US 20160039595A1

(19) **United States**
(12) **Patent Application Publication**
BRIGHT et al.
(10) **Pub. No.: US 2016/0039595 A1**
(43) **Pub. Date: Feb. 11, 2016**

(54) **INSULATED COLLAPSIBLE CONTAINER AND METHOD OF USE**

(71) Applicant: **OCUFREEZE**, Uniontown, OH (US)

(72) Inventors: **Lisa Britney BRIGHT**, North Canton, OH (US); **Thomas Joseph ZENO**, Uniontown, OH (US); **Tyler Timothy BOND**, Uniontown, OH (US)

(21) Appl. No.: **14/822,100**

(22) Filed: **Aug. 10, 2015**

Related U.S. Application Data

(60) Provisional application No. 62/035,180, filed on Aug. 8, 2014.

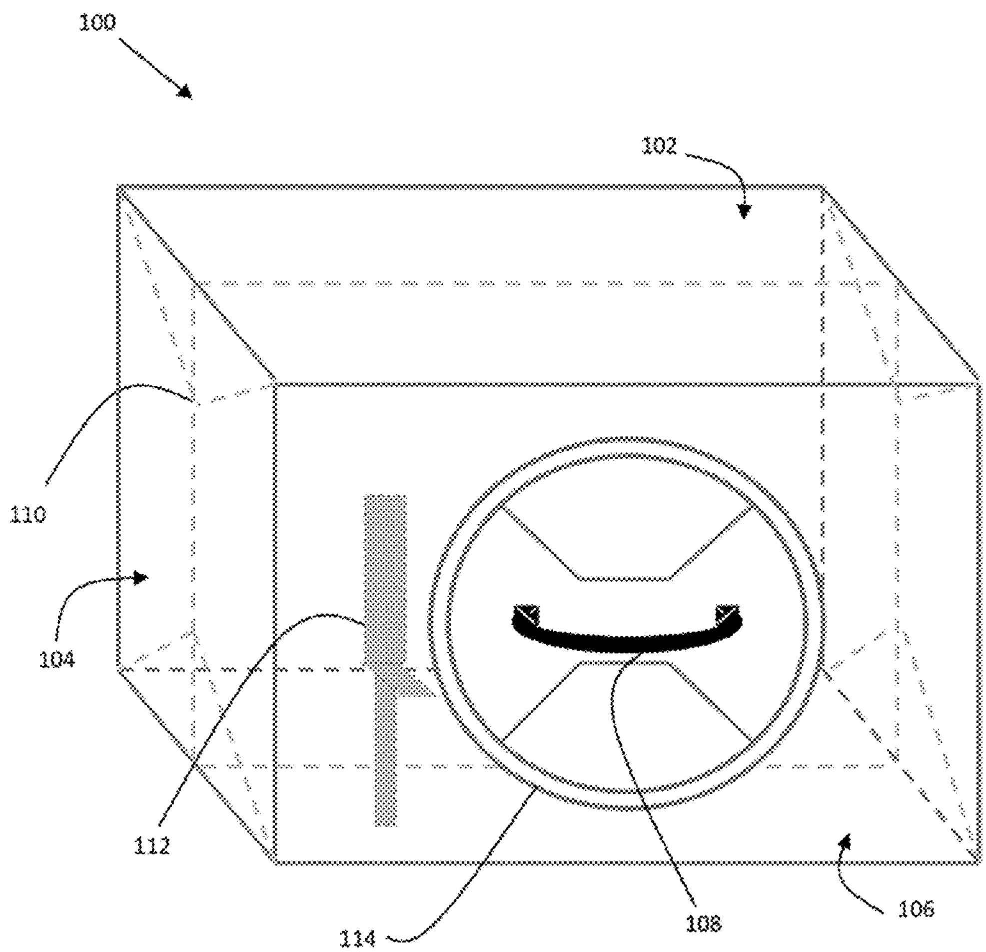
Publication Classification

(51) **Int. Cl.**
B65D 81/38 (2006.01)
B65D 25/38 (2006.01)
B65D 25/28 (2006.01)
B65D 21/08 (2006.01)

(52) **U.S. Cl.**
CPC ***B65D 81/3813*** (2013.01); ***B65D 21/086*** (2013.01); ***B65D 25/38*** (2013.01); ***B65D 25/28*** (2013.01)

(57) **ABSTRACT**

A container for reducing energy consumption by encapsulating air space in a climate-controlled environment is disclosed. The container includes a valve for enabling air to move between the inside of container and the outside of the container. The container further includes an anchor for securing the container inside the climate-controlled environment. The container further includes at least one insulated wall. The container further includes an expanding and collapsing mechanism for facilitating, the expanding, and collapsing of the container when air moves between the inside of the container and the outside of the container.



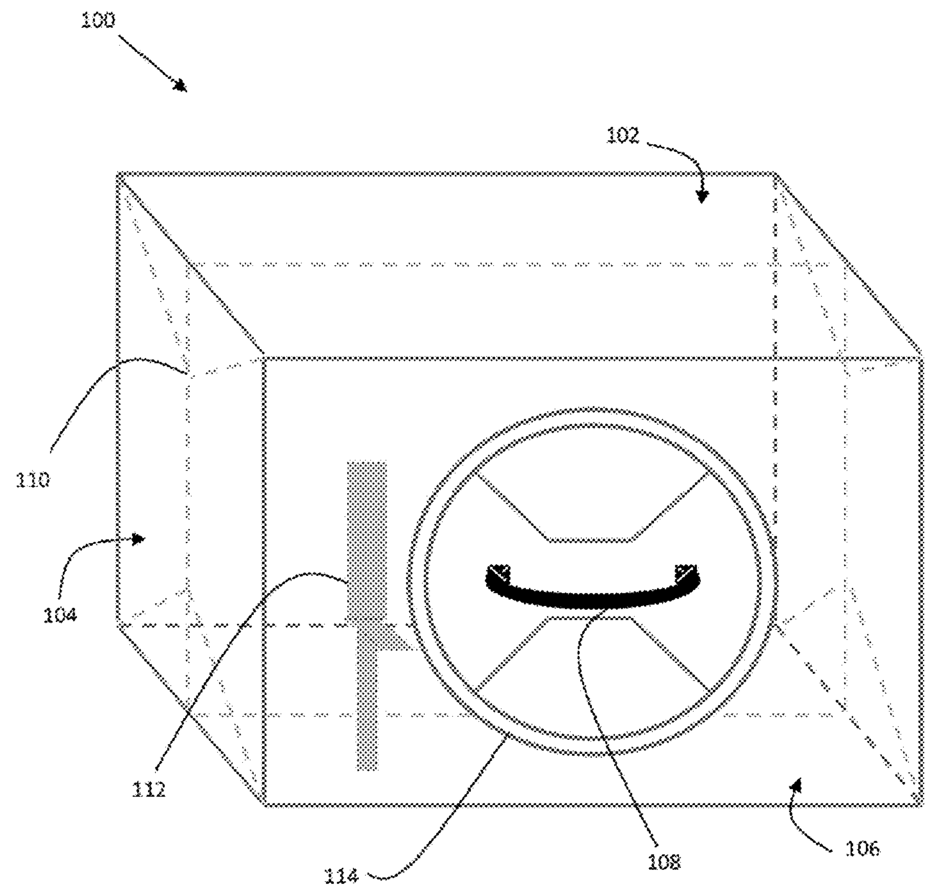


FIG. 1

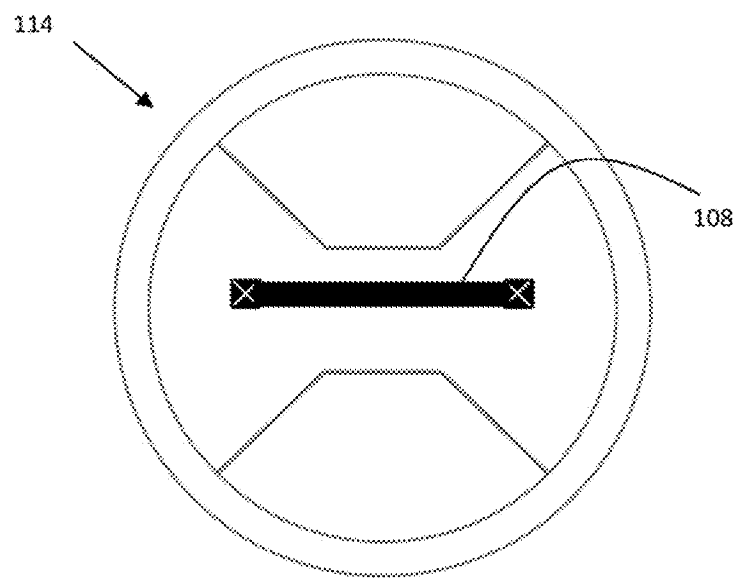


FIG. 2

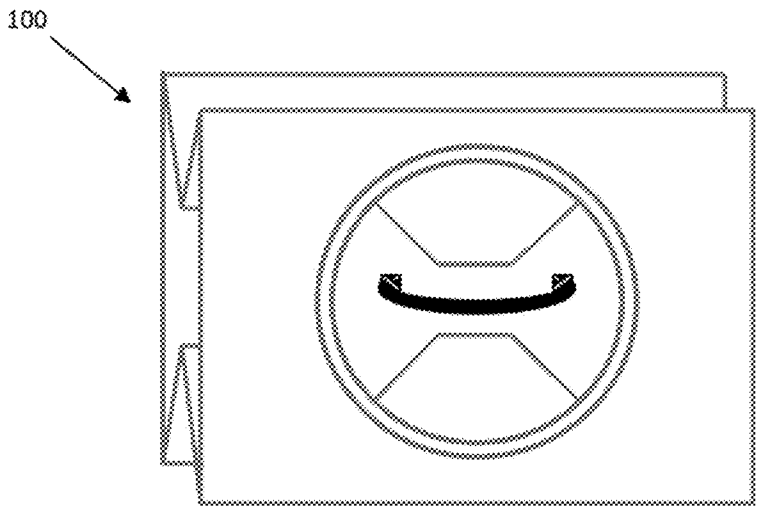


FIG. 3A

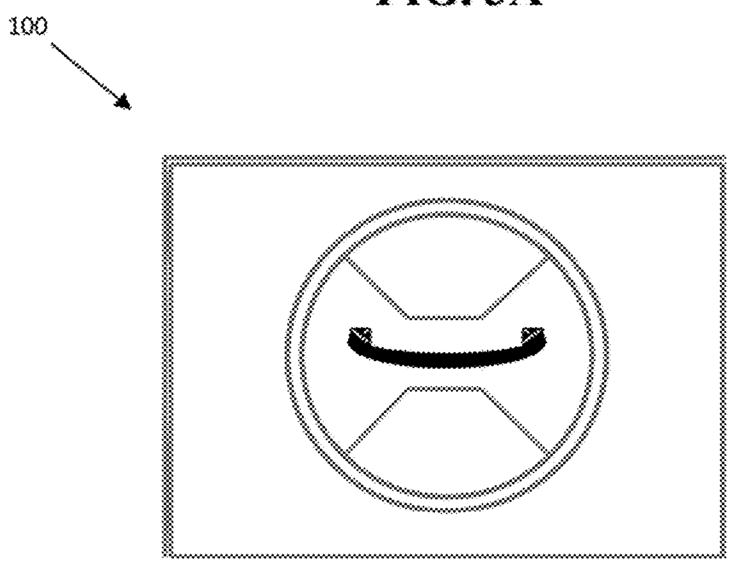


FIG. 3B

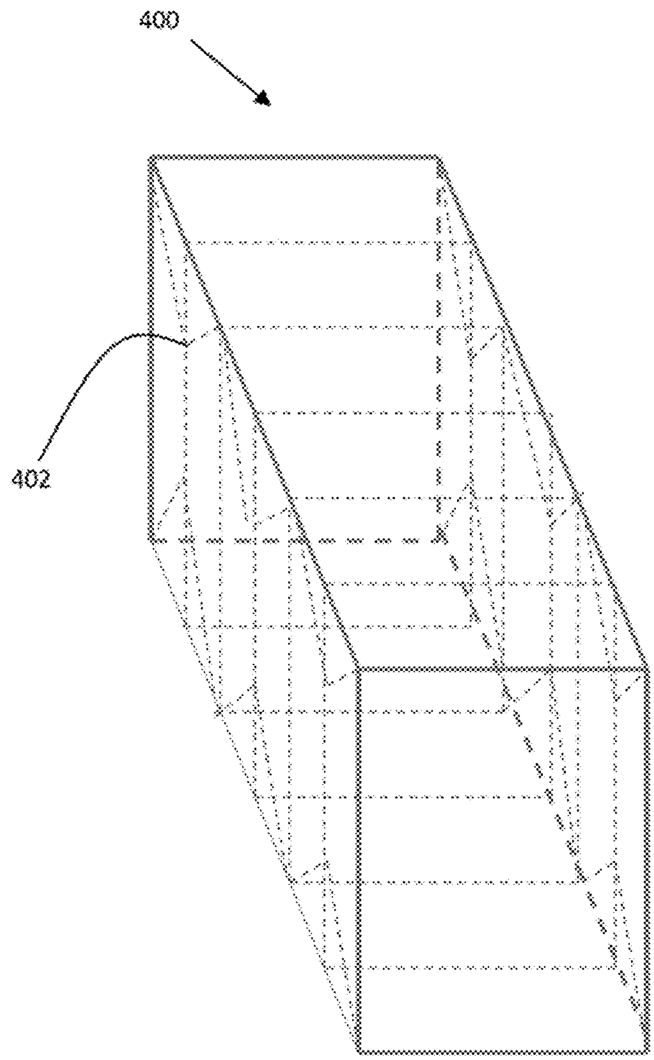


FIG. 4

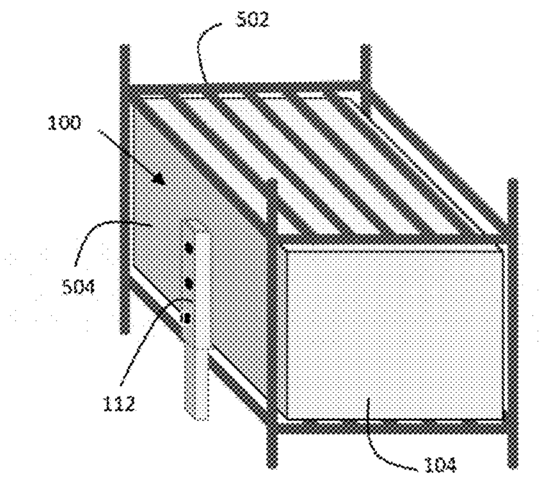


FIG. 5A

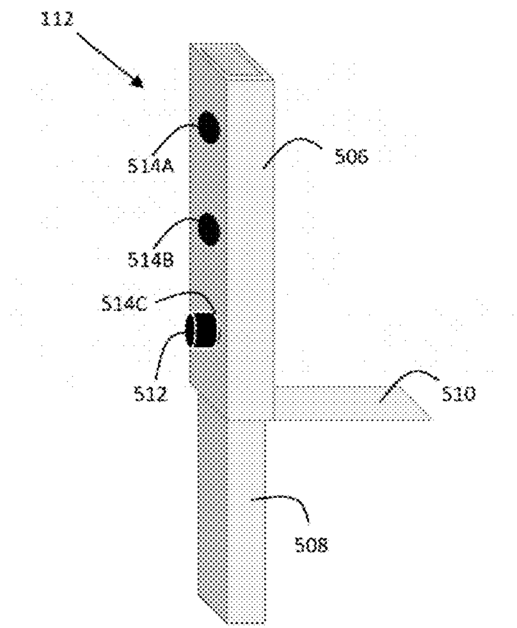


FIG. 5B

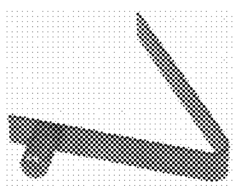


FIG. 5C

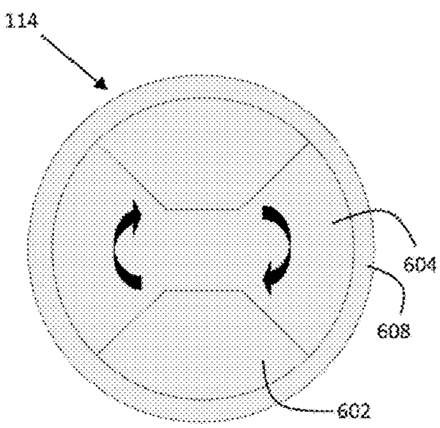


FIG. 6A

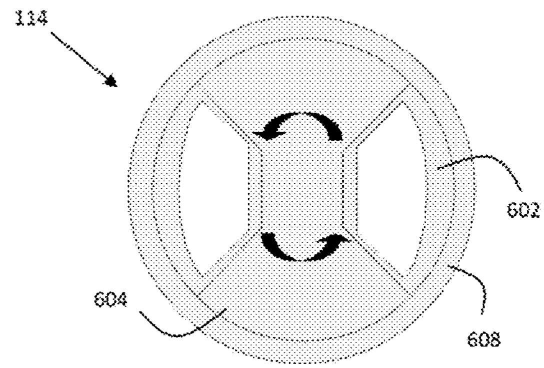


FIG. 6B

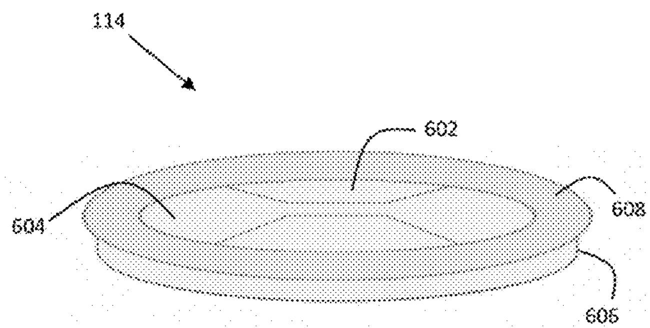


FIG. 6C

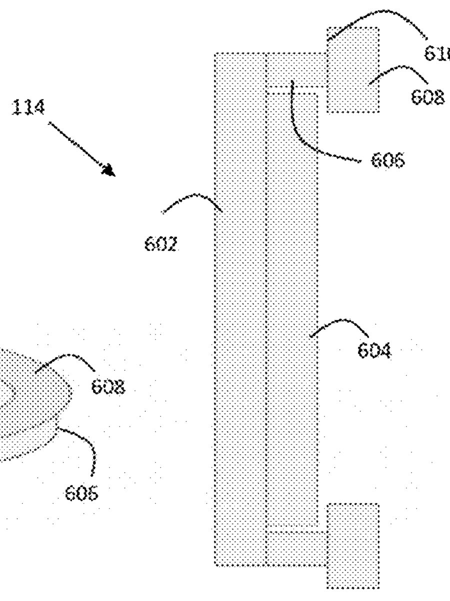


FIG. 6D

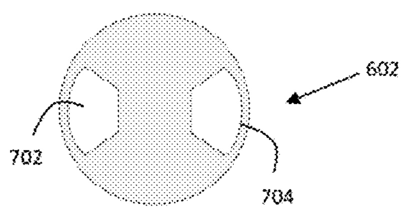


FIG. 7A

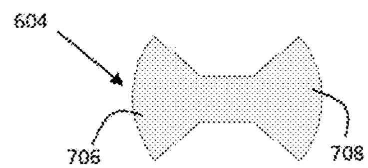


FIG. 7B

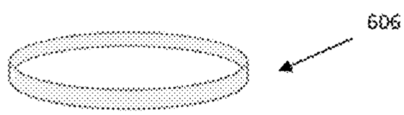


FIG. 7C

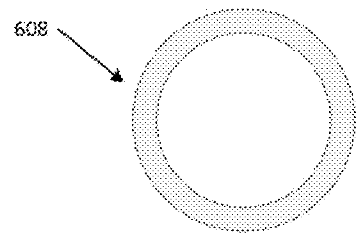


FIG. 7D

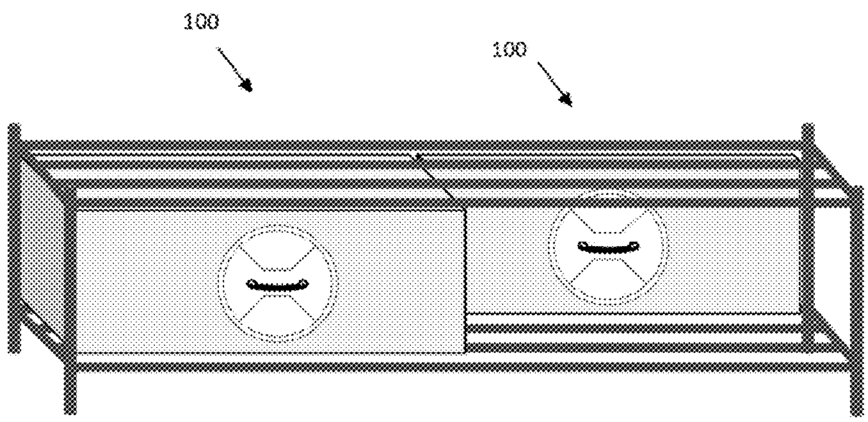


FIG. 8

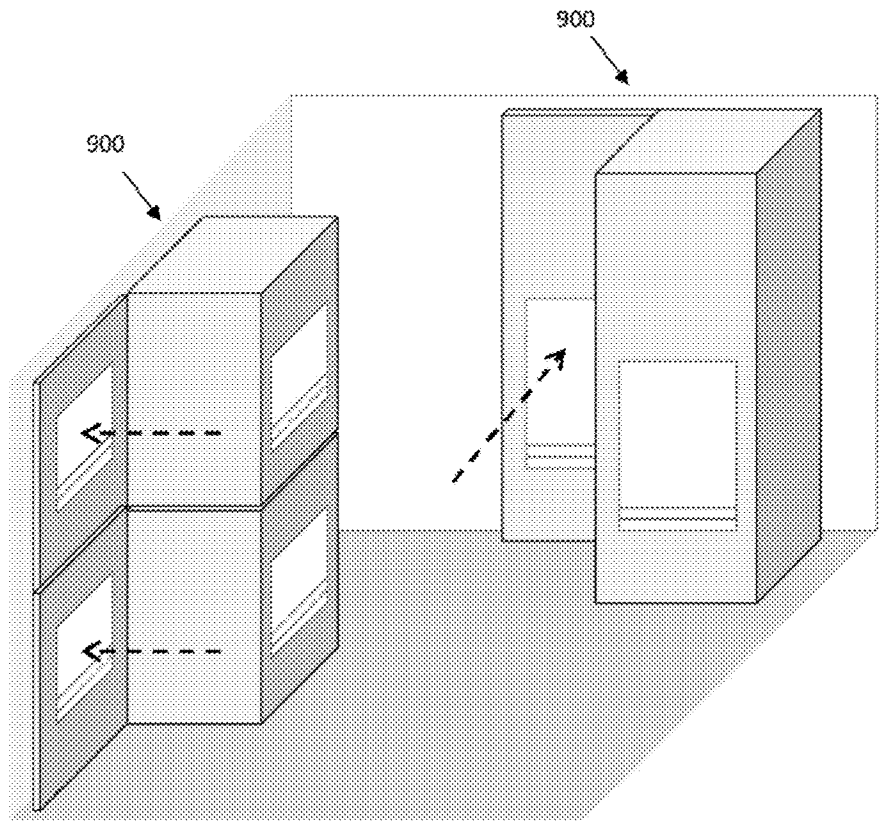


FIG. 9

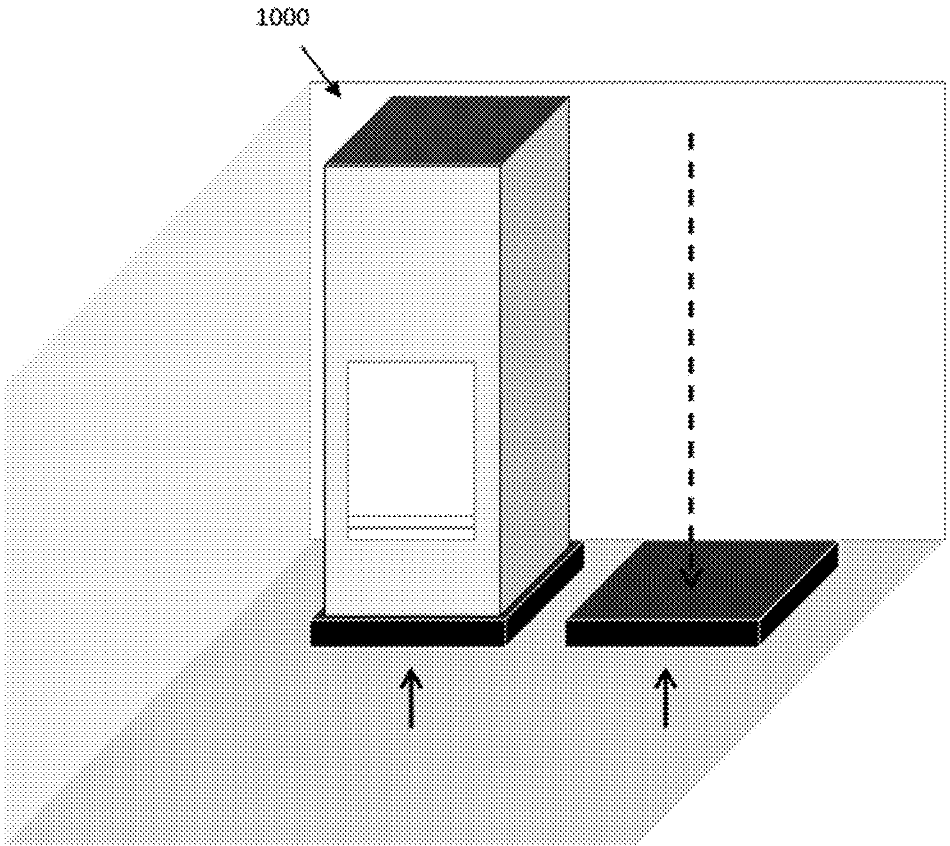


FIG. 10

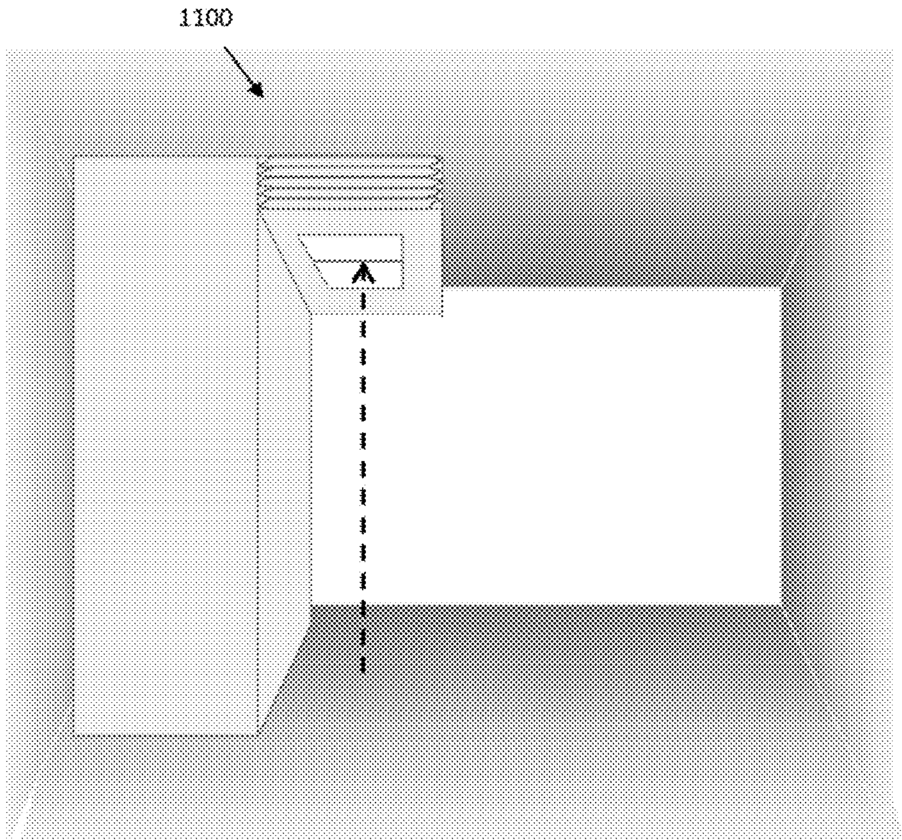


FIG. 11

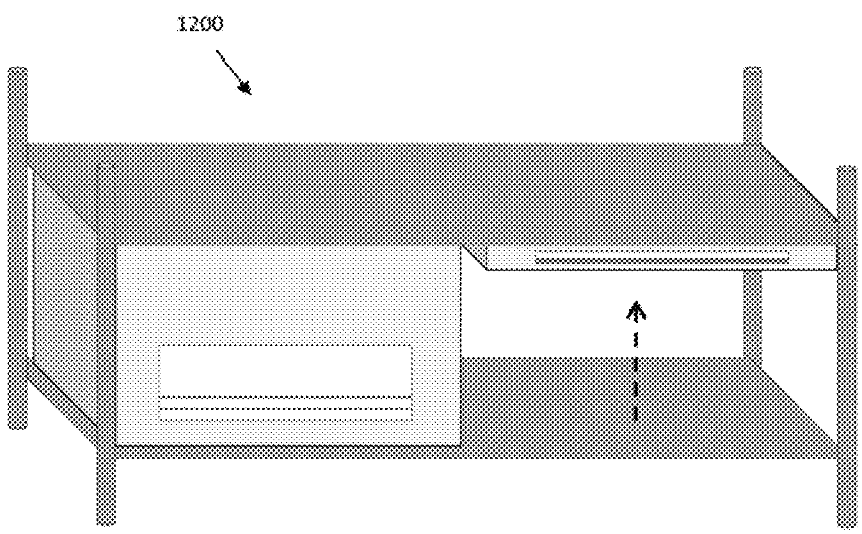


FIG. 12

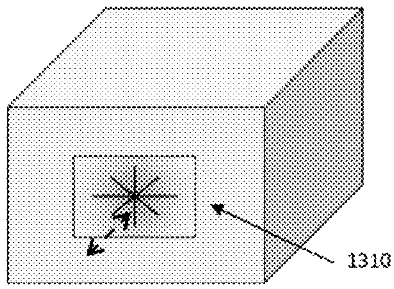


FIG. 13A

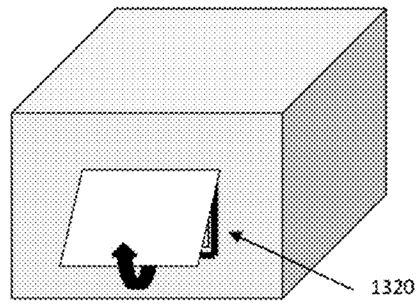


FIG. 13B

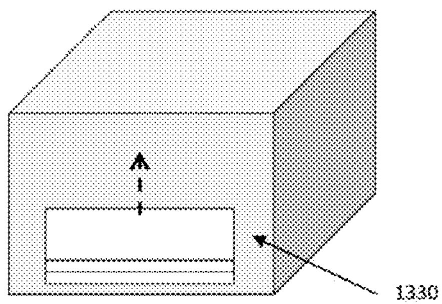


FIG. 13C

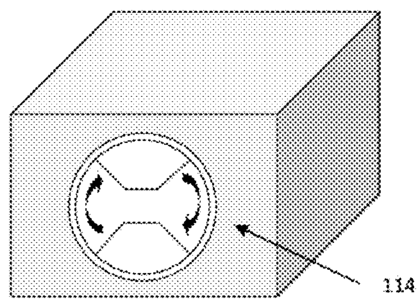


FIG. 13D

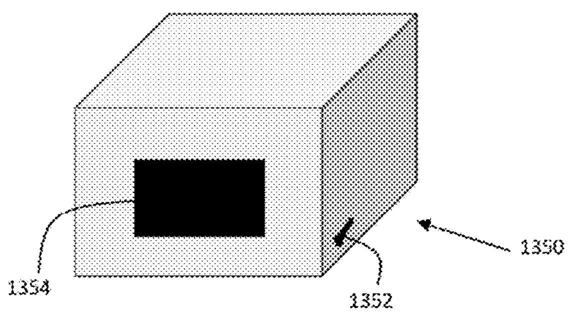


FIG. 13E

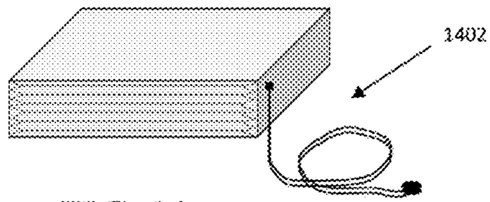


FIG. 14

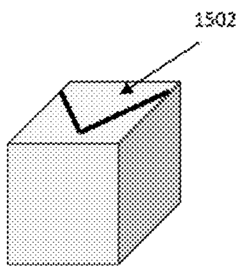


FIG. 15A

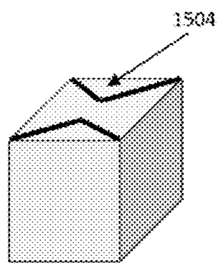


FIG. 15B

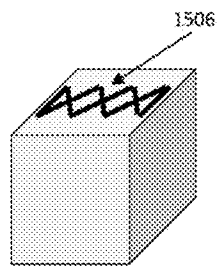


FIG. 15C

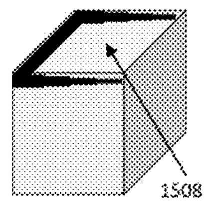


FIG. 15D

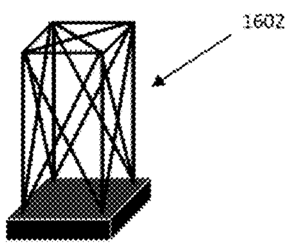


FIG. 16

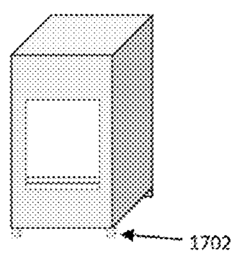


FIG. 17

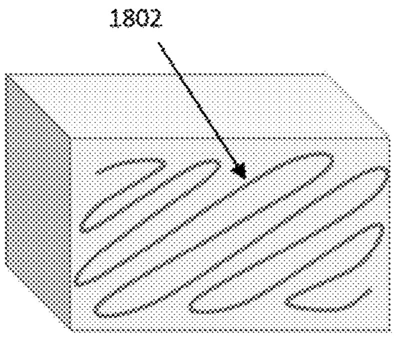


FIG. 18A

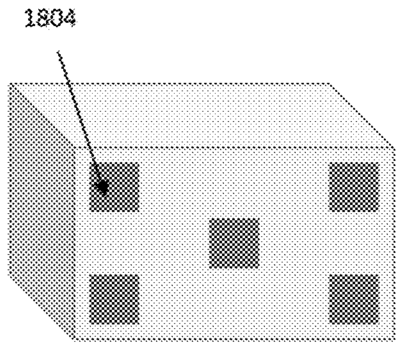


FIG. 18B

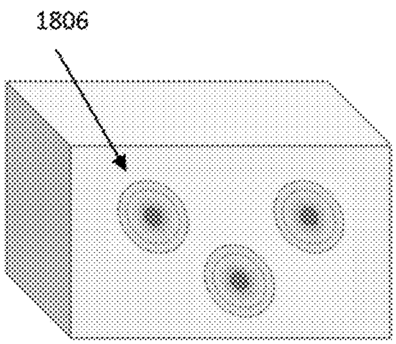


FIG. 18C

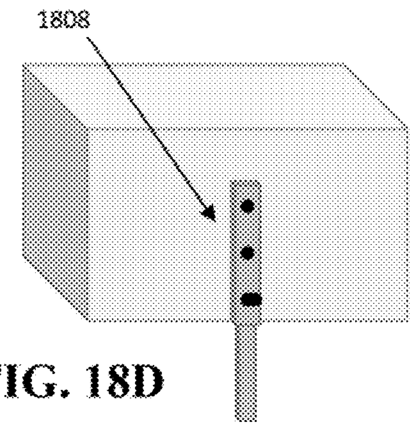


FIG. 18D

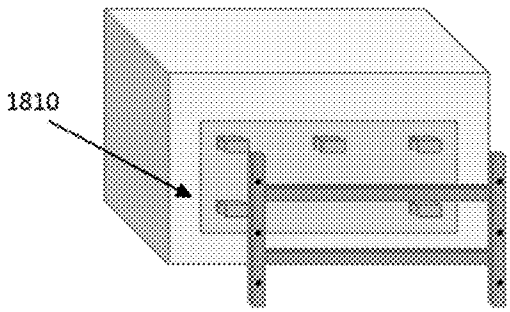


FIG. 18E

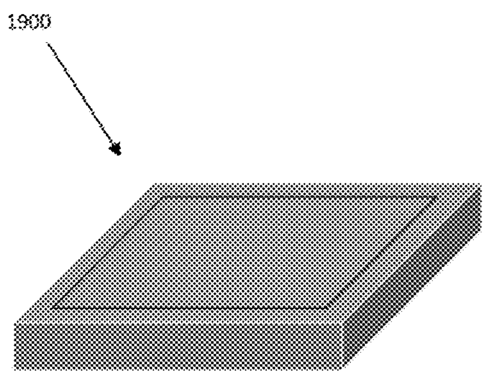


FIG. 19

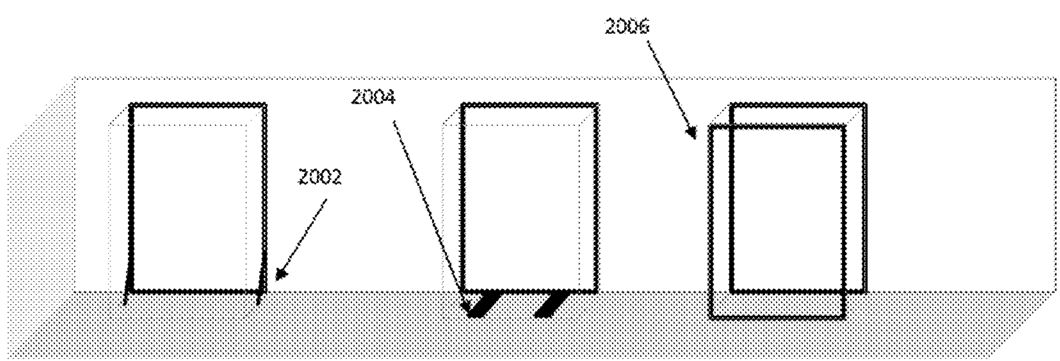


FIG. 20A FIG. 20B FIG. 20C

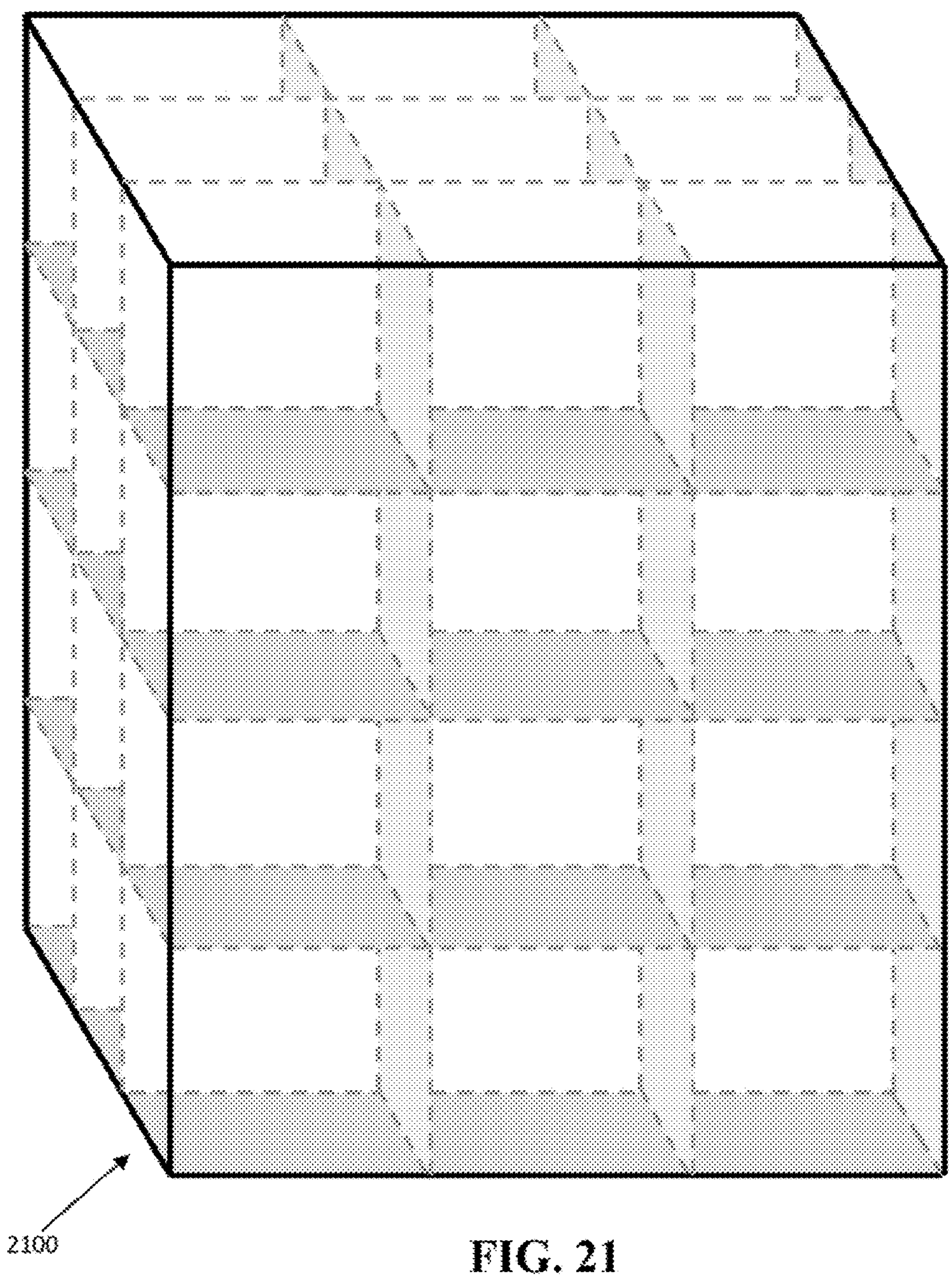


FIG. 21

INSULATED COLLAPSIBLE CONTAINER AND METHOD OF USE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from U.S. Patent Application No. 62/035,180 filed on Aug. 8, 2014, which is incorporated by reference herein in its entirety.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to insulated, collapsible containers and methods of their use. More specifically, insulated, collapsible containers may be utilized in methods for reducing power usage of temperature-controlled areas or systems.

BACKGROUND

[0003] While walking around the sales floor and backrooms of a grocery store to identify potential energy savings, it may be readily apparent to an observer that there may be a considerable amount of unused refrigeration space. Multiple factors may lead to large amounts of empty space in commercial refrigeration systems such as walk in freezers and cold storage rooms. On a regular basis, the space occupied by inventory remains empty between the time the inventory is used until another shipment may be received, or the area may be restocked. Other spaces, such as cold prep rooms, may require empty space to allow for the movement of people during operating hours, but the spaces may remain empty during non-operating hours. The movement towards just-in-time (JIT) inventory methods has reduced the amount of inventory kept on hand, thereby reducing the amount of refrigeration space required. Refrigeration spaces built prior to the adoption of the JIT methodology may have more space than inventory levels require. Refrigeration spaces are often designed with some level of extra capacity for busy seasons, special promotions, etc. This extra space often remains unused throughout the remainder of the year New stores are often built based on a template of a company's other stores, and therefore the refrigeration spaces may not be sized based on actual demand. In particular, stores with lower sales may have extra refrigeration space. As a result, various types of businesses across the world may be refrigerating empty space.

[0004] Cooling empty refrigeration space, however, can be costly since empty space may require more energy to cool than occupied space. Thus, it may be desirable, due to increasing energy costs and the increased focus on environmental sustainability, to reduce or eliminate the cooling of empty space. The general trend to reduce energy costs with a focus on environmental sustainability has led to many new energy reduction products; however, none of the existing products help reduce unused refrigeration space.

SUMMARY

[0005] In one example, a container for reducing energy consumption by encapsulating air space in a climate-controlled environment is disclosed. The container includes a valve for enabling air to move between the inside of container and the outside of the container. The container further includes an anchor for securing the container inside the climate-controlled environment. The container further includes at least one insulated wall. The container further includes an expanding and collapsing mechanism for facilitating the expanding and collapsing of the container when air moves between the inside of the container and the outside of the container.

[0006] In one example, a method for reducing the amount of energy required to control a temperature inside a climate-controlled environment is disclosed. The method includes the step of disposing an insulated container to the inside of a temperature-controlled environment. The method further includes the step of operating a valve, configured to allow air to move between the inside of the container and the outside of the container, to an open position. The method further includes the step of facilitating movement of air into the insulated expandable container until the insulated expandable container reaches a desired size. The method further includes the step of operating the valve to a closed position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In the accompanying drawings, structures are illustrated that, together with the detailed description provided below, describe exemplary embodiments of the claimed invention.

[0008] Like elements are identified with the same reference numerals. It should be understood that elements shown as a single component may be replaced with multiple components, and elements shown as multiple components may be replaced with a single component. The drawings are not to scale and the proportion of certain elements may be exaggerated for the purpose of illustration,

[0009] FIG. **1** illustrates an example insulated, collapsible container.

[0010] FIG. **2** illustrates an example valve of FIG. **1**

[0011] FIG. **3**A illustrates an example partially collapsed container.

[0012] FIG. **3**B illustrates an example fully collapsed container.

[0013] FIG. **4** illustrates an example container **400** with a repeating pattern of predefined creases.

[0014] FIG. **5**A illustrates an example container secured to an example rack.

[0015] FIG. **5**B illustrates a close-up view of an example anchoring and stabilizing mechanism.

[0016] FIG. **5**C illustrates an example spring push button.

[0017] FIGS. **6**A-D illustrate an example valve.

[0018] FIGS. **7**A-D illustrate example components of an example valve.

[0019] FIG. **8** illustrates an example insulated, collapsible container.

[0020] FIG. **9** illustrates an example insulated, collapsible container.

[0021] FIG. **10** illustrates an example insulated, collapsible container.

[0022] FIG. **11** illustrates an example insulated, collapsible container.

[0023] FIG. **12** illustrates an example insulated, collapsible container.

[0024] FIGS. **13**A-E illustrate example valves.

[0025] FIG. **14** illustrates an example expanding and collapsing mechanism.

[0026] FIGS. **15**A-D illustrate example expanding and collapsing mechanisms.

[0027] FIG. **16** illustrates an example expanding and collapsing mechanism,

[0028] FIG. **17** illustrates an example insulated, collapsible container with wheels.

[0029] FIGS. **18**A-E illustrate example anchoring and stabilizing mechanisms.

[0030] FIG. **19** illustrates an example insulated, collapsible container within an example anchoring and stabilizing mechanism.

[0031] FIGS. **20**A-C illustrate example insulated, collapsible containers including example anchoring and stabilizing mechanisms.

[0032] FIG. **21** illustrates an example insulated, collapsible container including a grid structure,

DETAILED DESCRIPTION

[0033] The present disclosure provides a collapsible, insulted container and a method of its use The insulated container encapsulates unused refrigeration space. The container may allow businesses to reduce their energy consumption, thus reducing, costs and their environmental footprint. The container may reduce the amount of space that the refrigeration unit must cool. The container may be set up in spaces that are rarely used, and therefore may be a fixed size and not need to be expandable or collapsible and/or it may be expanded and collapsed based on changing space requirements. Occupying unused space and encapsulating air within an insulated object may have many advantages, including, but not limited to: preventing cold air from escaping the refrigeration space; keeping the encapsulated air cooler for longer; and reducing temperature fluctuations within the refrigeration space,

[0034] It should be appreciated that although the example insulated, collapsible container may be discussed herein as used in refrigeration systems in a retail setting, the example, insulated, collapsible container may also be used in refrigeration areas of other suitable types of businesses that may wish to reduce energy consumption by reducing the amount of space that the refrigeration unit must cool. For example, the example insulated, collapsible container may be used by dine-in restaurants, fast food chains, wholesale clubs, refrigerated warehouses, hotels, refrigerated labs, and so on.

[0035] To accomplish the encapsulation of air, an insulated, collapsible container that may be expanded to encapsulate space and collapsed to make room for inventory is described herein. When inventory or other objects are present, the container may collapse, and when the inventory or other objects are not present, the container may expand to take up the unused space.

[0036] FIG. **1** illustrates an insulated, collapsible container **100** (hereinafter referred to as "container") according to one embodiment of the present disclosure. The container **100** includes a top insulated wall **102**, a bottom insulated wall (not shown), a left insulated wall **104**, and a right insulated wall (not shown). The container **100** further includes a front insulated wall **106** and a back insulated wall (not shown

[0037] It should be appreciated that the type of insulation material may vary. Nevertheless, the insulation material may meet defined criteria. For example, the material used may have low thermal conductivity and/or high reflectivity that lasts over time and not lose its effectiveness quickly. The material may also be pliable, durable, tear proof, puncture resistant, and impermeable to gases and liquids, and combinations thereof, for example. In one example, the material should be as thin and as lightweight as possible while still meeting the previous criteria.

[0038] In one example, the insulation material may reduce three types of heat transfer in order to reduce energy consumption. First, encapsulating the air reduces convection heat transfer within the refrigerated space by reducing the amount of free flowing air. Thus, less cold escapes through openings such as doors, less cold air mixes with the incoming warm air, and less air may be warmed by the constant rising of hot air. Second, the low thermal conductivity of the insulation material reduces conductive heat transfer. This keeps the air inside the container, on average, cooler than the air outside the container and effectively reduces the amount of space to be cooled. Third, the high reflectivity reduces radiation heat transfer. This prevents the containment space from increasing in temperature due to the radiation heat produced by other objects in the refrigerated space. The better the container may be sealed, the lower the thermal conductivity, and the higher the reflectivity, the more effective the container may be at reducing heat transfer and reducing energy consumption.

[0039] The properties of the insulation material may help to withstand use in a stockroom environment and enable functionality. For example, the material's pliability may enable the material to fold along the pre-defined creases to expand and collapse. The durability, tear proof, and puncture resistant properties may prevent the container from becoming damaged and allowing air to escape. In some embodiments, liquids should not be able to penetrate the material, and therefore spilling liquids on the container may not damage it. The goal may be to encapsulate the air, so it should be impermeable to gases. In one example, the material is kept as thin as possible to reduce the thickness of the container once it may be collapsed. In one example, the material should be lightweight so it may be easily operated with minimal effort.

[0040] In one example, the level of thermal conductivity (R-value) of the insulation material may vary depending on the intended use of the container **100**. While higher R-value material may increase the container's effectiveness, relatively lower R-values may be sufficient in certain circumstances. For example, in refrigerated areas where doors may be frequently opened and closed, simply encapsulating the cold air and preventing it from escaping may reduce energy consumption.

[0041] It should be appreciated that although high reflectivity may increase energy savings, the container **100** may also be designed without this property. For example, a reflective foil may be an optional feature that can be added onto the exterior of the container **100**. However, the material may still be lightly colored to reflect some heat.

[0042] It should be appreciated that, although the durability, tear proof, and puncture resistant properties may not be essential for a container **100** to be effective, these properties may extend the useful life of the container **100** and may help maintain its effectiveness over time. Some level of durability may be required however, given that the container **100** may be used in rugged settings such as warehouses, storage rooms, walk-in freezers, and so on.

[0043] It should be appreciated that in order to encapsulate air, the material may need to be impermeable to gases. However, the material may not necessarily have to be impermeable to liquids. This may be desirable to prevent the container from becoming saturated or filled with liquid.

[0044] It should be appreciated that, although a thin and lightweight material may be most desirable for a user-friendly and cost-effective container **100**, any suitable weight or thickness of material may be used.

[0045] Referring again to FIG. **1**, the container **100** further includes an expanding and collapsing mechanism for facilitating the expanding, and collapsing of the container **100**. In one example, the expanding and collapsing mechanism includes a handle **108** in one example, the handle **108** may be attached to the front of the container **100** using a bond that may remain effective in sub zero temperatures.

[0046] In one example, as illustrated in FIG. **2**, the handle **108** may be a single strap which can flatten against the top of the valve **114**, described in more detail below, so it may not be in the way of inventory. The handle **108** may be made out of flexible material which can easily flatten and may be slightly wider than the width of a human hand.

[0047] The handle **108** may be used to turn a plate of a valve **114** to the opened or closed position in order to expand and collapse the container **100**. For example, to expand the container, the user may grab the handle **108**, pull outwards to expand the container, and then turn the handle **108** to close the valve **114**. To collapse the container, the user may grab the handle **108**, turn the handle **108** to open the valve **114**, and then push the container towards the wall. In one example, the handle may be turned 90 degrees, either to the right or to the left, to open the valve and 90 degrees to either the right, or to the left to close the valve.

[0048] It should be appreciated that, although a single handle **108** is described and illustrated, a container **100** may contain any suitable number of handles.

[0049] Referring again to FIG. **1**, the example expanding, mechanism of the container **100** further includes predefined creases **110**. In the example illustrated, the top wall **102**, the bottom wall, the left side wall **104**, and the right side wall include predefined creases **110**. Thus, when force is applied to the handle **108** either in a forward or reverse direction, the top wall **102**, the bottom wall, the left side wall **104**, and the right side wall either expand or collapse by folding, or unfolding along predefined creases **110**. FIG. **3**A illustrates a partially collapsed container **100** and FIG. **313** illustrates a fully collapsed container **100**.

[0050] In one example, the left side wall **104** and the right side wall may have predefined creases **110** in an X-shape, while the top wall **102** and the bottom wall may have a predefined crease **110** of a single line. The number of times the predefined crease **110** pattern repeats may depend on the size of the container **100**. For example, if the container's **100** depth may be less than or equal to both its height and width, the pattern may not have to repeat. However, if the container's **100** depth may be greater than its height or width, the pattern may need to repeat a minimum number of times. In particular, the number of times a pattern repeats may be determined by the following formula: The depth of the container **100** is divided by the lesser of the height or width of the container **100**, and rounded up to the nearest whole number. For example, if the container **100** is 3 feet wide, 2 feet tall, and 1 foot deep, the pattern may not have to repeat because it may be less deep than it may be wide or tall. However, if the container **100** is 1.5 feet wide, 2 feet tall, and 4 feet deep, the pattern may need to repeat at least 3 times (4/1.5=2.67 rounded up to 3). FIG. **4** illustrates an example container **400** with a repeating pattern of predefined creases **402**. In one example, the pattern may be designed to limit the number of creases, and it may repeat as few times as possible to limit the thickness of the collapsed container.

[0051] In one example, when a user collapses the container **100** by exerting force on the handle **108**, the insulation material may fold along the predefined creases **110** and fit neatly behind the front side **106**. This may prevent the insulation material on the sides from bundling and sticking out beyond the front side **106** and getting snagged.

[0052] Referring back to FIG. **1**, it should be appreciated that, although the example container **100** includes predefined creases **110** along the top wall **102**, bottom wall, left side wall **104**, and right side wall, any suitable combination of walls may include predefined creases **110**.

[0053] The container **100** further includes an anchoring and stabilizing mechanism **112** for securing the container **100** to a location inside a refrigeration system and preventing the container **100** from shifting when a force is applied to the handle **108**. FIG. **5**A illustrates the container secured on an example rack **502** in a refrigeration system with a stabilizing mechanism **112**. FIG. **5**B illustrates a dose-up view of the stabilizing mechanism **112**. As illustrated, the stabilizing mechanism **112** may be located on the outside of the lower back of the container **100** and may be attached to the back side **504** and the bottom of the container **100**. The stabilizing mechanism **112** may be centered between the left side **104** and the right and may be attached using a bond that may remain effective in sub zero temperatures.

[0054] In one example, as illustrated, the stabilizing mechanism **112** is a T-shaped, adjustable bracket with four sub-components, including a top vertical bar **506**, the bottom vertical bar **508**, the horizontal bar **510**, and a spring, push button **512**. The top vertical bar **506** may be a narrow, hollow, rectangular prism attached to the back **504** of the container **100**. There may be three equally-spaced holes **514**A-C in the top vertical bar **506** which are turned away from back side **504**. The diameters of the holes **514**A-C may be slightly larger than the outer diameter of the spring, push button **512**. The bottom vertical bar **508** may be a narrow, hollow, rectangular prism similar to the top vertical bar **506** and equal in length, but the outer dimensions may be equivalent to the inner dimensions of the top vertical bar **506**, allowing the bottom vertical bar **508** to tit inside the top vertical bar **506**. The bottom vertical bar **508** may have a small hole (not shown), and the spring, push button **512** may protrude from the hole. The distance from the top of the bottom vertical bar **508** to the hole may be the same distance from the top of top vertical bar **506** to the first of the three holes **514**A-C. The spring push button **512** may be a V-shaped mechanism, as illustrated in FIG. **5**C, which may be fastened to the inside of the bottom vertical bar **508** and may function like a spring which forces the button through the small hole. The horizontal bar **510** may be a flat strip which may be attached to the bottom side of the container **100**. In one example, the horizontal bar **510** is manufactured to be part of the top vertical bar **506**. In one example, the bottom end of the top vertical bar **506** is tapered smaller and the top of the bottom vertical bar **508** may be tapered larger. In one example, the length of each of the top vertical bar **506**, the bottom vertical bar **508**, and the horizontal bar **510** may depend on the size of the container **100**. In particular, larger containers **100** may require a larger stabilizing mechanism **112**.

[0055] The purpose of the stabilizing mechanism **112** may be to prevent the container **100** from pulling off the rack **502** or folding forward when the user pulls on the handle **108** to expand the container **100**. The bottom vertical bar **508** may be designed to hang behind the rack **502** that the container **100** may be sitting on to prevent the container **100** from moving forward. The top vertical bar **506** combined with the horizontal bar **510** may keep the back **504** of the container **100** perpendicular to the rack **502** so that it may not bend forward as the user pulls on the handle **108**. The user may operate the stabilizing mechanism **112** when setting, up the container **100** for the first time or moving it to a new location. The stabilizing mechanism **112** may start in the closed position, with the bottom vertical bar **508** inside of the top vertical bar **506**, and the button **512** may protrude from the top hole **514**A of the three holes **514**A-C in the top vertical bar **506**. The user may place the container **100** on the rack **502** against a wall, reach behind the container **100**, and push the button **512**. The bottom vertical bar **508** then drops down out of the top vertical bar **506** to secure the container **100**. The bottom vertical bar **508** may be lowered to either of the other two holes **514**B-C, but it may not fall out of the top vertical bar **506** due to the tapering of both. In one example, the bottom vertical bar **508** may be extended from the top vertical bar **506** prior to putting the container **100** on the shelf if there is enough room.

[0056] The container **100** further includes a valve **114** to allow air to enter the container **100**. In one example, the valve **114** is attached to the container **100** using a bond that may remain effective in sub zero temperatures. FIGS. **6**A-**6**D illustrate in more detail an example valve **114** in a closed position, an open position, a side view, and a cross-sectional side view respectively. The valve **114** comprises four subcomponents; the bottom plate **602**, the top plate **604**, the rim **606**, and the lip **608**. The bottom plate **602** is stationary, while the top plate **604** rotates on top of the bottom plate **602**, rotating within the rim **606** and secured in place by the lip **608**. The bottom plate **602**, as illustrated further in FIG. **7**A, can be a circular plate that contains two holes **702** and **704** opposite each other, and the outer diameter can be equivalent to the outer diameter of the rim **606**. The top plate **604**, as illustrated further in FIG. **7**B, can be shaped like a bow tie with two fins **706** and **708** opposite each other and larger than the two holes **702** and **704** in bottom plate **602**. The outer diameter of the top plate **604** can be equivalent to the inner diameter of the rim **606** minus a very slim margin. The rim **606**, as illustrated further in FIG. **7**C, may be a circular ring. The outer diameter of the rim **606** may be equivalent, to the outer diameter of the bottom plate **602**. The inner diameter of the rim **606** may be equivalent to the outer diameter of the top plate **604** plus a very slim margin. The depth of the rim **606** may be equivalent to the thickness of the top plate **604** plus a very slim margin. The lip **608**, as illustrated further in FIG. **7**D, may be a flat, circular ring. The inner diameter of the lip **608** may be smaller than the outer diameter of the top plate **604** and the outer diameter of the lip **608** may be larger than the outer diameter of the rim **606**. The bottom plate **602** may be attached to the rim **606**, with the rim **606** sitting on top of the bottom plate **602**. The lip **608** may be attached to the rim **606**, with the lip **608** sitting on top of the rim **606**. The top plate **604** may not be attached, but may be sandwiched between the bottom plate **602** and the lip **608**.

[0057] Each component may serve a specific purpose. For example, the bottom plate **602** may be the primary mechanism that allows air to enter and exit the container. The top plate **604** may be the mechanism that allows the valve to open and close. The rim **606** may provide the space thru the top plate **604** to rotate. The lip **608** may keep the top plate **604** flush against the bottom plate **602**. The hack. **610** of the lip **608** that protrudes beyond the other subcomponents may provide a surface where the front of the container **100** can attach.

[0058] The valve may be operated by turning the top plate **604** to either the opened or closed position. When expanding the container, the valve may be in the opened position with the fins **706** and **708** on the top plate **604** opposite the openings **702** and **704** in the bottom plate **602**. Once the container may be expanded, the top plate **604** may be turned **90** degrees to the closed position, with the fins **706** and **708** on the top plate **604** covering the openings **702** and **704** in the bottom plate **602** to prevent air from escaping. The user may be able to turn the top plate **604** using the handle **108**.

[0059] In one example, the front insulated wall **106** and the back insulated wall may comprise shifter insulated material as compared to the top insulated wall **102**, the bottom insulated wall, the left insulated wall **104**, and the right insulated wall, even though the properties may otherwise be similar. The stiffer insulation material on the front wall **106** and back wail may be used to provide stability to the container **100**. This may prevent the back wall and the from wall **106** from bending as the container **100** may be pulled outward. Without the stiffer material, the container's **100** form may become distorted.

[0060] In some embodiments, the valve **114** may be essential to the container **100** because it allows air to enter and exit the container **100** and may enable it to expand and collapse. Even if the container **100** may be designed to be stationary, it may need to be shipped in the collapsed position and then expanded.

[0061] In some embodiments, the top insulated wall **102**, the bottom insulated wall, the left insulated wall **104**, the right insulated wall, the front insulated wall **106**, and the back insulated wall are essential because they form the main body of the container **100** and help encapsulate air. However, it should be understood that six defined sides may not be essential because the container **100** may be designed in a variety of shapes, such as a cylinder requiring one continuous side wall with a top wall and a bottom wall, for example.

[0062] In some embodiments, the handle **108** may not be an essential component of the container **100**. It may enable the user to easily expand the container **100**, but this may also be achieved. In some embodiments by holding the front and the back of the container **100** and pulling them apart.

[0063] In some embodiments, the pre-defined creases **110** in the insulation material may not be essential to the container. Without the pre-creased material, the container **100** may still be expanded and collapsed. However, the material on the sides may not fold neatly behind the front wall **106**, resulting in material sticking beyond the sides and a thicker collapsed container **100**.

[0064] In some embodiments, the anchoring mechanism **112** may not be an essential component, but the lack of an anchoring mechanism **112** may make the container **100** less stable. Without the anchoring mechanism **112**, the user may hold the back of the container **100** in place while pulling on the handle **108**.

[0065] In some embodiments, having a front wall **106** and a back wall of the container **100** may be essential, but it may not be essential that, they are made with stiffer material. As long as the insulation material can maintain some form, the container **100** may still be effective at encapsulating air.

[0066] It should be appreciated that, although the example container **100** has been described herein as being used by placing, it on a rack or shelf in a refrigerator system, the example container **100** may be used in a variety of other types of environments and setups. Several models/variations to accommodate different applications of the product are described herein. Each model may be designed to encapsulate air for the purpose of reducing energy consumption, but depending on the space, the product may be placed on a shelf against the wall, placed on the floor against the wall, placed on the floor, suspended from the ceiling, or suspended from the underside of a shelf, for example. Customers may be able to choose which model best suits their needs. Each model may include, as previously described, a valve, insulation material, an expanding and collapsing mechanism, and an anchoring and/or stabilizing mechanism. However, the design of each of these components may vary to enable the differences in application methods,

[0067] FIG. **8** illustrates multiple shelf containers **100** placed side by side on a shelf or rack, as previously described. The container on the left is in the expanded position, and the container of the right is in the collapsed position.

[0068] FIG. **9** illustrates an example wall model container **900** placed against a wall on the floor and anchored to the wall. The wall model, container **900** may be designed to sit on the floor and stand parallel to any vertical wall, allowing inventory to be placed in front of it. When inventory is no longer present, the container **900** may be expanded to occupy the empty space. The wall model container **900** may comprise one expandable segment or multiple expandable segments at varying heights. When designed with multiple expanding segments, the upper segment(s) may expand when inventory, such as a single pallet, may be on the floor.

[0069] This application may lend itself to modifying various components of the container. The wall model container **900** may be larger than the shelf model container **100**, so the valve may be modified to allow more air to enter and exit the container. In addition, the anchoring and stabilizing mechanism may require modifications to provide structure and to prevent the container and/or individual segments from filling over. The expanding and collapsing mechanism may also provide structural integrity so that the top segment(s) may expand perpendicular to the wall and may not rest upon any inventory below. The wall model container **900** may utilize a combination of component modifications, such as different expanding and collapsing mechanisms or valves for each of the segments. For example, the lowest segment may use a different expanding and collapsing mechanism than the segment(s) above it.

[0070] FIG. **10** illustrates an example floor model container **1000** anchored to the floor. The floor model may be designed to rest flat, on the floor. It may be encased so that inventory may be placed on top of the container. When inventory is used and no longer resting on top the container, it may expand vertically to encapsulate the empty space.

[0071] The floor model container **1000** may also require some modifications. The valve may need to freely allow air to enter and exit when expanding and collapsing the container, or the valve may need to collapse as part of one of the sides. In addition, the floor model container **1000** may require modifying the expanding and collapsing mechanism to expand and collapse the container vertically with limited effort. The anchoring and stabilizing mechanism may comprise a frame that may provide structural integrity and a hard, exterior case. The case may enclose the entire container when fully collapsed and hold the weight of inventory placed on top In one example, the floor model container **1000** may not be anchored to the floor, so it can be easily moved,

[0072] FIG. **11** illustrates an example ceiling model container **1100**. The ceiling model container **1100** may attach to the ceiling and expand downward toward the floor. This model may be expanded to any desired height based on inventory levels or other layout requirements.

[0073] The ceiling model container **1100** may also require some modifications. The valve and expanding/collapsing mechanism may be modified so they may be operated by someone standing on the floor. The anchoring and stabilizing mechanism may be modified so that the container can be temporarily or permanently secured to the ceiling.

[0074] FIG. **12** illustrates an example suspended shelf model container **1200**. The suspended shelf model container **1200** may hang from the underside of a shelf, expanding downward based on inventory levels. The suspended shelf model container **1200** may be used for shelves that are not set against a wall, and inventory may be pulled from either side of the she If.

[0075] The valve, expanding/collapsing mechanisms, and anchoring and stabilizing mechanisms of the suspended shelf model container **1200** may be modified similarly to the way the valve, expanding/collapsing mechanisms, and anchoring and stabilizing mechanisms of the ceiling model container **1100** may be modified.

[0076] It should be appreciated that there may be a variety of suitable designs that may achieve the objective of the valve and that the valve may be positioned in a variety of locations on the container and range in size depending on the model and overall container size. For example, a slit valve **1310**, as illustrated in FIG. **13**A, may include multiple cuts in the valve material which may allow air to pass through. In one example, the valve material may be the insulation material and the slit valve **1310** may include cuts in one of the sides. In another example, the valve material may be a mesh-like material that contains many small holes that allow air to pass in and out of the container. The slit valve **1310** may operate to allow air to enter as the container may be expanded and to allow air to exit as the container may be collapsed. This design may be cost effective and may require no additional effort to operate the valve.

[0077] The slit valve **1310** may be a cost-effective option for all models, but may be most likely used for the ceiling model **1100**, the floor model **1000**, or suspended shelf model **1200**. For the ceiling model **1100** and the floor model **1000**, this may be a potential option because the user may not be able to reach the valve if the valve was on the top the slit valve **1310** was located on the bottom of the suspended shelf model **1200**, it may be blocked when the container was expanded and resting, on the shelf.

[0078] A flap valve **1320**, as illustrated in FIG. **138**, may be designed to open and close like a door. In one example, the flap valve **1320** may swing freely. In one example, the flap valve **1320** may seal with a zipper. Velcro®, magnets, or with another suitable sealing mechanism. In one example, the flap valve **1320** may be made up of the same insulation material as the container wails. In another example, the flap valve **1320** may be made of a different material as compared to the container walls.

[0079] The flap valve **1320** design may be another cost-effective option for all models. For example, for the shelf model container **100** and wall model container **900**, the flap valve **1320** may be placed on the front of the container. For the floor model container **1000** and the suspended shelf model container **1200**, the flap valve **1320** may be built into one of the sides and fold with the container. For the ceiling model container **1100**, the flap valve **1320** may be located on the bottom.

[0080] A sliding valve model **1330**, as illustrated in FIG. **13**C, may be designed like a sliding window, moving vertically or horizontally. The sliding valve **1330** may slide open to allow air to enter and exit, and it may slide shut to prevent air from escaping once the container is expanded. The sliding valve **1330** may open and close when pressure is applied by an operator, thus creating a pathway for air flow. In one example, the sliding valve **1330** may be made of a stiff material, likely a form of plastic.

[0081] The turning valve model **114**, as illustrated in FIG. **13**D, and as described earlier, may incorporate threads to twist shut like a bottle cap in one example. In addition, the top plate **604** and the bottom plate **602** of the turning valve model **114** may be held together using a C-shaped rim that wraps around both plates, where the bottom plate may be secured to the rim.

[0082] An air pump valve model **1350**, as illustrated in FIG. **13**E, includes a valve **1352**, a pump (not shown), and a secondary opening **1354**, the pump, which may be either a manual or a motorized pump, may push air through the valve **1352** when the operator decides to inflate the container. As air pressure builds in the containment space, the container may expand. A sealable, secondary opening **1354** may allow the operator to easily open the containment space and allow air to escape. In one example, the valve **1352** may be designed to also allow air to escape through the valve **1352**, causing the container to collapse.

[0083] It should be appreciated that, although an example expanding, and collapsing mechanism has been described to include predefined creases and a handle, other suitable expanding and collapsing mechanisms may be used. For example, a pull string expanding and collapsing mechanism **1402**, as illustrated in FIG. **14**, may be used to raise and lower the container similar to window blinds. The pull string mechanism **1402** may allow the user to raise and lower the container to the desired height. Specifically, pulling on the strings may collapse/raise the container, and releasing the strings may expand/lower the container. A locking mechanism (not shown) may enable the container to stay at a desired height.

[0084] In one example, a mechanical arm may extend to expand and retract to collapse the container, while providing structural integrity. FIGS. **15**A-**15**D illustrate several example mechanical arms **1502**, **1504**, **1506**, and **1508**, respectively. The mechanical arm design may be most effective for the wall model container **900**, especially wall models with multiple segments. The wall model container **900** may be larger, and higher segments may not be able to rest on the floor. Therefore, the insulation material may be supported by the mechanical arm, allowing the container to expand perpendicular to the walk There may be multiple design options for the arm itself For example, the mechanical arm may be operated by hand with a handle or hand crank or it may be motorized. For models and segments that are easily reached, the user may expand and collapse the container using the valve and handle, and the mechanical arm may expand and collapse with the container as the user pulls and pushes, for example. If the handle is too high, it may be reached using a specially designed pole and hook. The hand crank and motorized versions may enable the user to expand and collapse the container even in hard to reach situations.

[0085] In one example, as illustrated in FIG. **16**, connecting poles **1602** located inside the container may enable the container to expand and lock into the expanded position similar to poles used to erect pop-up tents. The poles **1602** may lock into place providing structural integrity for the container when expanded. To collapse the container, the user may apply force to the poles **1602**, thus allowing the container to collapse.

[0086] In one example, as illustrated in FIG. **17**, wheels **1702** may be incorporated into a container to improve ease of use. The wheels **1702** may be located on the bottom segment, on the front of the container that pulls outward, and may prevent the bottom of the container from sliding across the floor as it is expanded and collapsed. In one example, the wheels **1702** may also allow the container to be rolled to a different location.

[0087] In one example, a container may be designed without an expanding and collapsing mechanism. Any of the models may be designed without an expanding/collapsing mechanism. For example, a container may be shipped in the collapsed position (e.g., disassembled, deflated, or folded). The user may then need to set up the container. This design may be used when there may be constantly unused space, such as a cold room that may never be more than half full at any time.

[0088] It should be appreciated that, although an example anchoring and stabilizing mechanism has been described, other suitable anchoring and stabilizing mechanisms may be used to prevent the container from moving freely and to provide structural integrity for the container. For example, an adhesive **1802**, as illustrated in FIG. **18**A, may be a cost-effective way to anchor a container into a fixed position. The adhesive **1802** may need to function in sub zero temperatures and may be removable.

[0089] In one example, magnets **1804**, illustrated in FIG. **18**B, may be used to anchor a container into a fixed position. Magnets **1804** may be used in a cooler, in a freezer, or on a shelving unit with metal walls or ceilings.

[0090] In one example, suction cups **1806**, illustrated in FIG. **18**C, may be used to anchor a container into a fixed position. The suction cups **1806** ma need to work in sub zero temperatures and maintain suction when the user expands and collapses the container.

[0091] A T-bracket **1808**, illustrated in FIG. **18**D, may include other suitable designs in addition to the design previously described. For example, the T-bracket **1808** may not need to have a spring, push button. Instead, it may use a track mechanism that may allow the T-bracket **1808** to slide flush with the container.

[0092] In one example, as illustrated in FIG. **18**E, installation brackets **1810** may secure a container to walls, shelving units, or to other objects.

[0093] In one example, as illustrated. In FIG. **19**, an enclosed case **1900** may be specifically designed for the model that may be placed on the floor. It may be approximately pallet-sized, for example, and may be sturdy enough to hold pallets containing inventory on top. The entire container may collapse and may be enclosed in the case **1900** when collapsed. In one example, a lighter design of the enclosed case **1900** may be applied to other models to protect the front and sides of the container from damage.

[0094] In one example, as illustrated in FIGS. **20**A-C, a frame or supporting structure may be used for any of the container models. A frame may contain the mechanical arm and may help the container maintain form. In one example, a kickstand **2002**, as illustrated in FIG. **201** may keep the wall unit from tipping, forward. In one example, an L-bracket **2004**, as illustrated in FIG. **20**B may keep the wall unit from tipping forward. In one example, as illustrated in FIG. **20**C, frame **2006** may be a double frame to provide structural form for the container, in one example, a frame may ship disassembled, and, therefore, the user may assemble the frame and container.

[0095] It should be appreciated that a container may be produced in any size, although there may be several standard sizes based on the standard North American pallet, size or based on standard ceiling heights, for example.

[0096] It should further be appreciated that, although the examples described herein illustrate a cubed or prism-shaped container, a container may be produced in any suitable three-dimensional shape. For example, a container may be shaped in the form of a cylinder, a cone, a hexagonal prism, a dome with pendentives, a sphere, a hemispherical dome, a square pyramid, a triangular pyramid, or a triangular prism.

[0097] In one example, a container may be filled with a variety of materials to make it more effective. In particular, filling a container with material may reduce heat transfer more effectively.

[0098] In one example, as illustrated in FIG. **21**, a container may be designed with a grid structure **2100** incorporated into the product. Creating air pockets may increase the effectiveness of the container by reducing heat transfer. A grid structure **2100** may most likely be employed in larger sized container models. For example, a wall model may be designed to be the size of a room. Although only one container may be operated, the grid structure **2100** would effectively create multiple, smaller containment spaces which may encapsulate air and reduce heat transfer more effectively. The grid structure **2100** may allow air to enter and escape each containment space when expanding and collapsing the container. In particular, this can be accomplished with breathable material or multiple slit valves within the container.

[0099] In one example, a container may be designed to include organizational methods to distinguish between container or space types. For example, containers may be designed in different colors or may include easy labeling features. These features may enable users to more easily make certain distinctions such as to distinguish between sizes, insulation material, inventory replaced by the container, and so on.

[0100] In one example, the expanding and collapsing function of a container may be automated using a mechanical or electronic controller or similar mechanism. This may include the use of a remote, panel, switch, fluidic valve, etc, to operate the container. A container may also include sensor technology, which may enable the container to operate based on a set time schedule, movement of people within the space, the absence or presence of objects in the room, an increase or decrease in the amount of occupied space in the room, air flow optimization, use of a light switch, and so on.

[0101] In one example, multiple containers may be connected together by any means to form a system. For example, multiple ceiling models may be placed on the ceiling, connected to one another, to cover all or a portion of the ceiling.

[0102] It should be appreciated that, although the examples described herein refer to containers being used in cooled spaces to reduce the amount of energy required to cool a space, example containers described may also be applied to heated spaces to reduce the energy required to heat the area.

[0103] To the extent that the term "includes" or "including" is used in the specification or the claims, it is intended to be inclusive in a manner similar to the term "comprising" as that term is interpreted when employed as a transitional word in a claim. Furthermore, to the extent that the term "or" is employed (e.g., A or B) it is intended to mean "A or B or both." When the applicants intend to indicate "only A or B but not both" then the term "only A or B but not both" will be employed. Thus, use of the term "or" herein is the inclusive, and not the exclusive use. See, Bryan A. Gamer, A Dictionary of Modem Legal Usage **624** (**2**d Ed. **1995**). Also, to the extent that the terms "in" or "into" are used in the specification or the claims, it is intended to additionally mean "on" or "onto." Furthermore, to the extent the term "connect" is used in the specification or claims, it is intended to mean not only "directly connected to," but also "indirectly connected to" such as connected through another component or components.

[0104] While the present application has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicants to restrict, or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the application, in its broader aspects, is not limited to the specific details, the representative apparatus and method, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the applicant's general inventive concept.

What is claimed:

1. A container for reducing energy consumption by encapsulating air space in a climate-controlled environment, the container comprising:

a valve for enabling air to move between the inside of container and the outside of the container;

an anchor for securing the container inside the climate-controlled environment;

at least one insulated wall; and

an expanding and collapsing mechanism for facilitating the expanding and collapsing of the container when air moves between the inside of the container and the outside of the container.

2. The container of claim **1**, wherein the expanding and collapsing mechanism comprises at least one of a handle, a predefined crease on the at least one insulated wall, a pull string, a mechanical arm, a connecting pole, and a wheel.

3. The container of claim **2**, wherein the container is configured to one of expand or collapse along the predefined crease responsive to a force being applied to one of the handle, the pull string, the mechanical arm, the connecting pole, and the internal walls of the container to move air between the outside of the container and the inside of the container.

4. The collapsible container of claim **1**, wherein the climate-controlled environment is one of a cooled environment and a heated environment

5. The container of claim **1**, wherein the at least one insulated wall comprises a top insulated wail, a bottom insulated wall, a left insulated wall, a right insulated wall, a front insulated, wall, and a back insulated wail.

6. The container of claim **5**, wherein two opposing walls selected from the top insulated wall, the bottom insulated wall, the left insulated wall, the right insulated wall, the front insulated wall, and the back insulated wall comprise a stiffness greater than the stiffness of the remaining walls.

7. The container of claim **1**, wherein the valve comprises one of a turning valve, a slit valve, a flap valve, a sliding valve, and a pump valve.

8. The container of claim **1**, wherein the valve comprises:

a stationary bottom plate comprising at least one opening;

a rim extending around the bottom plate;

a top plate configured to rotate within the rim and on top of the bottom plate; and

a lip to secure the top plate within the rim and above the bottom plate;

wherein the valve is configured to allow air to move through the at least one opening when the top plate is in an open position and to prevent air from moving through the at least one opening when the top plate is in a closed position.

9. The container of claim **1**, wherein the at least one insulated wall comprises insulation material comprising at least one of low thermal conductivity and high reflectivity.

10. The container of claim **1**, wherein the anchor comprises one of an adjustable-shaped bracket, a magnet, an adhesive, an installation bracket, and a suction cup.

11. The container of claim **1**, wherein the container further comprises a frame for providing structural form for the container.

12. The container of claim **1**, further comprising a controller configured to collapse or expand the container.

13. The container of claim **12**, Wherein the controller is further configured to automatically collapse or expand the container according to one of a predefined time schedule, operation of a light switch, an occupancy sensor configured to determine inventory levels, an occupancy sensor configure to detect the movement or people, and a sensor configured to optimize air flow.

14. The container of claim **1**, further comprising a grid structure comprising, a plurality of air pockets.

15. The container of claim **1**, further comprising a plurality of containers disposed as a system.

16. A method for reducing the amount of energy required to control a temperature inside a climate-controlled environment, comprising the steps of:

disposing an insulated contain to the inside of a temperature-controlled environment;

operating a valve, configured to allow air to move between the inside of the container and the outside of the container, to an open position;

facilitating movement of air into the insulated expandable container until the insulated expandable container reaches a desired size; and

operating the valve to a closed position.

17. The method of claim **16**, wherein the step of facilitating movement of air into the insulated container comprises operating an expanding mechanism

18. The method of claim **17**, wherein operating the expanding mechanism causes at least one wall to unfold along a predefined crease.

19. The method of claim **16**, further comprising the step of securing a plurality of insulated expandable containers to the inside of a temperature-controlled environment and connecting the plurality of insulated expandable containers to form a system of containers.

20. The method of claim **16**, wherein the step of disposing the insulated expandable container to the inside of the temperature-controlled environment comprises securing the insulated expandable container to one of a ceiling, a floor, a wall, and a rack.

* * * * *