(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 505 516 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.10.2012 Bulletin 2012/40

(51) Int Cl.:
B65D 88/74 *(2006.01)*

(21) Application number: **12161405.1**

(22) Date of filing: **27.03.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **30.03.2011 US 201113075874**

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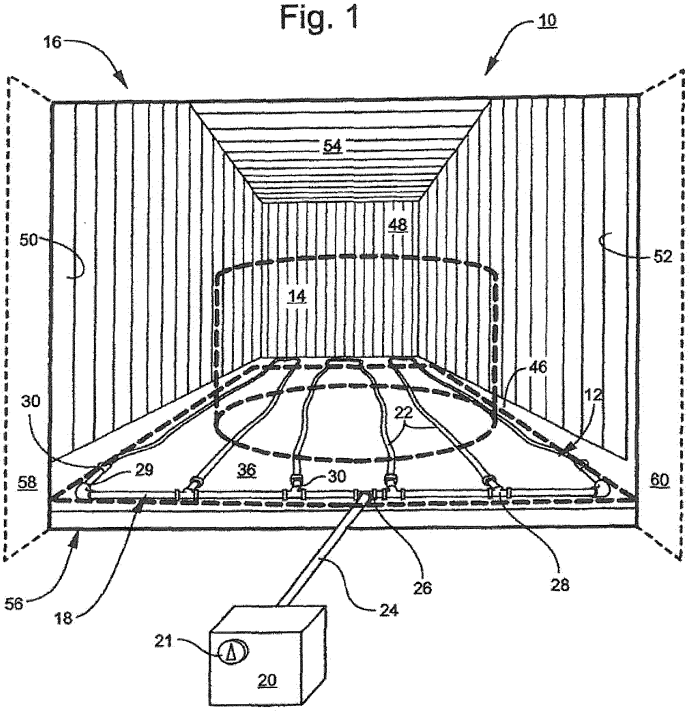
(54) Steam dispersion system for cargo containers, a cargo shipping system and a method of conditioning liquid cargo in a container therewith

(57) A cargo shipping system (10) is provided with a steam dispersion system (12), a cargo carrier (14) and a shipping container (16). The steam dispersion system (12) may include a manifold (18) and a plurality of steam diffusers (22) for expelling steam into the shipping container (16) in order to heat the entire surface area of the cargo carrier (14) substantially, instantaneously and completely in order to heat a liquid cargo within the cargo carrier (14). Methods of making and using the steam dispersion system (12) are also provided.

Fig. 1



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Description

BACKGROUND OF THE DISCLOSURE

[0001] Various systems and procedures are used to transport liquids in bulk quantities. For instance, reusable thermoplastic tanks for use in shipping containers are available from Powertex Inc. of Houston, Texas, as described in U.S. Patent Application Serial Number 11 /737,651.

[0002] When shipping fluids or viscous cargo in tanks through colder environments, the fluids may begin to change state, freeze, solidify, congeal, or harden thereby making unloading of the cargo difficult. Attempts have been made to heat cargo to ease discharge and unloading but known methods often are inefficient or are cumbersome and time consuming to employ.

[0003] What is needed in the cargo shipping industry is a system for conditioning cargo temperatures that is cost effective and easy to manufacture, install and use.

BRIEF SUMMARY OF THE DISCLOSURE

[0004] The present disclosure is directed in general to systems and methods of conditioning cargo temperatures within transport tanks or containers. The components of the systems are simple to manufacture, install and use.

[0005] For example, in one embodiment according to the present disclosure, a steam dispersion system for conditioning liquid cargo in a container is provided, which may include a steam generator for generating steam. The steam dispersion system may also include a diffuser in communication with the steam generator. The diffuser may be positioned around, under and/or in proximity to a container carrying a liquid cargo. The diffuser may have a plurality of apertures therethrough for expelling the steam into the container and about the liquid cargo to adjust a temperature of the cargo to facilitate unloading the cargo from the container. A permeable sheet may be positioned between the diffuser and the cargo to help with temperature regulation and to protect the cargo container from heat damage and/or wear.

[0006] The diffuser of the exemplary steam dispersion system may have a first end and a second end. The first end and the second may be connected to the distribution junction to expel the steam from the apertures. One or more diffusers may be placed between the container and the cargo.

[0007] The steam dispersion system may also include a distribution junction for directing the steam to the diffuser. The steam generator and the diffuser may be connected to the distribution junction.

[0008] The steam dispersion system may also include a thermoplastic tank for carrying the liquid cargo.

[0009] In another embodiment according to the disclosure, a cargo shipping system may include a first container and a second container positioned in the first container. The second container may contain a liquid cargo. The cargo shipping system may include a steam dispersion system with a diffuser located in the first container in proximity to the second container. The diffuser may have a plurality of apertures formed in the diffuser for expelling steam into the first container and around the second container to adjust a temperature of the liquid cargo. A permeable sheet may be placed between the steam dispersion system and the second container.

[0010] In this aspect of the disclosure, one or more diffusers may be placed between the first container and the second container. A steam generator may be provided for generating steam and a distribution junction may be provided for directing steam to the diffusers. The steam generator may be in communication with the diffusers to control the rate and flow of the steam from the diffusers.

[0011] In another aspect of the disclosure, a method of conditioning liquid cargo in a container may include positioning a steam dispersion system in a first container; loading a second container into the first container, the second container holding a liquid cargo proximate the steam dispersion system; and directing a quantity of steam through the steam dispersion system to expel the steam into the first container about the second container to adjust a temperature of the liquid cargo.

[0012] According to the exemplary method, the steam dispersion system may include one or more vents for venting the steam into the first container. One or more of the vents may be adjustable. Furthermore, a pressure regulator may be adjusted to regulate flow rate and pressure of the steam.

[0013] A sheet may be placed between the steam dispersion system and the second container according to this aspect of the disclosure.

[0014] The method may include off-loading the liquid cargo when the temperature reaches an optimal level.

[0015] According to another aspect of the disclosure, a cargo shipping system may include a steam dispersion system including a wicking sheet; a cargo carrier; and a shipping container. The cargo carrier may be placed within the shipping container and exposed to the steam dispersion system such that the steam dispersion system expels steam about the cargo carrier and the wicking sheet to heat the contents of the cargo carrier for discharge.

[0016] Additional aspects of the present subject matter are set forth in, or will be apparent to, those of ordinary skill in the art from the detailed description herein. Also, it should be further appreciated that modifications and variations to the specifically illustrated, referred and discussed features and elements hereof may be practiced in various embodiments and uses of the disclosure without departing from the spirit and scope of the subject matter. Variations may include, but are not limited to, substitution of equivalent means, features, or steps for those illustrated, referenced, or discussed, and the functional, operational, or positional reversal of various parts,

features, steps, or the like. Those of ordinary skill in the art will better appreciate the features and aspects of such variations upon review of the remainder of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] A full and enabling disclosure of the present subject matter, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures, in which:

FIGURE 1 is an elevational view of a cargo shipping system according to an aspect of the disclosure, particularly showing a steam dispersion system being employed in an intended use environment (some aspects shown in phantom for clarity);

FIGURE 2 is a partial perspective view of a portion of the steam dispersion system as in FIGURE 1;

FIGURE 3 is a perspective view of a portion of a steam dispersion system according to another aspect of the disclosure;

FIGURE 4 is a perspective view of an interior of a shipping container, particularly showing a cargo carrier positioned within the shipping container according to another aspect of the disclosure;

FIGURE 5 is a perspective view of the shipping container as in FIGURE 1, particularly showing an intended use of a steam supply hose and a cargo discharge hose;

FIGURE 6 is a chart showing results of tests of an embodiment of the steam dispersion system according to one aspect of the disclosure; and

FIGURE 7 is another chart showing results of tests of an embodiment of the steam dispersion system according to another aspect of the disclosure.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0018] Detailed reference will now be made to the drawings in which examples embodying the present subject matter are shown. The detailed description uses numerical and letter designations to refer to features of the drawings. Like or similar designations of the drawings and description have been used to refer to like or similar parts of various exemplary embodiments.

[0019] The drawings and detailed description provide a full and written description of the present subject matter, and of the manner and process of making and using various exemplary embodiments, so as to enable one skilled in the pertinent art to make and use them, as well as the best mode of carrying out the exemplary embodiments. However, the examples set forth in the drawings and detailed description are provided by way of explanation only and are not meant as limitations of the disclosure. The present subject matter thus includes any modifications and variations of the following examples as come within the scope of the appended claims and their equivalents.

[0020] Turning now to FIGURE 1, a cargo shipping system is designated in general by the number 10. The exemplary cargo shipping system 10 broadly includes a steam dispersion system 12, a cargo containment unit, flexitank or cargo carrier 14, and a shipping container 16. The shipping container 16 has a floor or bottom 46, a rear wall 48, side walls, 50, 52, a roof 54, and an entryway 56, including doors 58, 60 on either side of the entryway 56. Also shown, the steam dispersion system 12 is positioned within an interior of the shipping container 16, and the cargo carrier 14 (shown in phantom for clarity) is positioned over the steam dispersion system 12 for reasons which are described in greater detail below.

[0021] Also shown in FIGURE 1, the steam dispersion system 12 includes a steam distribution junction or manifold 18, which is connected to a steam generator 20 by way of a supply hose 24. The steam generator 20 may include a pressure control regulator or valve 21 to control steam pressure, as described by example operation below. Also shown, the manifold 18 has an input coupling 26, to which the supply hose 24 is connected. The manifold 18 may also include one or more distribution couplings 28, to which respective steam dispersion devices, dispersing units, or diffusers 22 are connected. Although the manifold 18 in this example is a metal pipe and the distribution couplings 28 are metal fittings, these components may be formed from other materials and may be configured in different arrangements. For instance, the manifold 18 may be rubber tubing and the distribution couplings 28 may be plastic fittings. See, e.g., FIGURE 3. There also may be fewer or additional distribution couplings 28 than the quantity shown in FIGURE 1. Thus, the manifold 18 and couplings 28 are not limited to the exemplary arrangement shown in FIGURE 1.

[0022] FIGURE 1 further shows that the steam diffusers 22 have attachment ends 30 that are connected to respective receiving or connection ends 29 of the distribution couplings 28. As will be described in greater detail below, each of the steam diffusers 22 has numerous apertures or vent openings from which steam is expelled into the shipping container 16.

[0023] Also shown in FIGURE 1, a permeable cloth, sheet or layer 36 (shown in phantom for clarity) may be placed over one or more of the steam diffusers 22 and between the steam diffusers 22 and the cargo carrier 14. The permeable sheet 36 may help prolong the life of the

cargo carrier 14, particularly if the cargo carrier 14 is a flexible plastic tank, such as a SEALINER® flexitank product available from Powertex, Inc. Specifically, the sheet 36 may protect the cargo carrier 14 from heat damage, and being permeable or porous, the sheet 36 does not entirely block release of steam into the shipping container 16, as described by example operation below.

[0024] FIGURE 2 is a detailed view of a portion of the manifold 18 as shown in FIGURE 1. Here, one of the distribution couplings 28 of the manifold 18 is connected to one of the steam diffusers 22 by mating the attachment or receiving end 30 of the respective steam diffuser 22 to the respective connection end 29 of the distribution coupling 28. In this example, the receiving ends 29, 30 are screwed together, but may be twist locked together or snap-fit, one end over the other, etcetera.

[0025] The exemplary arrangement in FIGURE 2 also shows that the steam diffuser 22 may be made of a coiled or spiral- or serpentine-wrapped metal that forms a plurality of apertures, gaps, spaces or vent openings 32 between each coil of metal. In other words, the diffuser 22 may be a continuous, metallic, helically formed device; however, the diffuser 22 could also be formed from hardened plastic and/or from separate pieces fitted together. Accordingly, when the steam generator 20 (see FIGURES 1 and 5) is activated, steam 34 is supplied from the manifold 18 into the steam diffuser 22 and is expelled under pressure from each of the vent openings 32 to fill the interior of the shipping container 16 with steam 34. Because the steam 34 is expressed under pressure from the steam diffuser 22 into the container 16 and is not merely circulated or pumped through the steam diffuser 22, heating occurs rapidly within the shipping container 16.

[0026] The apertures 32 of the steam diffusers 22 shown in FIGURE 2 may be staggered and may have different sizes. Alternatively, the apertures 32 may be evenly spaced. They may be formed over various areas of the steam diffusers 22, or the apertures 32 may be formed, for instance, only along sides of the steam diffusers 22 substantially parallel to the floor 46 of the container 16 to effect a directional diffusion of the steam 34; e.g., to direct the steam 34 away from the floor 46 of the container 16. Additionally, the apertures 32 may be adjustable, e.g., changed in size manually, electronically, or elastomerically by pressure to control the flow of the steam 34. For instance, one or more of the apertures 32 may be opened, adjusted, or closed, as indicated by double headed arrow in the inset of FIGURE 2, to a larger (or smaller) width, circumference, or the like as shown by element number 33 to control the flow of the steam 34 and thus the rate of temperature change within the container 16. By way of further example, steam pressure may be regulated by the pressure control regulator 21 (see FIGURES 1 and 5). As steam pressure is increased by adjusting the pressure control regulator 21, the apertures 32 may be expanded elastomerically under pressure to permit more of the steam 34 to discharge from the apertures 32. Conversely, as the pressure control regulator 21 decreases steam pressure, the apertures 32 may contract to limit the flow of the steam 34 into the container 16.

[0027] With reference now to both FIGURES 1 and 2, in one embodiment according to the disclosure, the floor 46 of the shipping container 16 may be angled. The sheet 36 may be a nonwoven textile to permit some of the steam 34 to condense within its fibers thereby saturating the sheet 36 with hot water. With assistance from the angled floor 46 and gravity, the sheet 36 wicks the condensed steam 34 (in the form of hot water) under the cargo carrier 14 and about the floor 46 thereby heating the floor 46 and increasing the efficiency of the steam dispersion system 12. The angled floor 46 may assist the hot water to weep from the shipping container 16, such as from near the entryway 56 or other openings in the shipping container 16. If the floor 46 is not angled, the sheet 36 may still wick some of the condensed steam 34 to help efficiencies of the steam dispersion system 12.

[0028] Turning to FIGURE 3, as briefly introduced above, an alternative manifold 118 may include a steam input nozzle 126 and a number of nipple-type fittings or dispersion connectors 128 having respective connection ends 129. As shown, the exemplary manifold 118 may be made from a flexible rubber or other elastomeric material and may be fitted with the nipple connectors 128. The connectors 128 may be hardened plastic or another suitably durable material for receiving attachment ends of respective steam diffusers (not shown but compare ends 30 of diffuser 22 in FIGURE 2). In the example shown in FIGURE 3, the diffuser attachment ends may be press-fit over the nipples 128. However, it is contemplated that the arrangement could be reversed; e.g., the attachment ends could be formed to press-fit or snap-fit into the nipples 128. Still other connection arrangements are possible and are within the scope of the present disclosure.

[0029] FIGURES 4 and 5 show the interior of the shipping container 16 with the cargo carrier 14 and the felt layer 36 positioned on the floor of the container 16. A gate assembly 38 is positioned to support the cargo carrier 14 after it is filled with a liquid cargo.

[0030] FIGURE 5 particularly shows a rear view of the shipping container 16. As shown, the gate assembly 38 includes an access port 40 through which a discharge hose 42 is connected to a loading/discharge port 44 of the cargo carrier 14 (having been filled with cargo relative to FIGURE 4). More particularly, the supply hose 24 is shown connected to the steam generator 20, briefly introduced above, leading through the entryway 56 of the shipping container 16 and is connected with the manifold 18 (compare FIGURE 1). The arrangement shown in FIGURE 5 provides for the steam 34 to be delivered into the manifold 18 and released into the environment of the container 16 to surround the cargo carrier 14.

[0031] Various tests were conducted to determine the efficacy of the steam dispersion systems according to

various aspects of the disclosure. In one series of tests conducted over three days, one embodiment of the system produced results as shown in FIGURE 6.

[0032] The test results in FIGURE 6 show that after about 24 to about 30 hours, the cargo shipping system 10 according to one aspect of the disclosure increased a temperature of a liquid cargo nearly threefold to a nominal temperature for unloading the liquid cargo.

[0033] As shown most clearly in the test data of FIGURE 7, a temperature of the liquid cargo in a flexitank at about 54° F in an ambient environment of about 20° F increased to about 130° F at 9 psi of steam pressure within thirty hours.

[0034] While the present subject matter has been described in detail with respect to specific embodiments thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing may readily produce alterations to, variations of, and equivalents to such embodiments. Accordingly, the scope of the present disclosure is by way of example rather than by way of limitation, and the subject disclosure does not preclude inclusion of such modifications, variations and/or additions to the present subject matter as would be readily apparent to one of ordinary skill in the art.

Claims

1. A steam dispersion system for conditioning liquid cargo in a container, the steam dispersion system comprising:

a steam generator for generating steam;
at least one diffuser in communication with the steam generator, the diffuser being disposed in a container carrying a liquid cargo, the diffuser having a plurality of apertures therethrough for expelling the steam into the container and about the liquid cargo to adjust a temperature of the cargo to facilitate unloading the cargo from the container; and
a permeable sheet interposed between the diffuser and the cargo.

2. The steam dispersion system as in claim 1, wherein the diffuser has a first end and a second end, the first end and the second end being connected to the distribution junction to expel the steam from the apertures.

3. The steam dispersion system as in claims 1 or 2, wherein the diffuser optionally is interposed between the container and the cargo.

4. The steam dispersion system according to any of the previous claims, further comprising a distribution junction for directing the steam to the diffuser, the steam generator and the diffuser being connected to the distribution junction.

5. The steam dispersion system according to any of the previous claims, further comprising a tank for containing the liquid cargo, the tank optionally being a thermoplastic tank.

6. A cargo shipping system, comprising:

a first container;
a second container disposed in the first container, the second container holding a liquid cargo;
the steam dispersion system as in Claim 1 including a diffuser disposed in the first container in proximity to the second container, the diffuser having a plurality of apertures therethrough configured for expelling steam into the first container and about the second container to adjust a temperature of the liquid cargo; and
a permeable sheet interposed between the steam dispersion system and the second container.

7. The cargo shipping system as in claim 6, further comprising a steam generator for generating the steam, the steam generator being in communication with the diffuser.

8. The cargo shipping system as in claim 6 or 7, further comprising a wicking sheet, the second container being exposed to the steam dispersion system such that the steam dispersion system expels steam about the second container and the wicking sheet to heat the contents of the second container for discharge.

9. A method of conditioning liquid cargo in a container as claimed in any of claims 1 to 8, comprising:

positioning a steam dispersion system in the first container;
loading the second container into the first container, the second container holding the liquid cargo proximate the steam dispersion system; and
directing a quantity of steam through the steam dispersion system to expel the steam into the first container about the second container to adjust a temperature of the liquid cargo.

10. The method of conditioning liquid cargo in a container as in claim 9,
wherein the steam dispersion system includes a plurality of vents for venting the steam into the first container, each of the vents optionally being adjustable.

11. The method of conditioning liquid cargo in a container as in claims 9 or 10, further comprising adjusting

a pressure regulator to regulate the steam.

12. The method of conditioning liquid cargo in a container as in claims 9, 10 or 11, further comprising interposing a sheet between the steam dispersion system and the second container.

13. The method of conditioning liquid cargo in a container as in claims 9, 10, 11 or 12, further comprising offloading the liquid cargo when the temperature reaches an optimal level.

Fig. 1

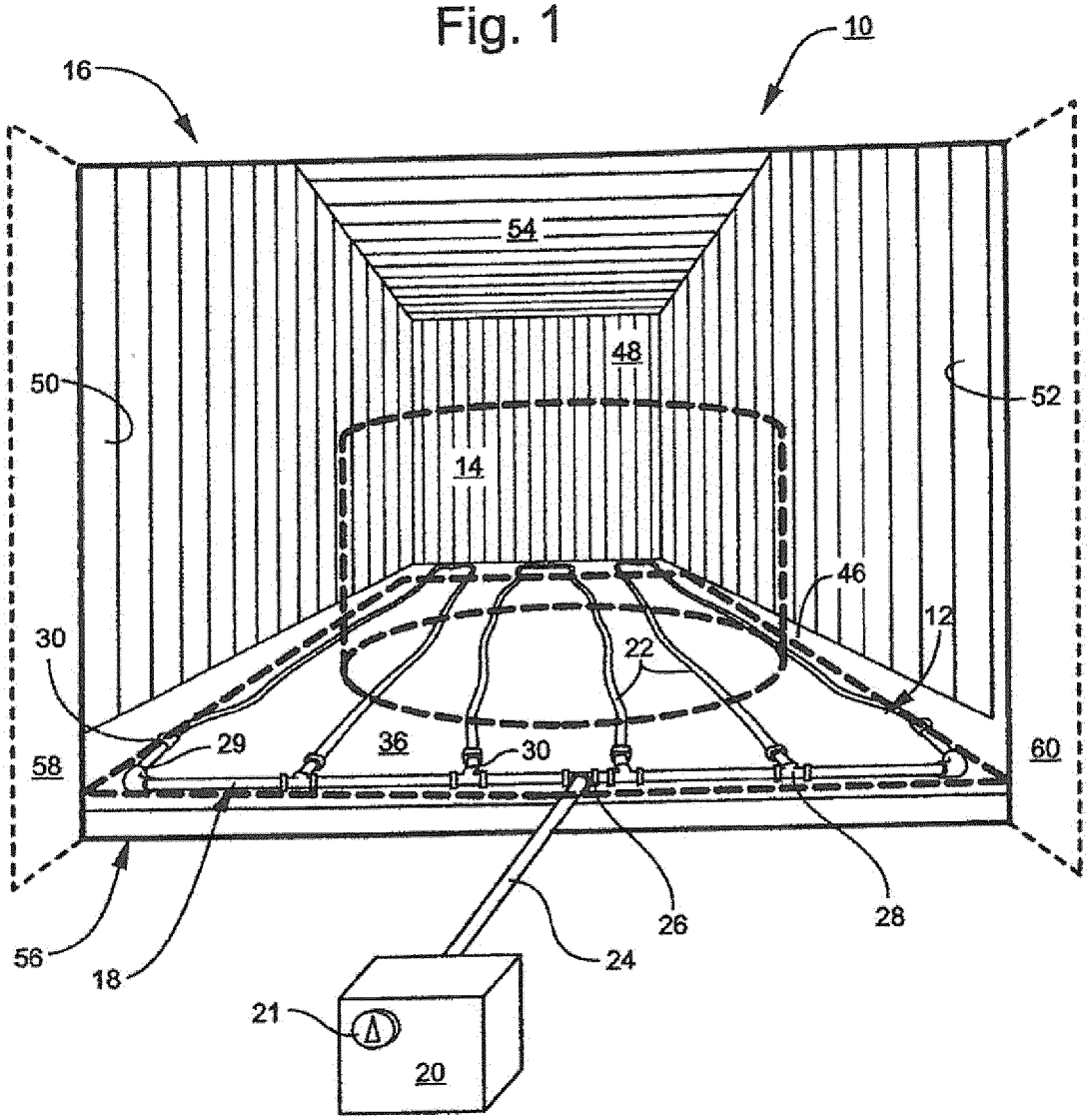


Fig. 2

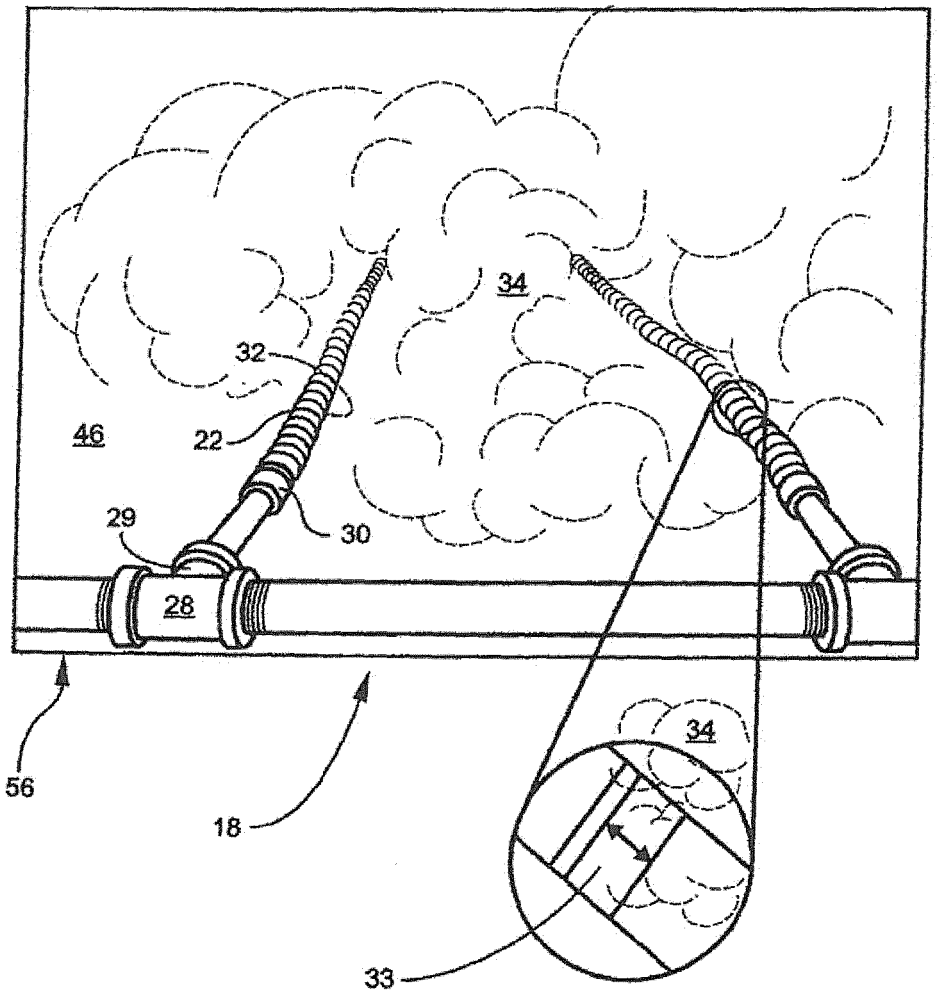


Fig. 3

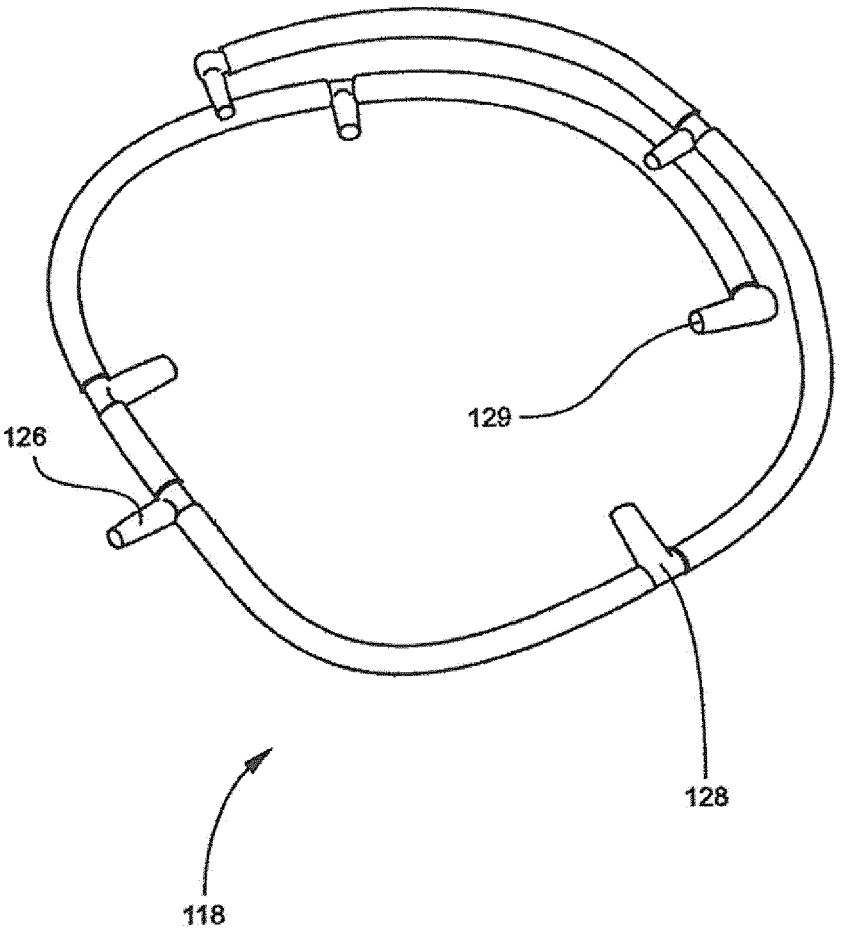


Fig. 4

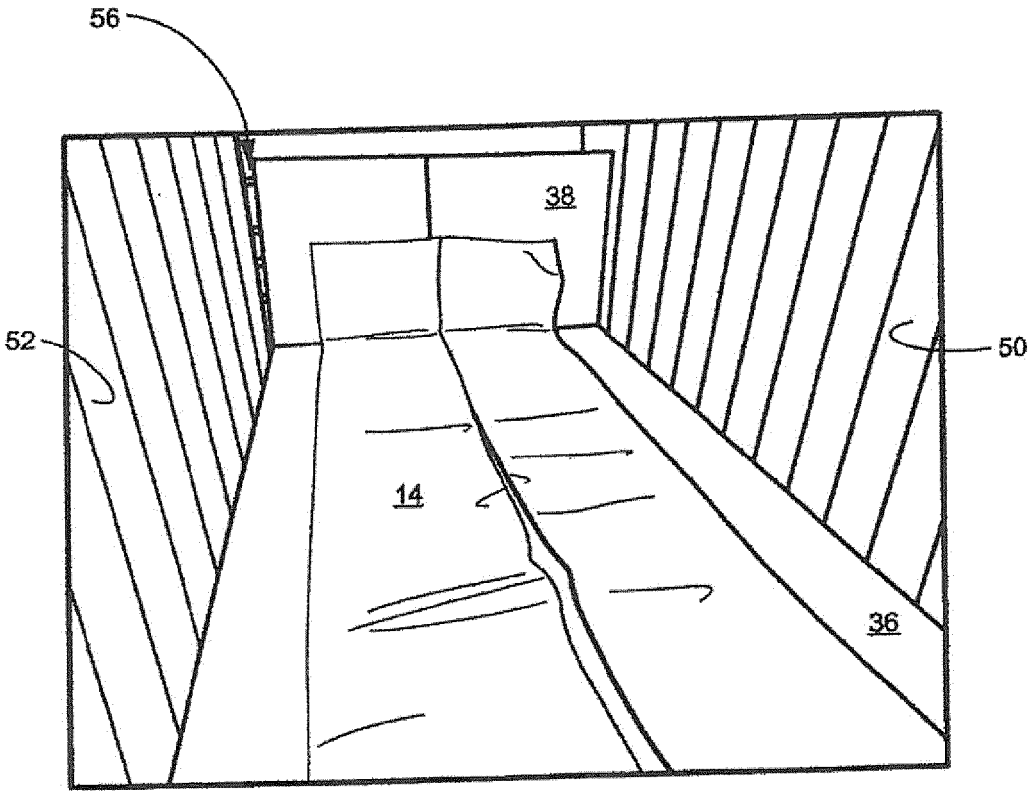


Fig. 5

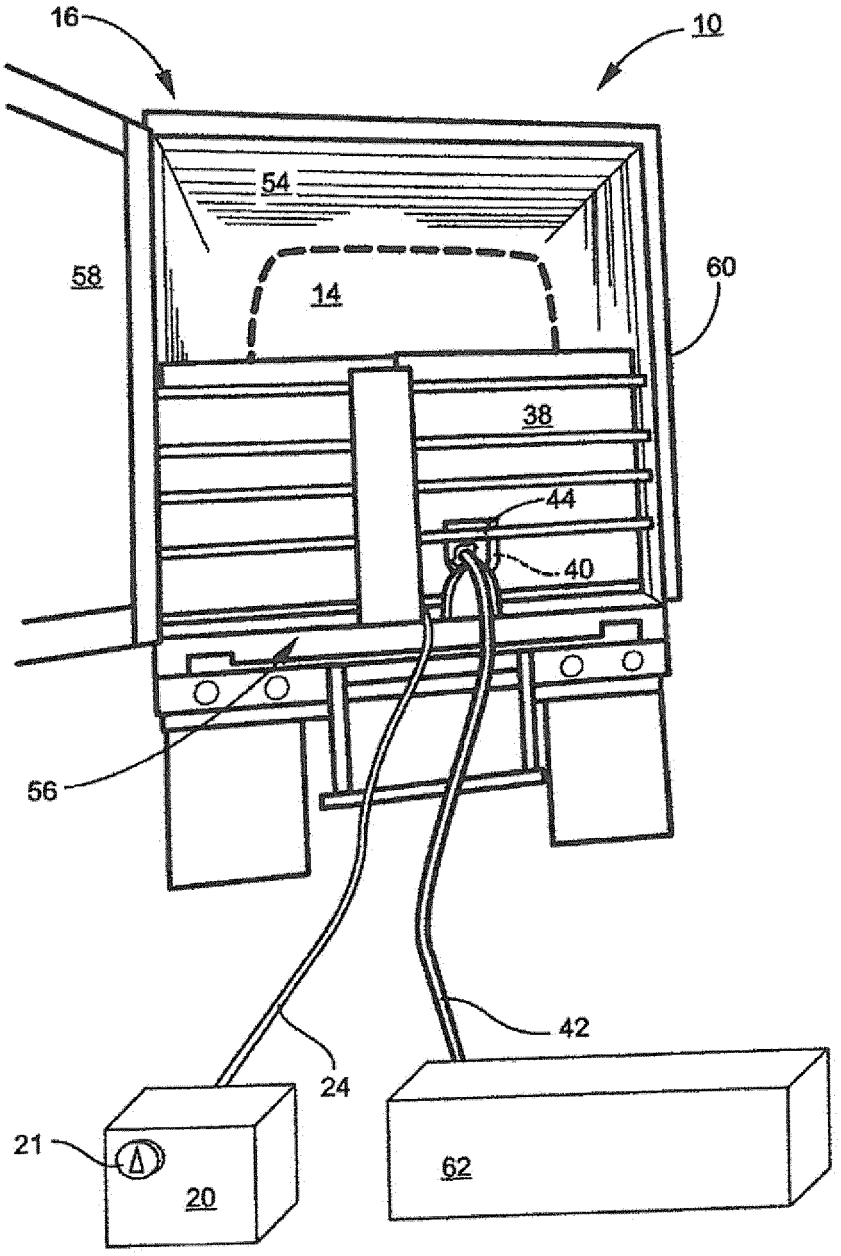
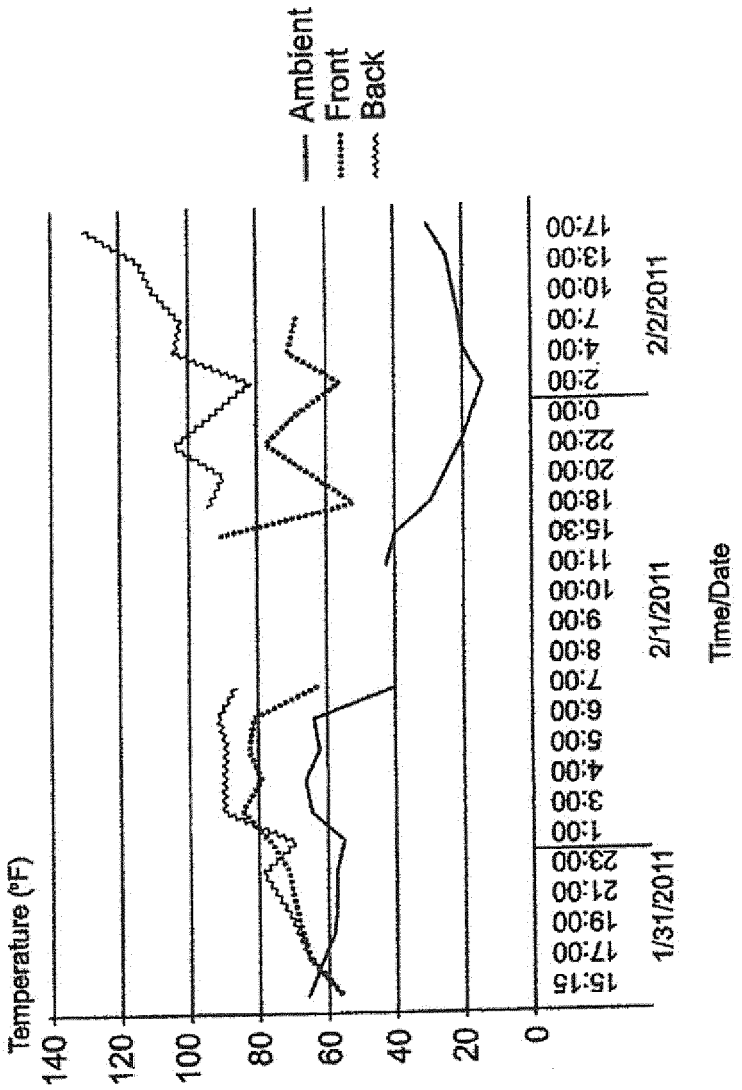


Fig. 6


Ambient
Front
Back
Temperature (°F)
140
120
100
80
60
40
20
0
15:15
17:00
19:00
21:00
23:00
1/31/2011
1:00
3:00
4:00
5:00
6:00
7:00
8:00
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0:00
2:00
4:00
7:00
10:00
13:00
17:00
2/1/2011
2/2/2011
Time/Date

Fig. 7

Date	Time	Ambient	Front	Back
11/31/2010	15:15	65	55	55
	17:00	62	64	63
	19:00	58	67	68
	21:07	57	69	72
	23:00	57	71	78
2/1/2011	1:00	55	75.7	68.6
	3:00	64	84	89
	4:00	66	79	89
	5:00	62	82	89
	6:00	64	81	91
	7:00	41	63	86
	8:00			
	9:00	48	75	81
	10:00			
	11:00	42		78
	15:30	40	90	
	18:00	30	51	94
	20:00	25	64	89
	22:00	20	77	104
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	13:00	25		115
	17:00	30		130

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 1405

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	US 3 553 971 A (CRANG TERENCE FURSDON) 12 January 1971 (1971-01-12) * column 1, line 23 - column 4, line 70 * * figure 1 * -----	1-13	INV. B65D88/74
A	DE 20 2007 005493 U1 (KRENZKE DIRK [DE]) 26 July 2007 (2007-07-26) * page 5, paragraph 36 - page 6, paragraph 38 * * figures 1-3 * -----	1,5,6,9	
A	JP 2006 056571 A (ARAKAWA CHEM IND) 2 March 2006 (2006-03-02) * abstract; figures 1-6 * -----	1,6,7,9	
A	WO 2004/101397 A1 (MAERSK CONTAINER IND AS [DK]; JOERGENSEN GERT [DK]) 25 November 2004 (2004-11-25) * abstract; figures 1A-3 * -----	1,6,9	
A	JP 58 112989 A (NIPPON STEEL CORP) 5 July 1983 (1983-07-05) * figures 1, 2 * -----	2,4	TECHNICAL FIELDS SEARCHED (IPC) B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 July 2012	Piolat, Olivier

CATEGORY OF CITED DOCUMENTS

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26-07-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3553971 A	12-01-1971	CH 483347 A	31-12-1969
		DE 1815578 A1	07-08-1969
		FR 1595410 A	08-06-1970
		GB 1182660 A	04-03-1970
		US 3553971 A	12-01-1971
DE 202007005493 U1	26-07-2007	DE 202007005493 U1	26-07-2007
		EP 1980502 A2	15-10-2008
JP 2006056571 A	02-03-2006	NONE	
WO 2004101397 A1	25-11-2004	NONE	
JP 58112989 A	05-07-1983	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 737651 A **[0001]**