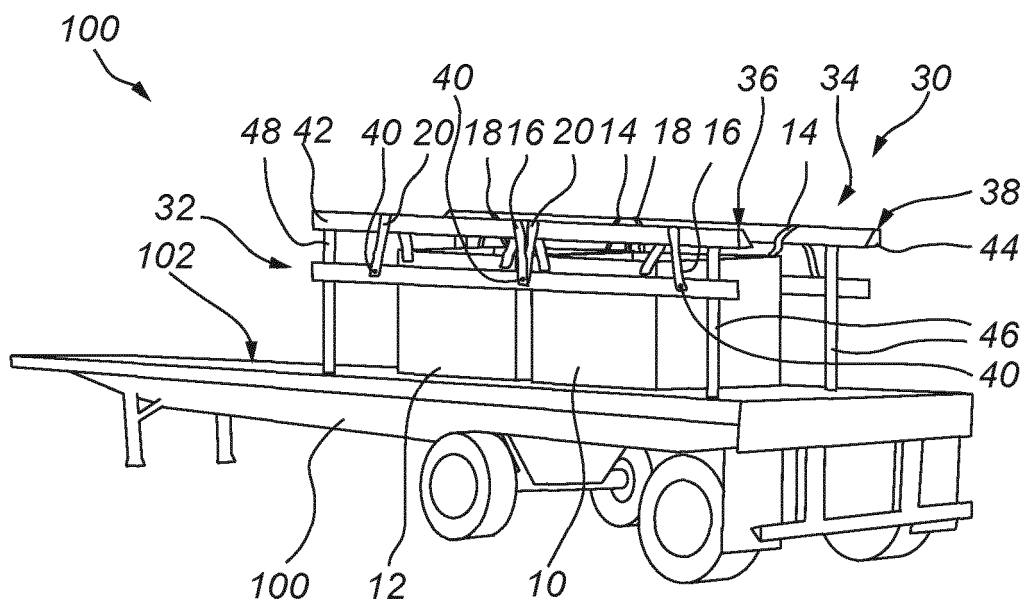


Fig. 1

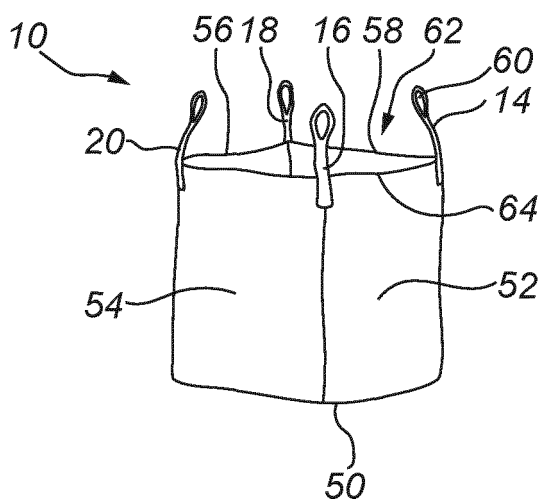


Fig. 2A

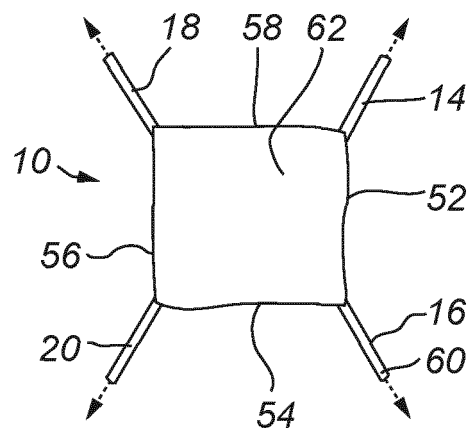


Fig. 2B

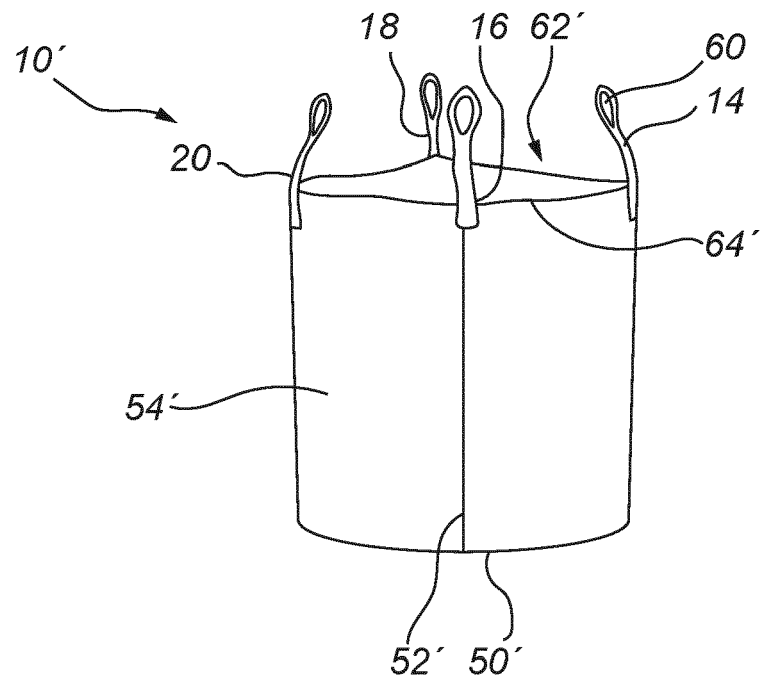


Fig. 3

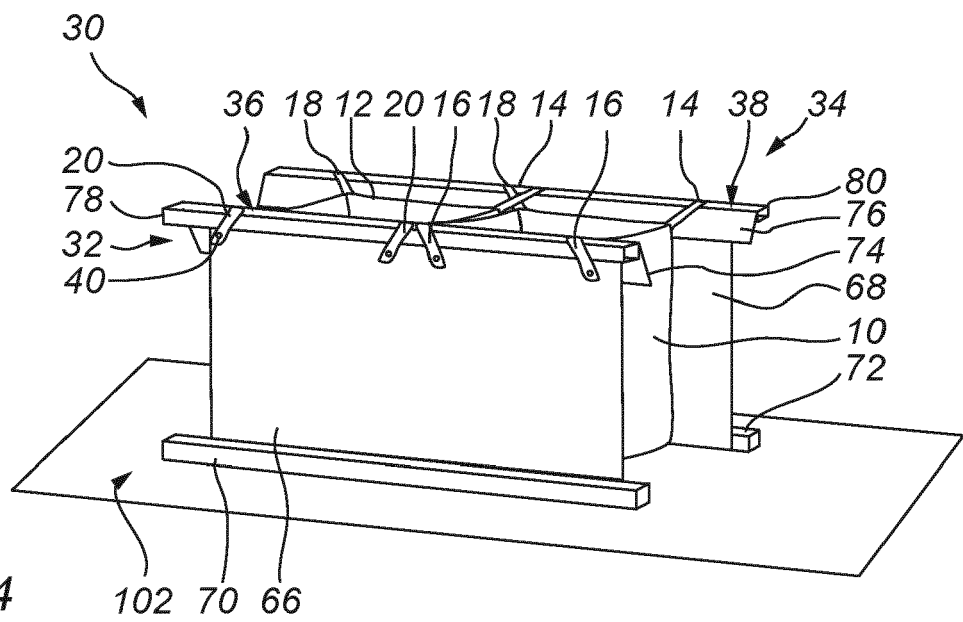


Fig. 4

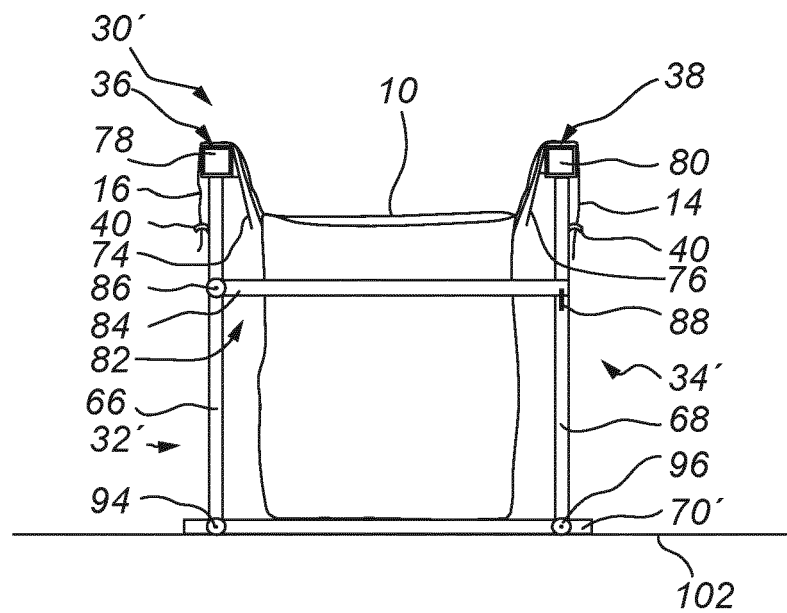


Fig. 5

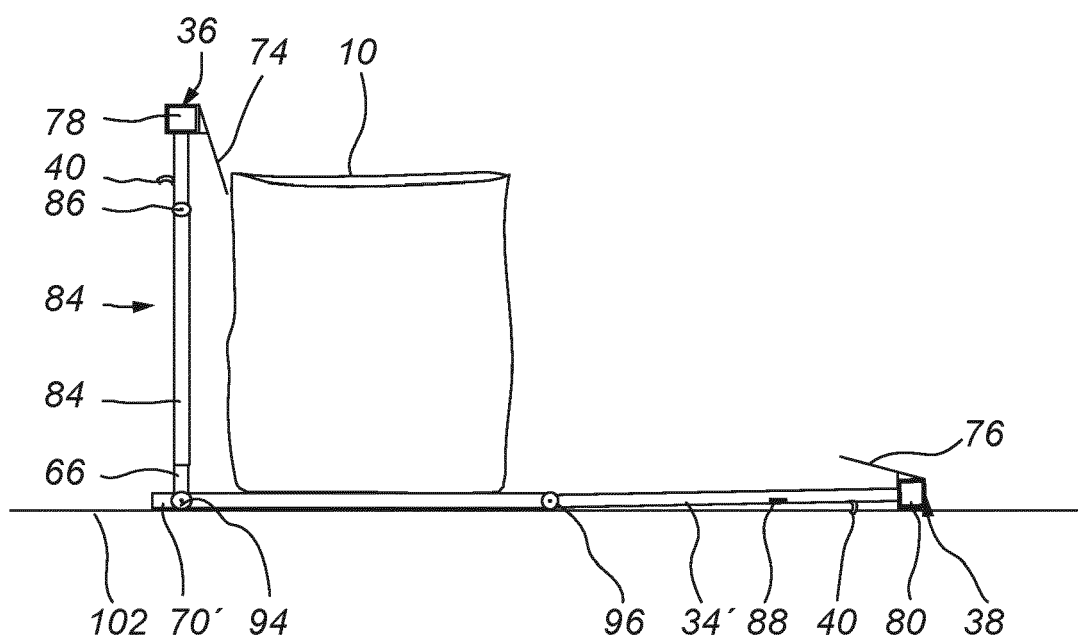


Fig. 6

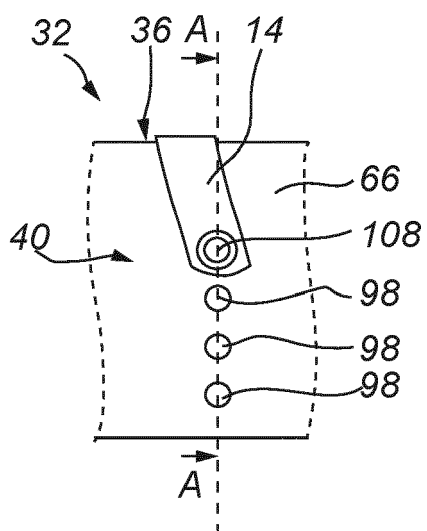


Fig. 7A

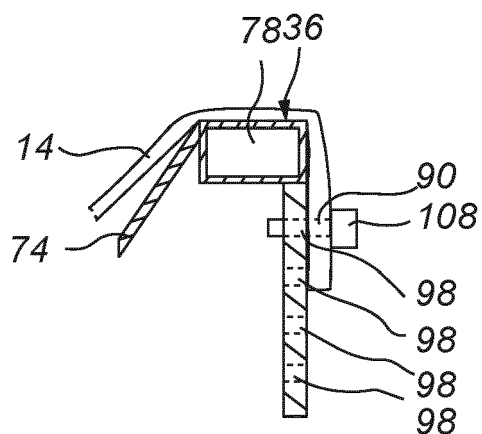


Fig. 7B

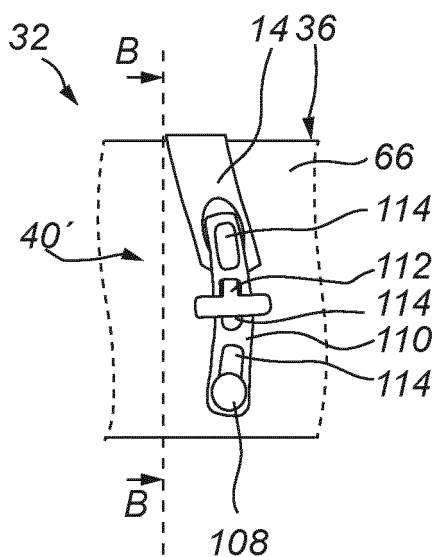


Fig. 8A

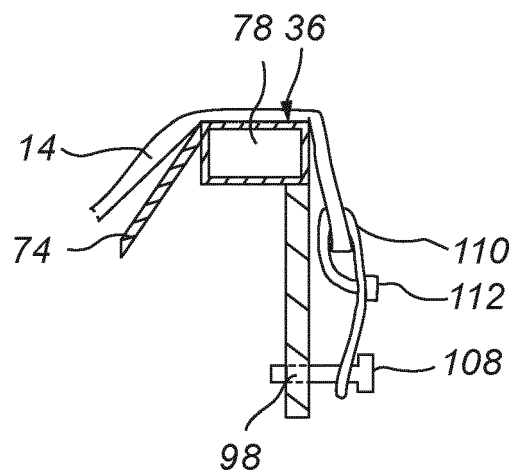


Fig. 8B

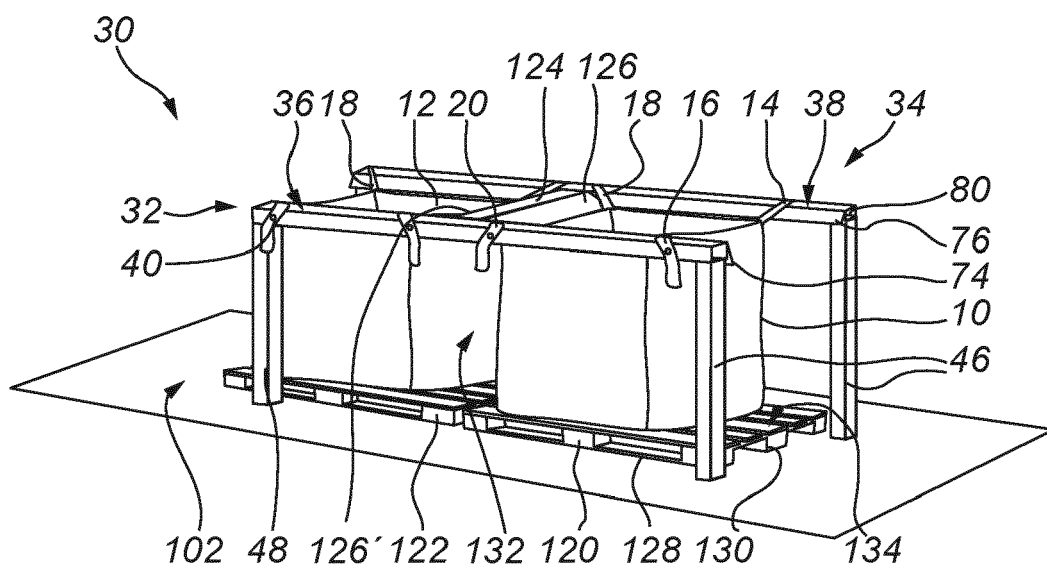


Fig. 9



EUROPEAN SEARCH REPORT

Application Number

EP 23 15 4940

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2009/121591 A2 (MACNABB BROTHERS [GB]; MACNABB MARK [GB]) 8 October 2009 (2009-10-08) * page 4, line 23 - page 12, line 6 *	1-5, 9, 13-15	INV. B66C1/59 B65D88/16 B65B67/12
Y	* page 4, line 23 - page 12, line 6 *	6-8, 10-12	
X	US 2019/177025 A1 (MCDONALD TOMMY D [US]) 13 June 2019 (2019-06-13) * paragraph [0018] - paragraph [0045] *	1	
X	US 8 910 813 B1 (BARRE BERTRAND [FR] ET AL) 16 December 2014 (2014-12-16) * column 2, line 16 - column 4, line 16 *	1	
X	US 2006/175474 A1 (LAWSON STEPHEN [CA] ET AL) 10 August 2006 (2006-08-10) * paragraph [0041] - paragraph [0055] *	1	
X	GB 2 533 611 A (ANDREW JOHN BALL [GB]) 29 June 2016 (2016-06-29) * page 5, line 3 - page 6, line 36 *	1	TECHNICAL FIELDS SEARCHED (IPC)
X	EP 0 373 506 A1 (SARIG ELAN) 20 June 1990 (1990-06-20) * column 2, line 27 - column 7, line 52 *	1	B66C B66F B65D B65B
X	WO 99/49941 A1 (ROSKY GREGORY C [US]) 7 October 1999 (1999-10-07) * page 2, line 14 - page 3, line 20 *	1	
Y	US 3 687 408 A (LAKE CONNIE) 29 August 1972 (1972-08-29) * column 2, line 30 - column 5, line 64 *	5-8, 10-12	
Y	US 1 572 971 A (SYERS PAUL R) 16 February 1926 (1926-02-16) * page 1, line 38 - page 2, line 13 *	5-8, 10-12	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 September 2023	Examiner Yazici, Baris
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	



EUROPEAN SEARCH REPORT

Application Number

EP 23 15 4940

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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