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(54) **Method for manufacturing and converting a ship, and a ship and container**

(57) The invention relates to a method for manufacturing a double-walled tanker, comprising of providing a single-walled tanker with hold and arranging in the hold tanks having tanks walls placed at a distance from the outer wall of the tanker, wherein the method further comprises of providing rolled plates and of partially manufacturing the tank wall from the rolled plate. The invention also relates to a vessel, comprising a hold and at least

one substantially box-like tank with tank walls received in the hold, wherein at least two mutually connected tank walls of a tank are formed by rolled plates with profile. The invention further relates to a container for products, comprising a number of side walls in a box-like configuration, wherein at least a bottom is formed by a rolled plate with profile in a longitudinal direction of the container.

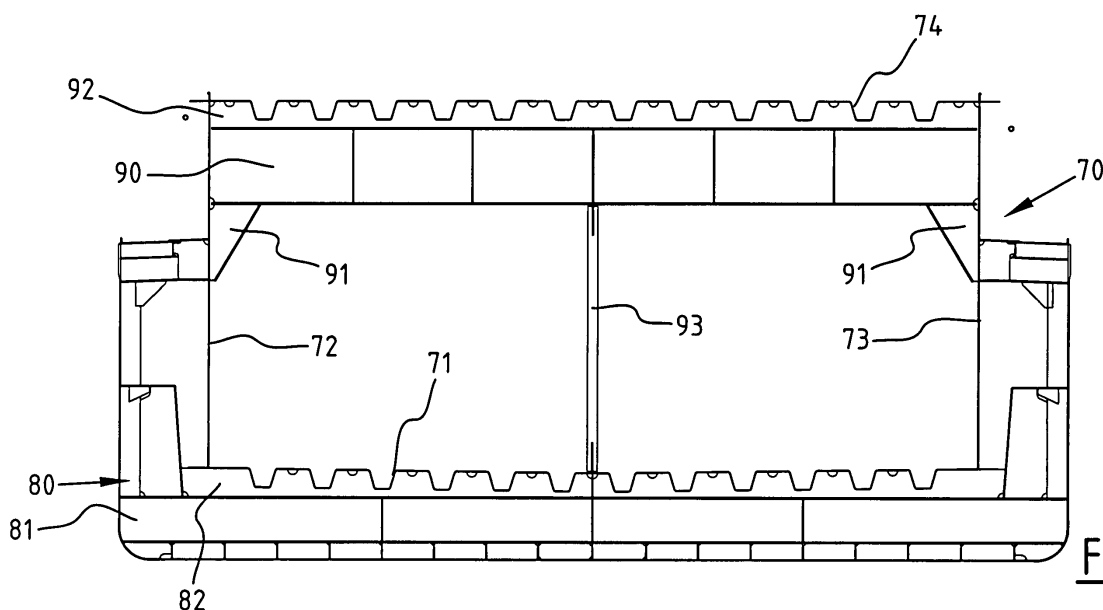


FIG. 7A

Description

[0001] The invention relates to a method for manufacturing a double-walled vessel with tank, and to a method for converting a single-walled vessel into a double-walled vessel with at least one tank. The invention also relates to a vessel with loading spaces and to a container.

[0002] In the inland navigation sector vessels are used to transport products, in particular liquid such as fuel oil and the like. The liquids are stored in tanks. Use is made in inland navigation of single-walled vessels, wherein the liquid is stored directly behind the wall of the vessel. The vessel can have a plurality of tanks. The tanks are separated from each other by means of partitions and longitudinal bulkheads. In the event of a collision a wall of the vessel can be damaged, whereby the tank empties. Double-walled vessels are increasingly being used in the shipping industry, particularly for the transport of liquids such as fuel oil. Partly as a result of legislation it has become economically interesting to convert single-walled vessels into double-walled vessels.

[0003] A problem with double-walled vessels is the increased weight compared to single-walled vessels. An aspect of the invention relates to providing a double-walled tanker with a small increase in weight relative to the single-walled tanker.

[0004] According to a first aspect of the invention, this objective is achieved in that the method for manufacturing a double-walled vessel comprises of providing a single-walled vessel with hold and arranging in the hold at least one tank, the outer wall of which is placed at a distance from the wall of the vessel. Two or more tanks are preferably arranged.

[0005] In another embodiment loading spaces are arranged, or a combination of loading spaces and tanks. A loading space is a tank which is substantially open to the top.

[0006] The method preferably comprises of providing rolled plates and of partially manufacturing at least one side wall of the loading space or tank from the rolled plate. Side walls of the tank are hereby formed by the rolled plate, whereby a weight-saving is achieved relative to wall plates normally used for tanks, such as plates strengthened with profiles. Particularly in the conversion of a single-walled vessel to a double-walled vessel wherein a loading space/tank is accommodated in the hold and the side walls of which are separated from and lie at a distance from the side walls of the vessel, the vessel will become heavier due to the tanks/loading space being built in. This increase in weight is reduced by applying the rolled plates.

[0007] The rolled plates can be provided with a profile, in particular a repeating corrugation, whereby after the rolling the plate has an increased bending stiffness at right angles to the direction of rolling. Thinner plates can hereby be used to manufacture the tank walls, thereby resulting in a weight-saving. It is not obvious to use rolled plates with a determined profile, since extra volume of

the container space is hereby "lost", since an undulating profile protrudes inward into the tank.

[0008] The weight-saving of the rolled plate relative to usual plates provided with strengthening profiles is considerable, the saving in working hours required for production is even more significant. In an embodiment the difference in volume can be compensated by having the tank to be built into the vessel protrude above the (old) deck of the vessel. The difference in volume, also that volume specifically related to the use of profiled rolled plates, can hereby be compensated.

[0009] The method relates particularly to an elongate vessel and comprises of arranging the rolled plates as tank wall with a profile in the longitudinal direction. The profiles hereby extend in the longitudinal direction, the direction in which the rolled plates acquire the most additional bending stiffness. It is hereby possible to dispense with other strengthening parts in this direction. Strengthening parts can be arranged at greater distance from each other in lengthwise direction of the vessel. This results in a further weight-saving.

[0010] According to a further embodiment, the method comprises of manufacturing the tank with a rectangular section with four side walls, wherein the four side walls are formed by rolled plates. The four side walls all consist of rolled plates, in particular sheet piling-like plates with corrugations, and this produces a container with a low weight. The rolled plates can be connected to each other. Use is particularly made of connecting a profiled edge of one rolled plate, an edge parallel to the cross-section of the profile of the rolled plate, to an outer end of another rolled plate, wherein this outer end is not rolled. This outer end is flat. The strip formed on the end, which is not rolled, has a width which is equal to or greater than the thickness of the profile in the rolled plate connected thereto. When use is for instance made of a rolled plate with a profile which has a substantially repetitive wave-shape, in particular with corrugations which are offset relative to each other, the rolled plate has a determined thickness, for instance 15 cm. The outer end of the other side wall of the tank connected thereto then has a strip along that side wall which is at least 15 cm wide, so that it can be connected, in particular can be welded, to the profiled edge.

[0011] According to a preferred embodiment an intermediate element is provided in the method according to the invention, wherein the intermediate element is preferably a frame, and a plurality of rolled plates are arranged in longitudinal direction of the vessel and mutually connected via an intermediate element therebetween. The rolled plates are arranged one after the other in lengthwise direction of the vessel, and the intermediate element is placed therebetween. The intermediate element is for instance the partition which ensures that diverse containers can be formed in longitudinal direction of the vessel. Through the use of an intermediate element the outer ends of the plates, which in particular are provided with the profile, can be connected to the interme-

mediate element, which is preferably provided with a flat side which is connected to the profiled edge. Forming of the connection, for instance a welded connection, between the profiled edge and the intermediate element is hereby facilitated, and working hours can be saved in making of the welds. The intermediate element is preferably flat on both sides and can be connected on both these sides to a profiled edge of a rolled plate.

[0012] In a further preferred embodiment the method comprises of manufacturing a dividing wall in the loading space/tank formed by the intermediate element and a rolled plate. The dividing wall thus comprises not only an intermediate element but also a rolled plate. This rolled plate forms the separation between the tanks formed on either side thereof, and a light-weight solution is obtained by using the rolled plate. The rolled plate is preferably connected to the intermediate element. The connection to the intermediate element can be made before the intermediate element is placed in the vessel. The welding can hereby take place outside the vessel.

[0013] The intermediate element preferably has a thickness dimension extending in the direction between the loading spaces/tanks. The dividing wall is preferably placed vertically with profiles of the rolled plate extending in vertical direction. The vertically placed dividing wall hereby has a determined depth in lengthwise direction of the vessel.

[0014] Manufacture of the intermediate element preferably comprises the use of tubular elements which are mutually connected such that a frame, to be referred below as superstructure, is formed. The frame/the superstructure constructed from tubular elements has a great rigidity and provides surfaces to which the side walls/rolled plates of the tank/loading space can be connected, in particular by welding.

[0015] Rectangular tubular elements are preferably used to form a superstructure. Hereby provided are flat surfaces to which can be connected the side walls of the tank for forming, in particular the profiled side walls.

[0016] It is further recommended that the opening of the frame/superstructure is closed with a rolled plate with profile. It is hereby also possible to apply the cheaper rolled plate as partition between tanks for forming, instead of plates provided with a profile.

[0017] It is further advantageous to have the method comprise of prefabricating a tank construction/loading space construction, wherein the tank construction comprises a frame having connected thereto vertical and horizontal side walls of a tank, wherein the prefabricated tank construction is placed in the vessel. The welding of a large number of components of the tank for forming is hereby carried out outside the vessel, whereby the welder has sufficient space to move and the welding can take place under easy conditions. The tank construction can be hoisted into the vessel.

[0018] The prefabricated tank construction has a substantially rectangular section, which is preferably connected to the frame of tubular elements. It is possible

here to use rolled plates as side walls for the four sides of the rectangular section of the tank or for the three sides of the rectangular section of the loading space.

[0019] According to a further aspect, the method comprises of arranging knees on either side of the hold of the vessel and of guiding and centring the tank/loading space construction with the knees when it is placed in the hold. Centring of the prefabricated tank construction is achieved with the knees, whereby a balanced state is obtained. The knees can comprise inward protruding curved surfaces which are placed in the vessel before the tank construction is placed therein. This results in further savings in the manufacture of a tank in the vessel.

[0020] The invention preferably relates to the conversion of a single-walled vessel to a double-walled vessel. The single-walled vessel can hereby be converted to meet legal requirements.

[0021] The invention also relates to a vessel. The vessel comprises a hold. The hold can be the hold of a single-walled vessel from which the tanks or loading spaces, in particular longitudinal bulkheads and transverse bulkheads of these tanks, are removed. According to the invention at least one substantially box-like tank/loading space with side walls is received in the hold. According to an aspect of the invention, the tank/loading space comprises at least two mutually connected side walls formed using rolled plates with a profile. The profile strengthens the plates and increases the bending stiffness at a minimal weight. A double-walled vessel can hereby be obtained in advantageous manner. This is particularly an advantageous structure when a single-walled vessel is converted into a double-walled vessel.

[0022] The side walls of the tank/loading space can be placed at a distance from the walls of the vessel, whereby the tank can be received in the hold of the vessel. An increase in weight when a single-walled vessel is converted to a double-walled vessel can be minimized by using rolled plates with profile.

[0023] The loss of storage space volume in the tanks of the single-walled vessel can further be minimized during conversion to the double-walled vessel in that the tanks to be formed can for instance protrude above the deck. The weight increase of the built-in tank is partly compensated by the reduced cargo capacity, in particular liquid which can be received in the tanks. The bending stiffness of the vessel is moreover enhanced by the rolled plates with profile.

[0024] The vessel according to a preferred embodiment comprises a rolled plate which has a wave-shaped or crenellated profile, in particular a sheet pile wall profile. Such a profile can easily be rolled into flat plates, in particular metal plates or stainless steel plates. A tank can hereby be provided at low cost and with a minimal weight.

[0025] It is further favourable that the vessel is elongate and that a plurality of tanks/loading spaces are arranged, separated by partitions, in the longitudinal direction of the vessel. Separate compartments are hereby obtained, thereby increasing the safety of the vessel.

[0026] It is a further advantage that the vessel has at least one tank/loading space, of which at least a bottom wall and one side wall are formed by rolled plates. The bottom wall and the side wall are mutually connected by means of connecting means. Use is hereby made of plates with bending stiffness in both the horizontal and vertical direction. Use is made particularly of a bottom wall, two side walls standing therefrom and an upper wall, whereby a substantially rectangular section of the tank is obtained.

[0027] The vessel according to the preferred embodiment preferably comprises a tank wall which comprises a rolled plate with a profiled part and a strip-like part along an outer end of this plate which is flat. The flat part of the plate is not provided with a profile by rolling. This flat part can be connected to another tank wall, in particular a profiled tank wall. The strip-like part along the side edge of the plate provides sufficient space for making connections, in particular welded connections, to the profiled edge of another side wall of the tank.

[0028] Particularly the bottom wall or the upper wall of the tank has a rolled profile in the horizontal direction, and the outer ends are provided on the sides with a strip which has at least the width of the thickness of the profile of the upright side walls. Connecting the profiled (not straight) edges of the side walls to the strip-like parts is easy, since the strip-like part is flat and a welded connection can easily be made thereon despite the profiled edge of the profile part not lying in one line.

[0029] It is further recommended that the tank comprises at least one intermediate element, in particular a frame, which forms a part of the tank wall. Connecting means in particular are used to connect at least one rolled plate to the frame. The frame forms a structure providing extra strength, and further forms a location to which the profiled side walls of the tank can be connected. The frame in particular provides at least a number of surfaces in the form of a strip to which can be connected the profiled edges of at least one side wall and preferably at least two side walls of the tank. Because the frame forms a strip, the profiled edge can be easily connected by means of welding to this strip, and thus to the frame.

[0030] The frame is preferably a tubular superstructure which is formed by mutually connected elongate elements. The superstructure preferably has a cross-section which corresponds partly with the cross-section of the tank to be formed. The superstructure can hereby form an outer end of the tank to be formed.

[0031] In a preferred embodiment the superstructure has a bottom part, two side parts and an upper part, and the respective parts of the superstructure are connected to tank walls formed by rolled plates. The superstructure thus forms an intermediate element, for instance for mutually connecting the box of a tank formed by four side walls, wherein the superstructure is always placed between such tank constructions consisting of four surfaces.

[0032] In a preferred embodiment the superstructure

is constructed from tubular elements. Particularly tubular elements with a rectangular section are used. At least two surfaces of the rectangular section can hereby be used as engaging surface for an edge of the rolled plate forming the side wall of the tank, in particular the profiled edge of the rolled plate.

[0033] According to a particular embodiment, a rolled plate is used to close the opening of the frame. Together with the rolled plate placed in the opening of the superstructure, the superstructure forms a partition in the tank. A plurality of compartments is hereby formed. The superstructure connects two tank compartments to each other and separates them from each other. The rolled plate is applied as separation, whereby a weight-saving is obtained relative to plates with a profile arranged thereon.

[0034] In yet another embodiment the vessel is provided with a tank having at least a bottom plate which is a substantially horizontally placed, rolled plate with profile, wherein an outer end of this plate, in particular the end with profile edge, is connected to a cross beam of a partition, in particular the superstructure. The cross beam is herein preferably hollow and provided with an opening connecting the tank to the cavity in the cross beam. It is hereby possible to use the cavity of the cross beam as a collecting space for liquid which is present in the tank, particularly during suctioning of these liquids out of the tank. The suction conduits are preferably arranged in the cavity of the cross beam. The conduits are used to suction off the liquid. Since a vessel is often loaded, wherein the vessel inclines to the rear, the liquid will collect close to the partition of the tank in the vessel placed further to the rear during pumping of the liquid out of this tank. This partition is provided with a cavity in the cross beam, and the liquid will collect in the cross beam, the lowest point.

[0035] In one embodiment the cross beam of the superstructure is particularly provided with a collecting reservoir which protrudes downward from the cross beam. Residues of the liquid in the tank will enter the cavity and can be discharged therefrom, wherein hardly any liquid remains in the tanks.

[0036] For suctioning purposes particular use is made of two conduits, one conduit with a greater diameter for suctioning out the bulk of the liquid and one conduit of smaller diameter for suctioning out the residues, in particular the residues from the collecting reservoir arranged in the cross beam.

[0037] In a further embodiment, and according to another aspect of the invention, the tank comprises a heating line received in the tank, wherein the heating line is received in strip-like profiled parts of the rolled plate. When a rolled plate has in particular a sheet pile wall profile, this plate has higher and lower parts in the case of a horizontally placed rolled plate. The heating line is arranged in the deeper parts, a trough or wave-shaped part, of this rolled bottom plate. In combination with the suctioning taking place close to the lowest parts of the tank, heating of liquid in the tanks is obtained, particularly

for instance in the case of fuel oil, whereby the viscosity of the liquid can be reduced. It is possible here to heat the volume of the liquid present in the tank and to reduce the viscosity, whereby discharge is possible.

[0038] The heating line is arranged in particular through the cavity arranged in the cross beam and the opening connecting the cross beam cavity to the lower parts of the horizontal rolled plate of the tank wall. The heating line can hereby be in communication with its heat source via the cavity of the cross beam, and can be controlled from there.

[0039] The invention also relates to a container for products, comprising a number of side walls in a box-like configuration, wherein at least a bottom is formed by a rolled plate with profiles in the longitudinal direction of the container. Such containers can be used in vessels and can be loaded and unloaded. These containers can be manufactured at low cost.

[0040] The container particularly has one or more of the properties indicated in the above in respect of the tanks/loading spaces arranged in the vessel.

[0041] The invention will be further described with reference to the drawings, in which:

Figure 1 shows a view of a vessel according to the prior art,

Figure 2 shows a view of a first embodiment of a vessel according to the invention,

Figure 3 shows a cross-section along III-III in figure 1, Figure 4 shows a cross-section along IV-IV in figure 1,

Figure 5 shows a cross-section along V-V in figure 1, Figure 6 shows a cross-section along VI-VI in figure 1,

Figure 7 shows a cross-section along VII-VII in figure 1,

Figure 8 shows a cross-section along VIII-VIII in figure 1,

Figure 9 shows a view of a tank construction for a vessel according to an embodiment,

Figure 10 shows a perspective view of an interior of a tank according to an embodiment,

Figure 11 shows a detail according to XI in figure 10.

[0042] Figure 1 shows an inland navigation vessel 1 of usual construction. The invention can be applied to any vessel in which cargoes are stored in spaces. According to a preferred embodiment the cargo is liquid, preferably fuel oil. The invention is however not limited to a specific cargo.

[0043] Vessel 1 has a bow 2 and a hold 4 which extends in lengthwise direction between bow 2 and bridge 3 and which is substantially box-shaped. Hold 4 is elongate in lengthwise direction of the vessel.

[0044] Vessel 1 is an exemplary embodiment of a vessel in which the invention can be applied. Another construction of the vessel is possible. Bridge 3 can be placed in the centre or on the bow of the vessel.

[0045] Tanks or loading spaces can be formed in hold 4 of vessel 1. Hold 4 can be provided with partitions, for instance a longitudinal bulkhead and one, two or more transverse bulkheads. The hold is hereby divided into multiple parts. In a prior art single-walled vessel 1 the cargo is arranged in the hold and herein lies against the side walls of the hold formed by walls 5 of the vessel. The cargo can here flow out of the vessel in the case of a collision and damage to the side wall of the vessel.

[0046] Figures 3-5 show sections of loading space 4 of vessel 1. Figure 3 shows a cross-section of an existing main frame at the position of a transverse bulkhead 10. Figure 4 shows an existing web frame 11 and figure 5 shows a normal frame 12. The frames strengthen the hold.

[0047] Figure 5 shows inter alia a cross-section of bottom 13 of the vessel. The bottom is here formed by a plate on which profiles, here bulb flat profiles 14, are arranged. The profile extends in longitudinal direction of the vessel.

[0048] The invention provides a method and device for converting a single-walled vessel as shown in figure 1 into a double-walled vessel at low cost and in economic manner, i.e. while retaining as much cargo capacity etc. as possible.

[0049] The invention also relates to a vessel incorporating the invention. The invention also relates to a loading space/tank construction, without vessel.

[0050] Figure 2 shows a vessel 20 in which the invention is applied. Vessel 1 can be converted to vessel 20 at a shipyard. During the conversion the vessel can for instance also be lengthened.

[0051] Vessel 20 is a double-walled vessel, i.e. one or more loading spaces/tanks 22 in which cargoes can be received are formed in hold 21. The tanks or loading spaces have a side wall. The side wall is arranged in hold 21 but is situated at a distance from the side wall and bottom of vessel 20.

[0052] Figure 2 shows a vessel with tanks 22. In the shown embodiment seven tanks are arranged in hold 21, separated in each case by a partition 24. Figure 6 shows a cross-section of partition 24.

[0053] It can be seen in figure 2 that the tanks according to the invention protrude above deck 26. The tanks hereby acquire additional volume. A part of the loss in volume due to placing the tanks at a distance from the side walls of the vessel is hereby compensated.

[0054] It is noted that it is recommended to unload vessel 20, wherein the bow lies higher than the stern. A cargo will hereby tend to flow in the direction of a rear transverse bulkhead and collect there.

[0055] Figure 6 shows a cross-sectional view at the position of transverse bulkhead 24. The vessel wall 30 is U-shaped. The vessel wall 30 forms the hold. A transverse bulkhead 31 is placed in the hold at the position of a former transverse bulkhead or at the position of a usual transverse bracing or at a random location in the hold. Transverse bulkhead 31 is closed and watertight. There

is no open connection between the spaces formed on either side of transverse bulkhead 31.

[0056] The bottom 33 of vessel 20 is provided with a profile in the form of a bulb flat profile 34. This profile strengthens the vessel in the longitudinal direction. The bulb flat profiles are arranged, preferably welded, at regular intervals. Between the bulb flat profiles are arranged partitions 36. Partitions 36 can be the remnants of a former transverse bulkhead in the converted single-walled vessel. These partitions can be re-used in the structure of the double-walled vessel.

[0057] A number of partitions 38 are arranged along side wall 30 of the vessel. A closing plate 39 connects to these partitions.

[0058] Partitions 38, closing plate 39 and partitions 36 leave a rectangular space open between them. Partitions 38 support a cross beam 41 of superstructure 40 arranged here.

[0059] Superstructure 40 is formed by a cross beam 41, two uprights 42,43 and a second beam 44. Metal beams 41-44 are mutually connected, for instance by welding, and form a frame. The superstructure, the frame form embodiments of an intermediate element according to the invention.

[0060] Beams 41-44 can be tubular elements. The beams can have a rectangular cross-section. The tube can be a metal, preferably iron tube. The tubes can have the same, but also different, sections. The beams preferably have at least one, preferably at least two sides forming a surface which can be an engaging surface for a welded connection, for instance with a regular edge of a rolled profile. Beam 41 supports on bottom 33. A welded connection can be made. Uprights 43,42 are connected to closing plates 39 by means of a welded connection.

[0061] Superstructure 40 is connected to four side walls of a loading space, here a tank, formed in hold 21 of vessel 20. The four side walls extend in a lengthwise direction of the vessel. Figure 6 shows only the cross-sections of the horizontal side walls 50,51 of the tank. A profile, crenellated, comparable to a cross-section of a sheet pile wall, can be seen.

[0062] Plates 50,51 which form parts of the side walls of the tank formed in the hold of the vessel are placed at a distance from side walls 30 of the vessel. This complies with requirements in respect of double-walled vessels. Plates 50,51 extend in horizontal direction. A box-like tank is hereby formed, wherein superstructure 40 is part of the side wall of this tank, and forms in particular an end part thereof, comparable to a transverse bulkhead in prior art tanks.

[0063] Plates 50,51 are rolled. This is an inexpensive operation. In addition, rolled plates can be transported and stored efficiently, this in contrast to plates with a bulb flat profile. Due to the rolling, wherein the rolling direction of the plates shown in figure 6 is from left to right, the plates acquire a greater stiffness in the direction transversely of the direction of rolling, in figure 6/figure 2 in lengthwise direction of the vessel.

[0064] In one embodiment a combination of rolled plates and non-rolled plates or otherwise strengthened plates is used for the side walls of the tank/loading space.

[0065] The edge of a plate 50,51 is at least partly corrugated, in this case a regular corrugated form. The plate is provided with corrugations 52 by the rolling. These extend as strips in the longitudinal direction of the vessel. In the shown embodiment the downward protruding corrugations of bottom plate 50 are narrower than the corrugations which protrude upward. The horizontal plate provides longitudinal strength and the V-shape created in the rolled plate is highly suitable for collecting the product.

[0066] On the left and right-hand edge of the shown cross-section of the profile of bottom plate 50 can be seen strip-like parts 55 which are not provided with the profile by rolling. The strip-like parts extend over a length 56, in the shown embodiment about 600 mm. Bottom plate 50 can consist of a plurality of parts. The parts can be welded to each other.

[0067] Bottom plate 50 is preferably constructed from three rolled plates and two plates with a part which is not rolled, these plates forming the outer parts, in particular strip part 55. Plates with a thickness of 5-15 mm are preferably used and rolled. In a preferred embodiment plates are 6-10 mm thick, preferably 7 mm.

[0068] In addition, a tank construction can be readily modified to the variable dimensions of different vessels due to such a construction. The width of the vessel can be taken into account by using a wider plate. The invention readily allows optimization of the use of the space in the vessel.

[0069] Uprights 43,42 are connected to a similarly embodied plate which forms the wall part of the tank. Uprights 42,43 are however connected to a side of the plate which is substantially parallel to the profile, i.e. with an edge which is substantially straight.

[0070] It is precisely the strip-like part 55 which is connected to the profiled edge of the upright side walls of the tank. Strip-like part 55 has a width 56 such that it has the depth/height 59 of a rolled plate. The same is true for the size of cross beam 41. This latter has a flat surface which is at least greater than the depth/height 59 of the profile. A watertight connection can hereby be formed in simple manner by means of welding.

[0071] Superstructure 40 forms a frame. The opening of the frame is closed off with a rolled plate 60 which, just as plates 50,51, is provided with a crenellated profile with corrugations. A profile is preferably used which is coarser than the profile of the side walls of the tank, as shown in figure 10. A welded connection closes the opening of frame 40.

[0072] Two conduits 64,65 are further shown in figure 6. The conduits have different diameters. The large conduit is for drawing liquids out of the tank. Mouth 66 of conduit 64 is visible. Mouth 66 protrudes to a position between a corrugation 67 of horizontal tank wall 50. Conduits 64,65 are preferably arranged close to the partition

situated on the rear side of each tank. The cargo of a tank will accumulate here due to the inclining position of the vessel. Conduits 64,65 are received between the corrugations of rolled plate 60.

[0073] In a preferred embodiment the cross beam 41 is provided with recesses 48 which debouch in each case between the corrugations of rolled plate 50. Recesses are in each case in contact with the lowest parts of the tank. A liquid present in the tank will hereby enter the interior of the hollow, tubular cross beam 40 via openings 48. In the preferred embodiment the mouth 66 of residue suction conduit 64 is arranged in the cross beam and from here suction the liquid out of the tank via openings 48.

[0074] Conduit 65 is smaller and protrudes into a reservoir 68. The reservoir is arranged in the centre of cross beam 41 and protrudes on the underside. The residues of the liquid cargo of the tank will accumulate in or close to this reservoir. It is hereby possible to suction out the final residues using additional suction conduit 65. Conduit 65 also protrudes into the cavity of cross beam 41.

[0075] The superstructure forms a strengthening for the tank. In addition, the superstructure forms the connection between the various side walls of a box-like tank formed by four rolled plates. The edges of the four side walls of the tank are connected to the superstructure on either side of the superstructure. When a loading space is formed with profiled rolled plates, there are at least three side walls. The superstructure also forms the partition between the tanks. Finally, the suctioning is integrated into the superstructure, in combination with the reservoir formed there.

[0076] Rainwater will fall on the deck of the vessel, in this embodiment formed inter alia by upper plate 51. As a result of the sheet piling form of upper plate 51 this rainwater will run into the strip-like corrugations. Due to the inclining position of the vessel the rainwater will collect close to the front or rear side of the relevant tank upper wall, i.e. at the end of upper plate 51 where this is connected to upper beam 44 of the superstructure.

[0077] Upper beam 44 is provided with recesses 49, thereby creating an open connection with the cavity of beam 44. The cavity of beam 44 can be used to collect and discharge rainwater. In the case of a calamity, for instance a burst conduit, the product present on upper plate 51 can also be caught and collected via recesses 49 and the cavity of beam 44. In one embodiment a pump means connected to a tank is arranged in the cavity of beam 44.

[0078] In one embodiment the upper beam 44 is a hollow tube. The outer ends of the tube are closed, for instance with a plate. In the plate is arranged an opening which is connected to a conduit. The conduit is connected to a closing valve, for instance a tap. The tap can be connected to a reservoir. By closing the tap the collected liquid is caught in the cavity of upper beam 44. The product can be discharged by opening the tap.

[0079] Figure 7a shows a cross-section of tank 70 at

a distance from the transverse bulkhead/superstructure. Four side walls 71-74 of rolled plates can be seen. It is noted that the profile of the upright side walls is not visible in this cross-section. The profile extends in lengthwise direction of the vessel.

[0080] Figure 7a shows a web frame 80 which mainly supports bottom wall 71. On the bulb flat profiles of the bottom of the vessel is arranged a beam 81, on which is arranged an elevation 85 of a web frame 82.

[0081] Figure 7b shows the detail of the elevation. Elevation 85 is a profile which fits closely onto the sheet pile form of the bottom plate. The same elevation of a web frame 92 is arranged between web frame 90 and upper plate 71 of the tank.

[0082] Elevations 85 can be prefabricated metal plates. The elevations can be connected along the length to the respective corrugated plates of the tank.

[0083] Elevation 85 has a form substantially corresponding to the crenellated form of bottom plate 71. When bottom plate 71 is placed on the web frame arranged in the vessel, this bottom plate will hereby be supported over the whole width. This results in additional strengthening. In addition, the positioning of the tank construction to be arranged in the vessel, which is manufactured on shore and placed integrally in the vessel, can hereby be facilitated. Alignment of the tank in the width direction is partly determined by the fitting of the different upward protruding projections 86 of the elevation.

[0084] At the position of cross-section VII-VII the tank is strengthened with a horizontal beam 90. The beam is connected to side walls 72,73 of the tank via two knees 91.

[0085] Beam 90 is connected to bottom surface 71 via an upright 93. Upright 93 can be connected to the various components of the tank by means of welding. Upright 93 increases the stiffness of the tank construction.

[0086] Figure 10 shows a perspective view of the formed tank.

[0087] Bottom surface 71 is clearly a rolled plate with corrugations. Bottom plate 71 is provided along the edges with strips 75. Strips 75 are connected to the profiled edge of side wall 72. The edge 76 of side wall 73 is visible. Each corrugation is connected on one side to the interior of beam 41 of the superstructure via an opening.

[0088] Conduits 69 are also arranged in the corrugations. The conduits can be used to heat the cargo. A viscous liquid such as fuel oil can hereby be made more fluid and can be suctioned out more quickly via the conduits available for this purpose.

[0089] As shown in detail in figure 11, heating conduits 69 are received in the corrugations of bottom plate 51. They are also arranged in the cavity of the tube of beam 41. They protrude inward via recesses 101. Two conduits 104,105 arranged in adjacent corrugations are mutually connected via this cavity 102. In addition, connecting conduits 69 are present close to the other end of the formed tank. A long heating conduit is in fact thus present in the tank.

[0090] Superstructure 40 is shown in figure 10. The 'thickness' of the tubular profiles of the frame is visible. The thickness 100 of the superstructure corresponds to or is smaller than the thickness of the profile of plate 60.

[0091] Figure 8 shows a cross-section of the tank at a position without special components. It can be clearly seen that a part of the volume in the hold remains unused. A part of the lost volume is regained in that the tank protrudes above the deck.

[0092] The construction for the tank built into the single-walled vessel has a determined weight. Because a smaller volume of cargo can be accommodated, the weight of the loaded double-walled vessel according to the invention will hardly be higher than that of its former, single-walled variant.

[0093] Figure 9 shows a tank construction without vessel. This tank construction 110 consists of a number of superstructures and rolled plates arranged therebetween. Such a construction can be prefabricated at a shipyard. A tank construction can consist of one, two or more superstructures and rolled tank wall parts. Such a construction can be hoisted into the hold of the vessel. This tank construction can herein be lifted and set down on the web frame elevations arranged in the vessel. The placing results in a determined measure of guiding to the correct position in the vessel.

[0094] On the basis of the foregoing it will be apparent to the skilled person how the invention can be applied in a vessel.

[0095] In another embodiment containers are provided with the construction of the tanks shown in figure 9. A container according to the invention comprises two outer ends formed by a superstructure of mutually connected tubular elements. Four rolled plates extend between the outer ends, wherein two edges of two sides have a strip-like side which is connected to the profiled edge of the other side walls. The superstructure is connected to the edges at the outer ends of the four plates extending substantially in lengthwise direction. The profile is preferably wave-shaped or crenellated. The frame formed by the superstructure is closed with a plate, preferably a rolled plate. Such a container is easy to construct. The container can further be provided with heating lines and/or suction elements as described in combination with the vessel. A manhole can be present in the tank/container.

[0096] Although the invention has been described on the basis of a preferred embodiment, it will be apparent to the skilled person that the invention is not limited thereto. In addition, the above description provides a basis for a number of possible divisional applications, such as a container, but also the construction of the partition, the particular use of the beam of the superstructure in combination with the open connection to the respective corrugations, and also a basis for divisional applications which are not further specified.

Claims

1. Method for manufacturing a double-walled tanker, comprising of providing a single-walled tanker with hold and arranging in the hold tanks having tanks walls placed at a distance from the outer wall of the tanker, wherein the method further comprises of providing rolled plates and of partially manufacturing the tank wall from the rolled plate.
2. Method as claimed in claim 1, wherein an elongate vessel is provided, and further comprising of arranging the rolled plates as tank wall with profile in the longitudinal direction.
3. Method as claimed in claim 1 or 2, further comprising of manufacturing the tank with a rectangular section with four side walls, wherein the four side walls are formed by rolled plates.
4. Method as claimed in any of the foregoing claims, further comprising of providing an intermediate element, arranging a plurality of rolled plates in longitudinal direction and mutually connecting the plates via the intermediate element.
5. Method as claimed in claim 4, further comprising of connecting an outer end of the profile of the rolled plate to a flat side of the intermediate element.
6. Method as claimed in any of the foregoing claims, wherein the method further comprises of arranging a dividing wall in the tank in order to form a plurality of tank spaces.
7. Method as claimed in claim 6, wherein the method further comprises of manufacturing the dividing wall from the rolled plate.
8. Method as claimed in claim 6 or 7, wherein the method further comprises of manufacturing the dividing wall from tubular elements which are mutually connected such that a frame, a superstructure, is formed.
9. Method as claimed in claim 8, wherein the method further comprises of closing an opening of the frame with a rolled plate.
10. Method as claimed in either of the claims 8 or 9, to the extent dependent on claim 4, wherein the method further comprises of connecting the rolled plates to the tubular elements of the frame.
11. Method as claimed in any of the foregoing claims, comprising of prefabricating a tank construction of a frame having connected thereto vertical side walls and horizontal walls of the tank, and placing the pre-

fabricated tank construction in the vessel.

12. Method as claimed in claim 11, wherein the prefabricated tank construction has a substantially rectangular section and is connected to the frame formed by tubular elements.
13. Method as claimed in either of the claims 11 or 12, comprising of arranging knees on either side of the hold of the vessel and of guiding and centring the tank construction with the knees when it is placed in the hold.
14. Method as claimed in any of the foregoing claims, wherein a single-walled vessel is converted to a double-walled vessel.
15. Vessel, comprising a hold and at least one substantially box-like tank with tank walls received in the hold, wherein at least two mutually connected tank walls of a tank are formed by rolled plates with profile.
16. Vessel as claimed in claim 15, wherein the rolled plate comprises a corrugated profile, in particular a sheet pile wall profile.
17. Vessel as claimed in claim 15 or 16, wherein the vessel is elongate and a plurality of tanks separated by partitions are arranged in the longitudinal direction of the vessel.
18. Vessel as claimed in any of the claims 15-17, wherein at least a bottom wall and one side wall of the tank comprise rolled plates.
19. Vessel as claimed in any of the claims 15-18, wherein at least one tank wall is formed by a rolled plate with a profiled part and a strip-like part along a side edge of the plate, this outer end being connected to another tank wall.
20. Vessel as claimed in any of the claims 15-19, wherein the tank comprises a frame which forms part of the tank wall, wherein connecting means connect at least one rolled plate to the frame.
21. Vessel as claimed in claim 19, wherein the frame is a tubular superstructure of mutually connected elongate elements.
22. Vessel as claimed in claim 21, wherein the superstructure comprises a bottom part, two side parts and an upper part, and the respective parts of the superstructure are connected to tank walls formed by rolled plates.
23. Vessel as claimed in claim 21 or 22, wherein the superstructure is constructed from tubular elements.

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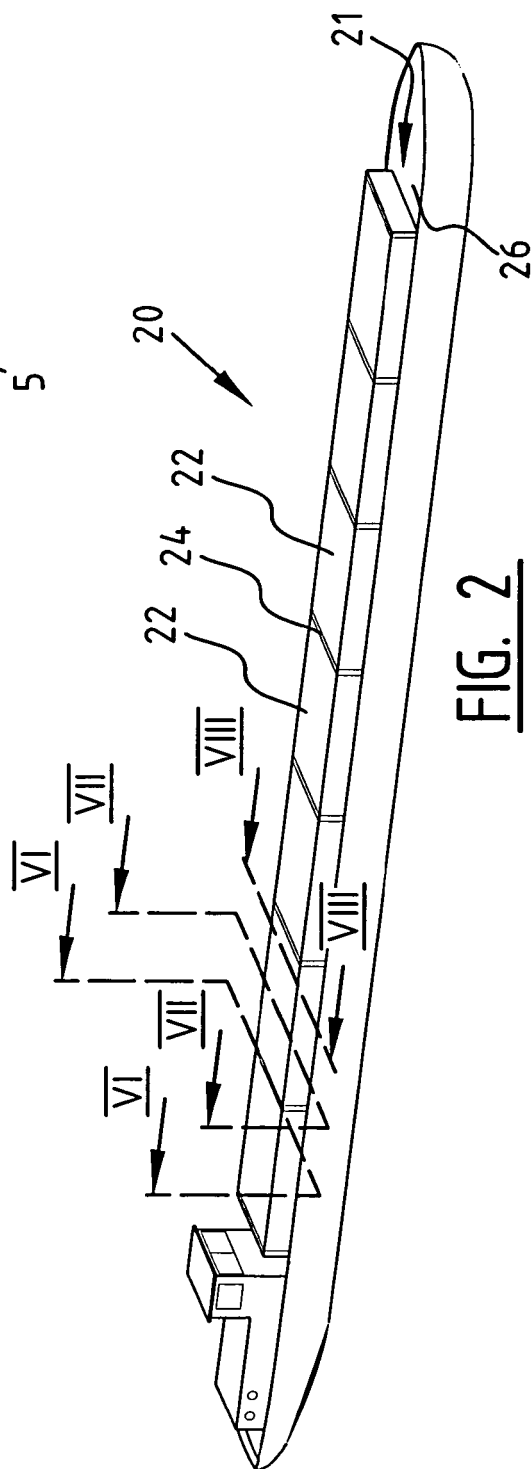
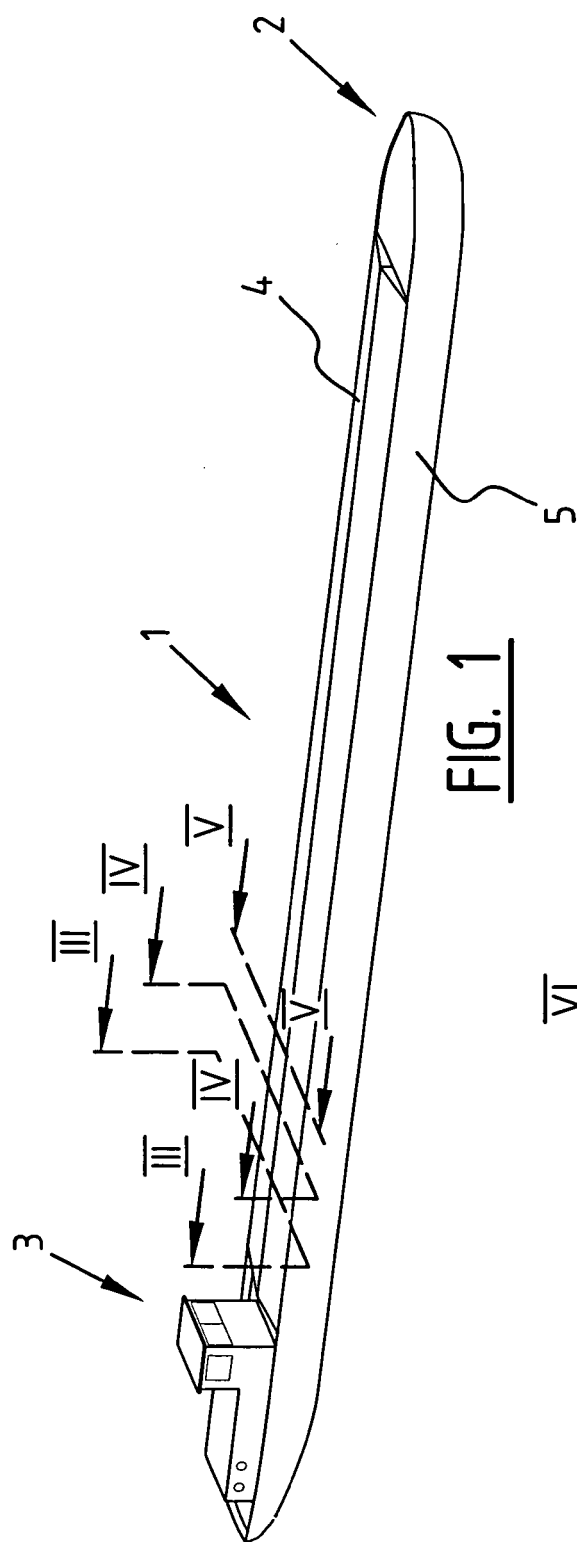
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24. Vessel as claimed in any of the claims 20-23, wherein the frame has at least one substantially flat side which is connected to side walls of the tank formed by rolled plates.
25. Vessel as claimed in any of the claims 20-24, wherein a rolled plate closes an opening of the frame, preferably of the superstructure, as a division between tank spaces.
26. Vessel as claimed in any of the claims 20-25, wherein the frame is substantially rectangular.
27. Vessel as claimed in any of the claims 15-26, wherein at least a bottom plate of the tank is a substantially horizontally placed, rolled plate, wherein an outer end of this plate is connected to a cross beam of a partition.
28. Vessel as claimed in claim 27, wherein the outer end of the bottom plate is connected to the cross beam substantially transversely of profile of the plate.
29. Vessel as claimed in claim 27 or 28, wherein the cross beam is hollow and provided with an opening connecting the tank to the cavity in the cross beam.
30. Vessel as claimed in claim 29, wherein a conduit is arranged, the mouth of which is arranged in the cavity in the cross beam.
31. Vessel as claimed in any of the claims 27-30, wherein the tank comprises a heating line received in strip-like profiled parts of the rolled plate.
32. Vessel as claimed in claim 31, wherein the heating line is arranged through a cavity in a cross beam connected to a bottom wall of the tank.
33. Container for products, comprising a number of side walls in a box-like configuration, wherein at least a bottom is formed by a rolled plate with profile in a longitudinal direction of the container.



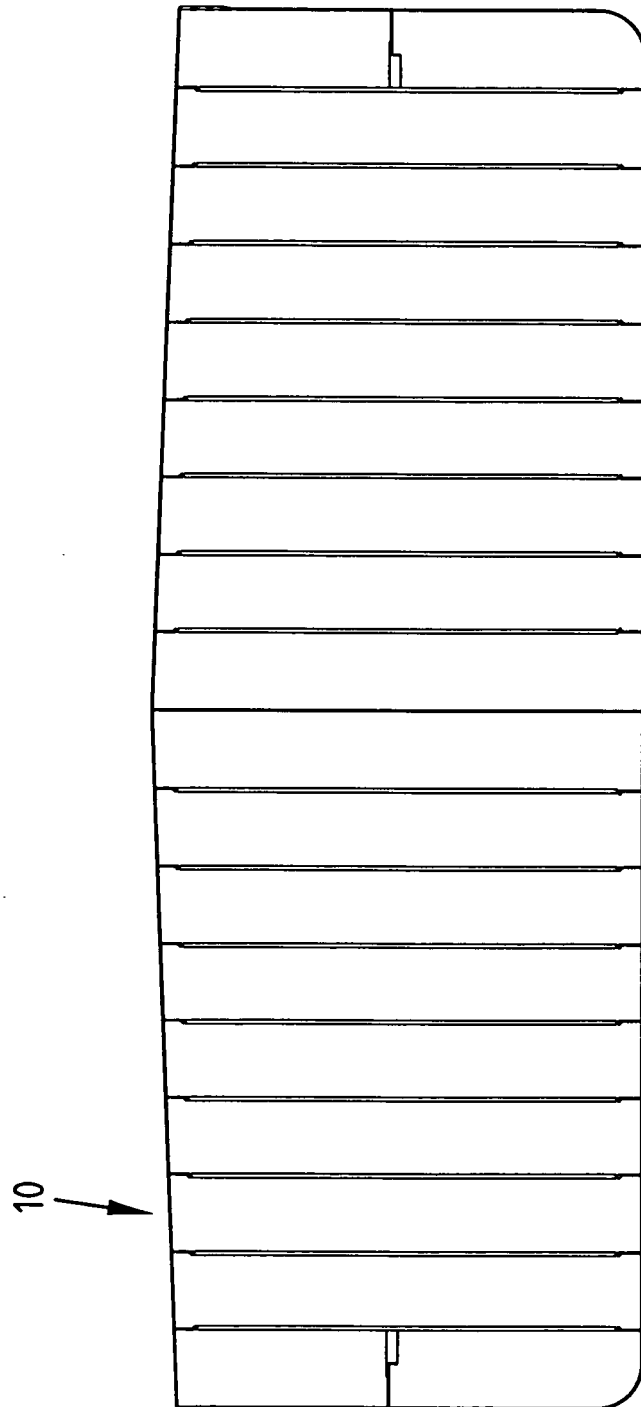


FIG. 3

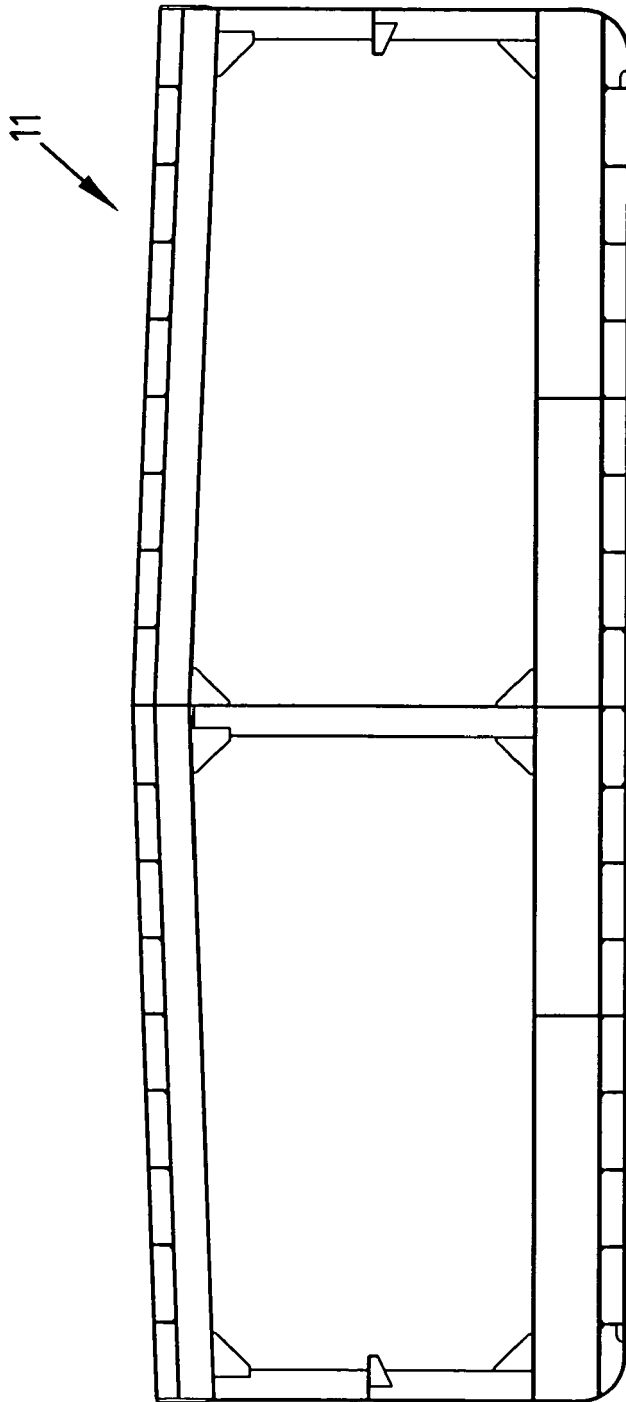


FIG. 4

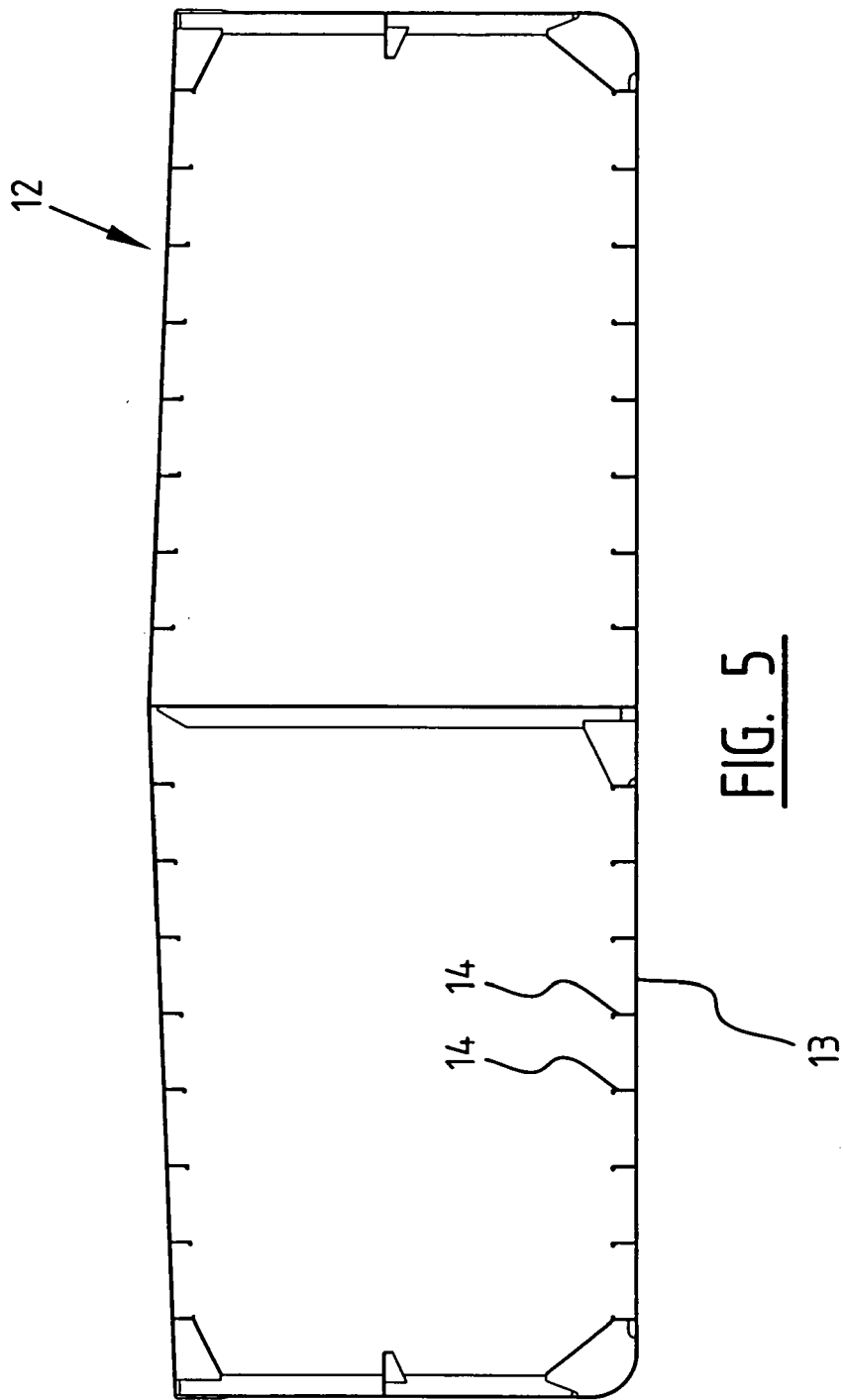
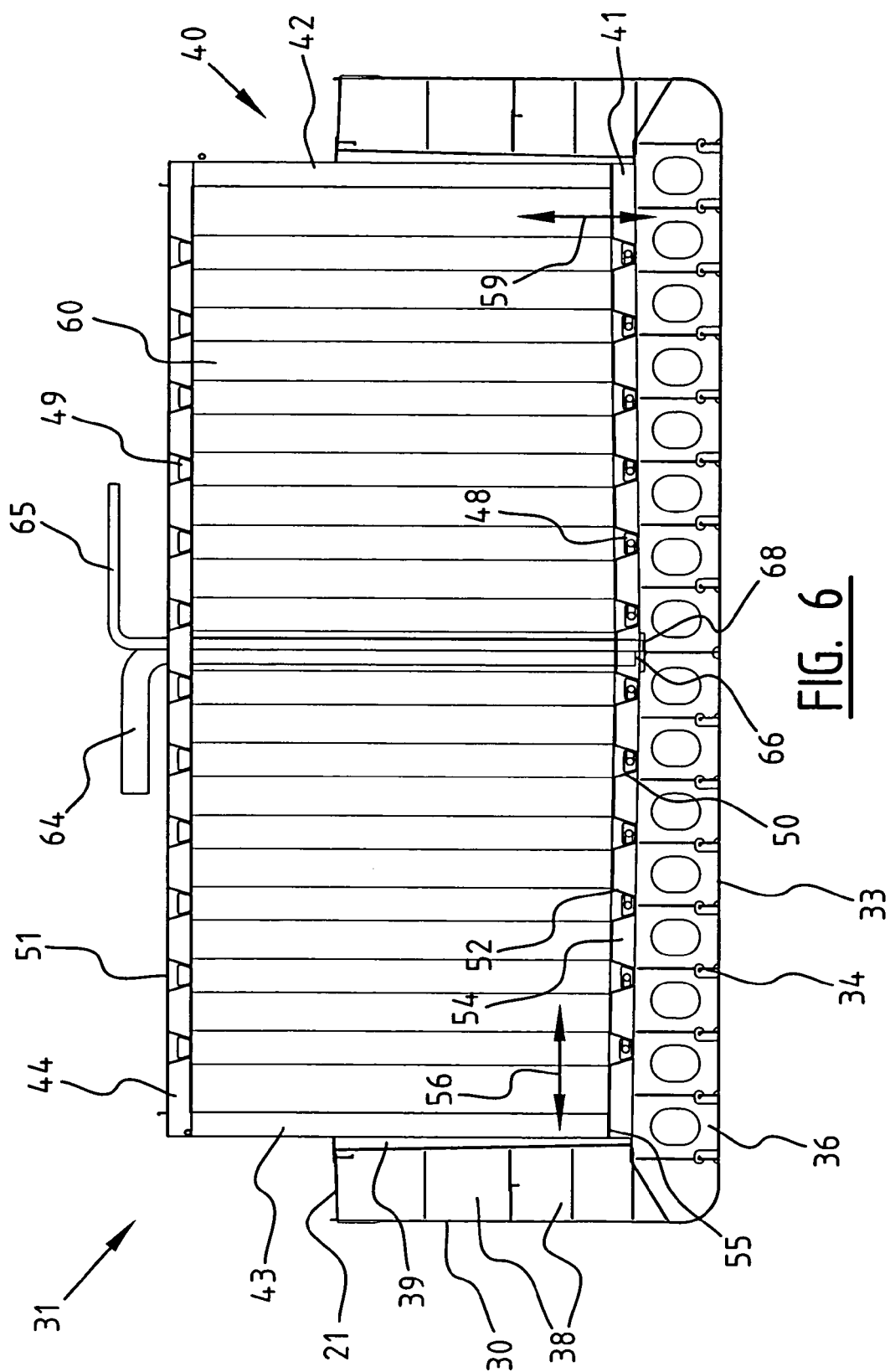


FIG. 5



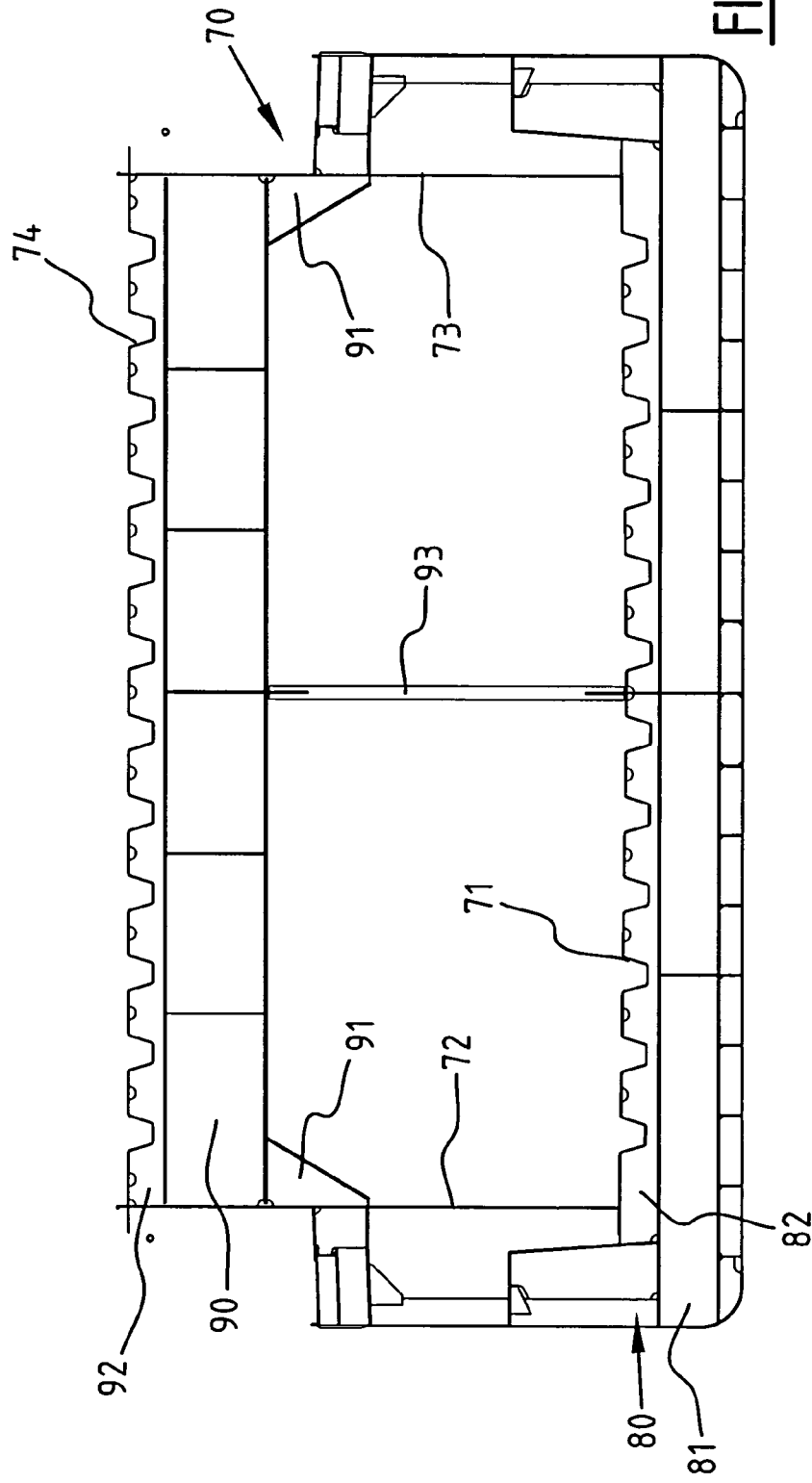


FIG. 7A

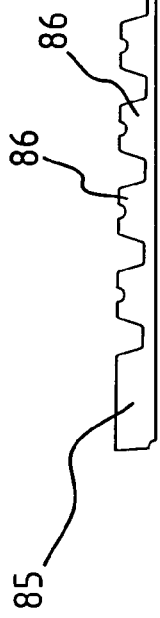


FIG. 7B

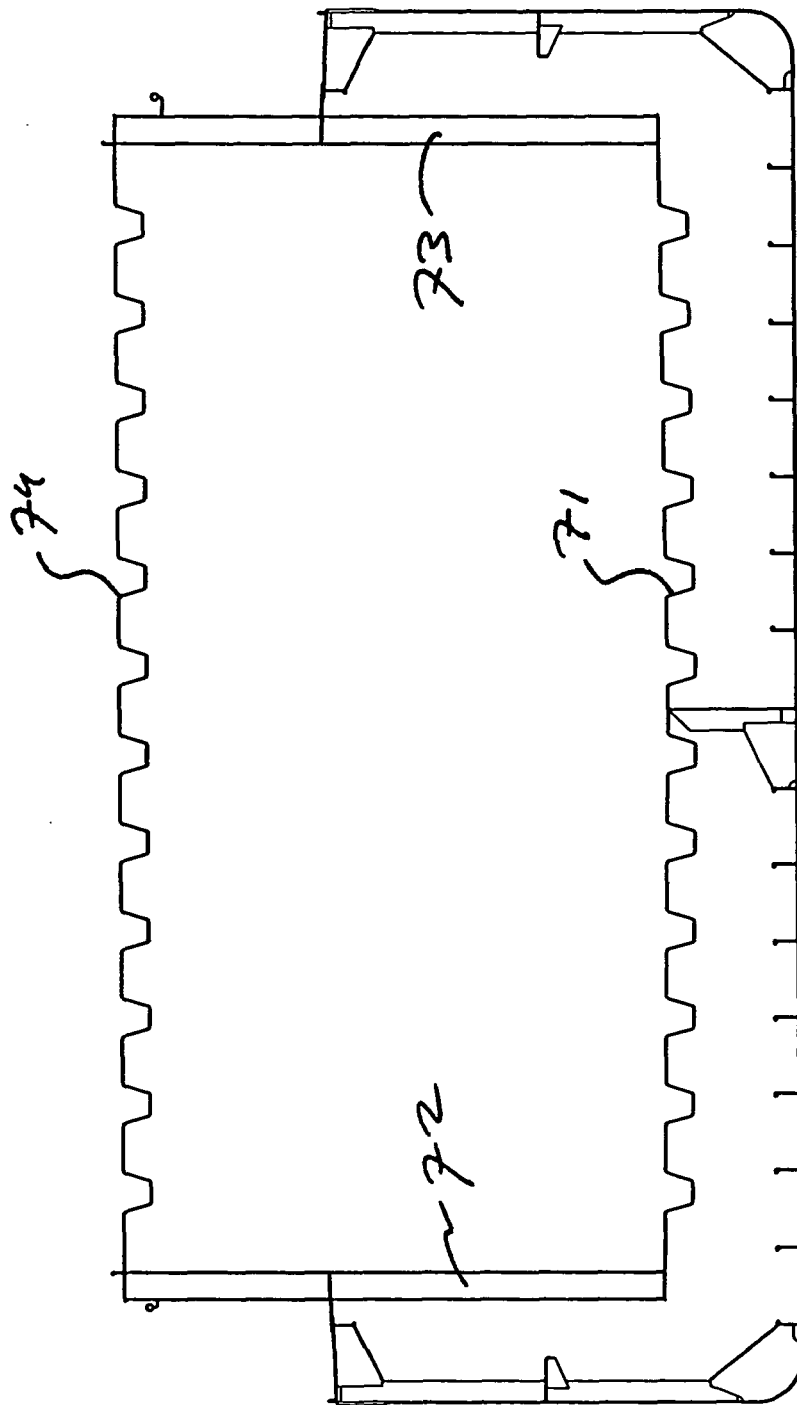


FIG. 8

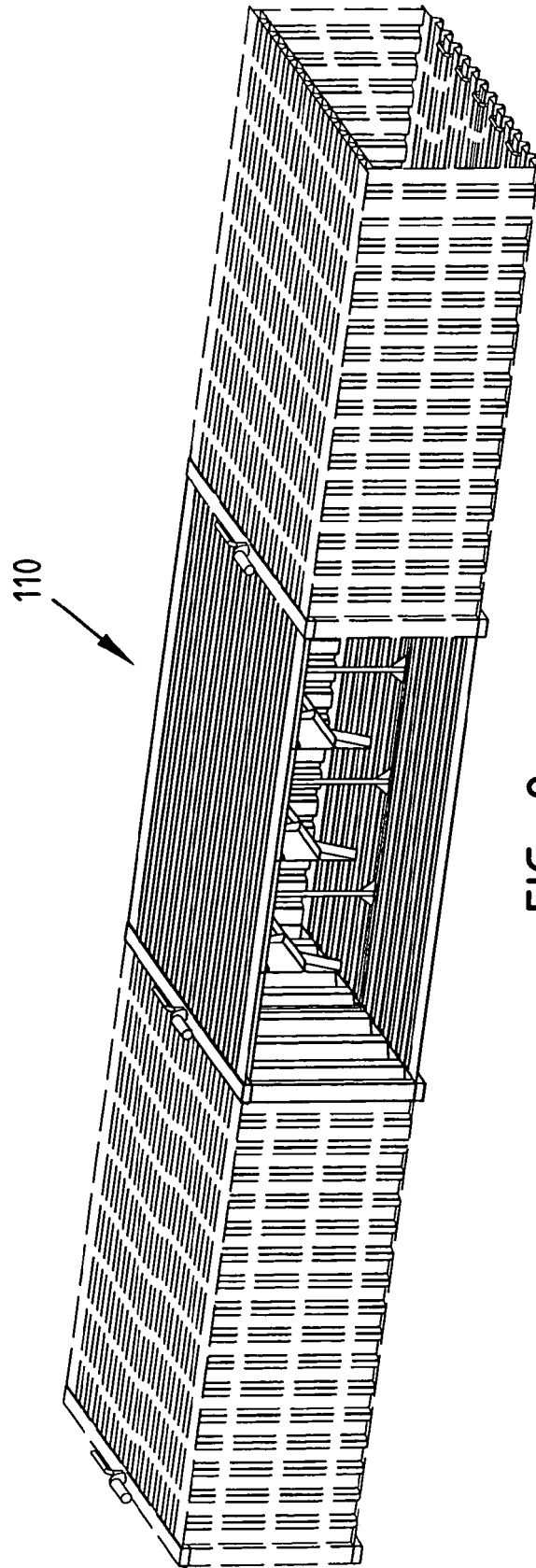
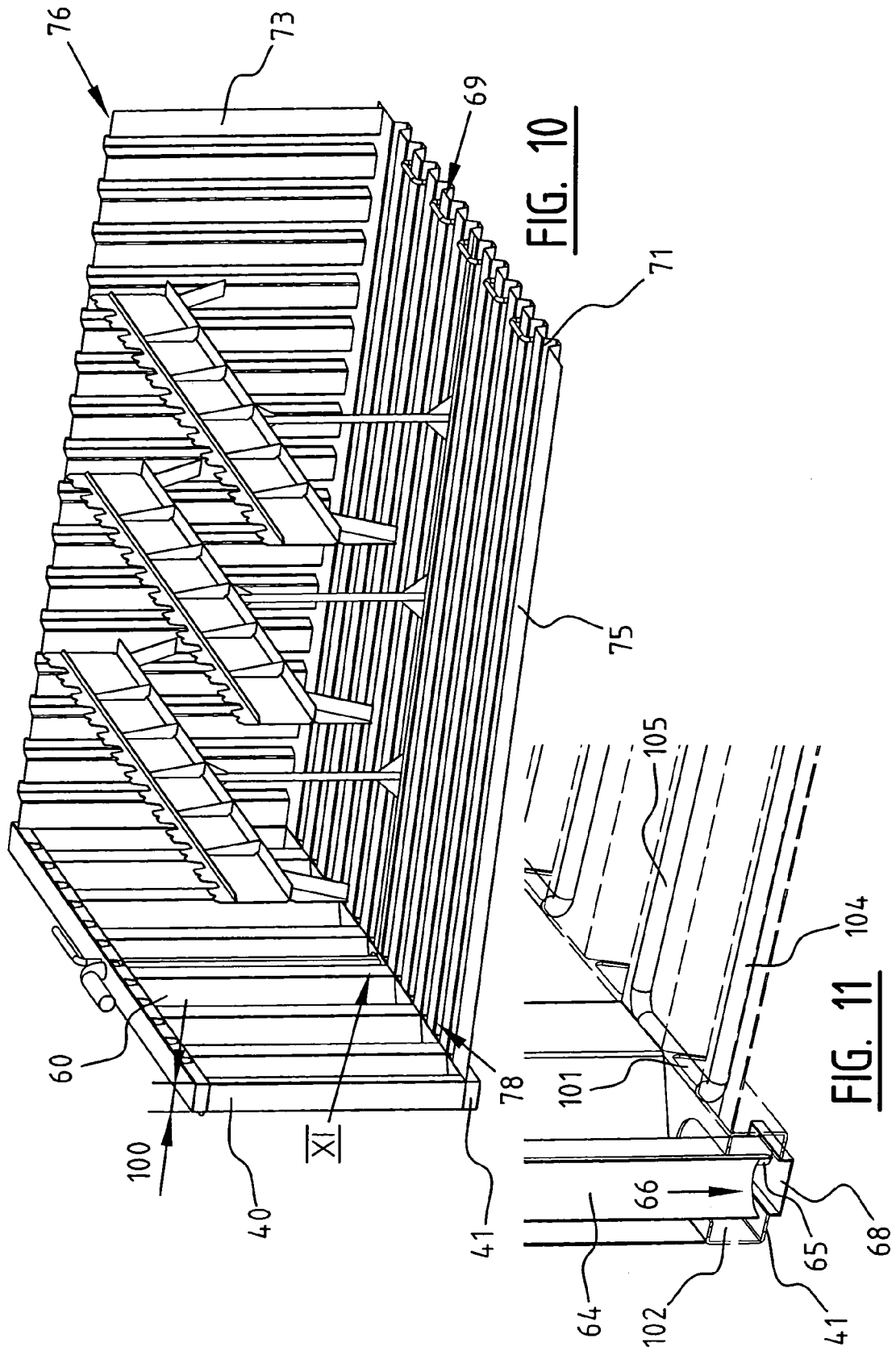


FIG. 9





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 01 8377

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