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SHELF WATER TANK

(57) A vacuum insulated appliance (10) includes a cabinet (12) defining a refrigeration compartment (14). The cabinet (12) defines a compartment passthrough (16). A shelf (18) is operably coupled to the cabinet (12). The shelf (18) includes a tank (20) having an upper wall (22), a back wall (24), a front wall (26), a bottom wall (28), and a pair of side walls (30a, 30b) to define a hollow interior (32) for housing a liquid, a spout (34) coupled to the tank (20) to dispense the liquid from the tank (20), and a tank inlet tube (36) coupled to the tank (20) and in fluid communication with the hollow interior (32). The vacuum insulation appliance (10) further includes a compartment inlet tube (38). A coupling assembly (40) is configured to selectively couple the tank inlet tube (36) to the compartment inlet tube (38). The compartment inlet tube (38) is routed through the compartment passthrough (16), into the refrigeration compartment (14), and to the coupling assembly (40) to add the liquid to the hollow interior (32) of the tank (20).

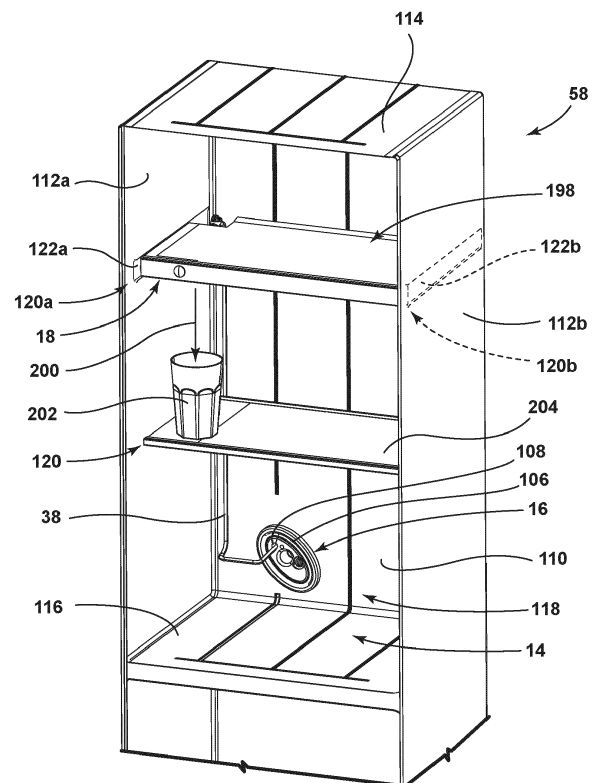


FIG. 6

Description**BACKGROUND OF THE DISCLOSURE**

[0001] The present disclosure generally relates to a shelf water tank, and more specifically, to a shelf water tank for an appliance.

SUMMARY OF THE DISCLOSURE

[0002] According to one aspect of the present disclosure, a vacuum insulated appliance includes a cabinet defining a refrigeration compartment. The cabinet defines a compartment passthrough. A shelf is operably coupled to the compartment. The shelf includes a tank having an upper wall, a back wall, a front wall, a bottom wall, and a pair of side walls to define a hollow interior for housing liquids, a spout coupled to the tank to dispense the liquid from the tank, and a tank inlet tube coupled to the tank and in fluid communication with the hollow interior. The vacuum insulation appliance further includes a compartment inlet tube. A coupling assembly is configured to selectively couple the tank inlet tube to the compartment inlet tube. The compartment inlet tube is routed through the compartment passthrough, into the refrigeration compartment, and to the coupling assembly to add the liquid to the hollow interior of the tank.

[0003] According to another aspect of the present disclosure, a refrigeration appliance including a cabinet defining a refrigeration compartment, and a water tank having a hollow interior defined by a plurality of walls. The water tank is configured to selectively couple to a liner of the cabinet to form a shelf within the refrigeration compartment. The water tank includes a water inlet line coupled to a back wall of the plurality of walls, where the water inlet line is in fluid communication with the hollow interior of the water tank to allow water to flow therein, and a water spout coupled to a bottom wall of the plurality of walls to selectively dispense the water from the hollow interior.

[0004] According to yet another aspect of the present disclosure, a refrigerator liquid dispenser including a shelf defining a hollow interior configured as a liquid storage tank. The shelf is configured to selectively couple to a refrigeration compartment liner and have a top wall for supporting items thereon. A spout is coupled to the shelf, where the spout is in fluid communication with the hollow interior of the shelf. A coupling assembly is coupled to a back wall of the shelf, where the coupling assembly is configured to releasably couple to a liquid line.

[0005] These and other features, advantages, and objects of the present disclosure will be further understood and appreciated by those skilled in the art by reference to the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] In the drawings:

FIG. 1 is a front perspective of a refrigeration appliance, according to the present disclosure;
 FIG. 2 is a cross-sectional view of a refrigeration appliance with a vacuum insulated cabinet and vacuum insulated doors, according to the present disclosure;
 FIG. 3 is an exploded side perspective view of a cabinet for a refrigeration appliance with a wrapper, a liner, and a trim breaker, according to the present disclosure;
 FIG. 4 is a front elevation view of the trim breaker of FIG. 3, according to the present disclosure;
 FIG. 5 is a side perspective view of a refrigeration appliance with a compartment passthrough, according to the present disclosure;
 FIG. 6 is a partial front perspective of a liner for a cabinet including multiple shelves with one of the shelves forming a tank, according to the present disclosure;
 FIG. 7 is a front perspective of a shelf forming a tank and including a connector for receiving fluid and a button for dispensing the fluid, according to the present disclosure;
 FIG. 8A is a side elevation view of a shelf forming a tank with a connector for engaging a water line, according to the present disclosure;
 FIG. 8B is a side elevation view of a shelf forming a tank with a connector engaging a water line, according to the present disclosure;
 FIG. 9A is a cross-sectional view of a shelf forming a tank including a mechanical valve for a spout, according to the present disclosure;
 FIG. 9B is a cross-sectional view of a shelf forming a tank including an electronic valve for a spout, according to the present disclosure;
 FIG. 10 is a front perspective of a shelf forming a tank and having a first dispenser, according to the present disclosure; and
 FIG. 11 is a cross-sectional view of a shelf forming a tank with a front dispenser, according to the present disclosure.

[0007] The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles described herein.

DETAILED DESCRIPTION

[0008] The present illustrated embodiments reside primarily in combinations of method steps and apparatus components related to a shelf water tank. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details

that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Further, like numerals in the description and drawings represent like elements.

[0009] For purposes of description herein, the terms "upper," "lower," "right," "left," "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the disclosure as oriented in FIG. 1. Unless stated otherwise, the term "front" shall refer to the surface of the element closer to an intended viewer, and the term "rear" shall refer to the surface of the element further from the intended viewer. However, it is to be understood that the disclosure may assume various alternative orientations, 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.

[0010] The terms "including," "comprises," "comprising," or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "comprises a ..." does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

[0011] Referring to FIGS. 1-11, reference numeral 10 generally designates a vacuum insulated appliance, such as a refrigerator including a cabinet 12 defining a refrigeration compartment 14. The cabinet 12 defines a compartment passthrough 16, also referred to as a refrigerator passthrough 16. A shelf 18 is operably coupled to the cabinet 12 within the compartment 14. The shelf 18 includes a tank or water tank 20 having an upper wall 22, a back wall 24, a front wall 26, a bottom wall 28, and a pair of side walls 30a, 30b to define a hollow interior 32 for housing liquids, a spout or a water spout 34 coupled to the tank 20 to dispense the liquid from the tank 20, and a tank inlet tube 36 or a water input line 36 coupled to the tank 20 and in fluid communication with the hollow interior 32. The vacuum insulated appliance 10 further includes a compartment inlet tube 38 or a liquid line 38. A coupling assembly 40 is configured to selectively couple the tank inlet tube 36 to the compartment inlet tube 38. The compartment inlet tube 38 is routed through the compartment passthrough 16, into the refrigeration compartment 14, and to the coupling assembly 40 to add the liquid to the hollow interior 32 of the tank 20.

[0012] Referring to FIGS. 1 and 2, the vacuum insu-

lated appliance 10 is illustrated as a refrigeration appliance, however, it is contemplated that the vacuum insulated appliance 10 disclosed herein may be for a variety of appliances or structures or for insulation purposes other than with an appliance. The refrigeration appliance 10 is illustrated as a bottom-mount refrigerator having an upper compartment configured as the refrigeration compartment 14 and a lower compartment configured as a freezer compartment 48.

[0013] The cabinet 12 of the illustrated refrigeration appliance 10 includes a first insulated door 50a and a second insulated door 50b. The first insulated door 50a and the second insulated door 50b, which can collectively be referred to as insulated doors 50, can have substantially similar configurations, as discussed further herein. In this way, the insulated doors 50a, 50b can seal the refrigerator and freezer compartments 14, 48 defined by the cabinet 12, respectively. Moreover, in various implementations, the appliance 10 may include the cabinet 12 defining at least a first compartment and a second compartment sealed with insulated doors 50. The appliance 10 may be, for example, a bottom-mount French door refrigerator, a top-mount refrigerator, a side-by-side refrigerator, a 4-door French door refrigerator, and/or a 5-door French door refrigerator. Further, the present disclosure is not limited to refrigerators. The appliance 10 may be, for example, freezers, coolers, vacuum insulated structures, and other similar appliances and fixtures within household and commercial settings.

[0014] The cabinet 12 of the appliance 10 is an insulated structure having an insulation cavity 54 defined between a wrapper 56 and a liner 58, which may collectively be referred to as a cabinet structural wrapper. Similarly, the insulated doors 50 are an insulated structure having an insulation cavity 60 defined between a door wrapper 62 coupled to a door liner 64, which may collectively be referred to as a door structural wrapper. Each of the insulation cavities 54, 60 of the cabinet 12 and the insulated doors 50 typically includes one or more insulation materials 66 disposed therein. It is generally contemplated that the insulation materials 66 may be glass-type materials, carbon-based powders, silicon oxide-based materials, silica-based materials, insulating gasses, and other standard insulation materials 66 known in the art.

[0015] The insulation materials 66 substantially fill the insulation cavity 54, forming a substantially continuous layer between the wrapper 56 and the liner 58. Similarly, the insulation materials 66 substantially fill the insulation cavity 60, forming a substantially continuous layer between the door wrapper 62 and the door liner 64. The insulation cavities 54, 60 are filled with the insulation materials 66 using a load port on the cabinet 12 and the insulated doors 50, respectively. The cabinet 12 and the insulated doors 50 each define an evacuation port for applying a vacuum or negative pressure to the insulation cavities 54, 60.

[0016] Referring still to FIGS. 1-3, an at least partial

vacuum 80 is defined within the insulation cavities 54, 60. The at least partial vacuum 80 defines a pressure differential 82 between an exterior 84 of the cabinet 12 and the insulation cavity 54. The pressure differential 82 serves to define the inward compressive force that is exerted on both the wrapper 56 and the liner 58 and tends to bias the wrapper 56 and the liner 58 toward the insulation cavity 54. The pressure differential 82 and the inward compressive force are also exerted on both the door wrapper 62 and the door liner 64 of the insulated doors 50 and tend to bias the door wrapper 62 and the door liner 64 towards the insulation cavity 60 in a similar manner.

[0017] The wrapper 56, the door wrapper 62, the liner 58, and the door liner 64 are made from a material at least partially resistant to bending, deformation, or otherwise being formed in response to an inward compressive force. These materials for the wrapper 56, the door wrapper 62, the liner 58, and the door liner 64 include, but are not limited to, metals, polymers, metal alloys, combinations thereof, and/or other similar substantially rigid materials that can be used for vacuum insulated appliances and structures.

[0018] Referring still to FIG. 3, as well as FIG. 4, the wrapper 56 and the liner 58 may be coupled together using a trim breaker 90. The trim breaker 90 may be coupled to the outer edges 92 of the wrapper 56 and/or the liner 58. The trim breaker 90 has a generally rectangular shape, however, it is contemplated that other geometric shapes known in the art may be used. In this way, the trim breaker 90 may not substantially interfere with access to the refrigerator and freezer compartments 14, 48 defined by the cabinet 12. At least one channel 94 may be defined around a perimeter of the trim breaker 90. The channel 94 may be configured to receive the outer edges 92 of the wrapper 56 and/or the liner 58. It is also contemplated that the trim breaker 90 may define more than one channel 94 to accommodate the wrapper 56 and the liner 58 in separate channels 94. The channels 94 may be filled with an adhesive, such as, for example, an epoxy. The adhesive is configured to couple the wrapper 56 and/or the liner 58 with the trim breaker 90 and seal the insulation cavity 54.

[0019] The trim breaker 90 includes a cross member 96 to define apertures 98a, 98b corresponding to the refrigerator and freezer compartments 14, 48 of the appliance 10. The channels 94 defined by the trim breaker 90 may extend around the perimeter of the trim breaker 90 as well as along the cross member 96. The cross member 96 defines a mullion region 100 between the refrigerator and freezer compartments 14, 48.

[0020] Referring to FIGS. 5 and 6, the compartment passthrough 16 is defined by the wrapper 56 and the liner 58 to provide a passage for service connections 104, such as the compartment inlet tube 38, as well as electrical, fluid, and other appliance connections between the refrigeration compartment 14 and outside the cabinet 12. A second compartment passthrough 102 may be defined by the wrapper 56 and the liner 58 to provide a passage

for the service connections 104 between the freezer compartment 48 and outside the cabinet 12. The pass-through 16 and second passthrough 102 generally include a first grommet or seal 106 and a second grommet or seal, respectively. The first grommet 106 and second grommet may couple to the wrapper 56 and the liner 58. The first grommet 106 and second grommet are configured to maintain the vacuum 80 within the insulation cavity 54 while allowing for the service connections 104 to be routed therethrough. In other words, the first grommet 106 and second grommet provides a seal to maintain the vacuum 80 in the insulation cavity 54, while allowing the service connection 104 to extend from outside the cabinet 12, through the cabinet 12, and into the respective compartment 14, 48 without substantially effecting the vacuum insulation of the cabinet 12.

[0021] The first grommet 106 and second grommet may each include connection apertures 108. The connection apertures 108 are configured to allow the service connections 104 to be routed through the first grommet 106 and second grommet, and the passthrough 16 and second passthroughs 102. The connection apertures 108 may be configured to have a similar diameter and shape as the service connections 104. For example, the connection apertures 104 may be configured to retain the compartment inlet tube 38 through the passthrough 16. The connection apertures 108, the first grommet 106 and second grommet are generally configured to reduce or minimize air intrusion into the compartments 14, 48 through the passthroughs 16, 102. The first grommet 106 and second grommet may be constructed of a rubber or plastic material that allows for the partial vacuum 80 to be maintained in the insulation cavity 54. The first grommet 106 and second grommet are constructed of a material that generally minimizes or prevents air intrusion through the material of construction (e.g., an air-impermeable material), thereby helping maintain the partial vacuum 80 in the insulation cavity 54.

[0022] Referring still to FIGS. 5 and 6, the compartment inlet tube 38 may be routed from outside the cabinet 12, through the passthrough 16, along a rear wall 110 of the liner 58 in the refrigeration compartment 14. Clips or other retaining features may be utilized to hold the compartment inlet tube 38 in position along the rear wall 110. Moreover, the compartment inlet tube 38 may be repositionable within the compartment 14 to selectively coupled with the shelf 18, which may be positioned at different locations or heights in the compartment 18. Further, a panel or other feature may be utilized to at least partially obscure the compartment inlet tube 38 from view. The compartment inlet tube 38 is generally connected to a liquid supply, such as a water source, thereby providing a liquid connection to the refrigeration compartment 14. Other connections for the shelf 18 may also be routed through the passthrough 16, such as electrical connections and drain lines, along a similar path as the compartment inlet tube 38. The liner 58 defining the refrigeration compartment 14 may include the rear wall 110, a pair of

side walls 112a, 112b, an upper wall 114, and a lower wall 116 that collectively form the compartment 14. The pass-through 16 may be defined on a lower portion 118 of the rear wall 110, which may allow increased flexibility for routing the compartment inlet tube 38 to various locations within the compartment 18.

[0023] Referring still to FIG. 6, the shelf 18 is operably coupled to the refrigeration compartment 14. The shelf 18 may be coupled to the liner 58 using a first coupling feature 120a and a second coupling feature 120b, which can collectively be referred to as coupling features 120. The coupling features 120 may include mounting studs, slots, channels, rail assemblies, or other fasteners coupled to the pair of side walls 112a, 112b and/or the rear wall 110, allowing for the partial vacuum 80 to be maintained on the insulation cavity 54. The coupling features 120 generally allow for the shelf 18 to be moved between a mounted position, where the shelf 18 is coupled to the refrigeration compartment 14, and an unmounted position, where the shelf 18 can be removed from the refrigeration compartment 14.

[0024] For example, the first coupling feature 120a may be a first slot 122a defined on the first side wall 112a of the pair of side walls 112a, 112b. The second coupling feature 120b may be a second slot 122b defined on the second side wall 112b of the pair of side walls 112a, 112b. The shelf 18 may be configured to slide into the slots 122a, 122b from the unmounted position to the mounted position. Stated differently, the shelf 18 may be selectively coupled to the liner 58 by sliding into the first slot 122a and the second slot 122b. When in the mounted position, the shelf 18 may be coupled to the compartment inlet tube 38, as discussed further herein. The coupling feature 120 may also include a locking feature having a locked position and an unlocked position. In the locked position, the shelf 18 is in the mounted position in the refrigeration compartment 14 and is prevented from being unmounted. The unlocked position allows for the shelf 18 to be moved between the mounted and the unmounted positions.

[0025] Referring to FIGS. 7-11, the shelf 18 includes the tank 20 having the hollow interior 32. The tank 20 has a plurality of walls 126 defining the hollow interior 32 to store a liquid. Stated another way, the shelf 18 defines the hollow interior 32, forming the tank 20 to store the liquid. The plurality of walls 126 includes the upper wall 22, the back wall 24, the front wall 26, the bottom wall 28, and the pair of side walls 30a, 30b. The tank 20 is generally configured to be a support surface 128 for the shelf 18. The upper wall 22 of the tank 20 may form a shelf surface or a support surface 128, where various items, such as food items or vessels, may be supported in the refrigeration compartment 14 when the shelf 18 is in the mounted position. Stated another way, the tank 20 is configured to form the shelf 18 within the refrigeration compartment 14. The shelf 18 being configured as the tank 20 may allow for efficient use of the volume of the refrigeration compartment 14 by having a similar footprint to other shelves

disposed in the refrigeration compartment 14 while providing a liquid dispensing feature. The tank 20 being included in the shelf 18 may use less room in the compartment 14 than traditional tanks and dispensers. Moreover, the tank 20 in the shelf 18 may maximize efficiency for manufacture of the doors 50 by removing conventional dispensers from the doors 50.

[0026] The tank 20 may be constructed with various ridged or semi-ridged materials, such as, but not limited to, metals or plastics. The material of the tank 20 is generally non-porous and impermeable, preventing the liquid contained within the hollow interior 32 from leaking through the material. The tank 20 may include a liner or a bladder to seal the tank 20, creating a barrier between the liquids and the plurality of walls 126. The liner or bladder may assist in sealing the tank 20 and allowing the liquid to be stored within the hollow interior 32. The liquid stored in the tank 20 may be cooled by ambient air in the refrigeration compartment 14.

[0027] Referring again to FIGS. 6-11, the shelf 18 may include a front bracket 130 and a rear bracket 132 coupled to the front wall 26 and the back wall 24, respectively, of the tank 20. The front and rear brackets 130, 132 may be configured to interface with or couple to the coupling feature 120. As illustrated, the front and rear brackets 130, 132 may slide into the slots 122a, 122b and assist in supporting the shelf 18. The brackets 130, 132 may extend beyond the side surfaces 30a, 30b of the tank 20 to engage the slots 122a, 122b. In some implementations, the rear bracket 132 may have an engagement feature 133 to operably couple the shelf 18 to the liner 58 which may include a corresponding engagement feature.

[0028] The front bracket 130 and/or rear bracket 132 may also partially extend across the width of the shelf 18, whereby either the pair of side walls 30, 30b of the tank 20, a mechanical compartment 134 coupled to the tank 20, and/or other corresponding coupling features engage the slots 122a, 122b. The front bracket 130 may conceal the tank 20 and other components for operating the shelf 18, such as the mechanical compartment 134. The front and rear brackets 130, 132 may also be configured to provide additional structural support for the shelf 18, which may be advantageous for supporting the weight of the liquids in the hollow interior 32 and items on the supporting surface 128. The front and rear brackets 130, 132 may be constructed of a ridged material, such as stainless steel or other metals and plastics.

[0029] The shelf 18 may include the mechanical compartment 134 in which mechanical or electrical components of the shelf 18 can be disposed. The mechanical compartment 134 is generally sealed and separate from the hollow interior 32 and does not allow liquid to be transferred therebetween. The mechanical compartment 134 may be formed within the hollow interior 32 of the tank 20 having an interior wall 136 dividing the hollow interior 32 into two separate volumes, as illustrated in FIGS. 7-9B. The mechanical compartment may be coupled to one of the side walls 30a of the pair of side walls 30a, 30b

of the tank 20, as illustrated in FIGS. 10 and 11. The mechanical compartment 134 may include an access panel or door 137 to access the mechanical or electrical components disposed therein. The mechanical compartment 134 may also extend the full depth of the shelf 18 and can have a generally L-shape. The mechanical compartment 134 is not limited to such construction or shape and may be another shape. The mechanical compartment 134 may be formed proximate to any of the plurality of walls 126 or coupled to any of the plurality of walls 126 of the tank 20 without departing from the teachings herein.

[0030] Referring still to FIGS. 6-11, the tank 20 may be coupled with the tank inlet tube 36, which is in fluid communication with the hollow interior 32. The tank inlet tube 36 may be coupled to the back wall 24 of the tank 20. As illustrated, the tank 20 has a recessed portion or notched region 138 including a recessed back wall portion 140 and a recessed side wall portion 142. The recess portions 140, 142 are parallel with but offset from the respective walls 24, 30a to form the notched region 138.

[0031] The tank inlet tube 36 is coupled to or routed through the recessed back wall portion 140 of the plurality of walls 126. The tank inlet tube 36 is not limited to being coupled to the back wall 24 or the recessed back wall 140 and may be coupled to any of the plurality of walls 126. The tank inlet tube 36 is positioned on the tank 20 such that the compartment inlet tube 38 is aligned with the tank inlet tube 36 when the tank 20 is in the mounted position.

[0032] The tank inlet tube 36 and the compartment inlet tube 38 may include the coupling assembly 40 allowing the tank inlet tube 36 and the compartment inlet tube 38 to be selectively coupled together. In some implementations, the coupling assembly 40 may be coupled to and in fluid communication with the tank 20 and is configured to releasably couple the compartment inlet tube 38. The notched region 138 allows for the coupling assembly 40 to be recessed from the back wall 24 of the tank 20 and allows for the shelf 12 to be placed against the rear wall 110 of the liner 58, thereby maximizing the internal capacity of the tank 20.

[0033] Referring to FIGS. 8A and 8B, the coupling assembly 40 allows for the tank 20 to be selectively coupled and uncoupled from a liquid source to fill the tank. The coupling assembly 40 allows for the tank inlet tube 36 and the compartment inlet tube 38 to be coupled together when the tank 20 is in the mounted position and for the tank inlet tube 36 and the compartment inlet tube 38 to be uncoupled to move the tank 20 from the mounted position to the unmounted position. The coupling assembly 40 allows for removal of the shelf 18 from the compartment 14, which allows for ease of cleaning and maintenance of the shelf 18.

[0034] The coupling assembly 40 may include a socket portion 146, a plug portion 148, and a locking portion 150. As illustrated, the plug portion 148 is coupled to the compartment inlet tube 38, and the socket portion 146 is coupled to the tank inlet tube 36. The locking portion

150 is rotatable and coupled to the socket portion 146. The locking portion 150 is rotatable between a locked position 152 holding the plug portion 148 within the socket portion 146 when coupled together, and an unlocked position 154 allowing the plug portion 148 and the socket portion 146 to be coupled and uncoupled. While the coupling assembly 40 is shown as a rotatable lock with a plug and socket, it is not limited to such assemblies and may be a threaded connection, a ball and sleeve connector, a cam-lock, luer lock, a twist lock, or other connection features allowing for the coupling assembly 40 to selectively couple and uncouple.

[0035] Referring again to FIGS. 9A and 9B, the tank inlet tube 36 may include a valve 156 to selectively allow the liquid to enter the tank 20. The valve 156 may be configured to have a closed position 158a preventing the liquid from entering the tank 20 and an opened position 158b allowing the liquid to enter the tank 20. The valve 156 may be coupled to an actuator 160 to move the valve 156 between the closed position 158a and the opened position 158b. The actuator 160 may be a manual actuator, a mechanical actuator 162, or an electronic actuator 163. Accordingly, the valve 156 may be either a manual valve, a mechanically actuated valve, or an electronically actuated valve.

[0036] The mechanical actuator 162 may include a float 164 configured to move the valve 156 between the closed position 158a and the opened position 158b based on the liquid level in the tank 20, as illustrated in FIG. 9A. The electronic actuator 163 may include a liquid level sensor 165 and a motor 166 coupled to the valve 156, where the motor 166 is activated when the liquid level sensor 165 senses the liquid level reaches a predetermined level within the tank 20, as illustrated in FIG. 9B. The liquid level sensor 165 may be a float switch or an optical sensor activated when the liquid level reaches the predetermined level. In various implementations, the liquid level sensor 165 may be a weight sensor or a pressure sensor. The predetermined level of liquid within the tank 20 may correspond to a predetermined weight or a predetermined pressure. In other non-limiting examples, the manual valve may include a ball valve, a gate valve, a butterfly valve, a plug valve, or any other valve allowing for manual operation using the manual actuator.

[0037] Referring again to FIGS. 9A and 9B, the spout 34 is coupled the tank 20 and is in fluid communication with the hollow interior 32. As illustrated, the spout 34 is coupled to the bottom wall 28 of the tank 20. However, the spout 34 may be coupled to any of the plurality of walls 126 and configured to allow the liquid to flow from the spout 34 into a vessel. An interior surface 168 of the bottom wall 28 within the hollow interior 32 may be sloped or slanted toward the spout 34 to direct the liquid thereto.

[0038] The spout 34 is generally configured to allow for a selective flow of the liquid from the tank 20 into the refrigeration compartment 14. The spout 34 may include a valve 170 to allow for the selective flow of the liquid. The valve 170 may be coupled to an actuation device 172 to

move the valve 170 between an opened position, allowing for the flow of the liquid, and a closed position, preventing the flow of liquid. In this way, the valve 170 is operable between the opened position, allowing the liquid to flow through the spout 34, and the closed position, retaining the liquid within the tank 20.

[0039] As illustrated in FIG. 9A, the actuation device 172 may be a mechanical linkage 174 between a push button 176 and the valve 170. The push button 176 may be coupled to the front bracket 130 or the front wall 26 of the tank 20. However, the push button 176 may be coupled to any of the surfaces of the shelf 18, including the tank 20 or the mechanical compartment 134. The mechanical linkage 174 is generally disposed in the hollow interior 32 of the tank 20.

[0040] The mechanical linkage 174 is illustrated as a rod 178 coupled to the push button 176 and the valve 170. The mechanical linkage 174 may include a spring 180, a biasing member 180, or a resilient member 180 to bias the valve 170 toward the closed position. When the push button 176 is pressed toward the tank 20, the biasing force of the resilient member 180 is overcome, moving the valve 170 to the opened position, thereby allowing the liquid to flow therethrough. When the push button 176 is subsequently released, the valve 170 is moved to the closed position by the biasing force of the resilient member 180, thereby preventing the liquid from flowing. The actuation device 172 is not limited to the mechanical linkage 174 configuration discussed herein and may include other configurations where the valve 170 is moved between the opened and closed position using a push button, a lever, a mechanical switch, or other actuation devices directly coupled to the valve 170.

[0041] As illustrated in FIG. 9B, the actuation device 172 may be a motor 182 coupled to the push button 176 using an electrical coupling 184 and coupled to the valve 170 using a mechanical coupling 186. Stated differently, the motor 182 is operably coupled to the push button 176 and to the valve 170. The push button 176 may be a user interface, a push button, a switch, a touch feature, or other activation switches or buttons. The motor 182 may be disposed in the mechanical compartment 134 or the hollow interior 32 of the tank 20.

[0042] As illustrated, the motor 182 is disposed in the mechanical compartment 134 with the mechanical coupling 186 disposed in the hollow interior 32 and partially in the mechanical compartment 134, while still maintaining the separation of the mechanical compartment 134 and the hollow interior 32. The motor 182 may move the valve 170 between the opened and closed positions. The push button 176 may activate the motor 182 to move the valve 170 between the opened and closed positions. The shelf 18 may be coupled to a wiring harness that is coupled to a power source to provide power to the motor 182 and the push button 176. The wiring harness may be routed through the passthrough 16, to the shelf 18, and through the mechanical compartment 134. The wiring harness may couple to the compartment inlet tube 38 and may be

selectively coupled to the shelf 18.

[0043] For example, the motor 182 may move and hold the valve 170 to the opened position while the push button 176 is activated or held in an activated state, thereby allowing the liquid to flow. The motor 182 may then move to the closed position when the push button 176 is released from the activated state, thereby preventing the liquid from flowing. In another example, the motor 182 may be configured to dispense a specific volume of liquid upon push activation of the push button 176. In such examples, the motor 182 moves the valve 170 to the opened position until the specific volume of liquid is dispensed by the spout 34. The motor 182 and the valve 170 may be separate components or may be integrated together as one, combined component. The actuation device 172 is not limited to the configuration of the motor 182 and the push button 176 and may include other configurations of the valve 170 being actuated using the motor 182, such as activation of the motor 182 using a proximity sensor or other sensor to determine the presence of a vessel.

[0044] Referring to FIGS. 10 and 11, the spout 34 is illustrated as being coupled to the front bracket 130 and the front wall 26 of the tank 20. The spout 34 is coupled to a pump or a water pump 190. The pump 190 is configured to selectively pull the liquid from the hollow interior 32 of the tank 20 and push the liquid out of the spout 34. The pump 190 is in fluid communication with the hollow interior 32 through a first liquid line 192. The pump 190 is in fluid communication with the spout 34 through a second liquid line 194. Through the pump 190 and the liquid lines 192, 194, the spout 34 is in fluid communication with the hollow interior 32 of the tank 20.

[0045] The pump 190 may be electrically coupled to the push button 176. The push button 176 may activate the pump 190 to pull the liquid from the hollow interior 32. For example, when the push button 176 is actuated and held in the activated position, the pump 190 may pull the liquid from the hollow interior 32 and dispense it out the spout 34. When the push button 176 is released from the activated position, the pump 190 may stop pulling the liquid from the hollow interior 32. In another example, the pump 190 may be configured to dispense a specific volume of liquid with a single activation of the push button 176. The shelf 18 may be coupled to a wiring harness that is coupled to a power source to provide power to the pump 190 and the push button. The wiring harness may be routed through the passthrough 16, to the shelf 18, and through the mechanical compartment 134. The wiring harness may be coupled to the compartment inlet tube 38 and may be selectively coupled to the shelf.

[0046] Referring again to FIGS 6-11, the shelf 18 forms a liquid dispensing system or a refrigerator liquid dispenser 198 within an interior of the compartment 14 that includes the tank 20. A flow path for the liquid starts with the liquid flowing through the compartment inlet tube 38, as shown by arrow 200. The liquid 200 then flows into the tank 20 and is stored therewithin until the spout 34 is

activated or in an opened position allowing for the liquid 200 to be dispensed. When the spout 34 is in the opened position, the liquid 200 flows from the tank 20 and out the spout 34. In some instances, a vessel 202 may be placed below the spout 34. The shelf 18 is configured to hold sufficient liquid to be able to fill the vessel 202. In some examples, a lower shelf 204 may be disposed in the refrigeration compartment 14 below the shelf 18. The lower shelf 204 may use a coupling feature similar to that discussed in reference to the shelf 18. The lower shelf 204 may be configured to support the vessel 202 below the shelf 18. The vessel 202 may be placed on the lower shelf 204 below the spout 34 of the shelf 18 thereby allowing the liquid 200 to be dispensed from the spout 34 to the vessel 202.

[0047] Use of the present device may provide a variety of advantages. For example, the shelf 18 including the tank 20 may provide for space savings or more efficient space use within the volume of the refrigeration compartment 14 compared to other dispensing system containers. By having the tank 20 volume distributed over the shelf 18, the tank 20 is included within a component typically included within the refrigeration compartment 14 and has a small increase in a vertical footprint compared to a standard shelf. The shelf 18 increases space for storage of other items within the refrigeration compartment 14. Additionally, the shelf 18 including the tank 20 being disposed in the refrigeration compartment 14 may allow for the liquid stored therein to be cooled without an additional system or mechanism to cool the liquid. The liquid may be more uniformly cooled compared to traditional storage tanks due to the generally flat construction of the tank 80. Moreover, the shelf 18 including the tank 20 provides a liquid source within the vacuum insulated structure 10. The tank 20 may provide for efficient filling of the vessel 202 by storing a greater volume of the liquid than used to fill the vessel 202. Further, the shelf 18 including the tank 20 may maximize efficiency in cleaning or maintenance of the liquid dispensing system 198, as the shelf 18 can be removed to allow for the cleaning or maintenance to be performed outside the refrigeration compartment 14. Additional benefits or advantages may be realized and/or achieved.

[0048] The device disclosed herein is further summarized in the following paragraphs and is further characterized by combinations of any and all of the various aspects described herein.

[0049] According to one aspect of the present disclosure, a vacuum insulated appliance includes a cabinet defining a refrigeration compartment. The cabinet defines a compartment passthrough. A shelf is operably coupled to the compartment. The shelf includes a tank having an upper wall, a back wall, a front wall, a bottom wall, and a pair of side walls to define a hollow interior for housing liquids, a spout coupled to the tank to dispense the liquid from the tank, and a tank inlet tube coupled to the tank and in fluid communication with the hollow interior. The vacuum insulation appliance further in-

cludes a compartment inlet tube. A coupling assembly is configured to selectively couple the tank inlet tube to the compartment inlet tube. The compartment inlet tube is routed through the compartment passthrough, into the refrigeration compartment and to the coupling assembly to add the liquid to the hollow interior of the tank.

[0050] According to another aspect, a liner of a cabinet defines a first slot and a second slot configured to allow a shelf to move between a mounted position within a refrigeration compartment and an unmounted position to be removed from the refrigeration compartment.

[0051] According to yet another aspect, a coupling assembly includes a plug portion coupled to a compartment inlet tube, a socket portion coupled to a tank inlet tube, and a locking portion coupled to a socket portion. The locking portion is operable between a locked position coupling the compartment inlet tube to the tank inlet tube and an unlocked position.

[0052] According to another aspect, a shelf includes a liquid level sensor disposed within a hollow interior of a tank, and an inlet valve having an actuator configured to selectively move the inlet valve between an opened position allowing a liquid to flow from an inlet tube into a tank and a closed position preventing the liquid from flowing from the inlet tube into the tank.

[0053] According to yet another aspect, a shelf includes a valve coupled to a spout. The valve is operable between an opened position allowing a liquid to flow through the spout and a closed position retaining the liquid within a tank. An actuation device is configured to move the valve between the opened position and the closed position.

[0054] According to another aspect, an actuation device is a motor operably coupled to a valve a push button, where the actuation of the push button is configured to activate the motor to move the valve to an opened position.

[0055] According to yet another aspect, an actuation device is a mechanical linkage between a push button and a valve. The mechanical linkage includes a rod coupled to the push button and the valve and a resilient member biasing the valve toward a closed position. Actuation of the push button adjusts the mechanical linkage against a biasing force of the resilient member to move the valve to an opened position.

[0056] According to another aspect, a compartment inlet tube is routed along an inner surface of a liner of a refrigeration compartment from a compartment passthrough to a tank.

[0057] According to another aspect of the present disclosure, a refrigeration appliance including a cabinet defining a refrigeration compartment, and a water tank having a hollow interior defined by a plurality of walls. The water tank is configured to selectively couple to a liner of the cabinet to form a shelf within the refrigeration compartment. The water tank includes a water inlet line coupled to a back wall of the plurality of walls, where the water inlet line is in fluid communication with the

hollow interior of the water tank to allow water to flow therein, and a water spout coupled to a bottom wall of the plurality of walls to selectively dispense the water from the hollow interior.

[0058] According to another aspect, a passthrough is defined by a cabinet and a compartment inlet tube, where a coupling assembly is configured to selectively couple a water inlet line to the compartment inlet tube. The compartment inlet tube is routed through a compartment passthrough, into a refrigeration compartment, and to the coupling assembly to add water to a hollow interior of a water tank.

[0059] According to yet another aspect, a back wall has a recessed portion offset from the back wall that engages a refrigeration compartment when a compartment inlet tube and a water inlet line are coupled together, where the recessed portion of the back wall at least partially defines a recessed portion. The water inlet line is disposed in the recessed portion.

[0060] According to another aspect, a coupling assembly includes a plug portion coupled to a compartment inlet tube, a socket portion coupled to a water inlet line, and a locking portion coupled to the socket portion. The locking portion has a locked position coupling the compartment inlet tube and the water inlet line together and an unlocked position allowing the compartment inlet tube and the water inlet line to be coupled and uncoupled.

[0061] According to yet another aspect, a water pump is in fluid communication with a hollow interior and a water spout, and a push button is configured to activate a water pump to dispense water through the water spout.

[0062] According to another aspect, a liner of a cabinet defines a first slot on a first side wall of the liner and a second slot on a second side wall of the liner. A water tank is configured to selectively couple to the liner by sliding into the first slot and the second slot.

[0063] According to yet another aspect of the present disclosure, a refrigerator liquid dispenser including a shelf defining a hollow interior configured as a liquid storage tank. The shelf is configured to selectively couple to a refrigeration compartment liner and have a top wall for supporting items thereon. A spout is coupled to the shelf, where the spout is in fluid communication with the hollow interior of the shelf. A coupling assembly is coupled to a back wall of the shelf, where the coupling assembly is configured to releasably couple to a liquid line.

[0064] According to another aspect, a shelf includes a mechanical compartment.

[0065] According to yet another aspect, a pump is disposed in a mechanical compartment. The pump is in fluid communication with a liquid storage tank and a spout. A push button is configured to activate the pump to dispense a liquid stored in the liquid storage tank through the spout.

[0066] According to another aspect, a spout is coupled to a bottom wall of a shelf.

[0067] According to yet another aspect, a shelf in-

cludes a valve coupled to a spout. The valve is operable between an opened position allowing liquid to flow through the spout and a closed position retaining the liquid within a liquid storage tank. An actuation device is configured to move the valve between the opened position and the closed position.

[0068] According to another aspect, an actuation device is a motor operably coupled to a valve and a push button. Actuation of the push button is configured to activate the motor to move the valve to an opened position.

[0069] 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.

Claims

1. A vacuum insulated appliance (10), comprising:

a cabinet (12) defining a refrigeration compartment (14), wherein the cabinet (12) defines a compartment passthrough (16);
a shelf (18) disposed within the refrigeration compartment (14), wherein the shelf (18) includes:

a tank (20) having an upper wall (22), a back wall (24), a front wall (26), a bottom wall (28), and a pair of side walls (30a, 30b) to define a hollow interior (32) for housing a liquid;

a spout (34) coupled to the tank (20) to dispense the liquid from the tank (20); and
a tank inlet tube (36) coupled to the tank (20) and in fluid communication with the hollow interior (32); and

a compartment inlet tube (38), wherein a coupling assembly (40) is configured to selectively couple the tank inlet tube (36) to the compartment inlet tube (38), and wherein the compartment inlet tube (38) is routed through the compartment passthrough (16), into the refrigeration compartment (14), and to the coupling assembly (40) to add the liquid to the hollow interior (32) of the tank (20).

2. The vacuum insulated appliance (10) of claim 1,

- wherein a liner (58) of the cabinet (12) defines a first slot (120a, 122a) and a second slot (120b, 122b) configured to allow the shelf (18) to move between a mounted position within the refrigeration compartment (14) and an unmounted position to be removed from the refrigeration compartment (14).
3. The vacuum insulated appliance (10) of either one of claims 1 or 2, wherein the coupling assembly (40) includes a plug portion (148) coupled to the compartment inlet tube (38), a socket portion (146) coupled to the tank inlet tube (36), and a locking portion (150) coupled to the socket portion (146), and wherein the locking portion (150) is operable between a locked position (152) coupling the compartment inlet tube (38) to the tank inlet tube (36) and an unlocked position (154).
 4. The vacuum insulated appliance (10) of any one of claims 1-3, wherein the compartment inlet tube (38) is routed along an inner surface of a liner (58) of the refrigeration compartment (14) from the compartment passthrough (16) to the tank (20).
 5. The vacuum insulated appliance (10) of any one of claims 1-4, wherein the tank inlet tube (36) is coupled to the back wall (24), and wherein the spout (34) is coupled to the bottom wall (28).
 6. The vacuum insulated appliance (10) of claim 5, wherein the back wall (24) has a recessed portion (138, 140) offset from a portion of the back wall (24) that engages the refrigeration compartment (14) when the compartment inlet tube (38) and the tank inlet tube (36) are coupled together, and wherein the tank inlet tube (36) is disposed in the recessed portion (138, 140).
 7. The vacuum insulated appliance (10) of any one of claims 1-6, wherein the shelf (18) further includes: a valve (170) coupled to the spout (34), wherein the valve (170) is operable between an opened position allowing the liquid to flow through the spout (34) and a closed position retaining the liquid within the tank (20).
 8. The vacuum insulated appliance (10) of claim 7, further comprising: an actuation device (172) configured to move the valve (170) between the opened position and the closed position.
 9. The vacuum insulated appliance (10) of claim 8, wherein the actuation device (172) is a motor (182) operably coupled to the valve (170) and a push button (176), and wherein actuation of the push button (176) is configured to activate the motor (182) to move the valve (170) to the opened position.
 10. The vacuum insulated appliance (10) of claim 8, wherein the actuation device (172) is a mechanical linkage (174) between a push button (182) and the valve (170).
 11. The vacuum insulated appliance (10) of claim 10, wherein the mechanical linkage (174) includes a rod (178) coupled to the push button (182) and the valve (170) and a resilient member (180) biasing the valve (170) toward the closed position, and wherein actuation of the push button (182) adjusts the mechanical linkage (174) against a biasing force of the resilient member (180) to move the valve (170) to the opened position.
 12. The vacuum insulated appliance (10) of any one of claims 1-11, wherein the shelf (18) includes a mechanical compartment (134).
 13. The vacuum insulated appliance (10) of claim 12, wherein the shelf (18) further includes:

a pump (190) disposed in the mechanical compartment (134) and in fluid communication with the hollow interior (32) and the spout (34); and a push button (176) configured to activate the pump (190) to dispense the liquid through the spout (34).
 14. The vacuum insulated appliance (10) of any one of claims 1-13, wherein the shelf (18) further includes: a liquid level sensor (165) disposed within the hollow interior (32) of the tank (20).
 15. The vacuum insulated appliance (10) of any one of claims 1-14, wherein the shelf (18) further includes: an inlet valve (156) having an actuator (160) configured to selectively move the inlet valve (156) between an opened position (158b) allowing the liquid to flow from the tank inlet tube (36) into the tank (20) and a closed position (158a) preventing the liquid from flowing from the tank inlet tube (36) into the tank (20).

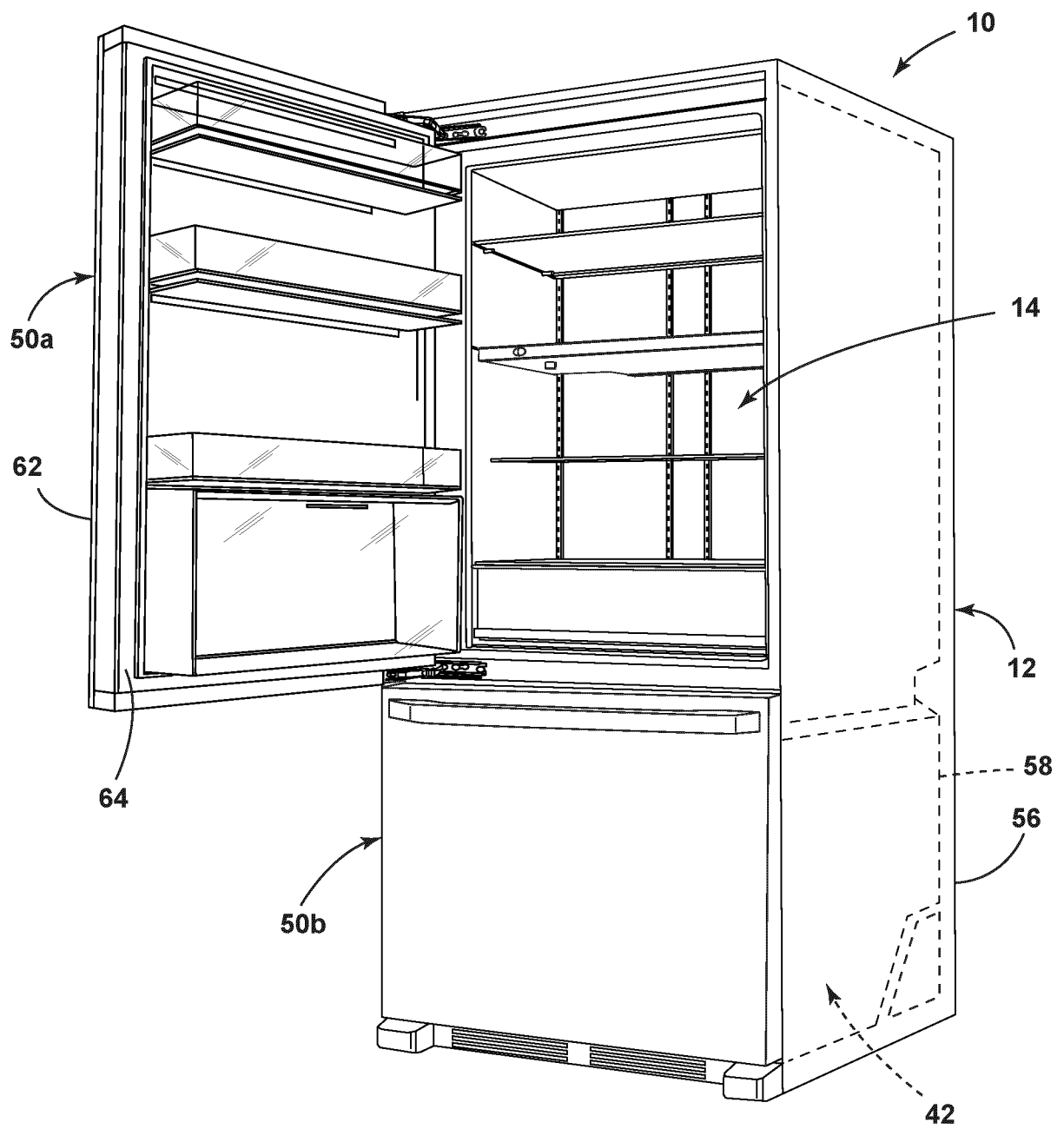


FIG. 1

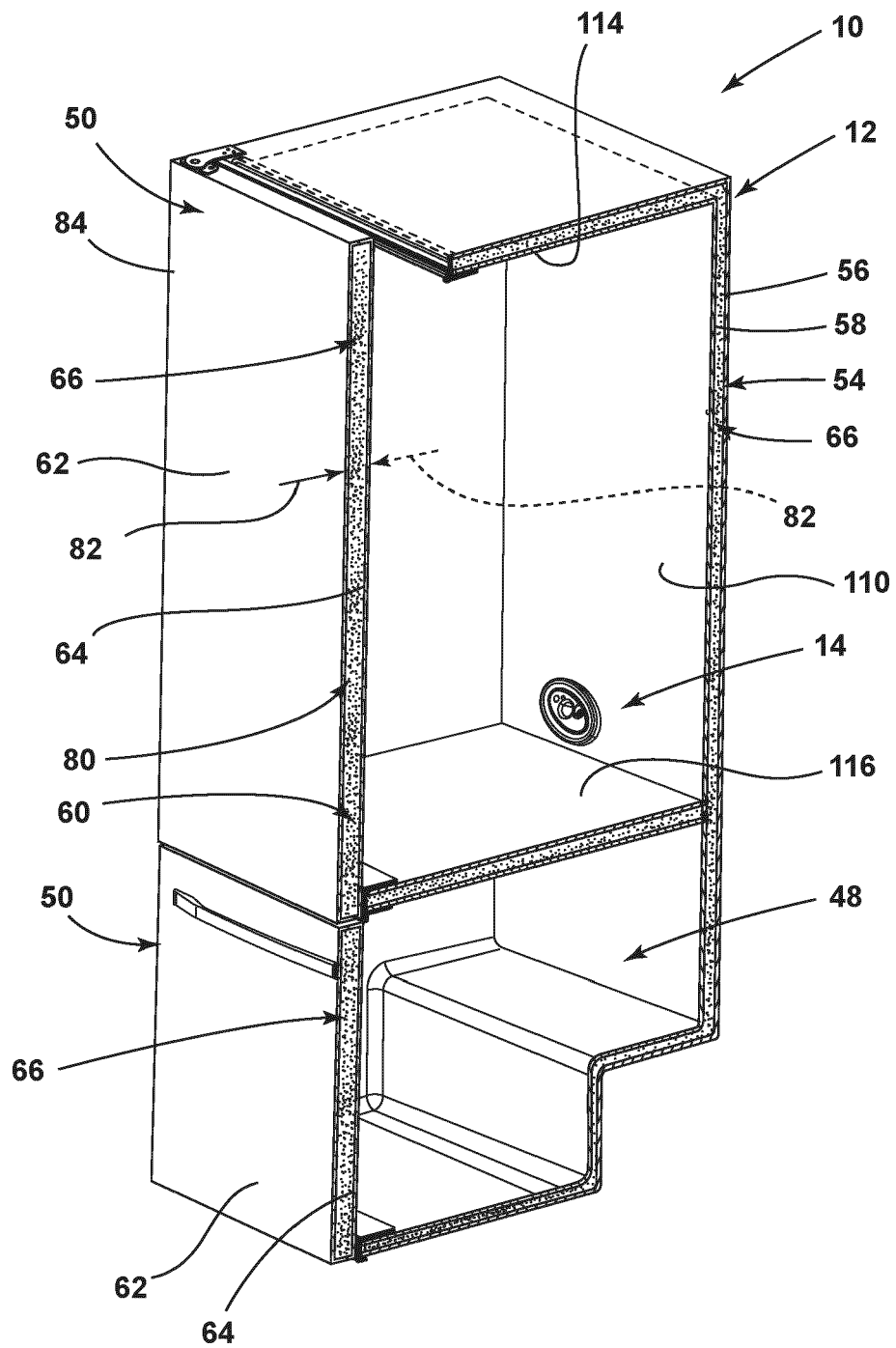


FIG. 2

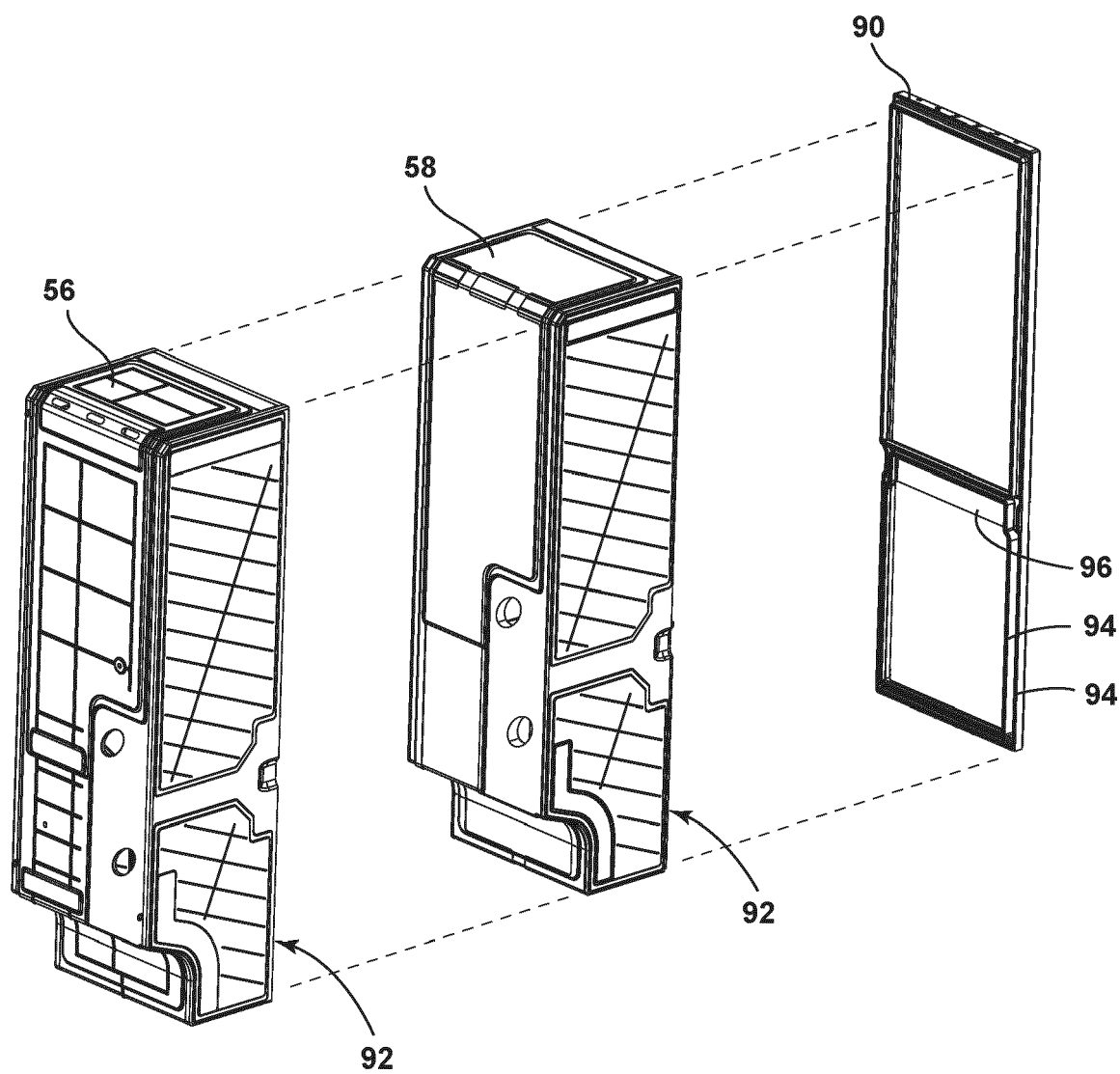


FIG. 3

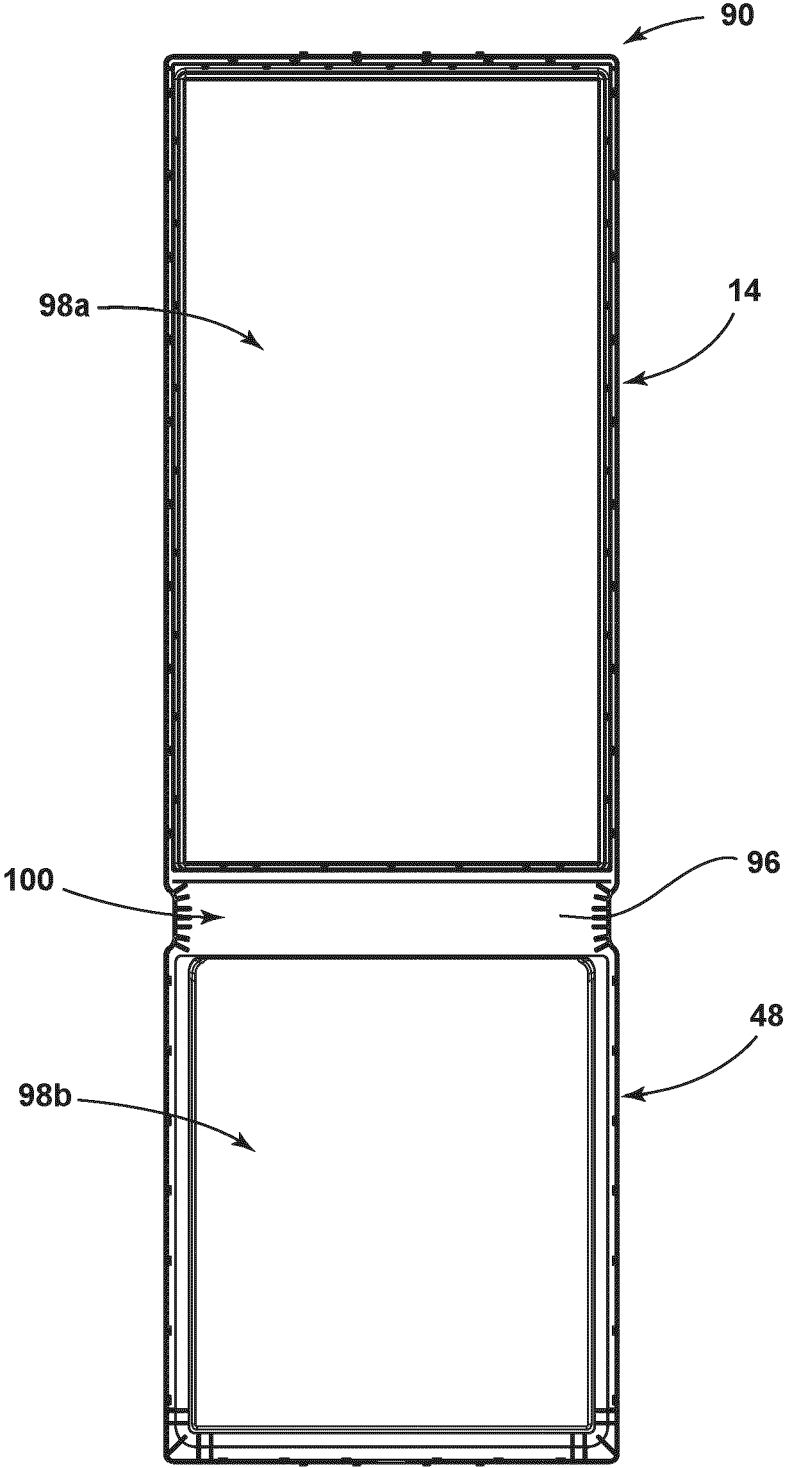


FIG. 4

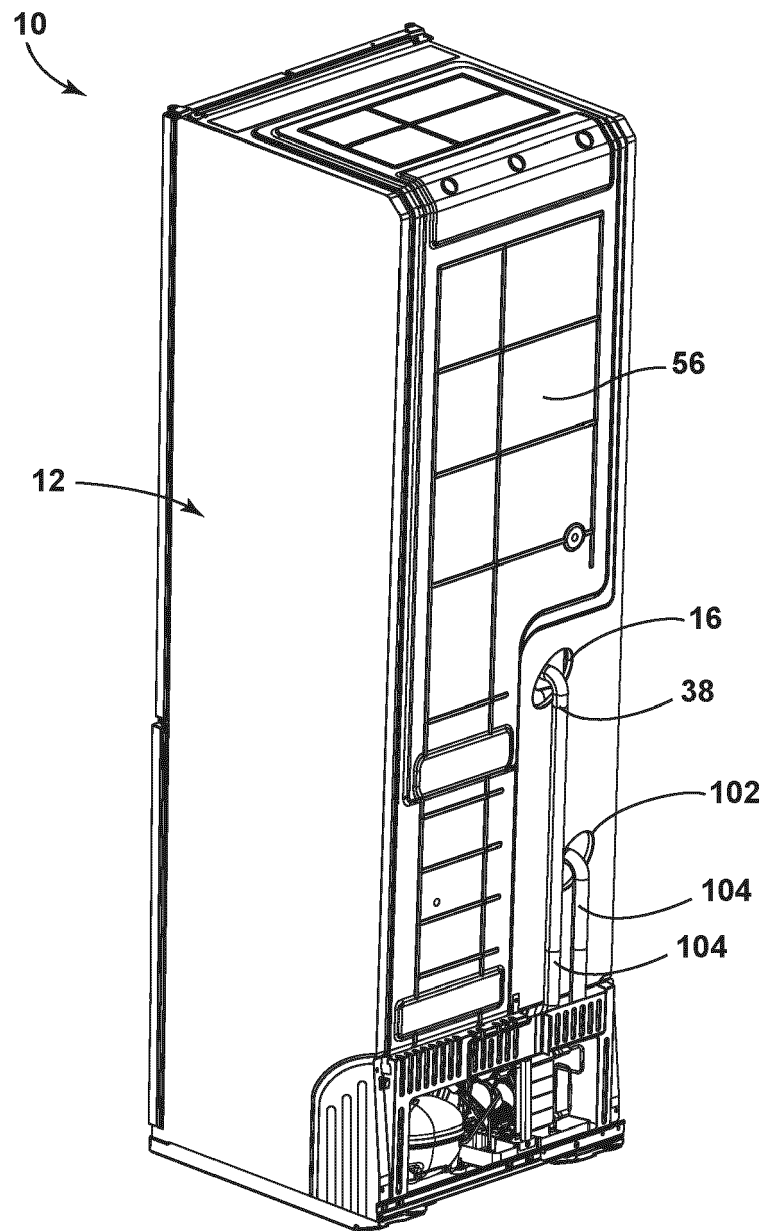


FIG. 5

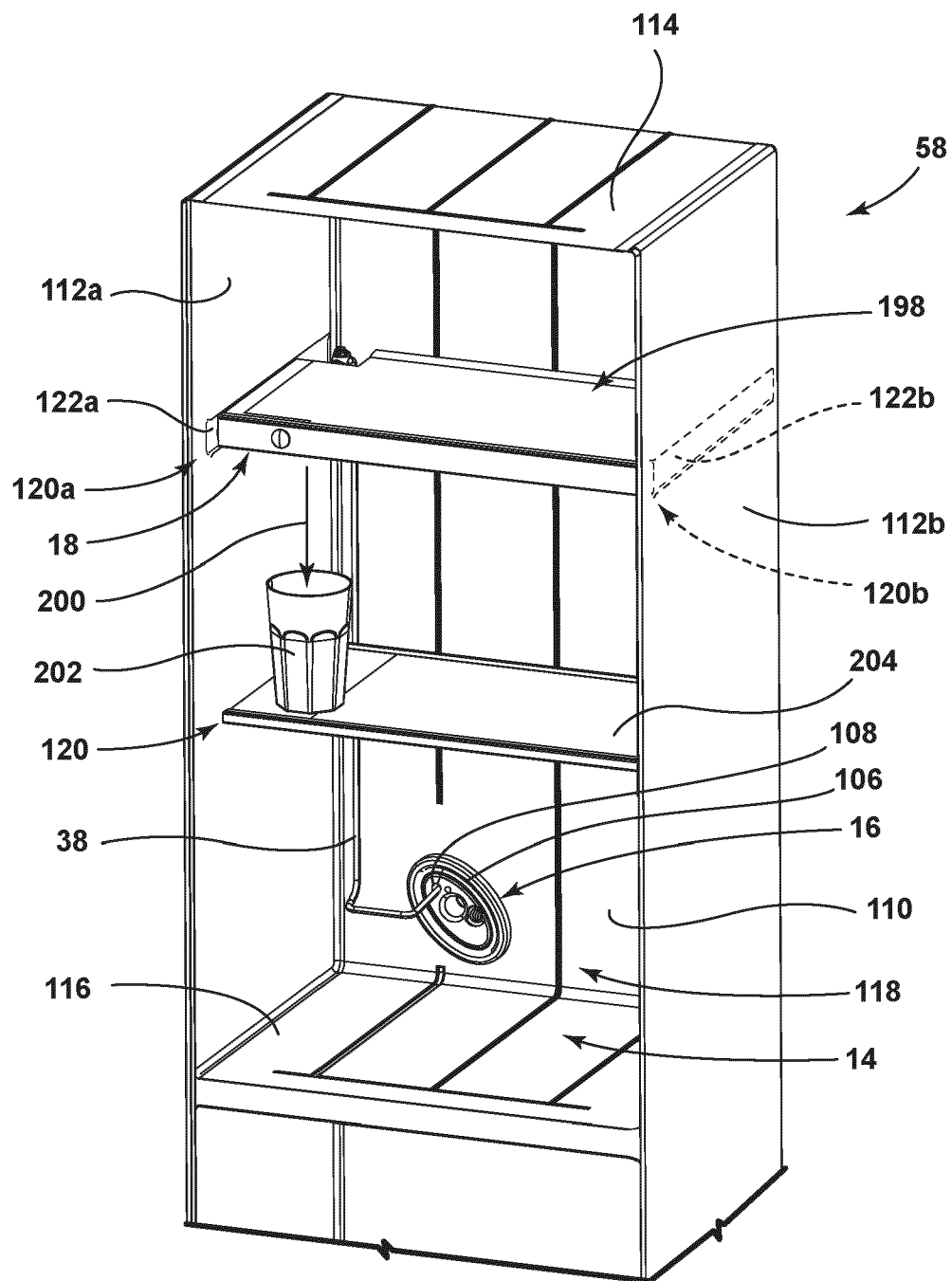


FIG. 6

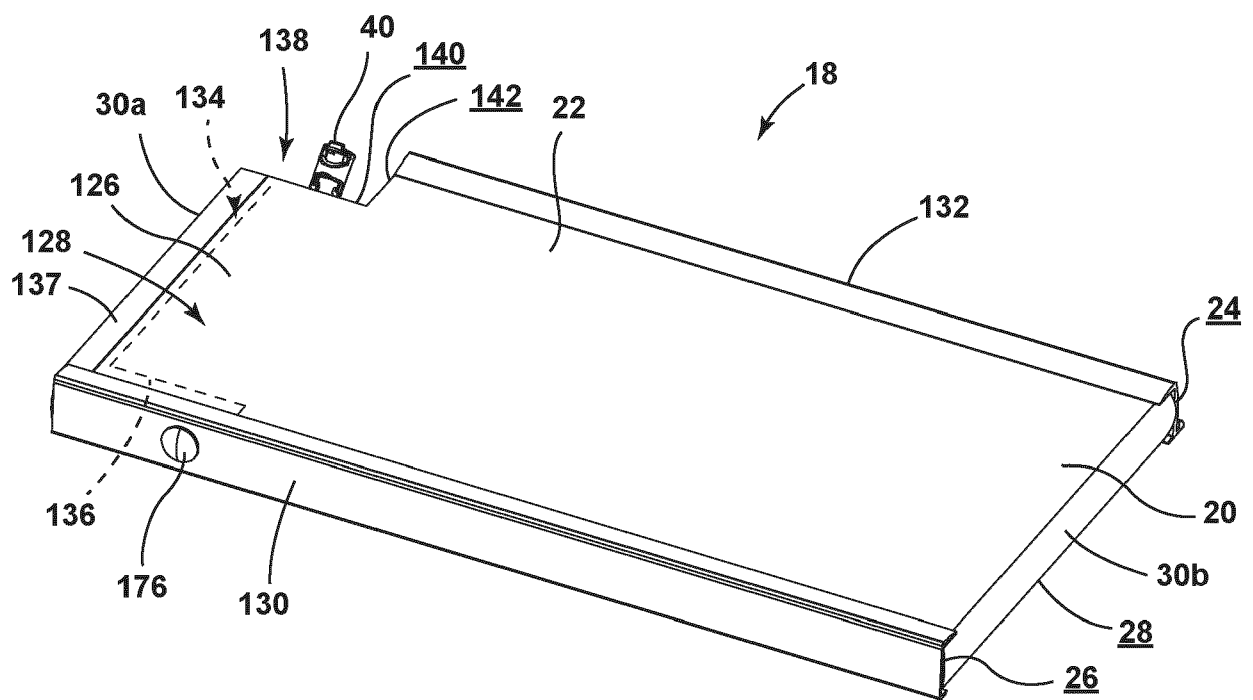


FIG. 7

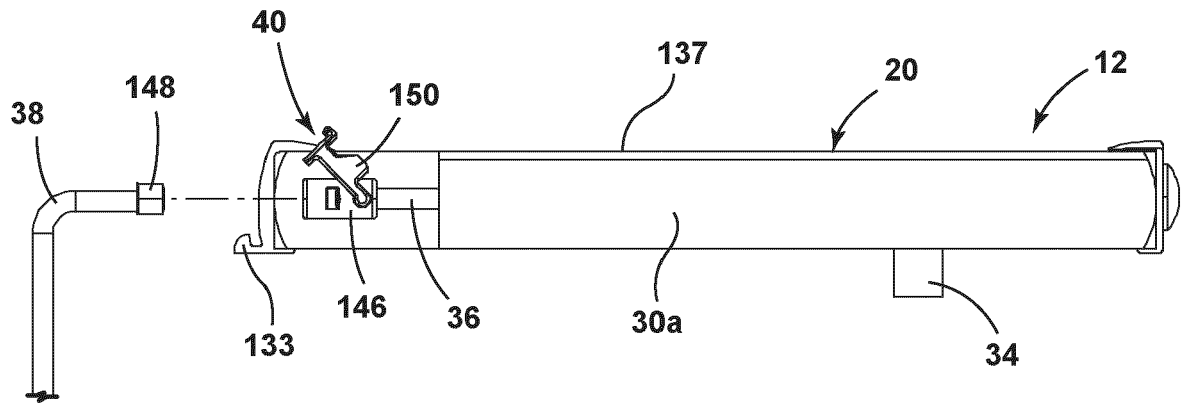


FIG. 8A

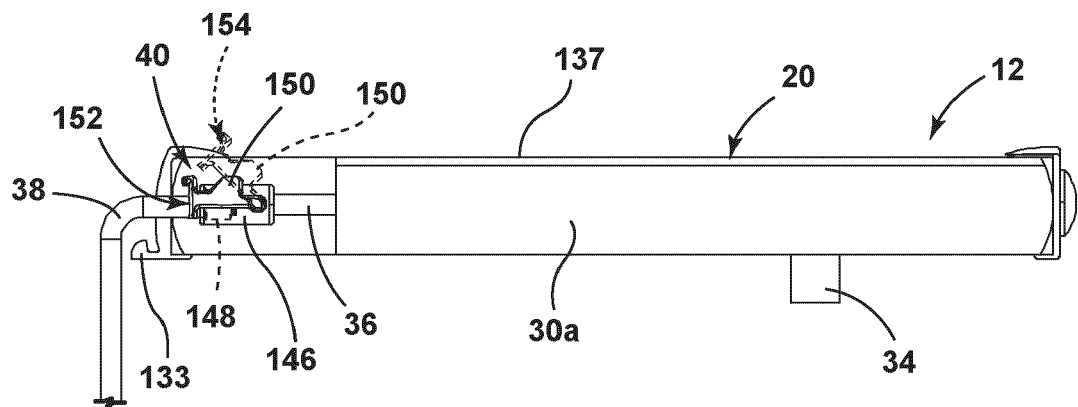


FIG. 8B

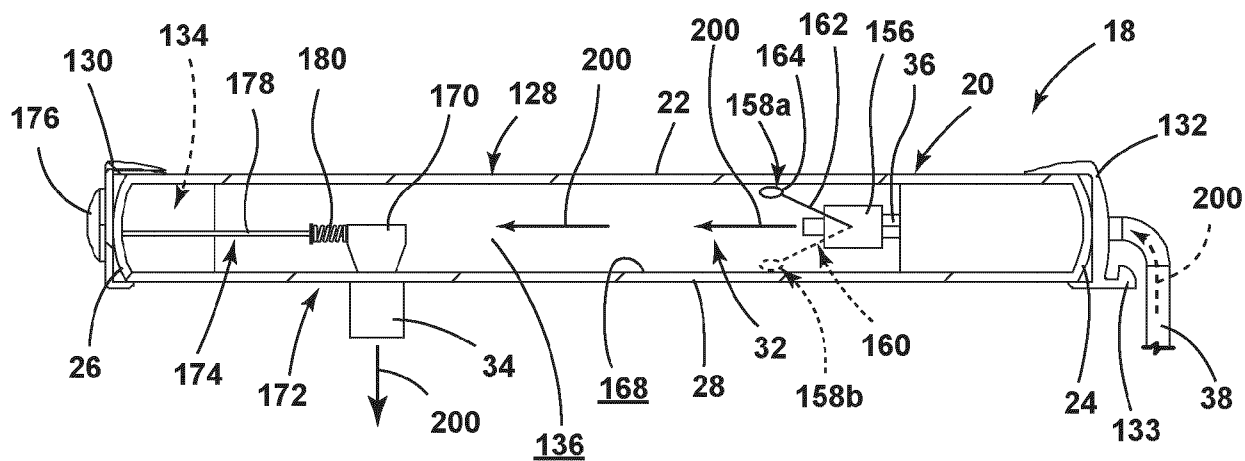


FIG. 9A

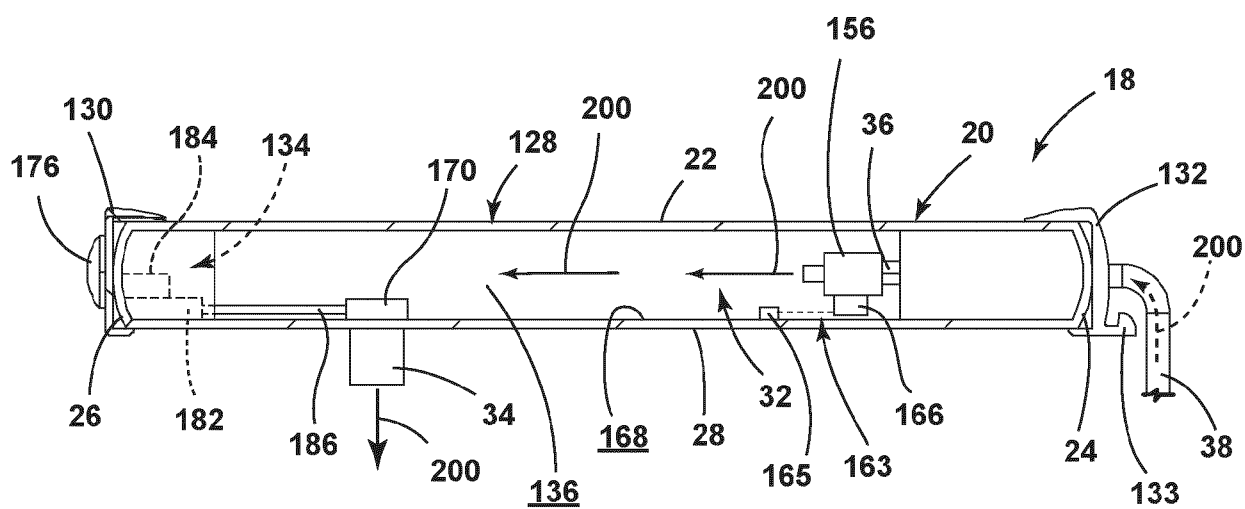


FIG. 9B

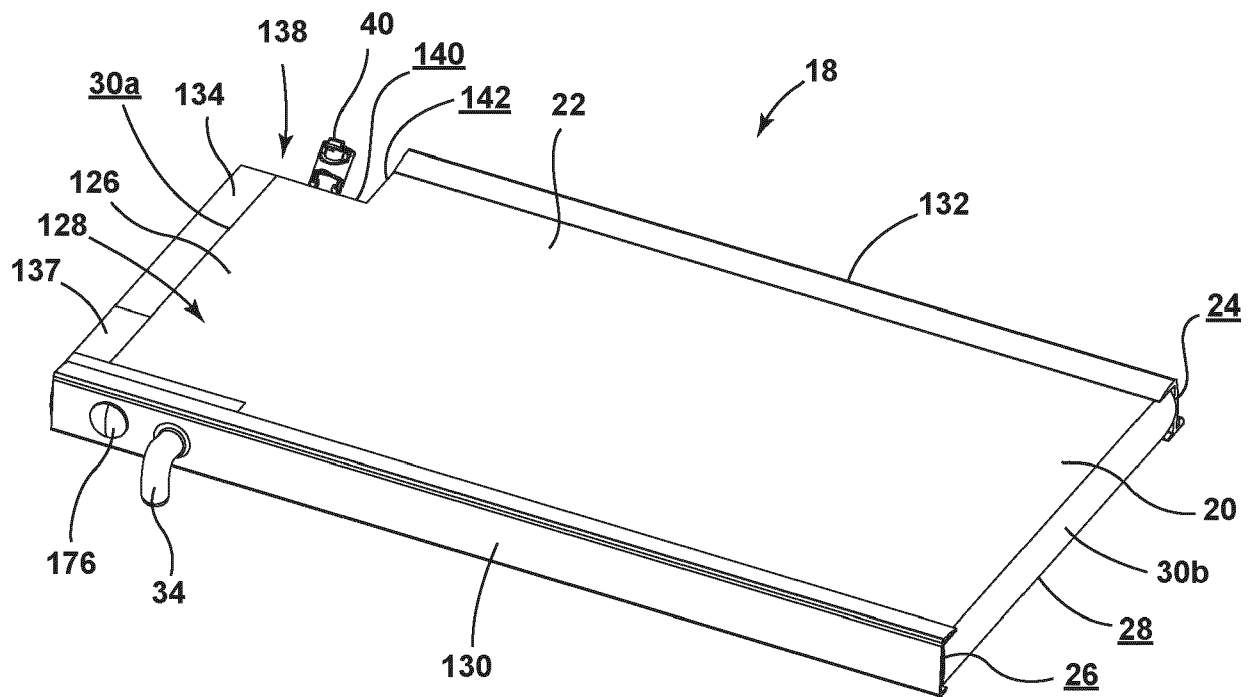


FIG. 10

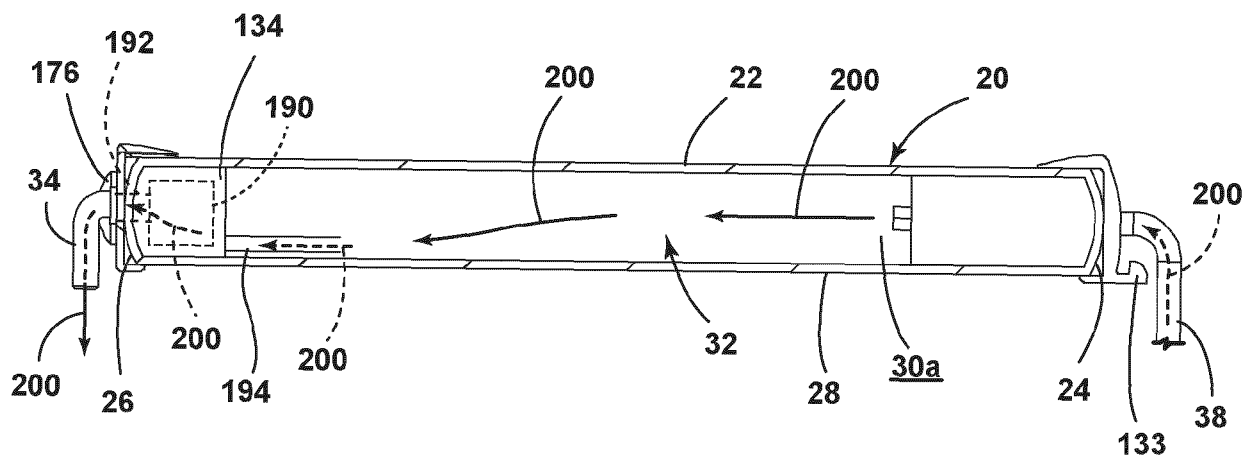


FIG. 11



EUROPEAN SEARCH REPORT

Application Number

EP 24 18 8233

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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Y	* column 3, lines 16,17,31,34; figures 1-3 *	1,10,11, 15	
Y	----- KR 2013 0017006 A (DAEWOO ELECTRONICS CORP [KR]) 19 February 2013 (2013-02-19) * paragraph [0048]; figures 7b,8 *	15	
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Y	----- US 5 156 021 A (ST-GELAIS GINO [CA] ET AL) 20 October 1992 (1992-10-20) * figure 9 *	10,11	
A	----- US 2 788 642 A (BURKHEAD BESSIE M ET AL) 16 April 1957 (1957-04-16) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 November 2024	Examiner Vigilante, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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