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

(11) **EP 3 443 283 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
26.05.2021 Bulletin 2021/21

(21) Application number: **16898812.9**

(22) Date of filing: **14.04.2016**

(51) Int Cl.:
F25D 11/02 *(2006.01)* ***F25D 23/06*** *(2006.01)*

(86) International application number:
PCT/US2016/027513

(87) International publication number:
WO 2017/180126 (19.10.2017 Gazette 2017/42)

(54) DOUBLE CABINET VACUUM INSULATED REFRIGERATOR WITH A STRUCTURAL FOAMED MULLION

VAKUUMISOLIERTE DOPPELSCHRANKKÄLTEMASCHINE MIT STRUKTURELLEM SCHAUMPFOSTEN

RÉFRIGÉRATEUR À ISOLATION SOUS VIDE À DOUBLE ARMOIRE, DOTÉ DE MENEAU STRUCTURAL EN MOUSSE

(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

(43) Date of publication of application:
20.02.2019 Bulletin 2019/08

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Description

[0001] The device is in the field of insulating structures for appliances, more specifically, a multi-component insulating structure having a structural foamed mullion.

SUMMARY

[0002] The present invention is disclosed in the independent claims 1 and 14. Further embodiments are disclosed in the dependent claims.

[0003] According to the present invention a cooling appliance according to the independent claim 1 includes a first vacuum insulated structure defining a first refrigerating compartment. The first vacuum insulated structure has an injection molded first-structure trim breaker extending between a first-structure inner liner and a first-structure outer wrapper of the first vacuum insulated structure. At least one door is operable to at least partially enclose the first refrigerating compartment. An interior mullion has a medial insulation structure with a rigid perimeter wall disposed within the interior mullion. The interior mullion further defines the first refrigerating compartment. The rigid perimeter wall includes a front portion that defines at least one hinge support adapted to support the at least one door.

[0004] According to the present invention a method of forming a cooling appliance according to the independent claim 14 includes shaping a rigid perimeter wall to define a mullion wall and upper and lower flanges that define a mullion cavity. At least one hinge support is formed within a front portion of the rigid perimeter wall. The mullion cavity is filled with an insulating material, wherein the insulating material is injected through an insulation port defined within the rigid perimeter wall. A first vacuum insulated structure is formed, wherein a vacuum insulated material is disposed between a first-structure liner and a first-structure wrapper and a first-structure trim breaker is injection molded to form a seal between the first-structure inner liner and the first-structure outer wrapper. The first vacuum insulated structure is formed on the upper flange of the rigid perimeter wall to define a first refrigerating compartment. A door is attached to the at least one hinge support, wherein structural support for the door is supplied by the rigid perimeter wall and wherein the door and the first vacuum insulated structure are each supported by the rigid perimeter wall.

[0005] WO2016013746A1 discloses a refrigerator wherein aerogel is employed as an auxiliary insulation material. The refrigerator comprises a main body having an inner case which forms a storage compartment and an outer case arranged on the outside of the inner case. A main insulation material is arranged between the inner case and the outer case and an aerogel coating layer is formed on a rear side of the inner case or a front side of the outer case.

[0006] EP1808657A1 discloses a refrigerator appliance comprising a first refrigerating compartment having a door, a mullion with a medial insulation structure and a rigid, C-shaped perimeter wall, wherein the mullion further defines the first refrigerating compartment and includes a front portion where at least one door hinge support is arranged.

[0007] US5082335A discloses a refrigeration appliance having an outer cabinet, a liner inside the cabinet and thermal insulation interposed in a space therebetween. The thermal insulation comprises a plurality of vacuum thermal insulation panels, including at least two hermetically sealed vacuum compartments defined by at least three walls of gas-impermeable barrier film laminate sealed together about their peripheries. The compartments are filled with a microporous filler insulating material and are evacuated of atmospheric gasses. The vacuum thermal insulation panels are secured within the space between the liner and the cabinet. Polyurethane foam is injected into the space between the liner and the cabinet to surround and permeate gaps between the vacuum thermal insulation panels and corners of the cabinet. The foam provides added thermal insulation and structural rigidity to the cabinet.

[0008] US4821399A discloses a method of assembling a refrigerator having a fresh food compartment and a freezer compartment separated by a mullion. The refrigerator has an outer metal casing and an inner liner. A foamed thermal insulation is provided between the metal outer casing and the inner liner.

[0009] These and other features, advantages, and objects of the present invention will be further understood by those skilled in the art upon studying the following specification, claims, and appended drawings, whereas the scope of the invention is defined by the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In the drawings:

FIG. 1 is a front perspective view of a refrigerating appliance incorporating an aspect of the multi-component insulation structure;

FIG. 2 is an elevational view of an aspect of the multi-component insulation structure for a cooling appliance;

FIG. 3 is an exploded perspective view of the multi-component insulation structure of FIG. 2;

FIG. 4 is a cross-sectional view of the multi-component insulation structure of FIG. 2 taken along line IV-IV;

FIG. 5 is a top perspective view of an aspect of a rigid perimeter wall for a medial insulation structure of an aspect of the multi-component insulation structure, with the rigid perimeter wall in a pre-formed state;

FIG. 6 is a top perspective view of the rigid perimeter wall of FIG. 5 with the rigid perimeter wall manipulated to define a mullion wall and upper and lower flanges of the rigid perimeterwall;

FIG. 7 is a cross-sectional view of the multi-component insulation structure of FIG. 3 taken along line VII-VII;

FIG. 8 is a cross-sectional view of an aspect of a multi-component insulation structure showing the installation of an insulating material within an insulating cavity formed by the rigid perimeter wall; and

FIG. 9 is a schematic flow diagram illustrating a method for forming a cooling appliance incorporating an aspect of the multi-component insulation structure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0011] For purposes of description herein the terms "upper," "lower," "right," "left," "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the device as oriented in FIG. 1. However, it is to be understood that the device may assume various alternative orientations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

[0012] As illustrated in FIGS. 1-4, reference numeral 10 generally refers to a multi-component insulation structure for a cooling appliance 12 according to the independent claims 1 and 14. According to the various embodiments, the multi-component insulation structure 10 for the cooling appliance 12 includes a first vacuum insulated structure 14 defining a first refrigerating compartment 16. At least one door 18 of the appliance 12 is operable to at least partially enclose the first refrigerating compartment 16. An interior mullion 20 of the appliance 12 includes a medial insulation structure 22 having a rigid perimeter wall 24 disposed within the interior mullion 20. The interior mullion 20 serves to further define the first refrigerating compartment 16. Additionally, the rigid perimeter wall 24 defines at least one hinge support 26 adapted to support the at least one door 18 of the appliance 12. According to various embodiments, the multi-component insulation structure 10 can also include a second vacuum insulated structure 28 that defines a second refrigerating compartment 30. A second refrigerating compartment (30) is comprised in the cooling appliance (12) according to the independent claims 1 and 14. In such an embodiment, the interior mullion 20 serves to at least partially define the second refrigerating compartment 30 and also separates the first and second refrigerating compartments 16, 30. The interior mullion 20 serves to separate the first and second vacuum insulated structures 14, 28.

[0013] Referring again to FIGS. 1-4, the rigid perimeter wall 24 includes a generally "C" type cross section that defines a mullion wall 40, an upper flange 42 and a lower flange 44. It is contemplated that the at least one hinge support 26 is defined within the mullion wall 40. Additionally, the first vacuum insulated structure 14 engages the upper flange 42 of the rigid perimeter wall 24 and the second vacuum insulated structure 28 engages the lower flange 44 of the rigid perimeter wall 24.

[0014] According to the various embodiments, the interior mullion 20 is oriented in a horizontal configuration such that the first vacuum insulated structure 14 that defines the first refrigerating compartment 16 is positioned above and rests upon the upper flange 42 of the rigid perimeter wall 24. In turn, the lower flange 44 of the rigid perimeter wall 24 is configured to rest upon the second vacuum insulated structure 28, such that the interior mullion 20 fully separates the first and second vacuum insulated structures 14, 28 and also provides a separation between the first and second refrigerating compartments 16, 30.

[0015] Referring again to FIGS. 2-6, the rigid perimeter wall 24 having the mullion wall 40 and the upper and lower flanges 42, 44 define a mullion insulating cavity 46. The mullion insulating cavity 46 is also defined by the first and second vacuum insulated structures 14, 28, where the first vacuum insulated structure 14 defines an upper boundary 48 of the mullion insulating cavity 46 and the second vacuum insulated structure 28 defines a lower boundary 50 of the mullion insulating cavity 46 of the rigid perimeter wall 24. It is contemplated that the mullion insulating cavity 46 is filled with an insulating material 52. Within at least a portion of the mullion wall 40, the rigid perimeter wall 24 includes an injection port 54 that extends through at least a portion of the interior mullion 20 and into the mullion insulating cavity 46. Through this injection port 54, the insulating material 52 is injected within the mullion insulating cavity 46 and within the interior mullion 20 between the first and second vacuum insulated structures 14, 28.

[0016] It is further contemplated that the insulating material 52 is disposed within the mullion insulating cavity 46 before the first and second vacuum insulated structures 14, 28 are assembled with the interior mullion 20. In this way, the rigid perimeter wall 24 is disposed within a form structure that defines the upper and lower boundaries 48, 50 of the mullion insulating cavity 46 defined by the rigid perimeter wall 24. The insulating material 52 is then injected into the mullion insulating cavity 46 to define the interior mullion 20, which is fully insulated, for assembly with the first and second vacuum insulated structures 14, 28. It is further contemplated that when the insulating material 52 is disposed within the mullion insulating cavity 46, various utility fixtures 60 can be disposed within the mullion insulating cavity 46 for use within the appliance 12. Such utility fixtures 60 can include, but are not limited to, ice dispensers, water filters, water dispensers, water tanks, water lines, electrical wiring, refrigerant lines, ductwork, conduit and/or harnesses therefor, combinations thereof, and other similar utility-related fixtures for serv-

ing the appliance 12. In such an embodiment, the one or more utility fixtures 60 can be at least partially surrounded by the insulating material 52.

[0017] Referring again to FIGS. 1-6, the hinge support 26 that is defined within the rigid perimeter wall 24 is adapted to receive at least one hinge 70 upon which a rotationally operable door 18 is supported. With the hinge support 26 defined within the rigid perimeter wall 24, downward force 72 and/or rotational force is transferred from the door 18 to the cabinet 74 of the appliance 12 that includes the multi-component insulation structure 10 and is delivered into the rigid perimeter wall 24 of the interior mullion 20. Accordingly, various rotational and downward forces 72 exerted by the weight of the door 18 are delivered into the interior mullion 20. These various rotational and downward forces 72 can then be transferred directly to other structural components of the door 18, such as a primary outer wrapper 76 that extends substantially over the multi-component insulation structure 10 to form the cabinet 74. Accordingly, portions of the rigid perimeter wall 24 can be attached directly to the primary outer wrapper 76. In this manner, the rotational and downward force 72 of the door 18 can be transferred through the hinge supports 26, into the rigid perimeter wall 24 and out to the primary outer wrapper 76 to be transferred to the floor. Accordingly, these downward forces 72 are directed away from the first and second vacuum insulated structures 14, 28, to prevent such forces from bending, twisting, or otherwise deforming the first and second vacuum insulated structures 14, 28. Such deformation may result in a stretching, cracking or other damage that can cause a loss of vacuum pressure within the first and second vacuum insulated structures 14, 28, and loss of insulating capability within the multi-component insulation structure 10.

[0018] According to the various embodiments, as exemplified in FIGS. 2-6, the rigid perimeter wall 24 can be made of various rigid materials that can include, but are not limited to, metal, metal alloys, composite materials, various polymers, combinations thereof, and other similar rigid materials within which the hinge supports 26 are defined for receiving and supporting the hinges 70 and doors 18 of the appliance 12.

[0019] Referring again to FIGS. 1-4, it is contemplated that the cooling appliance 12 can include right and left French doors 90, 92, such as in the case of a French door bottom mount (FDBM) cooling appliance 12. The at least one hinge support 26 can include right and left hinge supports 94, 96 disposed within the mullion wall 40 for supporting the right and left French doors 90, 92 from below. As discussed above, the placement of the hinge supports 26 within the mullion wall 40 of the rigid perimeter wall 24 serves to transfer the rotational and downward forces 72 of the right and left French doors 90, 92 into the rigid perimeter wall 24 and out to the primary outer wrapper 76 of the appliance 12. As noted above, these forces, through this configuration, are directed away from the first and second vacuum insulated structures 14, 28 to minimize the application of stresses placed upon the first and second vacuum insulated structures 14, 28.

[0020] Referring again to FIGS. 1-3, the first vacuum insulated structure 14 can include an upper rigid support 100 that is adapted to at least partially align and support a door 18 of the appliance 12. It is contemplated that the upper rigid support 100 can be positioned proximate the right and left French doors 90, 92 of the appliance 12 such that right and left upper hinge supports 102, 104 can be positioned within right and left upper rigid supports 106, 108 for supporting the right and left French doors 90, 92. As with the rigid perimeter wall 24, the right and left upper rigid supports 106, 108 can be connected to the primary outer wrapper 76 such that forces transferred from the right and left French doors 90, 92 can be directed through the right and left upper rigid supports 106, 108 and away from the first and second vacuum insulated structures 14, 28.

[0021] Referring again to FIGS. 1-7, the first vacuum insulated structure 14 includes a first-structure inner liner 110 and a first-structure outer wrapper 112. The first-structure inner liner 110 and the first-structure outer wrapper 112 are coupled together at a first-structure trim breaker 114 that spans therebetween and defines a hermetic seal of the first vacuum insulated structure 14. Similarly, the second vacuum insulated structure 28 can include a second-structure inner liner 116 and a second-structure outer wrapper 118. The second-structure inner liner 116 and second-structure outer wrapper 118 are coupled together at a second-structure trim breaker 120 that spans therebetween and defines a hermetic seal at the second vacuum insulated structure 28. During the formation of the first and second vacuum insulated structures 14, 28, before the first-structure trim breaker 114 and the second-structure trim breaker 120 are disposed on the first and second vacuum insulated structures 14, 28, respectively, an insulating material 52 is disposed within each of a first and second insulating cavity 124, 126 of the respective first and second vacuum insulated structures 14, 28. After air 122 is withdrawn from each of the first and second insulating cavities 124, 126, and an at least partial vacuum is defined within each of the first and second insulating cavities 124, 126, the hermetic seal defined by the injection molding of the first-structure trim breaker 114 and the second-structure trim breaker 120 substantially prevents the infiltration of air 122 into the first and second vacuum insulated structures 14, 28.

[0022] According to the various embodiments, the placement of the hinge supports 26 within the interior mullion 20 and within the right and left upper rigid supports 106, 108 serves to transfer various forces from the right and left French doors 90, 92 away from the first and second vacuum insulated structures 14, 28. According to various embodiments, the right and left upper rigid supports 106, 108 can be attached to the exterior 130 of the first-structure outer wrapper 112 such that the right and left hinge supports 94, 96 can extend upward or out-

ward and extend through the primary outer wrapper 76 for engagement with the hinges 70 of the right and left French doors 90, 92.

[0023] Referring again to FIGS. 2-7, the first-structure trim breaker 114 of the first vacuum insulated structure 14 is injection molded over portions of the first-structure inner liner 110 and the first-structure outer wrapper 112. According to various embodiments, during the injection molding of the first-structure trim breaker 114, a sealing material 140 can be disposed between the first-structure trim breaker 114 and the first-structure inner liner 110 and the first-structure outer wrapper 112. After being injection molded, the combination of the first-structure trim breaker 114 and the sealing material 140 defines the hermetic seal that maintains the at least partial vacuum within the first insulating cavity 124 of the first vacuum insulated structure 14. It is also contemplated that the second-structure trim breaker 120 can be injection molded over portions of the second-structure inner liner 116 and the second-structure outer wrapper 118. Again, during the injection molding of the second-structure trim breaker 120, the sealing material 140 can be disposed between the second-structure trim breaker 120 and the second-structure inner liner 116 and the second-structure outer wrapper 118 to further define the hermetic seal for maintaining the at least partial vacuum within the second insulating cavity 126 of the second vacuum insulated structure 28. According to various embodiments, the sealing material 140 can include various materials that can include, but are not limited to, glue, adhesives, silicone, rubber, and other similar sealing materials 140.

[0024] After the first-structure and the second-structure trim breakers 114, 120 are injection molded on the first and second vacuum insulated structures 14, 28, respectively, the primary outer wrapper 76 can be placed over portions of the first and second vacuum insulated structures 14, 28 and in particular over portions of the first-structure and second-structure trim breakers 114, 120. In this matter, the primary outer wrapper 76 can define a contact flange 150 that conceals the first-structure and second-structure trim breakers 114, 120 and provides a contact surface 152 against which the left and right French doors 92, 90 can engage and seal against to define a closed position of the right and left French doors 92, 90. It is also contemplated that an interstitial space 154 defined proximate the first-structure and second-structure trim breakers 114, 120 can include various condensation-limiting features that can include, but are not limited to, heating elements, foamed insulation, heat loops, utility fixtures 60, combinations thereof and other similar condensation-preventing fixtures.

[0025] Referring now to fig. 9, having described various aspects of the multi-component insulation structure 10 and its incorporation within various cooling appliances 12, a method 400 is disclosed for forming a cooling appliance 12 according to the independent claims 1 and 14 that incorporates a multi-component insulation structure 10. According to the method 400, a rigid perimeter wall 24 is shaped to define a mullion wall 40 and upper and lower flanges 42, 44 that define a mullion cavity (step 402). At least one hinge support 26 is formed within a front portion 160 of a rigid perimeter wall 24 (step 404). As discussed above, the at least one hinge support 26 is configured to support a hinge 70 and also at least one door 18 for the appliance 12, such that downward forces 72 experienced by the door 18 are not transferred into the first and second vacuum insulated structures 14, 28. The first vacuum insulated structure 14 is then disposed on the upper flange 42 of the rigid perimeter wall 24 to define the first refrigerating compartment 16 (step 406). As discussed above, it is contemplated that a second vacuum insulated structure 28 can be disposed under the lower flange 44 of the rigid perimeter wall 24 such that the second vacuum insulated structure 28 and the interior mullion 20 define a second refrigerating compartment 30. The availability of the second refrigerating compartment (30) is disclosed in the independent claims 1 and 14.

[0026] Referring again to fig. 9, according to the method 400, a first vacuum insulated structure 14 is formed (step 408). An insulating material 52 is disposed between a first-structure inner liner 110 and a first-structure outer wrapper 112. The first-structure trim breaker 114 is then injection molded to form a seal between the first-structure inner liner 110 and the first-structure outer wrapper 112. As discussed above, at least a portion of the air 122 defined within the first insulating cavity 124 is withdrawn to define at least partial vacuum to form the first vacuum insulated structure 14.

[0027] According to various aspects of the method 400, the mullion insulating cavity 46 is filled with an insulating material 52, where the insulating material 52 is injected through an insulation injection port 54 defined within a rigid perimeter wall 24 (step 410). As discussed above, the insulating material 52 is disposed within the mullion insulating cavity 46, when the rigid perimeter wall 24 is set within a form that defines the upper and lower boundaries 48, 50 of the insulating cavity. It is contemplated that after the multi-component insulation structure 10 is formed, a primary outer wrapper 76 can be disposed around the first and second vacuum insulated structures 14, 28 in the rigid perimeter wall 24 to define the cabinet 74 of the cooling appliance 12. After the cabinet 74 of the appliance 12 is formed, a door 18 is attached to the at least one hinge support 26 (step 412). As discussed above, the structural support for the door 18 is supplied by the rigid perimeter wall 24 and not by the first and second vacuum insulated structures 14, 28. Accordingly, the door 18 and the first vacuum insulated structure 14 are supported on the rigid perimeter wall 24. It is contemplated that the rigid perimeter wall 24 can be attached directly to the primary outer wrapper 76 such that downward forces 72 and rotational forces received by the rigid perimeter wall 24 can be transferred through the primary outer wrapper 76 and to the ground such that these forces can be kept away from the first and second vacuum in-

sulated structures 14, 28.

[0028] According to the various embodiments, the various insulation materials disposed within the multi-component insulation structure 10 can include, but are not limited to, an insulating foam adhesive, fumed silica, polyvinyl foam, other foam-type insulation, microspheres, nanospheres, insulating gasses, granulated insulation, combinations thereof, and other similar insulating materials 52 that can be incorporated within a vacuum insulated structure.

[0029] For purposes of this disclosure, the term "coupled" (in all of its forms, couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature or may be removable or releasable in nature unless otherwise stated.

[0030] should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures, and combinations.

[0031] It is clear that the embodiments shown in the drawings and described above are merely for illustrative purposes and are not intended to limit the scope of protection, which is defined by the following claims.

Claims

1. A cooling appliance (12) comprising two refrigerating compartments (16, 30),
a first vacuum insulated structure (14) defining a first refrigerating compartment (16), wherein the first vacuum insulated structure (14) includes a first-structure inner liner (110) and a first-structure outer wrapper (112), **wherein** a vacuum insulated material is disposed between the first-structure inner liner (110) and the first-structure outer wrapper (112),
wherein the first-structure inner liner (110] a
nd the first-structure
outer wrapper (112) are coupled together at a first-structure trim breaker (114) that spans therebetween and defines a substantially air-tight seal of the first vacuum insulated structure (14);
at least one door (18) that is operable to at least partially enclose the first refrigerating compartment (16); and
an interior mullion (20) having a medial insulation structure (22) with a rigid perimeter wall (24) disposed within the interior mullion (20), wherein:

the interior mullion (20) further defines the first refrigerating compartment (16); and

the rigid perimeter wall (24) includes a front portion (160) that defines at least one hinge support (26) adapted to support the at least one door

characterized in that the first vacuum insulated structure (14) is configured in away, in which the first-structure trim breaker (114) is injection molded over portions of the first-structure inner liner (110) and the first-structure outer wrapper (112).

2. The cooling appliance (12) of claim 1, wherein a sealing material (140) is positioned between the first-structure trim breaker (114) and the first-structure inner liner (110) and the first-structure outer wrapper (112).

3. The cooling appliance (12) of claim 1 or 2, further comprising:
a second vacuum insulated structure (28) defining a second refrigerating compartment (30), wherein the interior mullion (20) at least partially defines the second refrigerating compartment (30) and also separates the first and second refrigerating compartments (16, 30).

4. The cooling appliance (12) of claim 3, wherein the perimeter wall (24) includes a cross section defining a mullion wall (40), an upper flange (42) and a lower flange (44), wherein the at least one hinge support (26) is defined in the mullion wall (40), wherein the first vacuum insulated structure (14) engages the upper flange (42) and the second vacuum insulated structure (28) engages the lower flange (44).

5. The cooling appliance (12) of any one of claims 1-4, wherein the rigid perimeter wall (24) defines an insulating cavity (46) that is at least partially filled with an insulating material (52).

6. The cooling appliance (12) of any one of claims 1-5, wherein the rigid perimeter wall (24) includes a mullion wall (40) and an upper flange (42) that engages the first vacuum insulated structure (14).

7. The cooling appliance (12) of any one of claims 3-6, wherein the rigid perimeter wall (24) includes a lower flange (44) that engages the second vacuum insulated structure (28).

8. The cooling appliance (12) of any one of claims 1-7, wherein the at least one door (18) includes right and left French doors (90, 92), and wherein the at least one hinge support (26) includes right and left hinge supports (94, 96) that support the right and left French doors (90, 92), respectively.

9. The cooling appliance (12) of any one of claims 1-8, wherein the first vacuum insulated structure (14) in-

cludes an upper rigid support (100) that defines an upper hinge support (102, 104) adapted to at least partially support the at least one door (18).

10. The cooling appliance (12) of claim 9, wherein the upper rigid support (100) is attached to the exterior of the first-structure outer wrapper (112).

11. The cooling appliance (12) of any one of claims 3-10, wherein the second vacuum insulated structure (28) includes a second-structure inner liner (116) and a second-structure outer wrapper (118), wherein the second-structure inner liner (116) and second-structure outer wrapper (118) are coupled together at a second-structure trim breaker (120) that spans therebetween and defines a substantially air-tight seal of the second vacuum insulated structure (28).

12. The cooling appliance (12) of claim 11, wherein the second-structure trim breaker (120) is injection molded over portions of the second-structure inner liner (116) and the second-structure outer wrapper (118).

13. The cooling appliance (12) of any one of claims 2-12, wherein a sealing material (140) is further disposed between the second-structure trim breaker (120), the second-structure inner liner (116) and the second-structure outer wrapper (118).

14. A method of forming the cooling appliance (12) of claim 1, comprising steps of:

shaping a rigid perimeter wall (24) to define a mullion wall (40) and upper and lower flanges (42, 44) that define a mullion cavity;
forming at least one hinge support (26) within a front portion (160) of the rigid perimeter wall (24);
filling the mullion cavity with an insulating material (52) wherein the insulating material (52) is injected through an insulation port defined within the rigid perimeter wall **(24);**
forming a first vacuum insulated structure (14), wherein a vacuum insulated material is disposed between a first-structure inner liner (110) and a first-structure outer wrapper (112) and a first-structure trim breaker (114) is injection molded to form a seal between the first-structure inner liner (110) and the first-structure outer wrapper (112);
disposing the first vacuum insulated structure (14) on the upper flange (42) of the rigid perimeter wall (24) to define a first refrigerating compartment (16);
attaching a door (18) to the at least one hinge support (26), wherein structural support for the door (18) is supplied by the rigid perimeter wall (24) and wherein the door (18) and the first vacuum insulated structure (14) are each supported by the rigid perimeter wall (24).

Patentansprüche

1. Kühlgerät (12), umfassend zwei Kühlfächer (16, 30), eine erste vakuumisolierte Struktur (14), die ein erstes Kühlfach (16) definiert, wobei die erste vakuumisolierte Struktur (14) eine Erststruktur-Innenauskleidung (110) und eine Erststruktur-Außenhülle (112) einschließt, wobei ein vakuumisoliertes Material zwischen der Erststruktur-Innenauskleidung (110) und der Erststruktur-Außenhülle (112) angeordnet ist, wobei die Erststruktur-Innenauskleidung (110) und die Erststruktur-Außenhülle (112) an einem Erststruktur-Türfutterkissen (114), das sich zwischen diesen erstreckt und einen im Wesentlichen luftdichten Verschluss der ersten vakuumisolierten Struktur (14) definiert, miteinander verkoppelt sind;
wenigstens eine Tür (18), die betätigbar ist, um das erste Kühlfach (16) zumindest teilweise zu umschließen; und
einen Innenpfosten (20), der eine mittlere Isolationsstruktur (22) mit einer innerhalb des Innenpfostens (20) angeordneten starren Umfassungswand (24) aufweist, wobei:

der Innenpfosten (20) weiter das erste Kühlfach (16) definiert; und
die starre Umfassungswand (24) einen vorderen Abschnitt (160) einschließt, der wenigstens eine Scharnierstütze (26) definiert, die dazu eingerichtet ist, die wenigstens eine Tür (18) zu stützen,

dadurch gekennzeichnet, dass die erste vakuumisolierte Struktur (14) in einer Weise konfiguriert ist, in der das Erststruktur-Türfutterkissen (114) über Abschnitte der Erststruktur-Innenauskleidung (110) und der Erststruktur-Außenhülle (112) spritzgegossen ist.

2. Kühlgerät (12) nach Anspruch 1, wobei ein Dichtmaterial (140) zwischen dem Erststruktur-Türfutterkissen (114) und der Erststruktur-Innenauskleidung (110) und der Erststruktur-Außenhülle (112) positioniert ist.

3. Kühlgerät (12) nach Anspruch 1 oder 2, weiter umfassend:
eine zweite vakuumisolierte Struktur (28), die ein zweites Kühlfach (30) definiert, wobei der Innenpfosten (20) das zweite Kühlfach (30) wenigstens teilweise definiert und auch das erste und das zweite Kühlfach (16, 30) trennt.

4. Kühlgerät (12) nach Anspruch 3, wobei die Umfas-

sungswand (24) einen Querschnitt einschließt, der eine Pfostenwand (40), einen oberen Flansch (42) und einen unteren Flansch (44) definiert, wobei die wenigstens eine Scharnierstütze (26) in der Pfostenwand (40) definiert ist, wobei die erste vakuumisolierte Struktur (14) in den oberen Flansch (42) eingreift und die zweite vakuumisolierte Struktur (28) in den unteren Flansch (44) eingreift.

5. Kühlgerät (12) nach einem der Ansprüche 1-4, wobei die starre Umfassungswand (24) einen isolierenden Hohlraum (46) definiert, der wenigstens teilweise mit einem Isoliermaterial (52) gefüllt ist.

6. Kühlgerät (12) nach einem der Ansprüche 1-5, wobei die starre Umfassungswand (24) eine Pfostenwand (40) und einen oberen Flansch (42) einschließt, der in die erste vakuumisolierte Struktur (14) eingreift.

7. Kühlgerät (12) nach einem der Ansprüche 3-6, wobei die starre Umfassungswand (24) einen unteren Flansch (44) einschließt, der in die zweite vakuumisolierte Struktur (28) eingreift.

8. Kühlgerät (12) nach einem der Ansprüche 1-7, wobei die wenigstens eine Tür (18) eine rechte und eine linke Fenstertür (90, 92) einschließt, und wobei die wenigstens eine Scharnierstütze (26) eine rechte und eine linke Scharnierstütze (94, 96) einschließt, die die rechte bzw. die linke Fenstertür (90, 92) stützen.

9. Kühlgerät (12) nach einem der Ansprüche 1-8, wobei die erste vakuumisolierte Struktur (14) eine obere starre Stütze (100) einschließt, die eine obere Scharnierstütze (102, 104) definiert, die dazu eingerichtet ist, die wenigstens eine Tür (18) wenigstens teilweise zu stützen.

10. Kühlgerät (12) nach Anspruch 9, wobei die obere starre Stütze (100) an der Außenseite der Erststruktur-Außenhülle (112) angebracht ist.

11. Kühlgerät (12) nach einem der Ansprüche 3-10, wobei die zweite vakuumisolierte Struktur (28) eine Zweitstruktur-Innenauskleidung (116) und eine Zweitstruktur-Außenhülle (118) einschließt, wobei die Zweitstruktur-Innenauskleidung (116) und die Zweitstruktur-Außenhülle (118) an einem Zweitstruktur-Türfutterkissen (120), das sich zwischen diesen erstreckt und einen im Wesentlichen luftdichten Verschluss der zweiten vakuumisolierten Struktur (28) definiert, miteinander verkoppelt sind.

12. Kühlgerät (12) nach Anspruch 11, wobei das Zweitstruktur-Türfutterkissen (120) über Abschnitte der Zweitstruktur-Innenauskleidung (116) und der Zweitstruktur-Außenhülle (118) spritzgegossen ist.

13. Kühlgerät (12) nach einem der Ansprüche 2-12, wobei ein Dichtmaterial (140) weiter zwischen dem Zweitstruktur-Türfutterkissen (120), der Zweitstruktur-Innenauskleidung (116) und der Zweitstruktur-Außenhülle (118) angeordnet ist.

14. Verfahren zum Bilden des Kühlgeräts (12) nach Anspruch 1, umfassend die folgenden Schritte:

Formen einer starren Umfassungswand (24), um eine Pfostenwand (40) und einen oberen und einen unteren Flansch (42, 44), die einen Pfostenhohlraum definieren, zu definieren;
Bilden wenigstens einer Scharnierstütze (26) innerhalb eines vorderen Abschnitts (160) der starren Umfassungswand (24);
Füllen des Pfostenhohlraums mit einem Isoliermaterial (52), wobei das Isoliermaterial (52) durch eine innerhalb der starren Umfassungswand (24) definierte Isolieröffnung eingespritzt wird;
Bilden einer ersten vakuumisolierten Struktur (14), wobei ein vakuumisoliertes Material zwischen einer Erststruktur-Innenauskleidung (110) und einer Erststruktur-Außenhülle (112) angeordnet wird und ein Erststruktur-Türfutterkissen (114) spritzgegossen wird, um eine Dichtung zwischen der Erststruktur-Innenauskleidung (110) und der Erststruktur-Außenhülle (112) zu bilden;
Anordnen der ersten vakuumisolierten Struktur (14) auf dem oberen Flansch (42) der starren Umfassungswand (24), um ein erstes Kühlfach (16) zu definieren;
Anbringen einer Tür (18) an die wenigstens eine Scharnierstütze (26), wobei eine strukturelle Stützung für die Tür (18) durch die starre Umfassungswand (24) bereitgestellt wird, und wobei die Tür (18) und die erste vakuumisolierte Struktur (14) jeweils durch die starre Umfassungswand (24) gestützt werden.

Revendications

1. Appareil de refroidissement (12) comprenant deux compartiments de réfrigération (16, 30),
une première structure à isolation sous vide (14) définissant un premier compartiment de réfrigération (16), dans lequel la première structure à isolation sous vide (14) inclut une doublure intérieure de première structure (110) et une enveloppe extérieure de première structure (112), dans lequel un matériau à isolation sous vide est disposé entre la doublure intérieure de première structure (110) et l'enveloppe extérieure de première structure (112),
dans lequel la doublure intérieure de première structure (110) et l'enveloppe extérieure de première

structure (112) sont couplées ensemble à un disjoncteur de garniture de première structure (114) qui s'étend entre elles et définit un joint sensiblement étanche à l'air de la première structure à isolation sous vide (14);
au moins une porte (18) qui peut être actionnée pour enfermer au moins partiellement le premier compartiment de réfrigération (16) ;et
un meneau intérieur (20) ayant une structure d'isolation médiane (22) avec une paroi périmétrique rigide (24) disposée à l'intérieur du meneau intérieur (20), dans lequel :

le meneau intérieur (20) définit en outre le premier compartiment de réfrigération (16) ; et
la paroi périmétrique rigide (24) inclut une partie avant (160) qui définit au moins un support de charnière (26) adapté pour supporter la au moins une porte (18),
caractérisé en ce que la première structure à isolation sous vide (14) est configurée d'une manière selon laquelle le disjoncteur de garniture de première structure (114) est moulé par injection sur des parties de la doublure intérieure de première structure (110) et de l'enveloppe extérieure de première structure (112).

2. Appareil de refroidissement (12) selon la revendication 1, dans lequel un matériau d'étanchéité (140) est positionné entre le disjoncteur de garniture de première structure (114) et la doublure intérieure de première structure (110) et l'enveloppe extérieure de première structure (112).

3. Appareil de refroidissement (12) selon la revendication 1 ou 2, comprenant en outre :
une seconde structure à isolation sous vide (28) définissant un second compartiment de réfrigération (30), dans lequel le meneau intérieur (20) définit au moins partiellement le second compartiment de réfrigération (30) et sépare également les premier et second compartiments de réfrigération (16, 30).

4. Appareil de refroidissement (12) selon la revendication 3, dans lequel la paroi périmétrique (24) inclut une section transversale définissant une paroi de meneau (40), une bride supérieure (42) et une bride inférieure (44), dans lequel le au moins un support de charnière (26) est défini dans la paroi de meneau (40), dans lequel la première structure à isolation sous vide (14) vient en prise avec la bride supérieure (42) et la seconde structure à isolation sous vide (28) vient en prise avec la bride inférieure (44).

5. Appareil de refroidissement (12) selon l'une quelconque des revendications 1-4, dans lequel la paroi périmétrique rigide (24) définit une cavité isolante (46) qui est au moins partiellement remplie d'un matériau isolant (52).

6. Appareil de refroidissement (12) selon l'une quelconque des revendications 1-5, dans lequel la paroi périmétrique rigide (24) inclut une paroi de meneau (40) et une bride supérieure (42) qui vient en prise avec la première structure à isolation sous vide (14).

7. Appareil de refroidissement (12) selon l'une quelconque des revendications 3-6, dans lequel la paroi périmétrique rigide (24) inclut une bride inférieure (44) qui vient en prise avec la seconde structure à isolation sous vide (28).

8. Appareil de refroidissement (12) selon l'une quelconque des revendications 1-7, dans lequel la au moins une porte (18) inclut des portes françaises droite et gauche (90, 92), et dans lequel le au moins un support de charnière (26) inclut supports de charnière droit et gauche (94, 96) qui supportent respectivement les portes françaises droite et gauche (90, 92).

9. Appareil de refroidissement (12) selon l'une quelconque des revendications 1-8, dans lequel la première structure à isolation sous vide (14) inclut un support rigide supérieur (100) qui définit un support de charnière supérieur (102, 104) adapté pour supporter au moins partiellement la au moins une porte (18).

10. Appareil de refroidissement (12) selon la revendication 9, dans lequel le support rigide supérieur (100) est fixé à l'extérieur de l'enveloppe extérieure de première structure (112).

11. Appareil de refroidissement (12) selon l'une quelconque des revendications 3-10, dans lequel la seconde structure à isolation sous vide (28) inclut une doublure intérieure de seconde structure (116) et une enveloppe extérieure de seconde structure (118), dans lequel la doublure intérieure de seconde structure (116) et l'enveloppe extérieure de seconde structure (118) sont couplées ensemble à un disjoncteur de garniture de seconde structure (120) qui s'étend entre elles et définit un joint sensiblement étanche à l'air de la seconde structure à isolation sous vide (28).

12. Appareil de refroidissement (12) selon la revendication 11, dans lequel le disjoncteur de garniture de seconde structure (120) est moulé par injection sur des parties de la doublure intérieure de seconde structure (116) et de l'enveloppe extérieure de seconde structure (118).

13. Appareil de refroidissement (12) selon l'une quelconque des revendications 2-12, dans lequel un ma-

tériau d'étanchéité (140) est disposé en outre entre le disjoncteur de garniture de seconde structure (120),
la doublure intérieure de seconde structure (116) et l'enveloppe extérieure de seconde structure (118).

14. Procédé de formation de l'appareil de refroidissement (12) selon la revendication 1, comprenant les étapes consistant à :

mettre en forme une paroi périmétrique rigide (24) pour définir une paroi de meneau (40) et des brides supérieure et inférieure (42, 44) qui définissent une cavité de meneau ;
former au moins un support de charnière (26) dans une partie avant (160) de la paroi périmétrique rigide (24) ;
remplir la cavité de meneau avec un matériau isolant (52) dans lequel le matériau isolant (52) est injecté à travers un orifice d'isolation défini à l'intérieur de la paroi périmétrique rigide (24) ;
former une première structure à isolation sous vide (14), dans lequel un matériau à isolation sous vide est disposé entre une doublure intérieure de première structure (110) et une enveloppe extérieure de première structure (112) et un disjoncteur de garniture de première structure (114) est moulé par injection pour former un joint d'étanchéité entre la doublure intérieure de première structure (110) et l'enveloppe extérieure de première structure (112) ;
disposer la première structure à isolation sous vide (14) sur la bride supérieure (42) de la paroi périmétrique rigide (24) pour définir un premier compartiment de réfrigération (16);
fixer une porte (18) au au moins un support de charnière (26), dans lequel un support structurel de la porte (18) est fourni par la paroi périmétrique rigide (24) et dans lequel la porte (18) et la première structure à isolation sous vide (14) sont chacun supportés par la paroi périmétrique rigide (24).

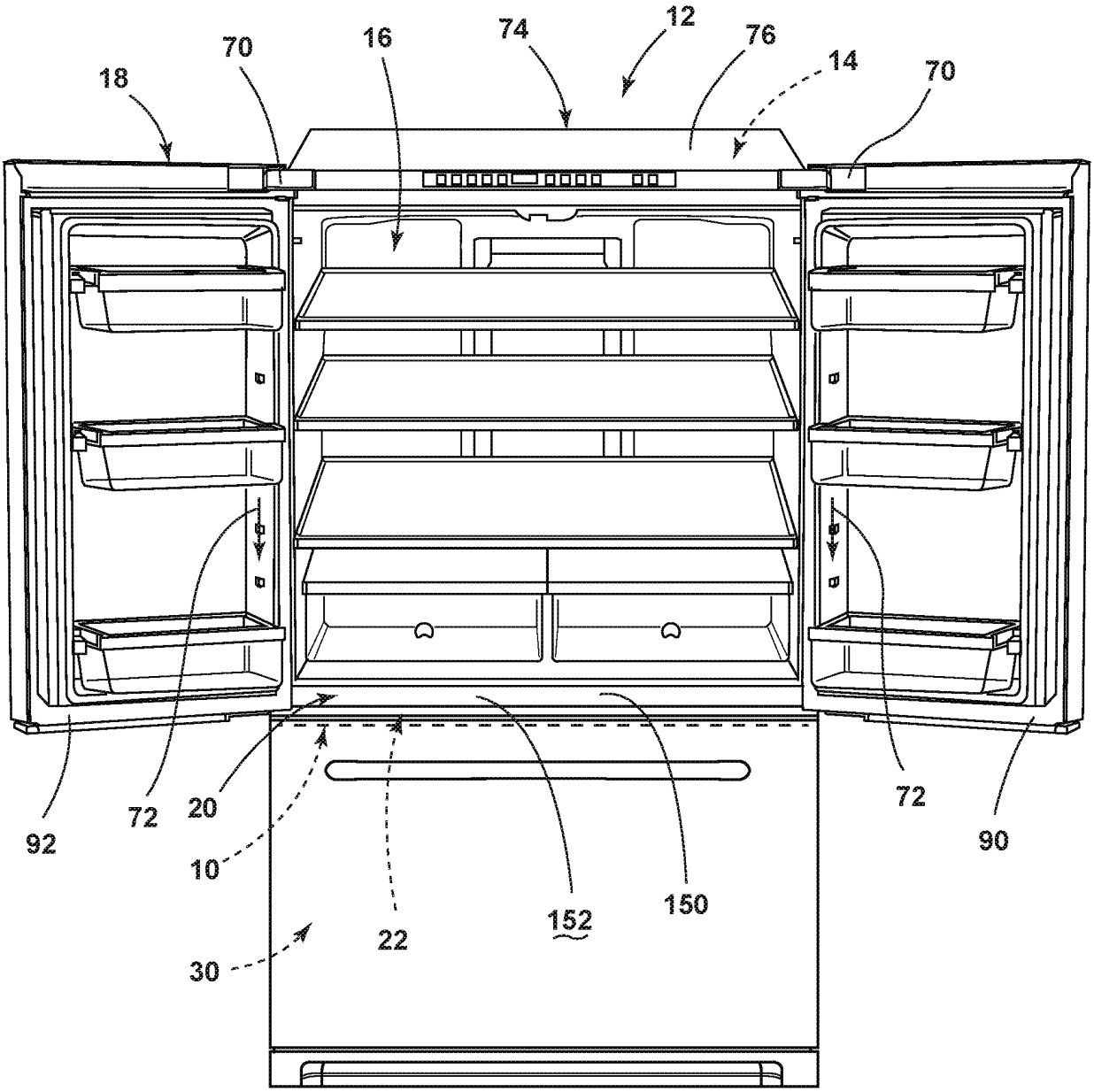
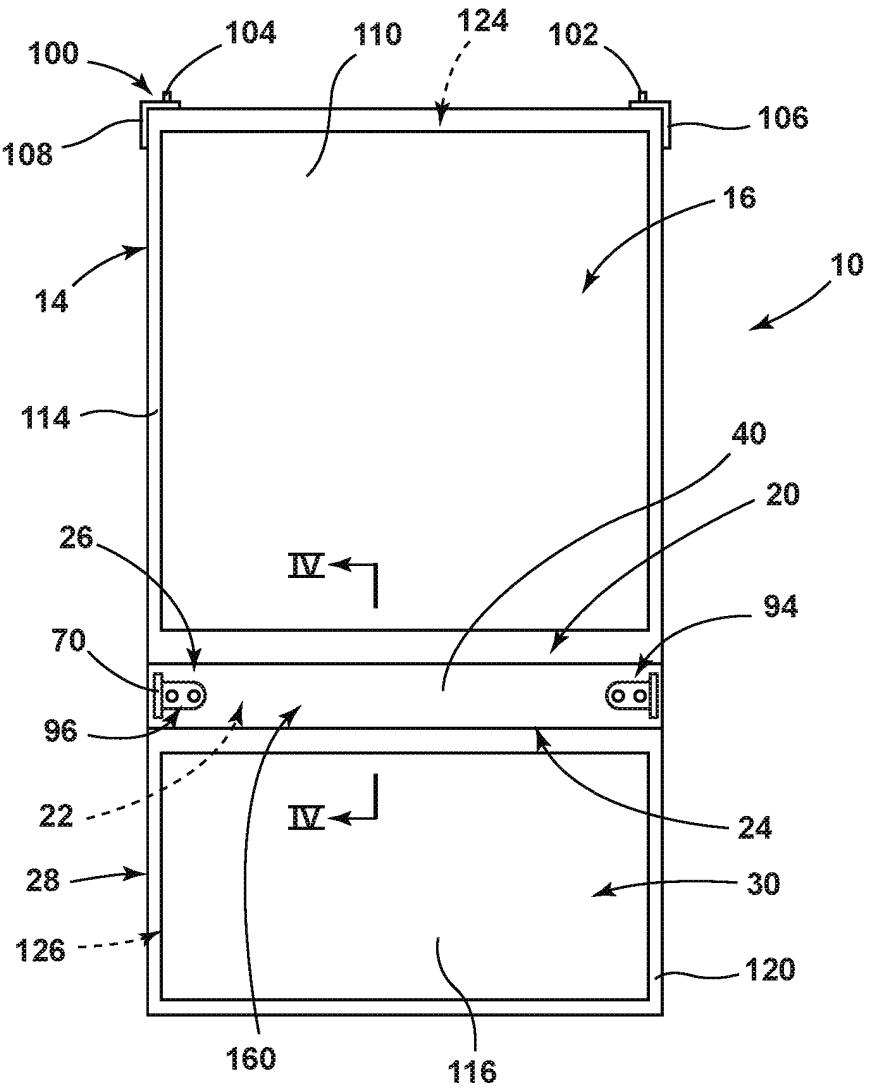


FIG. 1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108
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IV
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28
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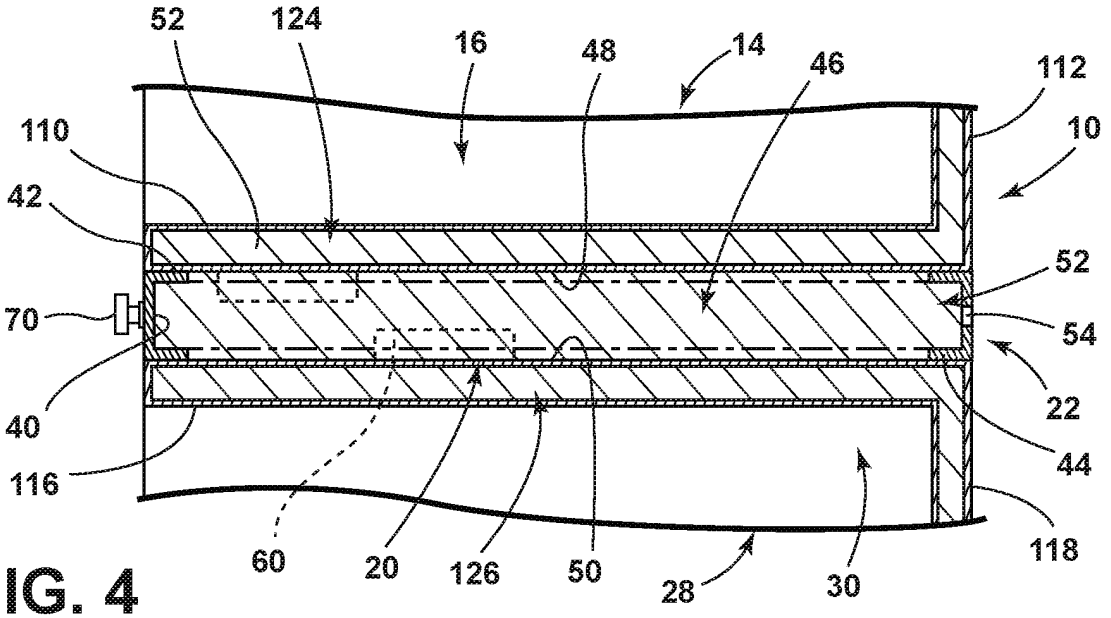
126
120
160
116

FIG. 2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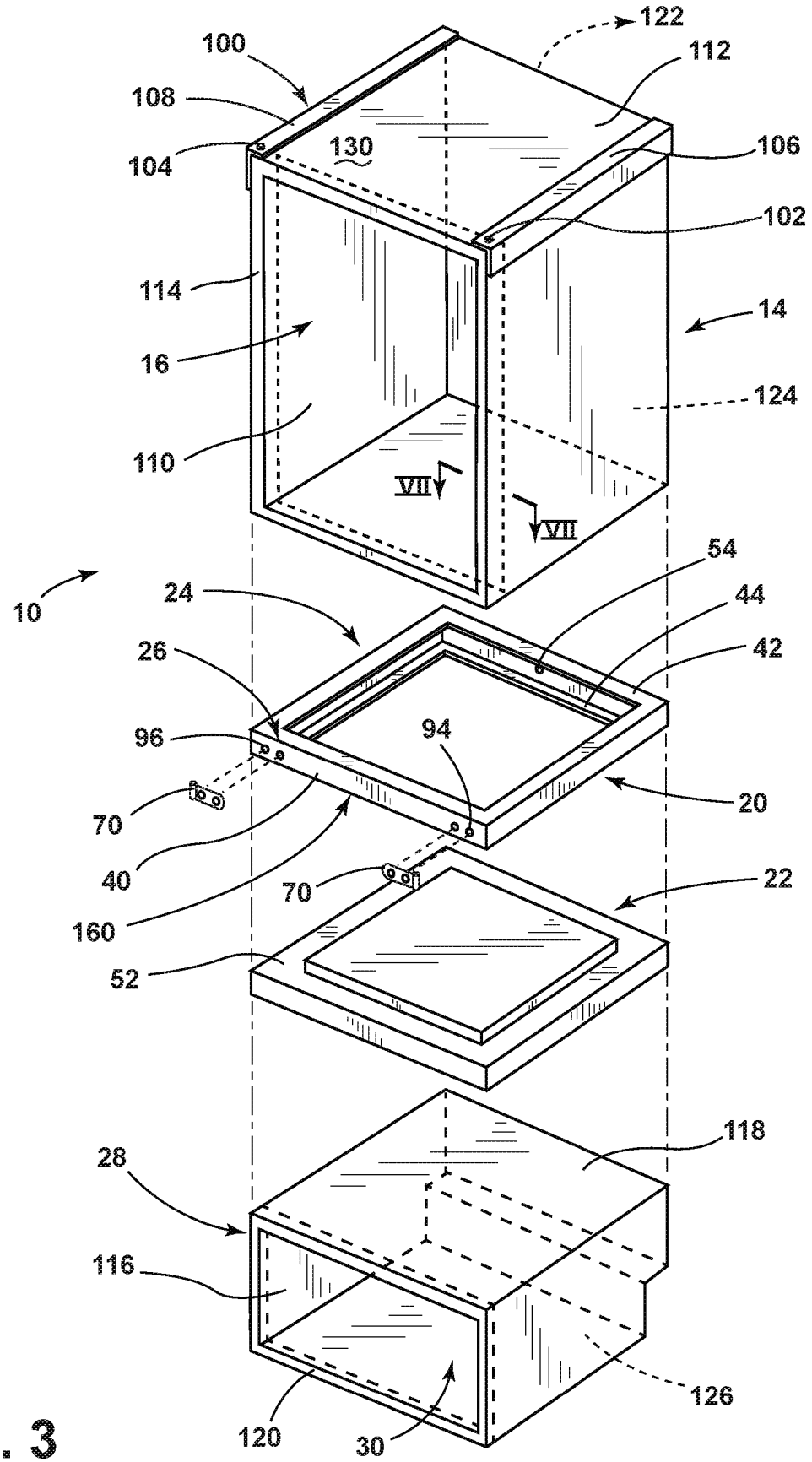
118

FIG. 4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54
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94
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40
70
22
160
52
118
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116
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120
30

FIG. 3

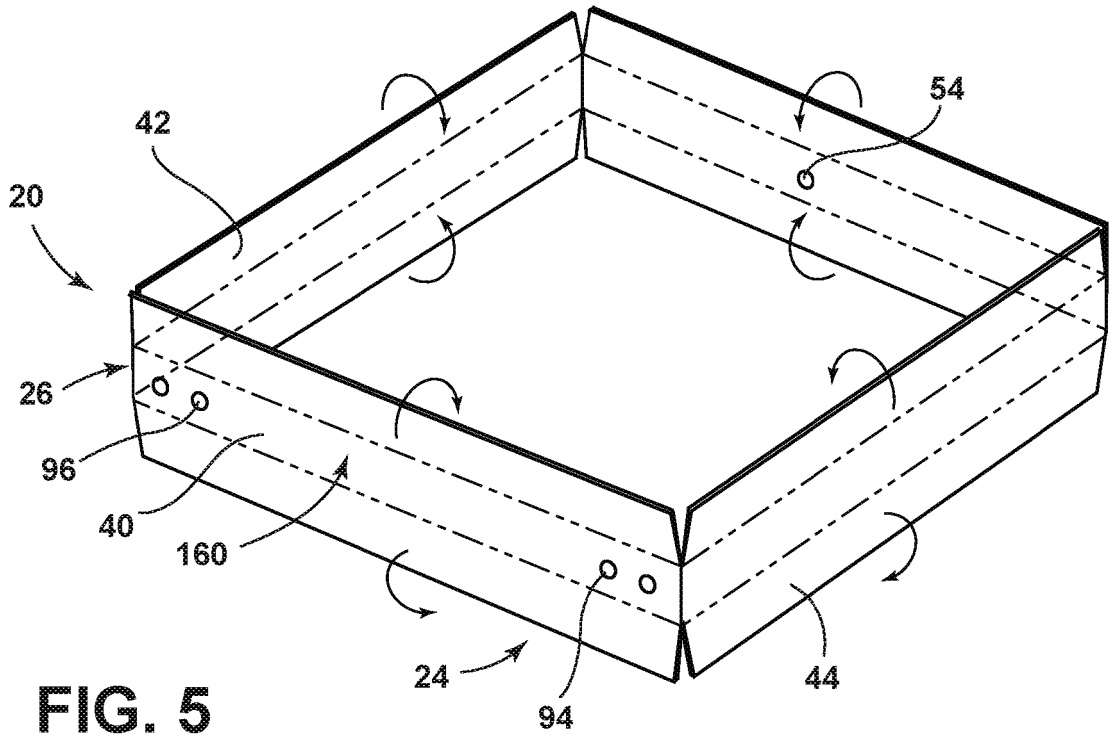


FIG. 5

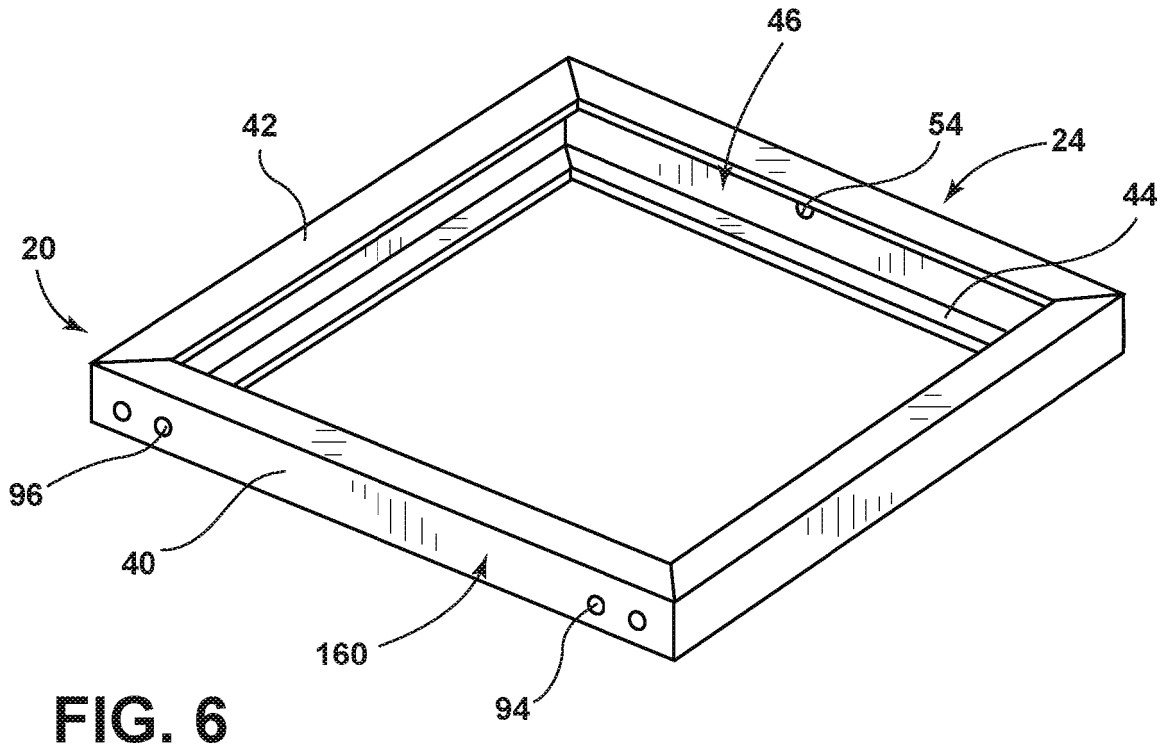
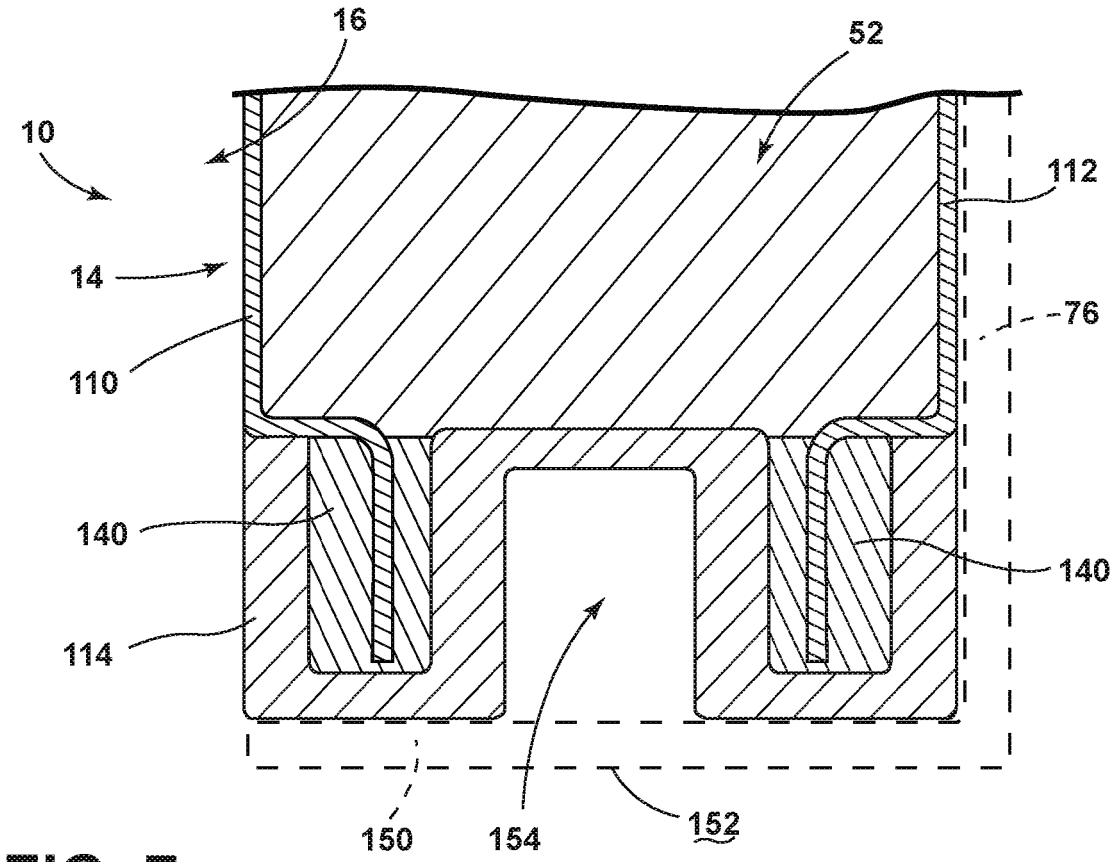


FIG. 6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152

FIG. 7

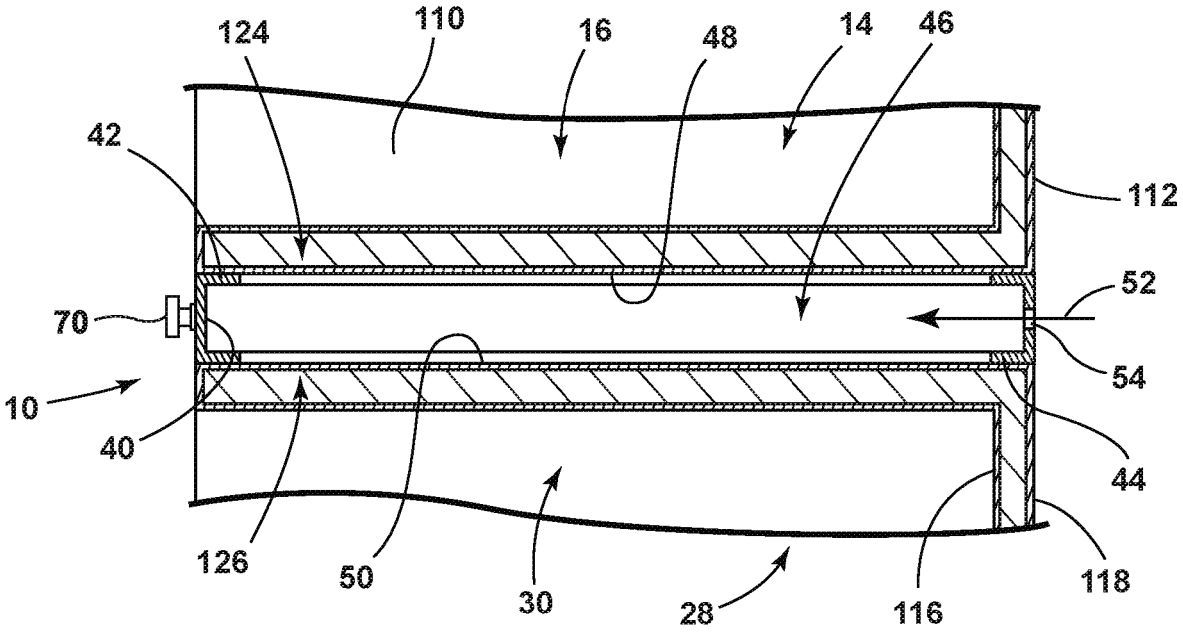
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FIG. 8

Method 400 for Forming an Appliance having a Multi-Component Insulation Structure

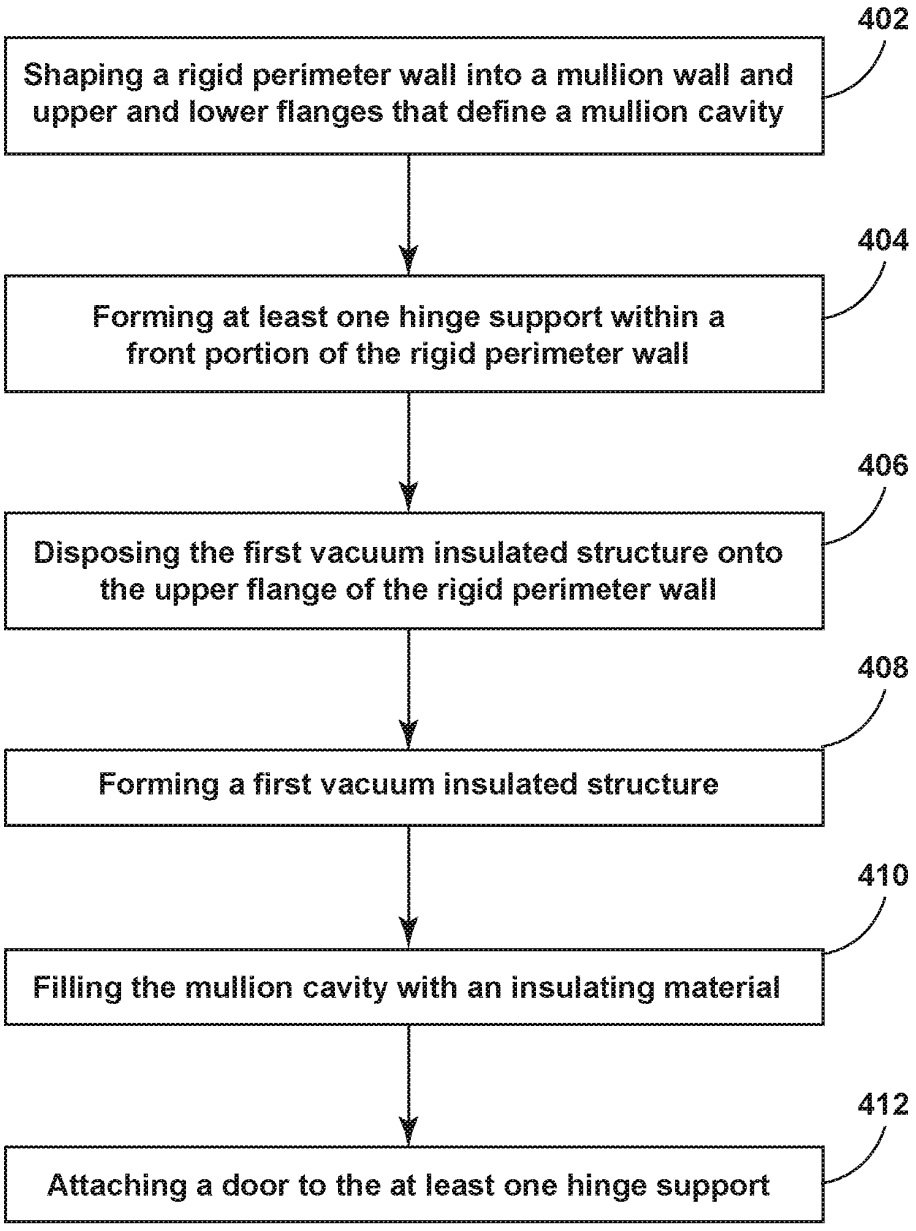

FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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- US 4821399 A **[0008]**