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Ref.: Asunto: No. de Radicación: **11-55331**
Trámite: **PCT Patente de Invención**
Título: **DEPÓSITO FLEXIBLE DE TRANSPORTE DE LÍQUIDO CON DEFLECTORES DE AMORTIGUACIÓN DE OSCILACIONES.**
Solicitante: **DONMARK HOLDINGS INC.**

MEMORIAL DE ALCANCE

MAURICIO JARAMILLO C., abogado en ejercicio, portador de la cédula de ciudadanía número 80'421,942 de Usaquén, y de la Tarjeta Profesional No. 74,555 del Consejo Superior de la Judicatura, actuando en mi carácter de apoderado de la sociedad DONMARK HOLDINGS INC., solicitante del asunto de la referencia, dando alcance a la solicitud presentada el 5 de Mayo del 2011, adjunto los siguientes documentos:

1. Copia de la Solicitud No. 61/449.197, emitida por la Oficina de Marcas y patentes de Estados Unidos de América, de la cual se invocó prioridad en la solicitud.
2. Copia de la Solicitud No. 61/331.712, emitida por la Oficina de Marcas y patentes de Estados Unidos de América, de la cual se invocó prioridad en la solicitud.

Atentamente,

MAURICIO JARAMILLO C.
C.C. No. 80'421,942 de Usaquén
T.P. No. 74,555 del C.S.J.

Adjunto: lo anunciado.
GAG



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June 21, 2011

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OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT
APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A
FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 61/449,197

FILING DATE: March 04, 2011

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY
APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS
CONVENTION, IS US61/449,197

By Authority of the
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N. Williams
N. WILLIAMS
Certifying Officer

Electronic Acknowledgement Receipt

EFS ID:	9587693
Application Number:	61449197
International Application Number:	
Confirmation Number:	3162
Title of Invention:	FLEXIBLE LIQUID TRANSPORT TANK WITH SURGE DAMPENING BAFFLES
First Named Inventor/Applicant Name:	Victor YAREMENKO
Customer Number:	51590
Filer:	Otto Zsigmond
Filer Authorized By:	
Attorney Docket Number:	50021-78
Receipt Date:	04-MAR-2011
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1	Provisional Cover Sheet (SB16)	provisionalsb.pdf	1000435 9180617da78df09d8a89015d11416158e728173	no	3
Warnings:					
Information:					
2		specfin.pdf	79728 d173b6a7fb6a4472e21c009c5dfc9f56d72f9b	yes	11
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	10	
	Claims		11	11	
Warnings:					
Information:					
3	Drawings-other than black and white line drawings	drawfin.pdf	9643610 264987345859f674b1c317d25734276200990f99	no	9
Warnings:					
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4	Fee Worksheet (PTO-875)	fee-info.pdf	29698 61933fd6fb68fcd47235b980213036a7cee6abcd	no	2
Warnings:					
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Total Files Size (in bytes):			10753471		
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Provisional Application for Patent Cover Sheet
This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1						Remove
Given Name	Middle Name	Family Name	City	State	Country	
Victor		YAREMENKO	Delta	BC	CA	

Inventor 2						Remove
Given Name	Middle Name	Family Name	City	State	Country	
Richard		LUMSDEN	Delta	BC	CA	

Inventor 3						Remove
Given Name	Middle Name	Family Name	City	State	Country	
George		BARTZ	Delta	BC	CA	

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the Add button.

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Title of Invention	FLEXIBLE LIQUID TRANSPORT TANK WITH SURGE DAMPENING BAFFLES
Attorney Docket Number (if applicable)	50021-67

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number	☐ Firm or Individual Name
Customer Number	51590

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.	
☒ No.	
☐ Yes, the name of the U.S. Government agency and the Government contract number are:	

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Entity Status Applicant claims small entity status under 37 CFR 1.27					
☒ Yes, applicant qualifies for small entity status under 37 CFR 1.27 ☐ No					
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Signature Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	/Otto Zsigmond/			Date (YYYY-MM-DD)	2011-03-04
First Name	Otto	Last Name	Zsigmond	Registration Number (If appropriate)	56312
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FLEXIBLE LIQUID TRANSPORT TANK WITH SURGE DAMPENING BAFFLES

The present invention provides a flexible fuel (or other liquid) transport tank
5 that enables cargo aircraft, both civilian and military, to support remote site fuel
cache operations. Each tank may be customized and fitted to specific fixed wing
or rotary wing aircraft to maximize the lifting capabilities of the air craft and to
ensure the correct centre of gravity and liquid surge dampening system is applied.

Operators generally want the ability to transport bulk fuel to remote camps
10 that are only serviceable by small air craft. The alternatives to a flexible transport
tank is a plurality of metal drum fuel tanks or hard tanks flown in aircraft that are
typically too large to land in within the confined spaced of the remote site.

Military operators want the ability to support remote fuel caches with bulk
fuel transport tanks for emergency applications, northern operations and re-supply
15 of fire bases that are cut off because ground transport is too risky due to enemy
activity or improvised explosive devices (IED), or remote jungle or arctic bases
where water or ground transportation is unavailable.

The flexible liquid transport tank of the present invention effectively converts
any aircraft into flying tanker, enabling bulk fuel to be delivered to remote sites.
20 When the flexible liquid transport tank is empty, it can be rolled up and stored,
thereby releasing the space in the aircraft for other cargo or passengers.

One of the benefits provided by the present invention is that it eliminates wasted flights where only empty fuel drums or hard tanks are being removed from remote sites; the return flights can be used to carry other payloads. This not only saves money, but is a more environmentally sound practice since many empty fuel
5 drums are usually simply abandoned at the remote sites. The present invention also enables virtually any aircraft to be quickly converted into or from a bulk fuel tanker, thereby allowing for dual use operations. The present invention further reduces contamination and fuel loss from minor spills that are often associated with fuel drums, and it reduces the overall environmental footprint of a remote site
10 fueling operation.

The flexible liquid transport tank of the present invention is designed to minimize liquid dynamics and any effects to the centre of gravity of the aircraft. The tank has a new and unique fabric and cable baffling system that limits the liquid dynamic of the fuel during flight. This new cable baffling system enables the
15 manufacturer to custom size each tank to specific aircraft.

For a better understanding of the present invention and to show more clearly how it may be carried into effect, reference is made by way of example to the accompanying drawings in which:

Fig. 1 is a top plan view of a flexible liquid transport tank of the present
20 invention showing the outer tank;

Fig. 2 is a side elevation view of the outer tank of the flexible liquid transport tank in Fig. 1;

Fig. 3 is a perspective view from the top of the outer tank of the flexible liquid transport tank in Fig. 1;

5 Fig. 4 is a close-up perspective view from the top of an end of the outer tank of the flexible liquid transport tank in Fig. 1;

Fig. 5 is a perspective view from the top of the inner tank of the flexible liquid transport tank in Fig. 1;

10 Fig. 6 is a perspective view from the bottom of the inner tank of the flexible liquid transport tank in Fig. 1;

Fig. 7 is a perspective view from the top of the inner tank of the flexible liquid transport tank in Fig. 1, with the walls of the inner tank shown translucent to reveal the structure of the baffles within the inner tank;

15 Fig. 8 is a close-up perspective view from the top of an end of the inner tank of the flexible liquid transport tank in Fig. 1, with the walls of the inner tank shown translucent to reveal the structure of the baffles within the inner tank;

Fig. 9 is a perspective view of a section of another embodiment of an inner tank of the present invention shown with the walls of the inner tank shown translucent to reveal the structure of the baffles within the inner tank; and

Fig. 10 is a perspective view of the section of the inner tank of Fig. 9 shown with the foremost baffle removed and with the walls of the inner tank shown translucent to reveal the structure of the baffles within the inner tank.

5 The flexible liquid transport tank **10** of the present invention is a double layered "walled" design. There is an inner tank **12** that is received within an outer tank **14**. The inner tank **12** is removable from the outer tank **14**, and is designed to be in constant contact with fuel. The inner tank is made of material that is compatible for use with hydrocarbon fuels. Such material is well known in the art of
10 bladder tanks designed for hydrocarbon fuel storage. Examples include a heavy duty urethane coated fabric. Test strips of the same material as the inner tank are provided that are attached to the inner tank; the test strips may be reviewed periodically (perhaps annually) to assess material deterioration due to chemical interaction, abrasion or aging.

15 The outer tank **14** is highly abrasion and puncture resistant and is also chemically resistant to hydrocarbon fuel to reduce aging. A suitable material for the outer tank is an abrasion resistant urethane coated fabric, which is known and used in inflatable booms for containment of oil spills. A fuel resistant liquid tight zipper **16** on the outer tank **14** is provided to enable the inner tank to be removed
20 for inspection or replacement. The location and/or the configuration of the zipper may vary from one design of tank to another. The outer tank also has a

customizable webbing system **18** built in to enable the tank to be secured to the floor of the aircraft.

In order to provide for safe transport by aircraft, each flexible liquid transport tank is preferably designed for use with a particular aircraft or model of aircraft. As well, the tank should be transported either completely full to minimize fluid dynamics, or empty. As well, the inner tank is fuel compatible and the fabric in contact with the fuel meets Mil-Spec 52983. The tank should have a fuel resistant outer layer that is resistant to heavy abrasion. The outer layer is also provided with a built in adjustable webbing/strapping system **18** that enables the tank to be secured to the cargo deck. The tie down locations on the tank are preferably specific to the particular aircraft or model of aircraft for which tank is designed.

Each tank has one or two dedicated fill and drain ports **20,22** with valves **24** on the outer tank **14** to facilitate filling and discharging of fuel, as well as a flame arrestor vent **25**, the location of which may depend on the type of aircraft for which the tank is designed, to enable proper function during take-offs and landings.

The inner tank **12** is provided with a plurality of internal baffles **28**, each baffle being disposed in a plane that is substantially transverse to the principal direction of surge action of the liquid (fuel) in the elongate tank (i.e. substantially transverse to the length of the inner tank). Each baffle **28** is comprised of a plurality of sections or flap portions **30** having a base portion **32** that is attached (welded) to the inside wall of the inner tank in line with the plane of the baffle **28**.

Each flap portion **30** has a free end that includes a loop **34**, which are adjacent to the loops of neighboring flap portions in the assembled inner tank. A rope or cable **36** is laced through the loops **34** in a weave pattern to draw the loops together and thereby draw the flap portions taut to provide structural rigidity to the baffle.

5 The manufacture of a collapsible liquid transport tank that has internal baffles is an extremely labor intensive process, especially during the final stage when the tank has to be closed and baffles have to be installed and/or assembled on the inside of the substantially closed shell. In contrast, in the flexible liquid transport tank of the present invention, all of the baffle components are
10 preinstalled on the individual tank panels prior to them being assembled together. This significantly reduces the labor component of manufacturing our tanks. After the tank panels are welded together (techniques for doing so are well known) and substantially closing the inner tank shell, a person climbs inside the inner tank, via an encapsulated access hole (which is sealed in the finished product), and
15 performs the final assembly of the baffles **28** by lacing the baffles flaps one by one – one rope/cable **36** per one baffle **28**. Advantageously, since the baffles **28** are composed from separate sections or flap portions **30** (which are joined together centrally by the cord/cable **36**) it is possible to weld these sections on a flat panel, prior to assembly of the panels, which is a relatively simple process. This is in
20 contrast to having to weld single piece baffles with curvilinear contours onto a panel if the baffles were not composed out of separate sections.

Once the panels of the inner tank are assembled to define the shape of the inner tank, the baffle sections or flap portions **30** of each baffle **28** will be oriented in a plane with their base portions **32** being welded to the inside surface of the inner tank and their free end portions radiating inwardly towards the centre of the baffle. The terminal end of each baffle section or flap portion **30** is provided with a loop **34**, which is produced by folding end of the fabric section to define the loop and then weld it onto itself. Hence, once the panels of the inner tank are assembled and the inner tank has taken shape, the loops **34** on the flap portions **30** of each baffle are proximate to the loops **34** of the other flap portions on the same baffle. A cable **36**, which is conveniently produced from the same material as the inner tank by taking a long strip, folding it lengthwise, and welding it onto itself, is laced through each of the loops **34** on one baffle **28** in a weave pattern so that the flap sections are drawn taut to provide structural rigidity to the baffle. The ends of the cable **36** are provided with loops, and these are drawn together, once the cable has been laced through the flap portions, and connected by quick connect chain link (not shown). This is repeated with each baffle. In this way, the inside of the inner tank only has components that are made from the same fabric as the inner tank, with the exception of quick connectors. The assembled baffles **28** define a number of voids **42** in between adjacent flap portions, and some ports **44** are provided in some (or all) of the flap portions to allow a reduced flow of liquid between sections of the inner tank during filling and emptying of the inner tank.

With the tank filled, the baffles **28** provide a wave buffering system. The baffle outer contour coincides with the natural contour of the filled tank, and because the baffle is a structure comprised of separate flap portions that are bundled up by the cable, it significantly reduces the material weight, and material
5 and labor costs of producing baffle structures in a form that is effective in minimizing fluid dynamics within the tank. The baffles of the present invention maintain the natural width and length of the inner tank, and prevent the propagation of waves along tank length and width due to aircraft evolutions. As a result, they prevent the centre of gravity of the tank from shifting, which is very
10 important for aircraft controllability.

The number of flap portions **30** per baffle may vary depending on the cross sectional dimensions of the desired inner tank, as well as by other factors such as the overall dimensions of the tank, the number and location of baffles, the baffle structure, the harnessing layout and the type of the aircraft.

15 Connection points **46** between the inner tank and the outer tank are also provided. Structurally the connection point is a pair of handles one of each installed on the outside of the inner tank and a corresponding one on the inside of the outer tank so that they are opposite each other. This is a quick connection which is can be easy connected/disconnected if needed. There are three
20 connection points on each end of the tanks, but the numbers may vary depending on dimensions of the tanks. The purpose of these points is to maintain proper

inner tank position inside the outer tank and to prevent the inner tank from shifting during operation (when it's empty). Rounded corners **48** on both the inner tank and the outer tank are provided for smooth stress distribution.

Referring to Figs. 9 and 10, sections of another embodiment of the present invention is shown which, in addition to the baffles **28**, includes longitudinal baffles **52** that extend between two adjacent baffles **28** to provide additional resistance to lateral fluid surges in the tank **10** for certain applications in which the tank **10** is likely to encounter lateral acceleration in addition to longitudinal acceleration, such as for example, helicopter applications where the aircraft creates side-to-side movement (lateral acceleration) for the tank contents in addition to front to back movement (longitudinal acceleration).

Each longitudinal baffle **52** comprises a plurality of longitudinally aligned panels **54** made of the same or similar flexible material as the baffles **28**. Each panel **54** includes a base portion **56** along a base edge of the panel **54** and a connecting portion **58** adjacent the edge of the panel opposite of the base portion **56**. The base portion **56** of each panel is connected (for example welded) to the inside wall of the inner tank **12** in a manner such that each base portion **56** is parallel to the longitudinal axis of the inner tank **12** and spaced approximately equidistant from the adjacent base portions around the periphery of the inside wall of the inner tank **12**. The connection portion **58** of each panel **54** is attached to the connecting portions of the other panels in a manner such that the connecting

panels **54** form straight-line connection lines between opposite top and bottom sides of the inner tank shell **12** in a cross like manner. In some embodiments, the panels **54** of each longitudinal baffle **52** may radiate from near the longitudinal axis of the inner tank toward (and connect with) the wall of the inner tank **12**.

5 In the illustrated embodiment, the connecting portion **58** comprises a plurality of extensions **60** terminating in a D-ring **62**. The D-rings of the panels are interconnected or linked with the adjacent D-rings of the other panels. However, other configurations of connecting portions, and mechanisms of interconnecting same, will be apparent to a skilled reader. Additionally, each panel includes a
10 number of holes **64** to allow limited fluid flow through the panels to allow for gradual fluid movement and equalization of pressures across the panels. The number, placement and configuration of the holes may be varied as desired or as required for a particular application of the present invention.

 Other aspects and features of the present invention will become apparent to
15 those of ordinary skill in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

 While the above description and illustrations constitute preferred or alternate embodiments of the present invention, it will be appreciated that numerous variations may be made without departing from the scope of the
20 invention. It is intended that the invention be construed as including all such modifications and alterations.

WHAT IS CLAIMED IS:

1. A system of baffles for a flexible liquid transport tank substantially as illustrated and described.
2. A flexible liquid transport tank substantially as illustrated and described.
- 5 3. A method of making a flexible liquid tank substantially as illustrated and described.
4. All inventions as herein disclosed.

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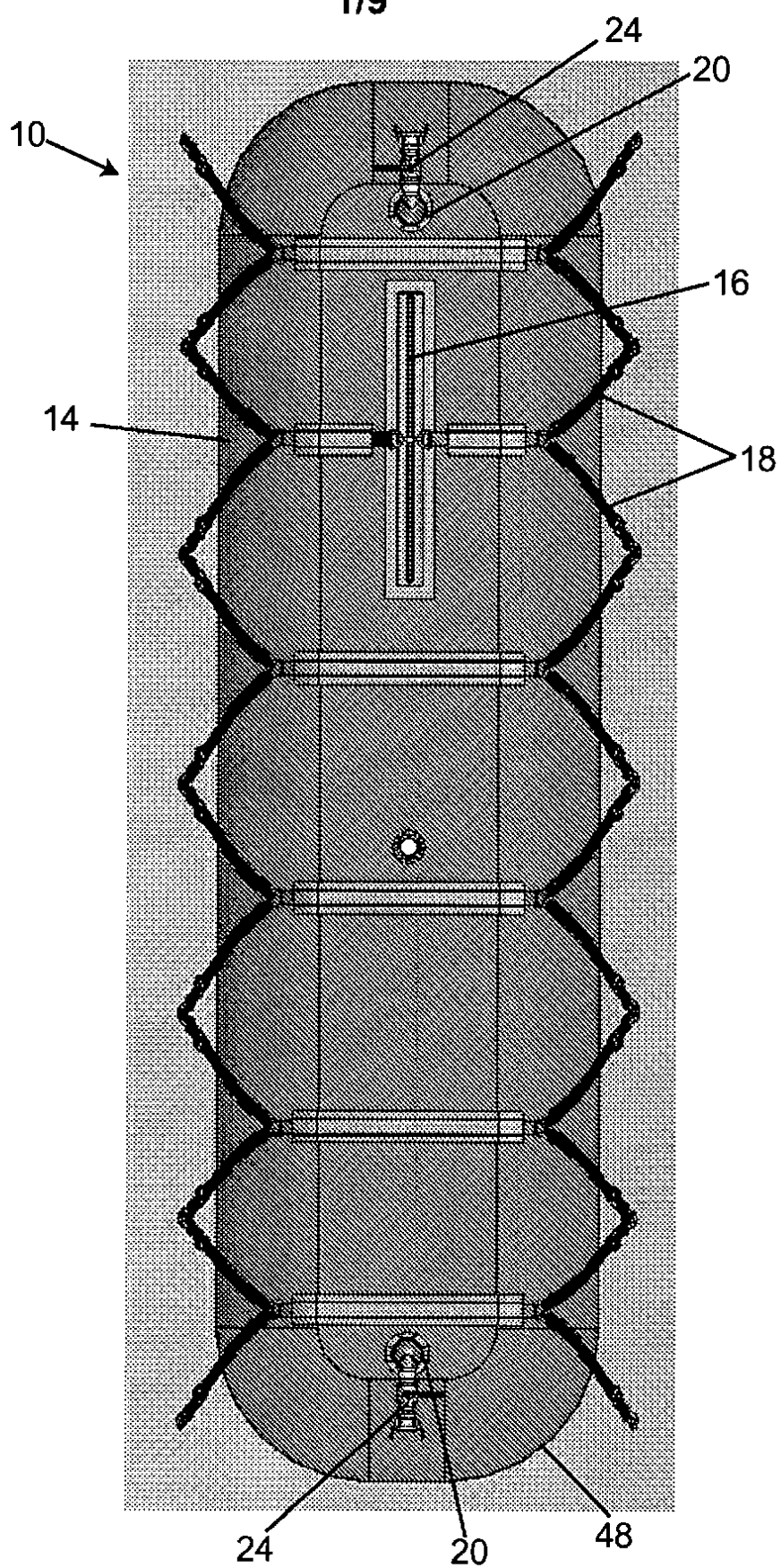
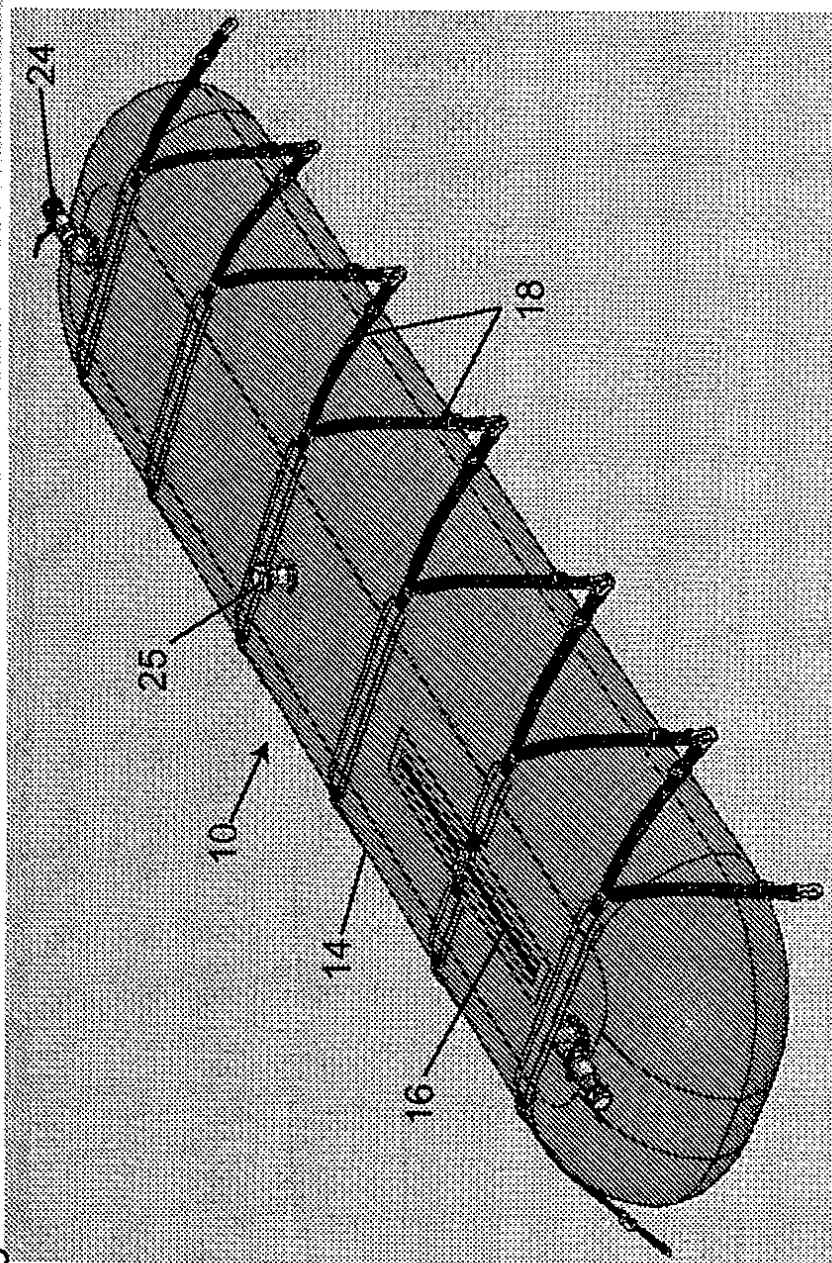
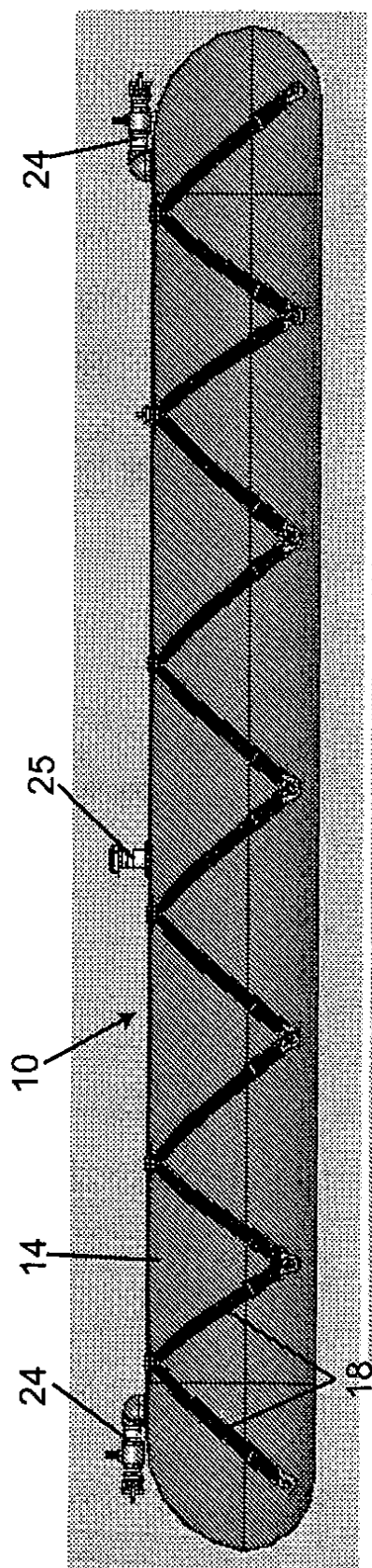


Fig. 1



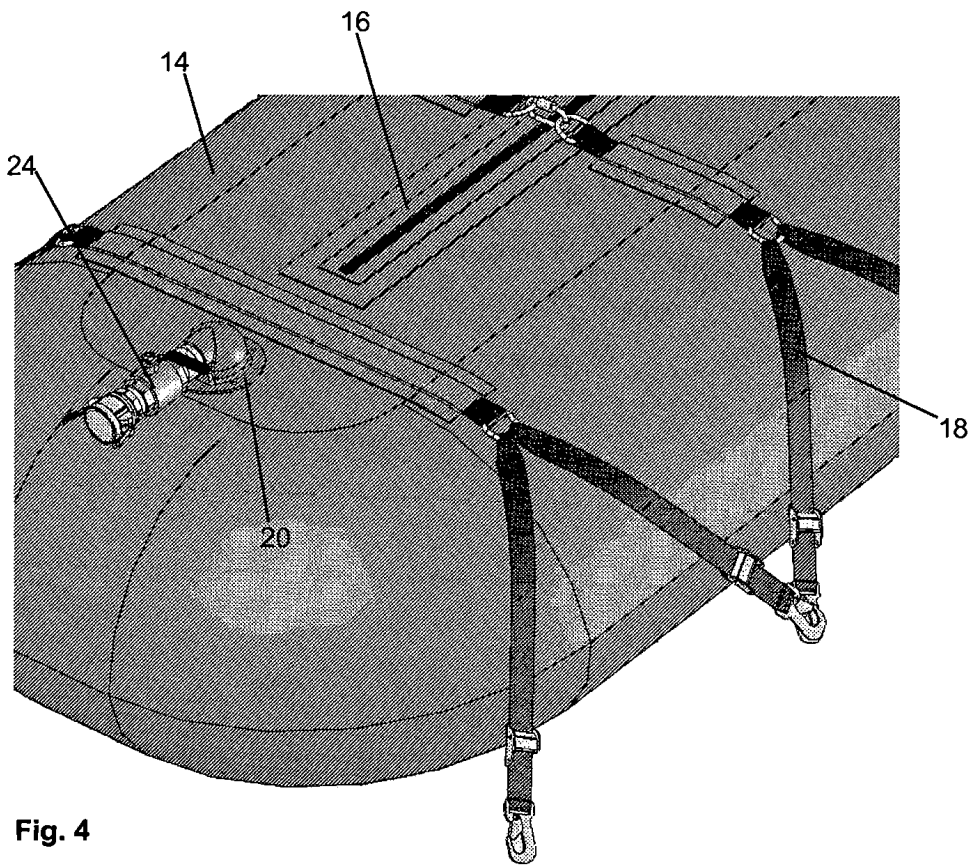


Fig. 4

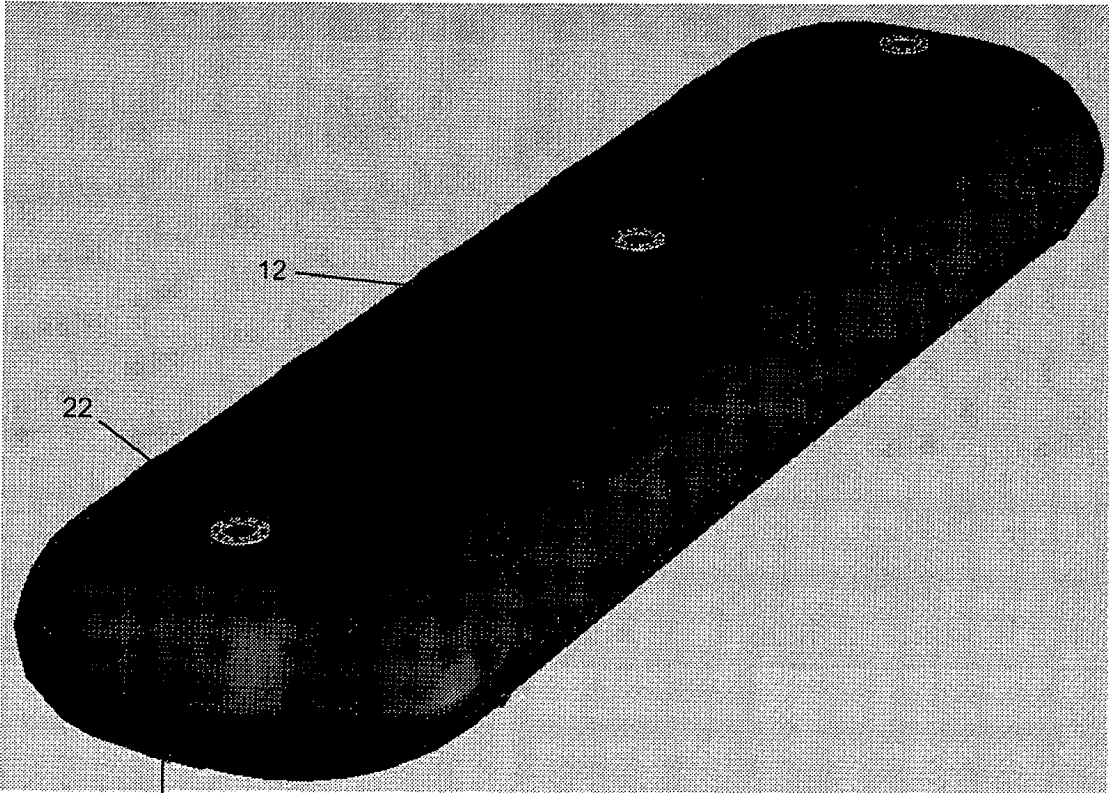


Fig. 5

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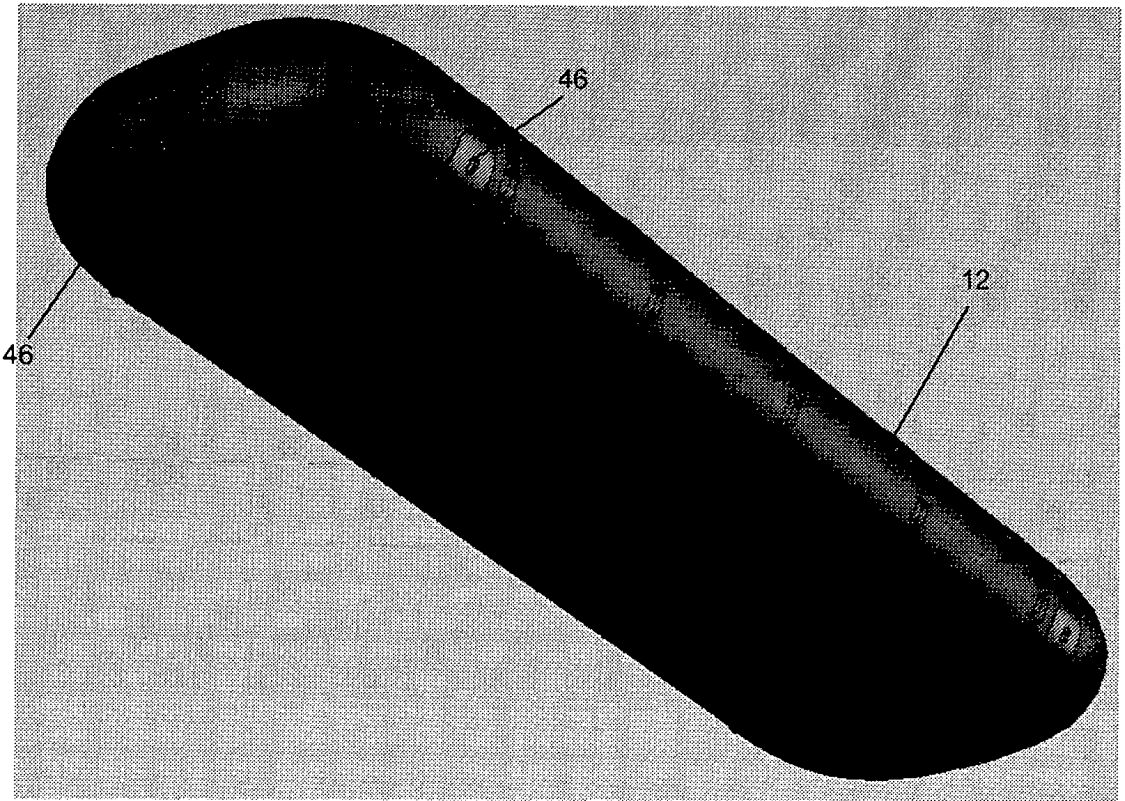


Fig. 6

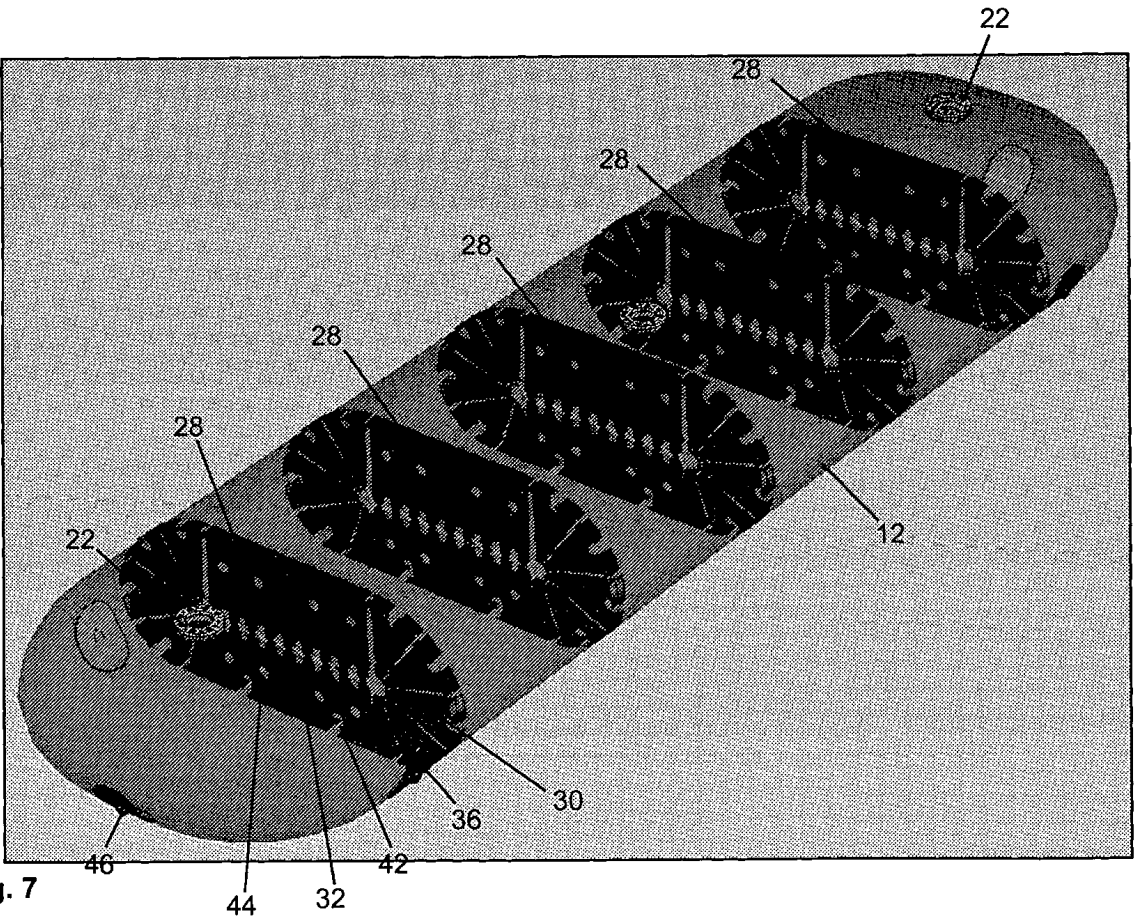


Fig. 7

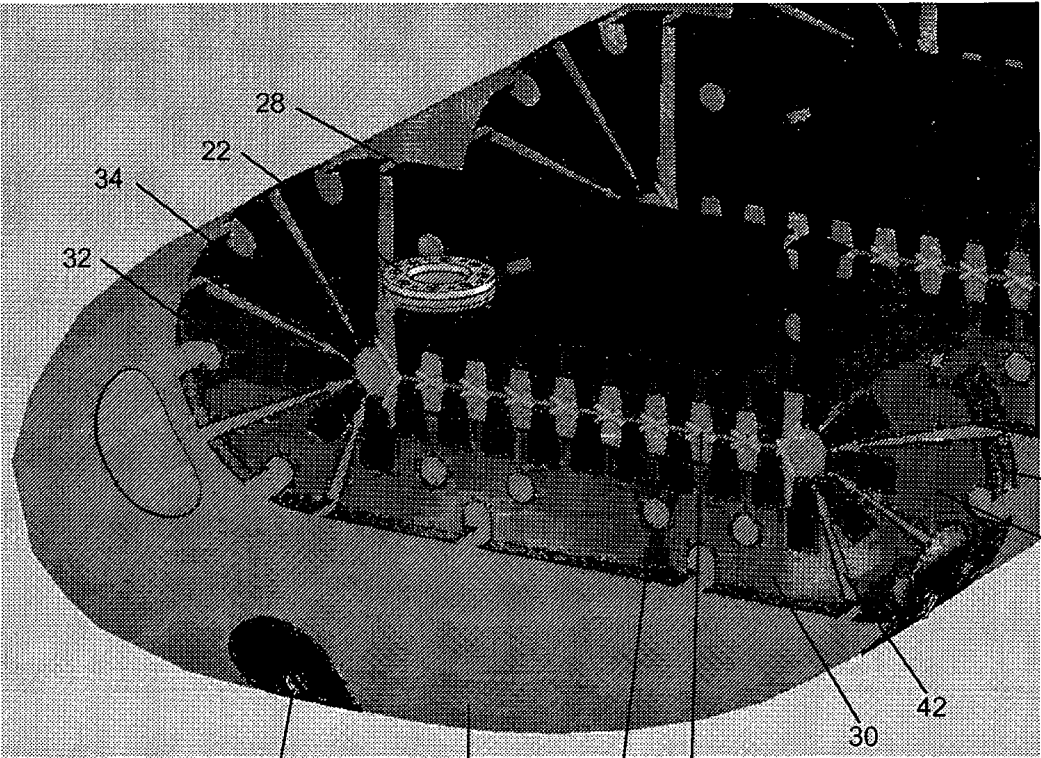


Fig. 8

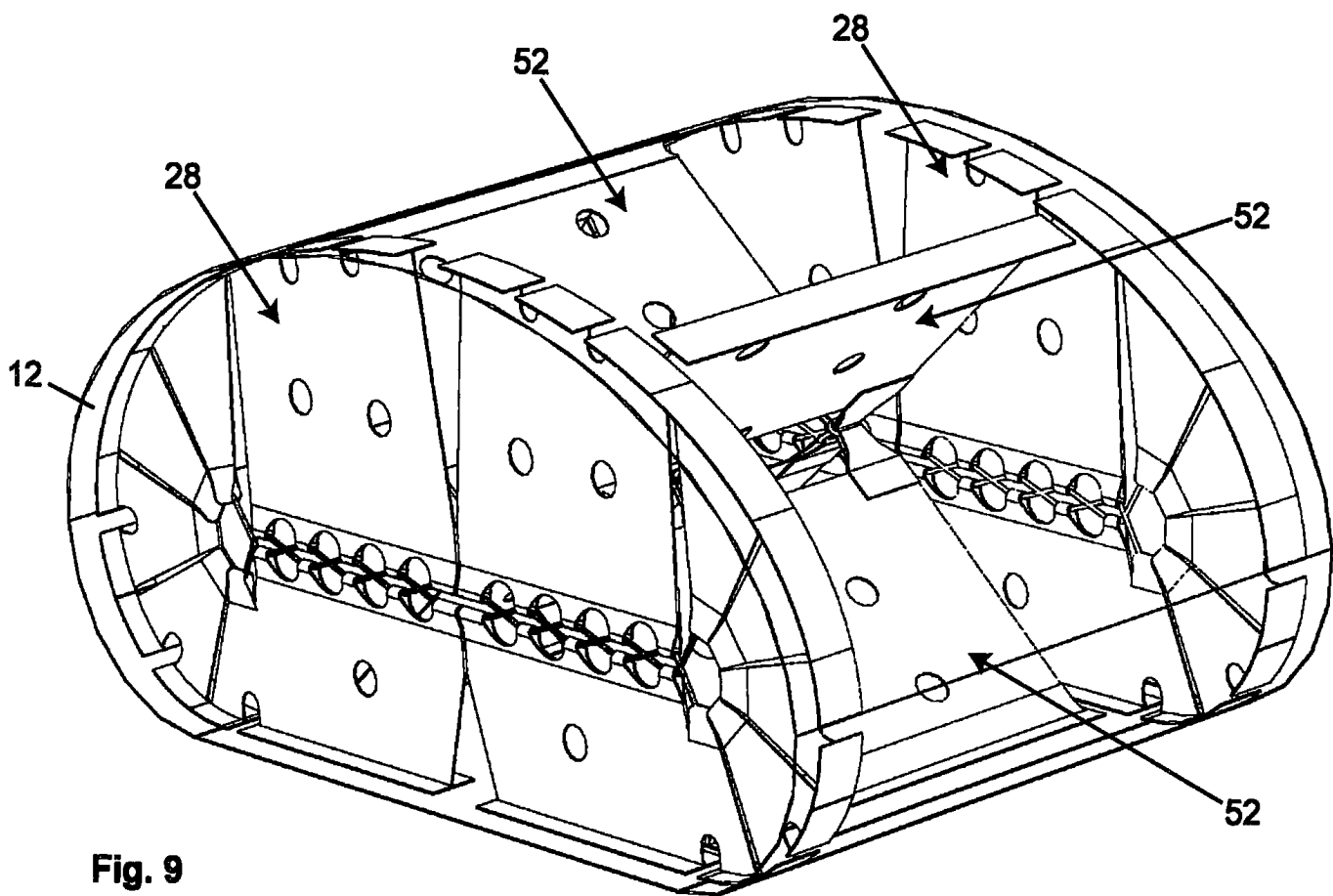


Fig. 9

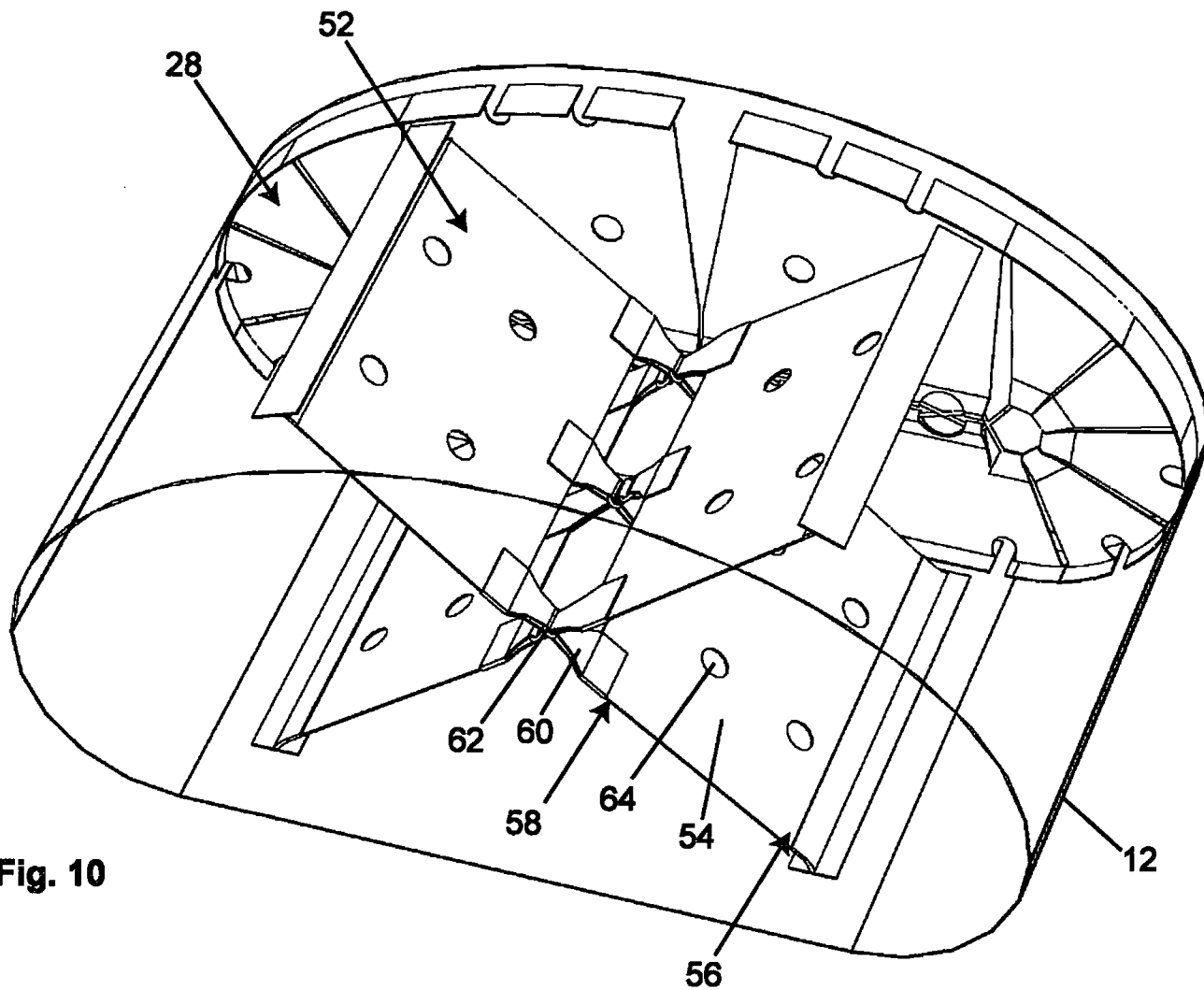
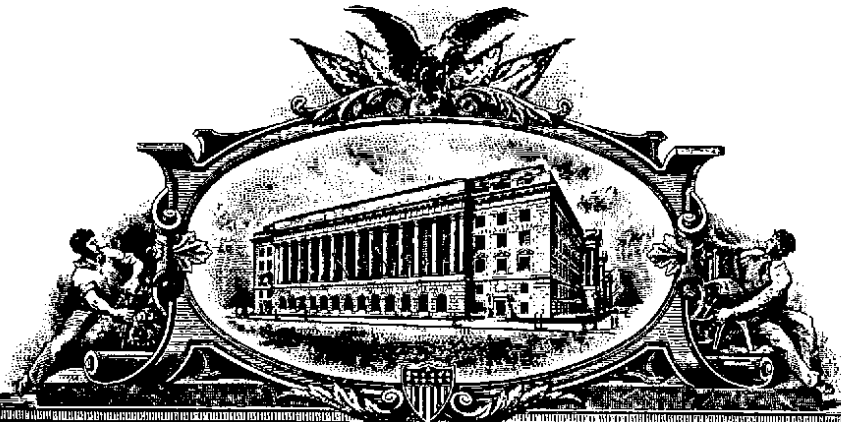


Fig. 10

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APPLICATION NUMBER: 61/331,712

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N. WILLIAMS

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Title of Invention:	FLEXIBLE LIQUID TRANSPORT TANK WITH SURGE DAMPENING BAFFLES
First Named Inventor/Applicant Name:	Victor YAREMENKO
Customer Number:	51590
Filer:	Otto Zsigmond
Filer Authorized By:	
Attorney Docket Number:	50021-62
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1	Provisional Cover Sheet (SB16)	provisionalsb.pdf	1000424 d802fb7ad68b6e6ee13f60c70a903f66950b22	no	3
Warnings:					
Information:					
2		spec.pdf	89067 727d2144a0410cce8104dd38d4f53f731f592cef	yes	9
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	8	
	Claims		9	9	
Warnings:					
Information:					
3	Drawings-other than black and white line drawings	drawings.pdf	2359373 7597f40523c5e3f4d1fad3e3c9a7a928658118e9	no	7
Warnings:					
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4	Fee Worksheet (PTO-875)	fee-info.pdf	29634 7d6adff4b66faed7f98ffafef71357a94941bd676	no	2
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Provisional Application for Patent Cover Sheet
This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1 Remove

Given Name	Middle Name	Family Name	City	State	Country
Victor		YAREMENKO	Delta	BC	CA

Inventor 2 Remove

Given Name	Middle Name	Family Name	City	State	Country
George		BARTZ	Delta	BC	CA

Inventor 3 Remove

Given Name	Middle Name	Family Name	City	State	Country
Richard		LUMSDEN	Delta	BC	CA

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Title of Invention	FLEXIBLE LIQUID TRANSPORT TANK WITH SURGE DAMPENING BAFFLES
Attorney Docket Number (if applicable)	50021-62

Correspondence Address

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☒ No.	
☐ Yes, the name of the U.S. Government agency and the Government contract number are:	

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Entity Status

Applicant claims small entity status under 37 CFR 1.27

- ☒ Yes, applicant qualifies for small entity status under 37 CFR 1.27
☐ No

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Signature	/Otto Zsigmond/			Date (YYYY-MM-DD)	2010-05-05
First Name	Otto	Last Name	Zsigmond	Registration Number (If appropriate)	56312

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FLEXIBLE LIQUID TRANSPORT TANK WITH SURGE DAMPENING BAFFLES

The present invention provides a flexible fuel (or other liquid) transport tank that enables cargo aircraft, both civilian and military, to support remote site fuel cache operations. Each tank may be customised and fitted to specific fixed wing or rotary wing aircraft to maximise the lifting capabilities of the air craft and to ensure the correct centre of gravity and liquid surge dampening system is applied.

Operators generally want the ability to transport bulk fuel to remote camps that are only serviceable by small air craft. The alternatives to a flexible transport tank is a plurality of metal drum fuel tanks or hard tanks flown in aircraft that are typically too large to land in within the confined spaced of the remote site.

Military operators want the ability to support remote fuel caches with bulk fuel transport tanks for emergency applications, northern operations and re-supply of fire bases that are cut off because ground transport is too risky due to enemy activity or improvised explosive devices (IED), or remote jungle or arctic bases where water or ground transportation is unavailable.

The flexible liquid transport tank of the present invention effectively converts any aircraft into flying tanker, enabling bulk fuel to be delivered to remote sites. When the flexible liquid transport tank is empty, it can be rolled up and stored, thereby releasing the space in the aircraft for other cargo or passengers.

One of the benefits provided by the present invention is that it eliminates wasted flights where only empty fuel drums or hard tanks are being removed from remote sites; the return flights can be used to carry other payloads. This not only saves money, but is a more environmentally sound practice since many empty fuel drums are usually simply abandoned at the remote sites. The present invention also enables virtually any aircraft to be quickly converted into or from a bulk fuel tanker, thereby allowing for dual use operations. The present invention further reduces contamination and fuel loss from minor spills that are often associated with fuel drums, and it reduces the overall environmental footprint of a remote site fuelling operation.

The flexible liquid transport tank of the present invention is designed to minimise liquid dynamics and any effects to the centre of gravity of the aircraft. The tank has a new and unique fabric and cable baffling system that limits the liquid dynamic of the fuel during flight. This new cable baffling system enables the manufacturer to custom size each tank to specific aircraft.

For a better understanding of the present invention and to show more clearly how it may be carried into effect, reference is made by way of example to the accompanying drawings in which:

Fig. 1 is a top plan view of a flexible liquid transport tank of the present invention showing the outer tank;

Fig. 2 is a side elevation view of the outer tank of the flexible liquid transport tank in Fig. 1;

Fig. 3 is a perspective view from the top of the outer tank of the flexible liquid transport tank in Fig. 1;

Fig. 4 is a close-up perspective view from the top of an end of the outer tank of the flexible liquid transport tank in Fig. 1;

Fig. 5 is a perspective view from the top of the inner tank of the flexible liquid transport tank in Fig. 1;

Fig. 6 is a perspective view from the bottom of the inner tank of the flexible liquid transport tank in Fig. 1;

Fig. 7 is a perspective view from the top of the inner tank of the flexible liquid transport tank in Fig. 1, with the walls of the inner tank shown translucent to reveal the structure of the baffles within the inner tank; and

Fig. 8 is a close-up perspective view from the top of an end of the inner tank of the flexible liquid transport tank in Fig. 1, with the walls of the inner tank shown translucent to reveal the structure of the baffles within the inner tank.

The flexible liquid transport tank 10 of the present invention is a double layered "walled" design. There is an inner tank 12 that is received within an outer tank 14. The inner tank 12 is removable from the outer tank 14, and is designed to be in constant

contact with fuel. The inner tank is made of material that is compatible for use with hydrocarbon fuels. Such material is well known in the art of bladder tanks designed for hydrocarbon fuel storage. Examples include a heavy duty urethane coated fabric. Test strips of the same material as the inner tank are provided that are attached to the inner tank; the test strips may be reviewed periodically (perhaps annually) to assess material deterioration due to chemical interaction or abrasion.

The outer tank 12 is highly abrasion and puncture resistant and is also chemically resistant to hydrocarbon fuel to reduce ageing. A suitable material for the outer tank is an abrasion resistant urethane coated fabric, which is known and used in inflatable booms for containment of oil spills. A fuel resistant liquid tight zipper 16 on the outer tank 12 is provided to enable the inner tank to be removed and inspected. The location and/or the configuration of the zipper may vary from one design of tank to another. The outer tank also has a customisable webbing system 18 built in to enable the tank to be secured to the floor of the aircraft.

In order to provide for safe transport by aircraft, each flexible liquid transport tank is preferably designed for use with a particular aircraft or model of aircraft. As well, the tank should be transported either completely full to minimise fluid dynamics, or empty. As well, the inner tank is fuel compatible and the fabric in contact with the fuel meets Mil-Spec 52983. The tank should have a fuel resistant outer layer that is resistant to heavy abrasion. The outer layer is also provided with a built in webbing/strapping system 18 that enables the tank to be secured to the cargo deck. The tie

down locations on the tank are preferably specific to the particular aircraft or model of aircraft for which tank is designed.

Each tank has one or two dedicated fill and drain ports 20,22 with valves 24 on the outer tank 14 to facilitate filling and discharging of fuel, as well as a flame arrestor vent 25, the location of which may depend on the type of aircraft for which the tank is designed, to enable proper function during take-offs and landings.

The inner tank 12 is provided with a plurality of internal baffles 28, each baffle being disposed in a plane that is substantially transverse to the principal direction of surge action of the liquid (fuel) in the elongate tank (i.e. substantially transverse to the length of the inner tank). Each baffle 28 is comprised of a plurality of sections or flap portions 30 having a base portion 32 that is attached (welded) to the inside wall of the inner tank in line with the plane of the baffle 28. Each flap portion 30 has a free end that includes a loop 34, which are adjacent to the loops of neighbouring flap portions in the assembled inner tank. A rope or cable 36 is laced through the loops 34 in a weave pattern to draw the loops together and thereby draw the flap portions taut to provide structural rigidity to the baffle.

The manufacture of a collapsible liquid transport tank that has internal baffles is an extremely labor intensive process, especially during the final stage when the tank has to be closed and baffles have to be installed and/or assembled on the inside of the substantially closed shell. In contrast, in the flexible liquid transport tank of the present invention, all of the baffle components are preinstalled on the individual tank

panels prior to them being welded together. This significantly reduces the labour component of manufacturing our tanks. After the tank panels are welded together (techniques for doing so are well known) and substantially closing the inner tank shell, a person climbs inside the inner tank, via an encapsulated access hole (which is sealed in the finished product), and performs the final assembly of the baffles 28 by lacing the baffles flaps one by one – one rope/cable 36 per one baffle 28. Advantageously, since the baffles 28 are composed from separate sections or flap portions 30 (which are joined together centrally by the cord/cable 36) it is possible to weld these sections on a flat panel, prior to assembly of the panels, which is a relatively simple process. This is in contrast to having to weld single piece baffles with curvilinear contours onto a panel if the baffles were not composed out of separate sections.

Once the panels of the inner tank are assembled to define the shape of the inner tank, the baffle sections or flap portions 30 of each baffle 28 will be oriented in a plane with their base portions 32 being welded to the inside surface of the inner tank and their free end portions radiating inwardly towards the centre of the baffle. The terminal end of each baffle section or flap portion 30 is provided with a loop 34, which is produced by folding end of the fabric section to define the loop and then weld it onto itself. Hence, once the panels of the inner tank are assembled and the inner tank has taken shape, the loops 34 on the flap portions 30 of each baffle are proximate to the loops 34 of the other flap portions on the same baffle. A cable 36, which is conveniently produced from the same material as the inner tank by taking a long strip,

folding it lengthwise, and welding it onto itself, is laced through each of the loops 34 on one baffle 28 in a weave pattern so that the flap sections are drawn taut to provide structural rigidity to the baffle. The ends of the cable 36 are provided with loops, and these are drawn together, once the cable has been laced through the flap portions, and connected by quick connect chain link (not shown). This is repeated with each baffle. In this way, the inside of the inner tank only has components that are made from the same fabric as the inner tank, with the exception of quick connectors. The assembled baffles 28 define a number of voids 42 in between adjacent flap portions, and some ports 44 are provided in some (or all) of the flap portions to allow a reduced flow of liquid between sections of the inner tank during filling and emptying of the inner tank.

With the tank filled, the baffles 28 provide a wave buffering system. The baffle outer contour coincides with the natural contour of the filled tank, and because the baffle is a structure comprised of separate flap portions that are bundled up by the cable, it significantly reduces the material weight, and material and labour costs of producing baffle structures in a form that is effective in minimising fluid dynamics within the tank. The baffles of the present invention maintain the natural width and length of the inner tank, and prevent the propagation of waves along tank length and width due to aircraft evolutions. As a result, they prevent the centre of gravity of the tank from shifting, which is very important for aircraft controllability.

The number of flap portions 30 per baffle may vary depending on the cross sectional dimensions of the desired inner tank, as well as by other factors such as the overall dimensions of the tank, the number and location of baffles, the baffle structure, the harnessing layout and the type of the aircraft.

Connection points 46 between the inner tank and the outer tank are also provided. Structurally the connection point is a pair of handles one of each installed on the outside of the inner tank and a corresponding one on the inside of the outer tank so that they are opposite each other. This is a quick connection which is can be easy connected/disconnected if needed. There are three connection points on each end of the tanks, but the numbers may vary depending on dimensions of the tanks. The purpose of these points is to maintain proper inner tank position inside the outer tank and to prevent the inner tank from shifting during operation (when it's empty). Rounded corners 48 on both the inner tank and the outer tank are provided for smooth stress distribution.

Other aspects and features of the present invention will become apparent to those of ordinary skill in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

While the above description and illustrations constitute preferred or alternate embodiments of the present invention, it will be appreciated that numerous variations may be made without departing from the scope of the invention. It is intended that the invention be construed as including all such modifications and alterations.

CLAIMS:

1. A system of baffles for a flexible liquid transport tank substantially as illustrated and described.
2. A flexible liquid transport tank substantially as illustrated and described.
3. A method of making a flexible liquid tank substantially as illustrated and described.
4. All inventions as herein disclosed.

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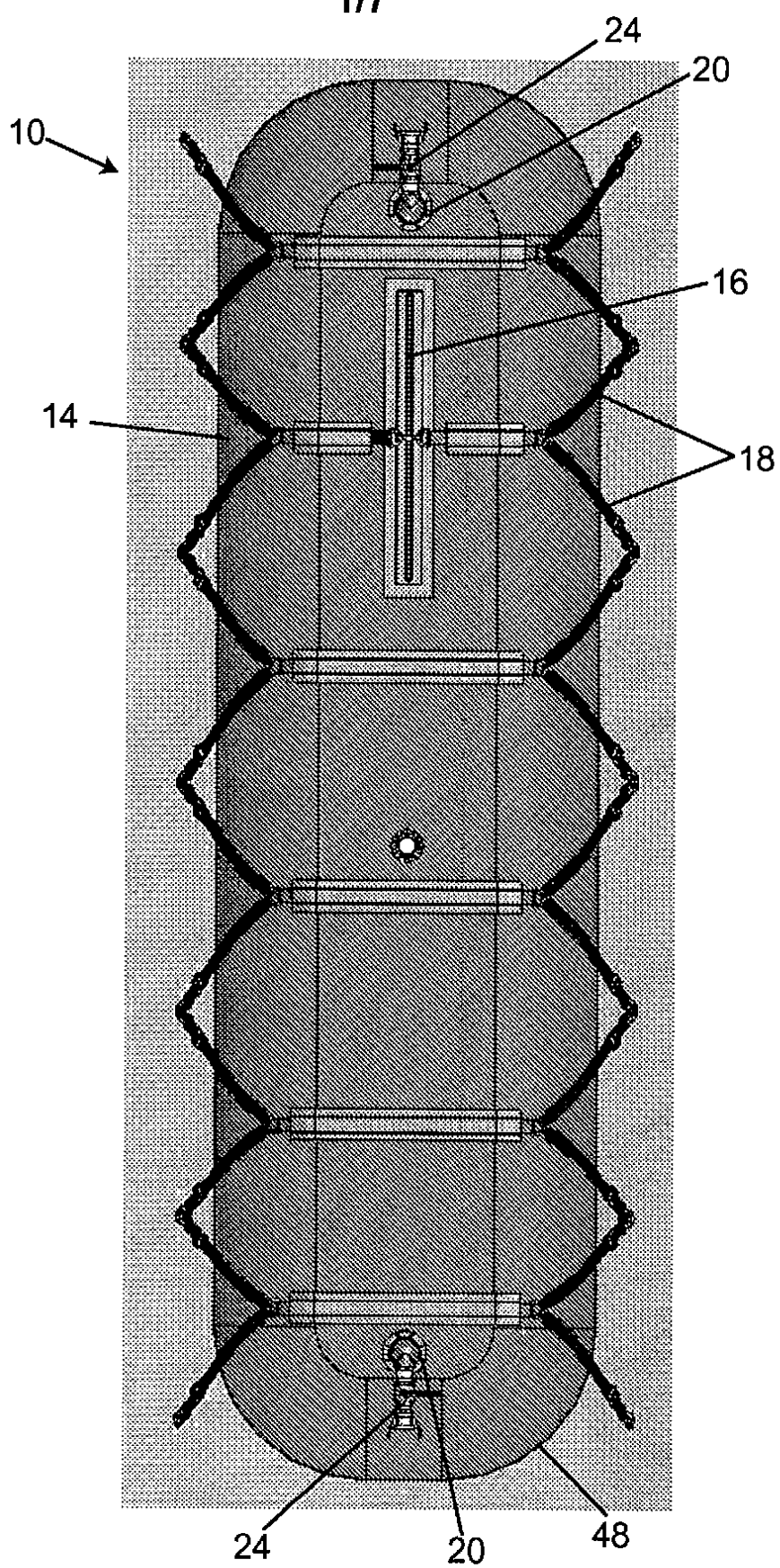


Fig. 1

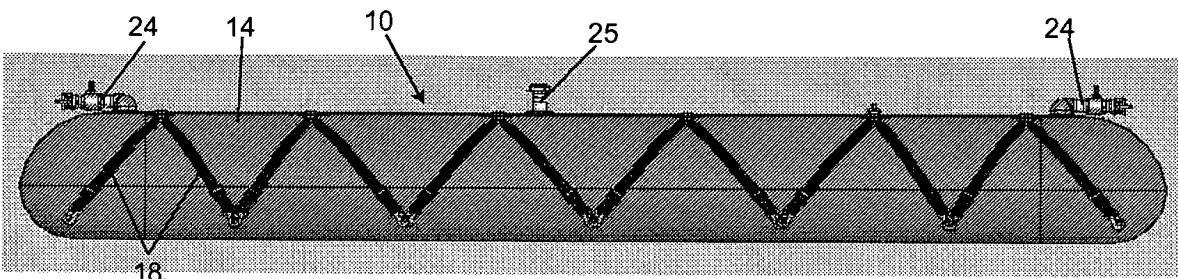


Fig. 2

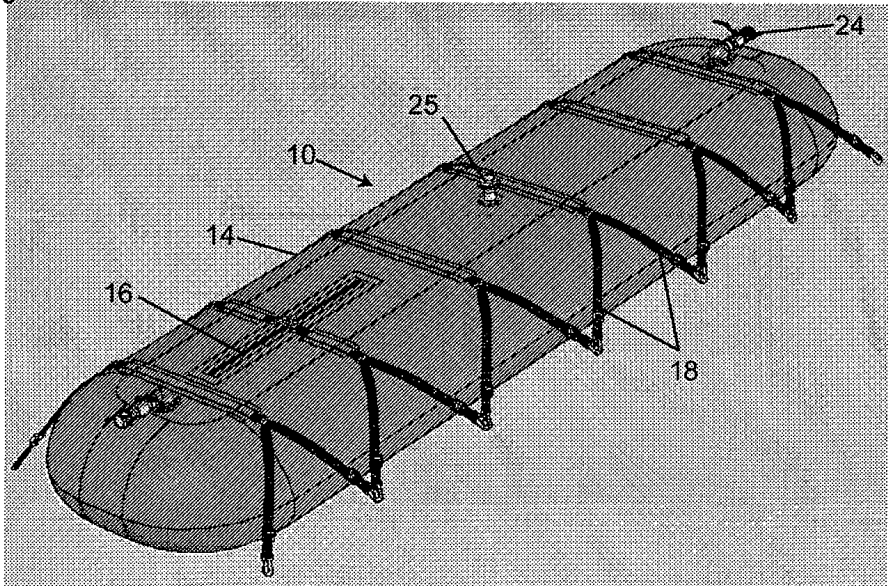


Fig. 3

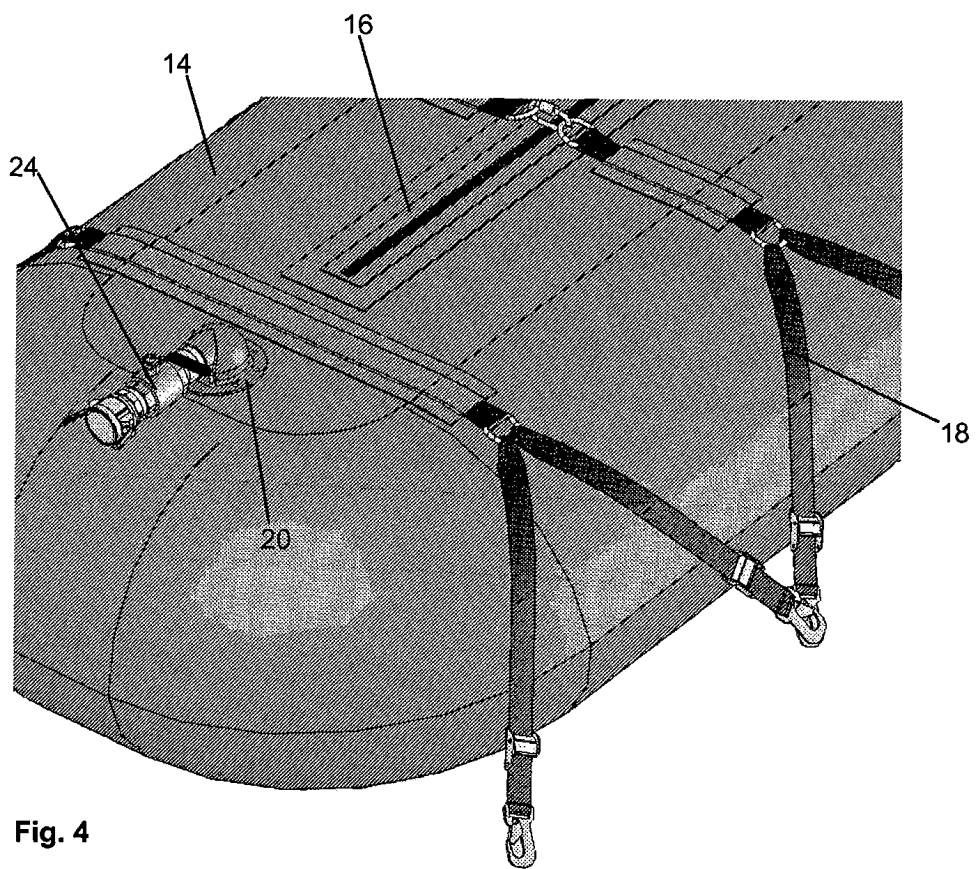


Fig. 4

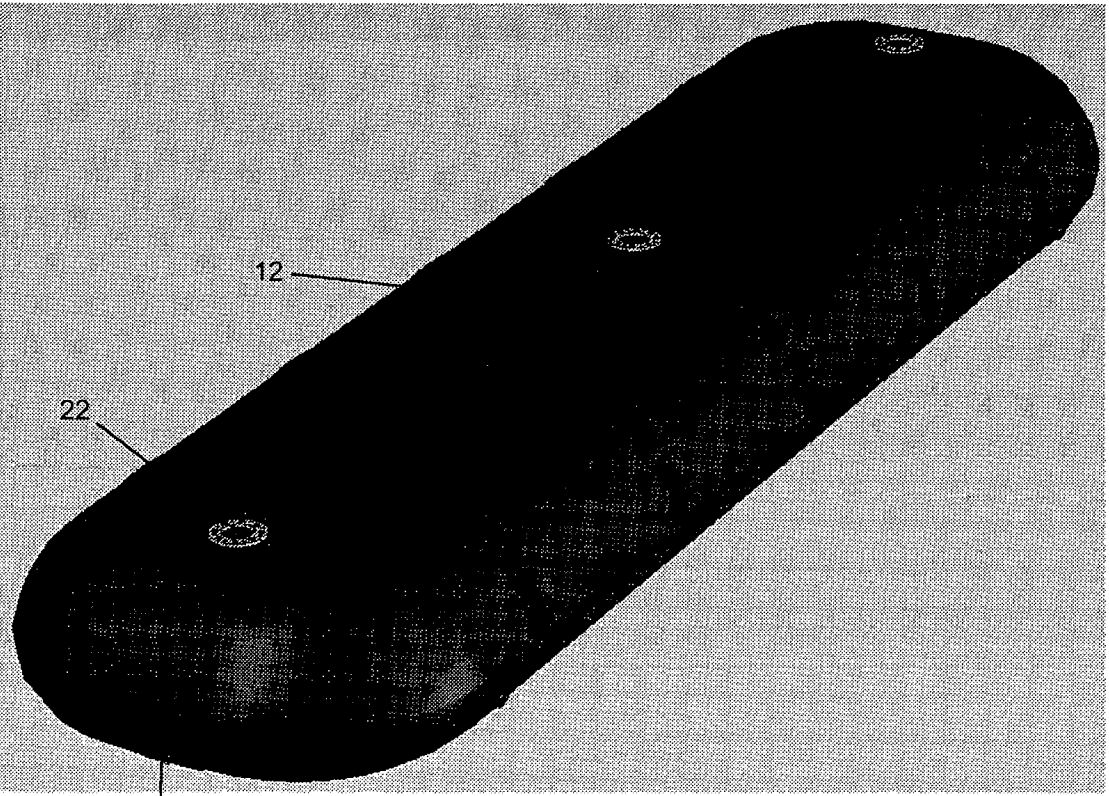


Fig. 5

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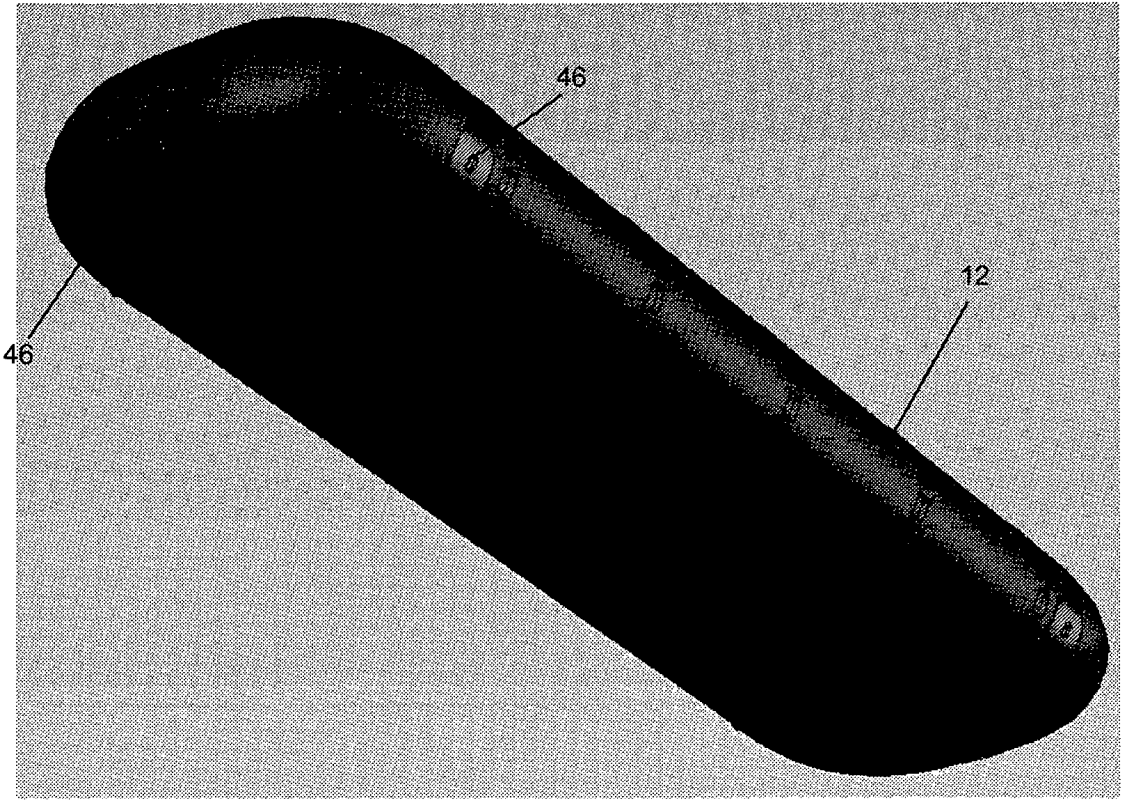


Fig. 6

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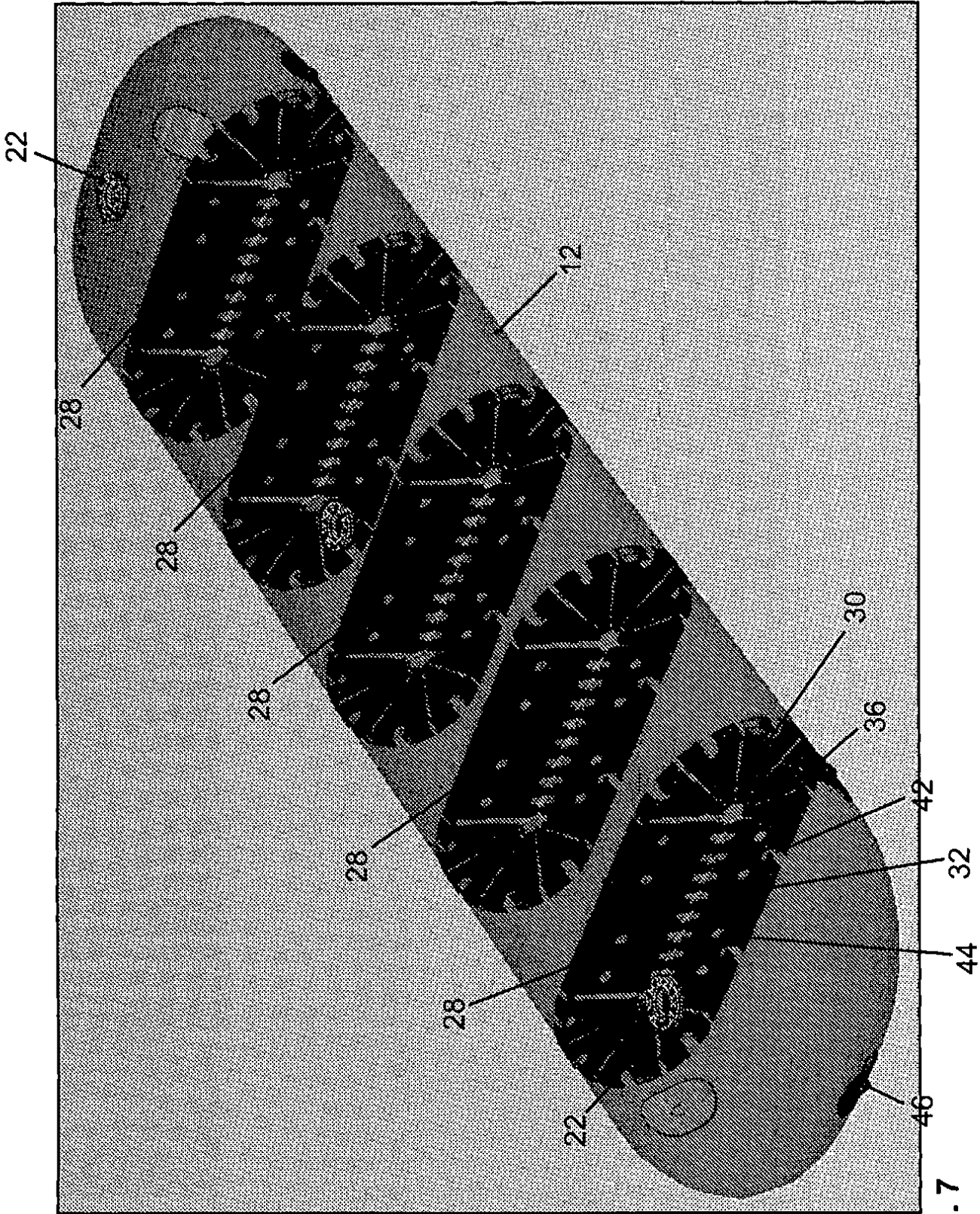


Fig. 7

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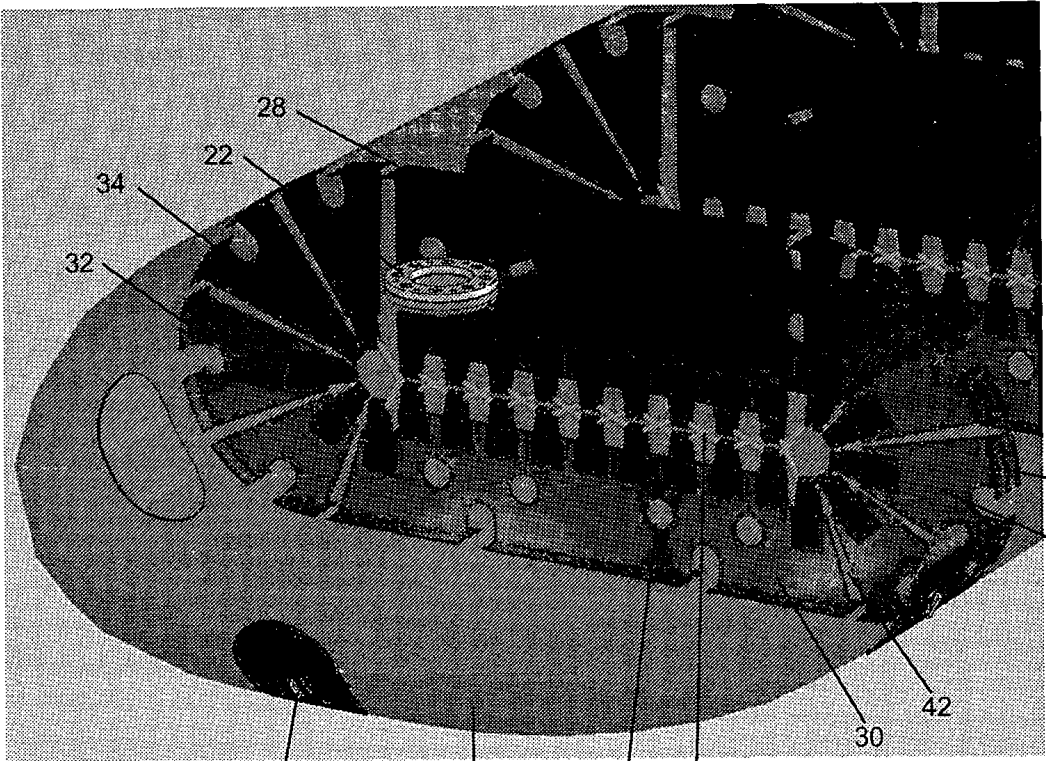


Fig. 8

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