

(19)



(11)

EP 2 794 429 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

30.03.2016 Bulletin 2016/13

(51) Int Cl.:

B65D 81/38 *(2006.01)* **F25D 11/00** *(2006.01)*
B65D 90/04 *(2006.01)* **B65D 88/74** *(2006.01)*
B65D 90/02 *(2006.01)*

(21) Application number: **12815885.4**

(86) International application number:

PCT/US2012/069493

(22) Date of filing: **13.12.2012**

(87) International publication number:

WO 2013/096087 (27.06.2013 Gazette 2013/26)

(54) **CARGO CONTAINER, METHOD**

CARGO CONTAINER, VERFAHREN

CONTENEUR CARGO , MÉTHODE

(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**

- **CHEN, Yu H.**
Manlius, NY 13104 (US)
- **GRAAFF, Wolfgang**
Auburndale, MA 02466 (US)

(30) Priority: **20.12.2011 US 201161577855 P**

(74) Representative: **Klunker . Schmitt-Nilson . Hirsch**
Patentanwälte
Destouchesstraße 68
80796 München (DE)

(43) Date of publication of application:
29.10.2014 Bulletin 2014/44

(73) Proprietor: **Carrier Corporation**
Farmington, CT 06034 (US)

(56) References cited:
GB-A- 2 197 638 US-A- 5 678 715
US-A1- 2006 078 412 US-A1- 2009 242 552

(72) Inventors:

- **CRESSWELL, Kenneth**
Cazenovia, NY 13035 (US)

EP 2 794 429 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

FIELD OF INVENTION

[0001] This invention relates generally to a transport refrigeration system and, more particularly, to vacuum insulation bags to be used with blown polyurethane foam to increase the insulation properties of an integrated refrigerated container.

DESCRIPTION OF RELATED ART

[0002] Products such as produce, meat and the like being shipped relatively long distances are conventionally placed within refrigerated containers. These refrigerated containers are specifically designed for conditioning an interior space with a temperature for the products for an extended period of time. The refrigerated containers utilize a transport refrigeration unit for cooling these products during transport. The refrigeration unit is typically secured to the front wall of the refrigerated container and circulates cooled air inside the interior space through evaporator fans which direct the air from the front of the container to the rear.

[0003] Generally, insulation and air leakage is a concern when shipping produce and meat in these refrigerated containers. Typically, refrigerated containers use polyurethane cell foam technology that is injected into the gap separating the outer wall from the inner liner. The polyurethane foam is used for both its insulation properties as well as for its structural integrity. But, air leakage and heat transfer is still an issue when using the polyurethane foam. An insulation technology is required that will overcome the drawbacks of the current cell foam technology being utilized.

[0004] US 2006/078412 A1 shows a new storage apparatus is provided which includes a rectangular box-like containment vessel in which a false movable floor is provided over the bottom floor. A dunnage bag or other actuator is provided to selectively raise and lower the false floor to facilitate self-evaluation and discharge of dry flowable material through a discharge port. The false floor structure may be removed to provide for versatility and different storage options. For example, the containment vessel can be left empty to provide for storage of other objects through openable doors or a pillow tank may be installed within the containment vessel to provide for liquid holding capabilities.

[0005] US 5 678 715 A shows an intermodal shipping container including a top wall, a bottom wall, opposite side walls, and a composite frame structure including upper and lower longitudinals interconnecting the side walls with the top and bottom walls, and a pair of stacking frame assemblies for supporting the weight of one or more other containers. Each stacking frame assembly includes a pair of vertical stacking posts each integrated into one of the side walls and a horizontal crossmember integrated into the top wall. The stacking posts and the crossmem-

ber are pultruded of composite material, and the stacking post can include layers of different material to optimize performance. Each of the stacking frame assemblies also includes a pair of upper connector assemblies at the intersections between the upper longitudinal members, the stacking posts, and the crossmember, and a pair of lower connector assemblies at the intersections of the lower longitudinal members and the stacking posts. Each connector assembly includes a hollow metal fitting, a pair of splice plates adhesively bonded to one of the stacking posts to form a double lap joint, and a tubular member telescopically received in, and adhesively bonded to, one of the longitudinal members to form a telescopic lap joint.

[0006] US 2009/242552 A1 shows a lightweight transportable container is disclosed in which the wall, roof, and floor of the container are laminated panels bonded together to form a rigid monolithic structure. The container has fittings attached thereto to provide for the attachment of lifting hooks, tie downs, and alignment and coupling pins for attachment with other units when stacked one on top of the other. Load transfer plates are secured to both the fittings and an interior surface of the container to distribute loads otherwise concentrated at the fittings. The container is particularly useful in hostile and extreme temperature environments and is designed to withstand the application of numerous forces from various directions, such as those typically applied, for example, in ISO certification testing.

[0007] GB 2 197 638 A shows a ventilated container, wherein air circulates through respective tubular longitudinal side frame member provided with apertures and composed of outer supporting elements internal cavity closure means and screens. In the lower longitudinal side frame member, the cavity closure means are constituted by a pair of sheet metal elements, the lower of which is positioned opposite an inclined lower end flange of the supporting element and the upper of which is provided with through holes.

BRIEF SUMMARY

[0008] The invention is a cargo container comprising an insulation system according to claim 1 which includes at least one wall having an exterior panel and an interior liner, the exterior panel and the interior liner being substantially parallel to each other; a cavity disposed between the exterior panel and the interior liner, the cavity being coextensive with a surface area of each of the exterior panel and the interior liner; and at least one vacuum insulation bag disposed within the cavity, the at least one vacuum insulation bag being configured for insulating the interior liner from the exterior panel.

[0009] The invention is further a method for insulating a cargo container according to claim 9 which includes providing at least one wall having an exterior panel and an interior liner, the exterior panel and the interior liner being coextensive to each other; and positioning at least one vacuum insulation bag within a cavity, the at least

one vacuum insulation bag being configured for insulating the interior liner from the exterior panel. Also, the cavity is disposed between the exterior panel and the interior liner, the cavity being coextensive with a surface area of each of the exterior panel and the interior liner.

[0010] Other aspects, features, and techniques of the invention will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] Referring now to the drawings wherein like elements are numbered alike in the FIGURES:

FIG. 1 illustrates a perspective view of an integrated container with a refrigeration system according to an embodiment of the invention;

FIG. 2 illustrates schematic top view of a cross-section of the side wall of the integrated container according to an embodiment of the invention; and

FIG. 3 illustrates a top view of a cross-section of the side wall of the integrated container but with reinforcement members inserted within the side wall according to an embodiment of the invention.

DETAILED DESCRIPTION

[0012] Embodiments of an insulated integrated refrigerated container include walls that are formed from an inner liner and an exterior panel and enclose one or more vacuum insulation bags. In embodiments, the vacuum insulated bags are confined or sandwiched within a cavity provided between each of an exterior panel and inner liner, side and rear walls, roof, and floor or in combination with other commonly used insulation materials for improving the insulation properties of insulated integrated refrigerated container. In an embodiment, the vacuum insulation bags are attached to an interior surface of the exterior panel and can be held in place with polyurethane foam having a blowing agent that fills the cavity after the vacuum insulation bags are attached. Other embodiments include reinforcing members when polyurethane foam is not utilized for structural support. In one example, the vacuum insulated bags use a polyurethane foam as a core material, however, but it is contemplated that other core materials can be used.

[0013] Referring now to the drawings, FIG. 1 illustrates an integrated refrigerated container 100 including a cargo container 105 coupled to a refrigeration system 110 according to an embodiment of the invention. The integrated refrigerated container 100, which is shown formed into a generally rectangular construction, and includes opposed side walls 115, a front wall 120, a top wall 125, a directly opposed bottom wall 130, and a door or doors (not shown) attached on hinges at the rear end 135. The walls 115-130 may be formed from an inner liner and an exterior panel (shown in FIG. 2) comprising for example

welded corrugated steel or aluminum in order to provide significant strength and structural integrity. In an example, the integrated refrigerated container 100 may be approximately twenty feet in length, with a width and height of approximately eight feet. However, these dimensions may vary depending on the particular environment in which the integrated refrigerated container 100 is utilized. The refrigeration system 110 is integrated into a front cavity 140 within the cargo container 105. The front cavity 140 houses components of the refrigeration system 110, which is provided for cooling an interior space (not shown) enclosed by walls 115-130 and the door or doors (not shown).

[0014] FIG. 2 illustrates a schematic top view of a cross-section of the side wall 115 of the integrated refrigerated container 100 including at least one vacuum insulation bag 210 according to an embodiment of the invention. The side wall 115 may include an exterior sheet metal panel 205, adjacent to the ambient environment, and an interior liner 215, adjacent to the interior space being conditioned. The exterior panel 205 and interior liner 215 cooperate to enclose a cavity 220 that is generally coextensive with the surface area of the panel 205 and the liner 215. The exterior panel 205 may be formed of sheet aluminum while the inner liner may include a resin impregnated fiber panel, or the like. Also, the side wall 115 may include a plurality of substantially similar vacuum insulation bags such as, for example, the vacuum insulation bag 210 that is confined or sandwiched within the cavity 220. The plurality of vacuum insulation bags 210 are inserted into the cavity 220 along an interior surface of the exterior panel 205 and held in place with insulating material such as, for example, polyurethane foam 225 having a blowing agent that is "foamed-in" the cavity 220 after one or more of the vacuum insulation bags 210 is attached. The polyurethane foam 225 expands upon curing and fills the areas surrounding the vacuum insulation bags 210 within the cavity 220. The vacuum insulation bag 210 may be attached to the interior surface for example with pins, nails, screws, tape, glue, or other similar types of materials prior to filling the cavity with polyurethane foam 225. In embodiments, one or more vacuum insulation bags 210 may be utilized within cavities formed between the interior liner 215 and each of the side walls 115 (FIG. 1), the front wall 120 (FIG. 1), the top wall 125 (FIG. 1), and the bottom wall 130 (FIG. 1) that are held in place with insulating material such as, for example, polyurethane foam 225 having a blowing agent that is "foamed-in" into the cavities to hold the insulation bags 210 in place.

[0015] The vacuum insulation bag 210 may include a substantially gas-tight barrier film or outer layer surrounding a rigid core or filler insulation from which air has been evacuated. The barrier film may be made of a non-permeable wall that prevents air from entering the vacuum insulation bag 210 while the filler or core is a rigid and highly-porous material to support the barrier film once the air has been evacuated. In a non-limiting example,

the filler is polyurethane foam, fumed silica, aerogel or glass fiber, however, other materials for the filler may be utilized without departing from the scope of the invention. A gas absorbent (also referred to as "getter") may be added to the filler material to collect gases leaked through the barrier film or offgassed from the barrier film. The barrier film may be formed into a pouch into which the filler material is inserted. A vacuum is applied to the bag 210 in order to evacuate air from the core material after which the barrier film is heat sealed to form the bag 210. In an example, a plurality of polymeric film layers are used as the edge layers having an inner metalized or aluminum layer with a thickness of, in one non-limiting example, 23 microns may be used. In some non-limiting examples, the vacuum insulation bag 210 having a length of about 2 feet (0.6096 meter), a width of about 2 feet (0.6096 meter) or 4 feet (1.2192 meter), and a thickness in the range of about 10 millimeter to about 25 millimeter may be utilized, however, other vacuum insulation bags 210 of various sizes may be utilized. In one embodiment, the width (distance from the exterior panel 205 to the interior liner 215) may be decreased in order to provide a closer fit with the vacuum insulation bags 210. It is to be appreciated that the polyurethane foam 225 provides structural integrity to the side wall 115 by supporting the exterior panel 205 to the inner liner 215 in addition to providing insulation properties between exterior panel 205 and inner liner 215.

[0016] In an embodiment, illustrated in FIG. 3, the side wall 115 includes a plurality of vacuum insulation bags 310 without polyurethane foam according to an embodiment of the invention. The embodiment in FIG. 3 is substantially the same as the embodiment in FIG. 2 with the principal exception that the side wall 115 includes an exterior panel 305 and an interior liner 315 supported by a plurality of substantially similar reinforcing members 325. The reinforcing members 325 are, in an embodiment, made from aluminum or stainless steel structural members that reinforce the connection between the exterior panel 305 and the interior liner 315. Further, the exterior panel 305 and the inner liner 315 cooperate to enclose a cavity 320, which is generally coextensive with the surface area of the panel 305 and the liner 315. Further, side wall 115 includes a plurality of vacuum insulation bags such as, for example, vacuum insulation bag 310 that is confined or sandwiched within the cavity 320 and attached to the interior surface of exterior panel 305 for example with pins, nails, screws, tape, glue, or other similar types of materials. One or more vacuum insulation bags 310 may be utilized within cavities formed between the interior liner 315 and each of side walls 115 (FIG. 1), the front wall 120 (FIG. 1), the top wall 125 (FIG. 1), and bottom wall 130 (FIG. 1) that are held in place with pins, nails, screws, tape, glue, or other similar types of materials. The vacuum insulation bag 310 is substantially the same as the vacuum insulation bag 210 that is shown and described in FIG. 2. In one embodiment, the width (distance from exterior panel 305 to interior liner 315)

may be decreased in order to provide a closer fit with the vacuum insulation bags 310.

[0017] The technical effects and benefits of embodiments relate to an integrated refrigerated container having one or more vacuum insulation bags. The vacuum insulation bags are confined or sandwiched within a cavity provided between the outer panel and inner liner forming the walls of the container. The vacuum insulation bags are attached to the interior surface of the exterior panel and held in place with polyurethane foam having a blowing agent that is filled into the cavity after the vacuum insulation bags are attached. Other embodiments include reinforcing members when polyurethane foam is not utilized for structural support.

Claims

1. A cargo container comprising an insulation system, comprising:
 - at least one wall having an exterior panel (205) and an interior liner (215), the exterior panel (205) and the interior liner (215) being substantially parallel to each other;
 - a cavity (220) disposed between the exterior panel (205) and the interior liner (215), the cavity (220) being coextensive with a surface area of each of the exterior panel (205) and the interior liner (215); and
 - at least one vacuum insulation bag (210) disposed within the cavity (220), the at least one vacuum insulation bag (210) being configured for insulating the interior liner (215) from the exterior panel (205).
2. The cargo container of claim 1, further comprising expandable polyurethane foam (225) disposed within the cavity (220), the polyurethane foam (225) expanding around the at least one vacuum insulation bag (210) upon curing.
3. The cargo container of claim 1, further comprising a plurality of reinforcing members (325) coupled to each of the exterior panel (205) and the inner liner (215).
4. The cargo container of claim 3, wherein the plurality of reinforcing members (325) are orthogonally coupled to interior surfaces of each of the exterior panel (205) and the inner liner (215).
5. The cargo container of claim 1, wherein the exterior panel (205) is adjacent to an ambient environment; or wherein the interior liner (215) is adjacent to an interior space being conditioned.

6. The cargo container of claim 1, wherein the at least one vacuum insulation bag (210) is coupled to an interior surface of the exterior panel (205) with at least one of pins, nails, screws, tape, or glue. 5
7. The cargo container of claim 1, wherein the at least one vacuum insulation bag (210) includes a barrier film enclosing an insulating material. 10
8. The cargo container of claim 7, wherein the insulating material is one of a polyurethane foam (225), fumed silica, aerogel, and glass fiber. 15
9. A method for insulating a cargo container, comprising: 20
 - providing at least one wall having an exterior panel (205) and an interior liner (215), the exterior panel (205) and the interior liner (215) being coextensive to each other; and
 - positioning at least one vacuum insulation bag (210) within a cavity (220), the at least one vacuum insulation bag (210) being configured for insulating the interior liner (215) from the exterior panel (205); 25
 - wherein the cavity (220) is disposed between the exterior panel (205) and the interior liner (215), the cavity (220) being coextensive with a surface area of each of the exterior panel (205) and the interior liner (215). 30
10. The method of claim 9, further comprising inserting expandable polyurethane foam (225) within the cavity (220), wherein the expandable polyurethane foam (225) expands upon curing to fill the cavity (220). 35
11. The method of claim 9, further comprising coupling a plurality of reinforcing members (325) to each of the exterior panel (205) and the inner liner (215). 40
12. The method of claim 11, wherein the plurality of reinforcing members (325) are orthogonally coupled to interior surfaces of each of the exterior panel (205) and the inner liner (215). 45
13. The method of claim 9, wherein the exterior panel (205) is adjacent to an ambient environment; or wherein the interior liner (215) is adjacent to an interior space being conditioned. 50
14. The method of claim 9, further comprising coupling the at least one vacuum insulation bag (210) to an interior surface of the exterior panel (205) with at least one of pins, nails, screws, tape, or glue. 55
15. The method of claim 9, wherein the at least one vacuum insulation bag (210) includes a barrier film en-

closing an insulating material; and/or wherein the insulating material is one of polyurethane foam (225), fumed silica, aerogel, and glass fiber.

Patentansprüche

1. Frachtbehälter, der ein Isolationssystem umfasst, umfassend:
 - mindestens eine Wand mit einer Außenplatte (205) und einer Innenauskleidung (215), wobei die Außenplatte (205) und die Innenauskleidung (215) im Wesentlichen parallel zueinander sind; einen Hohlraum (220), der zwischen der Außenplatte (205) und der Innenauskleidung (215) angeordnet ist, wobei der Hohlraum (220) koextensiv mit einem Oberflächenbereich sowohl der Außenplatte (205) als auch der Innenauskleidung (215) ist; und
 - mindestens einen Vakuumisolationsbeutel (210), der innerhalb des Hohlraums (220) angeordnet ist, wobei der mindestens eine Vakuumisolationsbeutel (210) zum Isolieren der Innenauskleidung (215) von der Außenplatte (205) konfiguriert ist.
2. Frachtbehälter nach Anspruch 1, weiter umfassend expandierbaren Polyurethanschaumstoff (225), der innerhalb des Hohlraums (220) angeordnet ist, wobei der Polyurethanschaumstoff (225) beim Aushärten um den mindestens einen Vakuumisolationsbeutel (210) expandiert ist.
3. Frachtbehälter nach Anspruch 1, weiter umfassend eine Vielzahl von Verstärkungselementen (325), die sowohl an der Außenplatte (205) als auch an der Innenauskleidung (215) befestigt sind.
4. Frachtbehälter nach Anspruch 3, wobei die Vielzahl der Verstärkungselemente (325) orthogonal an den Innenflächen sowohl der Außenplatte (205) als auch der Innenauskleidung (215) befestigt ist.
5. Frachtbehälter nach Anspruch 1, wobei die Außenplatte (205) benachbart zu einer Umweltumgebung ist; oder wobei die Innenauskleidung (215) benachbart zu einem Innenraum ist, der klimatisiert wird.
6. Frachtbehälter nach Anspruch 1, wobei der mindestens eine Vakuumisolationsbeutel (210) mit mindestens einem Element aus der Gruppe von Stiften, Nägeln, Schrauben, Band oder Klebstoff an einer Innenfläche der Außenplatte (205) befestigt ist.
7. Frachtbehälter nach Anspruch 1, wobei der mindes-

tens eine Vakuumisulationsbeutel (210) einen Barrierefilm umfasst, der ein Isolationsmaterial umschließt.

8. Frachtbehälter nach Anspruch 7, wobei das Isolationsmaterial ein Material aus der Gruppe von Polyurethanschaum (225), Quarzstaub, Aerogel und Glasfaser ist. 5
9. Verfahren zum Isolieren eines Frachtbehälters, umfassend: 10
Bereitstellen mindestens einer Wand mit einer Außenplatte (205) und einer Innenauskleidung (215), wobei die Außenplatte (205) und die Innenauskleidung (215) koextensiv zueinander sind;
Positionieren mindestens eines Vakuumisulationsbeutels (210) innerhalb eines Hohlraums (220), wobei der mindestens eine Vakuumisulationsbeutel (210) zum Isolieren der Innenauskleidung (215) von der Außenplatte (205) konfiguriert ist; 20
wobei der Hohlraum (220) zwischen der Außenplatte (205) und der Innenauskleidung (215) angeordnet ist, wobei der Hohlraum (220) koextensiv mit einem Oberflächenbereich sowohl der Außenplatte (205) als auch der Innenauskleidung (215) ist. 25
30
10. Verfahren nach Anspruch 9, weiter umfassend das Einbringen eines expandierbaren Polyurethanschaums (225) innerhalb des Hohlraums (220), wobei der expandierbare Polyurethanschaum (225) beim Härten expandiert, um den Hohlraum (220) zu füllen. 35
11. Verfahren nach Anspruch 9, weiter umfassend das Befestigen einer Vielzahl von Verstärkungselementen (325) sowohl an der Außenplatte (205) als auch an der Innenauskleidung (215). 40
12. Verfahren nach Anspruch 11, wobei die Vielzahl der Verstärkungselemente (325) orthogonal an den Innenflächen sowohl der Außenplatte (205) als auch der Innenauskleidung (215) befestigt ist. 45
13. Verfahren nach Anspruch 9, wobei die Außenplatte (205) benachbart zu einer Umweltumgebung ist; oder 50
wobei die Innenauskleidung (215) benachbart zu einem Innenraum ist, der klimatisiert wird.
14. Verfahren nach Anspruch 9, weiter umfassend das Befestigen des mindestens einen Vakuumisulationsbeutels (210) an einer Innenfläche der Außenplatte (205) mit mindestens einem Element aus der Gruppe von Stiften, Nägeln, Schrauben, Band oder 55

Klebstoff.

15. Verfahren nach Anspruch 9, wobei der mindestens eine Vakuumisulationsbeutel (210) einen Barrierefilm umfasst, der ein Isolationsmaterial umschließt; und/oder
wobei das Isolationsmaterial ein Material aus der Gruppe von Polyurethanschaum (225), Quarzstaub, Aerogel und Glasfaser ist.

Revendications

1. Conteneur cargo comprenant un système d'isolation, comprenant : 15
au moins une paroi ayant un panneau extérieur (205) et une doublure intérieure (215), le panneau extérieur (205) et la doublure intérieure (215) étant essentiellement parallèles l'un à l'autre ;
une cavité (220) disposée entre le panneau extérieur (205) et la doublure intérieure (215), la cavité (220) étant coextensive à une zone de surface de chacun du panneau extérieur (205) et de la doublure intérieure (215) ; et
au moins un sac d'isolation à vide (210) disposé à l'intérieur de la cavité (220), l'au moins un sac d'isolation à vide (210) étant configuré pour isoler la doublure intérieure (215) du panneau extérieur (205). 20
2. Conteneur cargo selon la revendication 1, comprenant en outre de la mousse de polyuréthane expansible (225) disposée à l'intérieur de la cavité (220), la mousse de polyuréthane (225) s'étendant autour de l'au moins un sac d'isolation à vide (210) lors de la réticulation. 25
3. Conteneur cargo selon la revendication 1, comprenant en outre une pluralité d'éléments de renforcement (325) couplés à chacun du panneau extérieur (205) et de la doublure intérieure (215). 30
4. Conteneur cargo selon la revendication 3, dans lequel la pluralité d'éléments de renforcement (325) sont couplés orthogonalement aux surfaces intérieures de chacun du panneau extérieur (205) et de la doublure intérieure (215). 35
5. Conteneur cargo selon la revendication 1, dans lequel le panneau extérieur (205) est adjacent à un environnement ambiant ; ou
dans lequel la doublure intérieure (215) est adjacente à un espace intérieur conditionné. 40
6. Conteneur cargo selon la revendication 1, dans lequel l'au moins un sac d'isolation à vide (210) est 45

couplé à une surface intérieure du panneau extérieur (205) avec au moins un parmi les broches, clous, vis, bande ou colle.

7. Conteneur cargo selon la revendication 1, dans lequel l'au moins un sac d'isolation à vide (210) comprend un film barrière entourant un matériau isolant. 5
8. Conteneur cargo selon la revendication 7, dans lequel le matériau isolant est un parmi une mousse de polyuréthane (225), silice pyrogénée, aérogel et fibre de verre. 10
9. Procédé d'isolation d'un conteneur cargo, comprenant : 15

la fourniture d'au moins une paroi ayant un panneau extérieur (205) et une doublure intérieure (215), le panneau extérieur (205) et la doublure intérieure (215) étant coextensifs l'un à l'autre ; 20

et

le positionnement d'au moins un sac d'isolation à vide (210) à l'intérieur d'une cavité (220), l'au moins un sac d'isolation à vide (210) étant configuré pour isoler la doublure intérieure (215) du 25

panneau extérieur (205) ;

dans lequel la cavité (220) est disposée entre le panneau extérieur (205) et la doublure intérieure (215), la cavité (220) étant coextensive à une 30

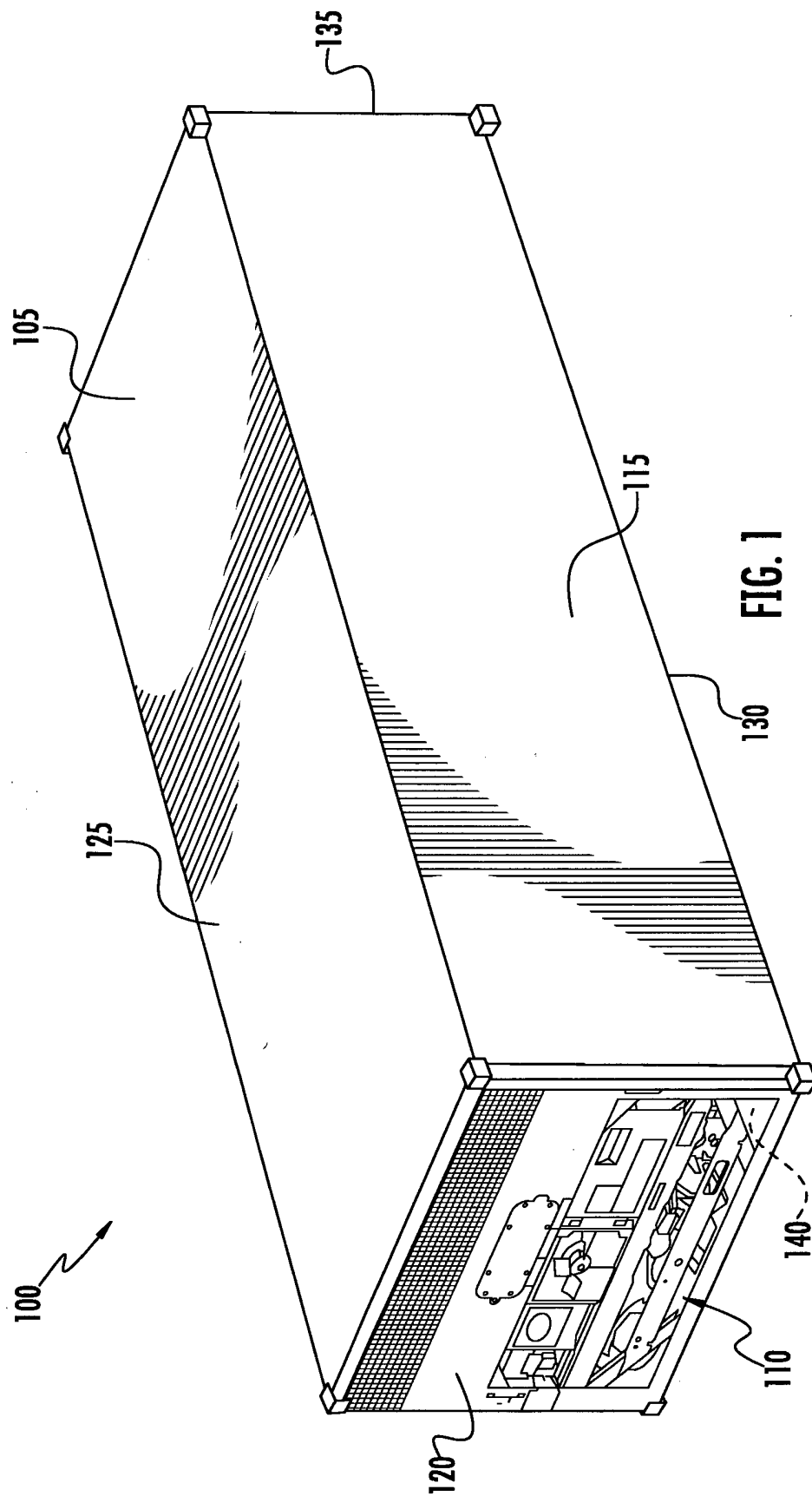
zone de surface de chacun du panneau extérieur (205) et de la doublure intérieure (215).
10. Procédé selon la revendication 9, comprenant en outre l'insertion de mousse de polyuréthane expansible (225) à l'intérieur de la cavité (220), dans lequel 35
- la mousse de polyuréthane expansible (225) s'étend lors de la réticulation pour remplir la cavité (220).
11. Procédé selon la revendication 9, comprenant en outre le couplage d'une pluralité d'éléments de renforcement (325) à chacun du panneau extérieur (205) et de la doublure intérieure (215). 40
12. Procédé selon la revendication 11, dans lequel la pluralité d'éléments de renforcement (325) sont couplés orthogonalement aux surfaces intérieures de chacun du panneau extérieur (205) et de la doublure intérieure (215). 45
13. Procédé selon la revendication 9, 50

dans lequel le panneau extérieur (205) est adjacent à un environnement ambiant ; ou

dans lequel la doublure intérieure (215) est adjacente à un espace intérieur conditionné. 55
14. Procédé selon la revendication 9, comprenant en outre le couplage de l'au moins un sac d'isolation à vide (210) à une surface intérieure du panneau ex-

térieur (205) avec au moins un parmi les broches, clous, vis, bande ou colle.

15. Procédé selon la revendication 9, dans lequel l'au moins un sac d'isolation à vide (210) comprend un film barrière entourant un matériau isolant ; et/ou dans lequel le matériau isolant est un parmi une mousse de polyuréthane (225), silice pyrogénée, aérogel et fibre de verre.



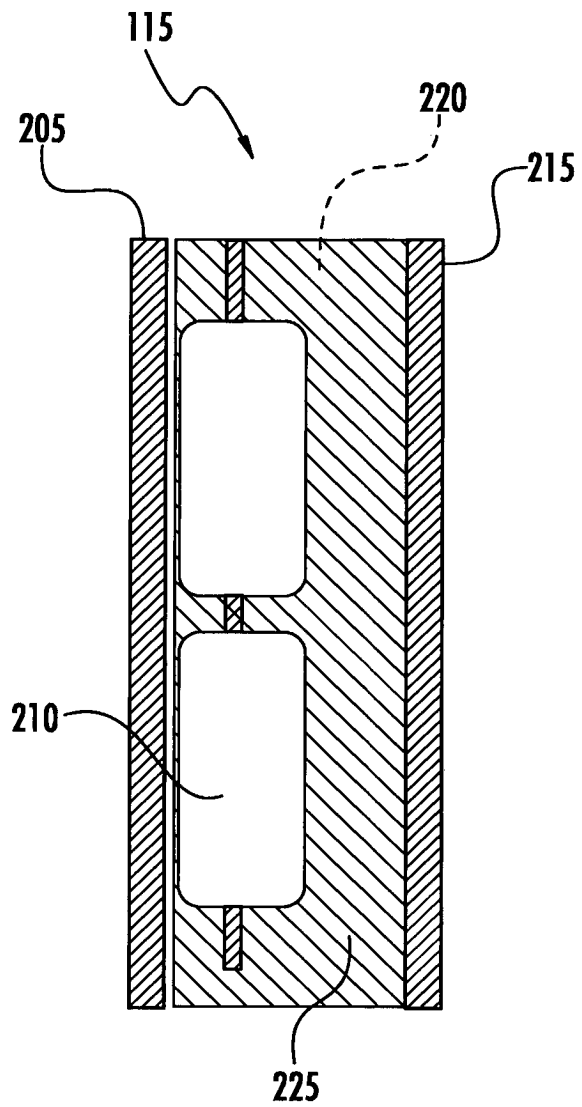


FIG. 2

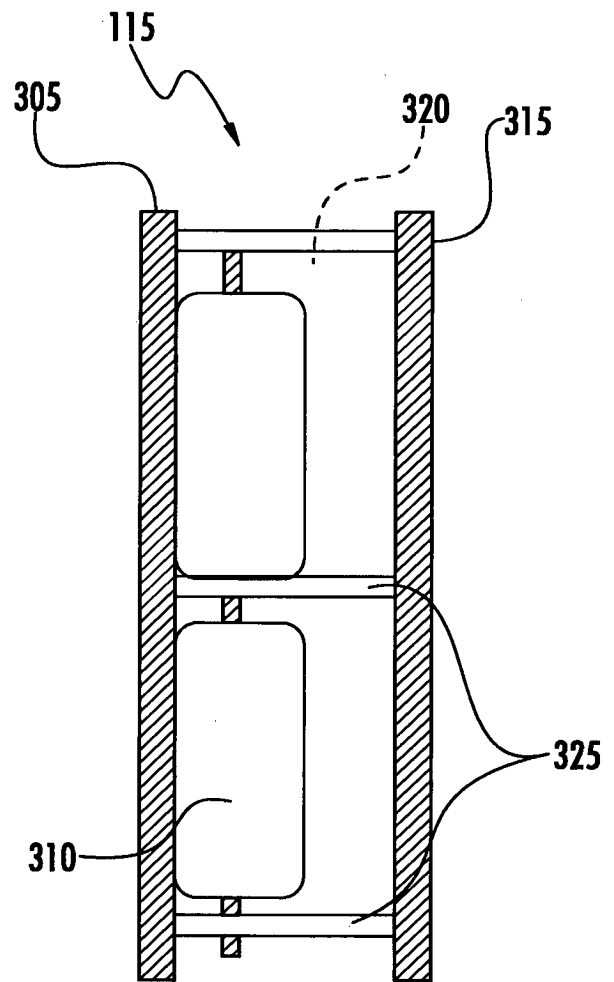


FIG. 3

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2006078412 A1 [0004]
- US 5678715 A [0005]
- US 2009242552 A1 [0006]
- GB 2197638 A [0007]