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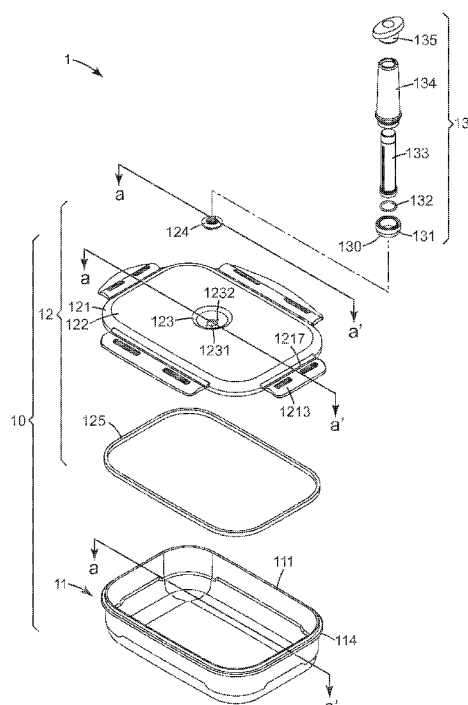


Fig. 1

(57) Abstract: Disclosed is a vacuum container, its cap and a vacuum container assembly. The vacuum container assembly comprises a vacuum container and an air extraction device. The vacuum container comprises a vessel and a cap, which jointly define a containment space. The vessel has an upper edge, and the cap comprises a first portion, a second portion, a third portion, and an air valve. The first portion accommodates the upper edge of the vessel. The second portion can be deformed under an external force and be restored to its original shape upon removal of the external force. The third portion and the first portion jointly surround the second portion, and the third portion is equipped with an air valve. The air extraction device comprises an opening, which is fitted with the third portion of the cap. The ratio between the thickness of the third portion adjacent to the second portion T2 and the thickness of the second portion of the cap adjacent to the third portion T1 (T2/T1) is at least equal to or greater than 1.1. Air inside the containment space is evacuated through the third portion by exerting an external force on the second portion and/or by driving the air valve with the air extraction device.



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VACUUM CONTAINER, CAP, AND VACUUM CONTAINER ASSEMBLY

Technical field

The present disclosure relates to a vacuum container, its cap, and a vacuum container assembly, and particularly relates to a vacuum container, a cap of the vacuum container, and a vacuum container assembly, in which a vacuum can be created optionally by manual pressing and/or using a vacuum extraction device.

Background

Currently, there are some types of vacuum containers for which a vacuum can be created in its containment space by evacuating air from the space with an additional device or object in order to preserve substances, such as the vacuum containers disclosed in the following patents: EP1714910A1, CN2406951Y, US20120006853A1, US7246555B2, CN200620138824.6 and US5651470. These vacuum containers need complicated air extraction devices which are provided and operated separately, such as the vacuum containers disclosed in CN2406951Y, US7246555B2, and CN200620138824.6. In the event that a user does not have such a device at hand, it would be impossible for the container to reach a vacuum state.

In order to solve the above problems, there are also techniques to create vacuums in the container by manual pressing, such as the technical solutions disclosed in the following patents: CN2815939Y, CN2293200Y, CN101125598A, CN2322924Y, CN2255958Y, and CN1429748A. However, the air volume evacuated by manual pressing the mechanism is limited; in other words, these containers are unable to reach a desired vacuum state.

Summary

The present disclosure provides a vacuum container, a cap of the vacuum container, and a vacuum container assembly. The structure of the cap of the vacuum container is designed to provide both options to extract air by manual pressing and by using a vacuum extraction device to overcome the disadvantages of current vacuum containers that cannot provide users with the options to extract air inside the containment space of the vacuum container by manual pressing and/or using a vacuum extraction device according to their needs. The cap of the vacuum container is also designed to take into consideration both the structural strength of the cap and its operational convenience by manual pressing.

One embodiment a vacuum container comprises a vessel and a cap, wherein the vessel has an upper edge; the cap defines a containment space jointly with the vessel, and comprises a first portion, a second portion, a third portion, and an air valve. The first portion accommodates the upper edge of the vessel. The second portion can be deformed under an external force and be restored to its original shape upon removal of the external force. The third portion and the first portion jointly surround the second portion, and the third portion is equipped with an air valve. The thickness of the second portion of the cap adjacent to the third portion is T1 and the thickness of the third portion adjacent to the second portion

is T2, wherein $T2/T1$ is at least equal to or greater than 1.1. Air inside the containment space is evacuated by exerting an external force on the second portion and/or the third portion to create vacuum inside the containment space.

In one embodiment, the second portion is tilted upwards from the first portion to the third portion, and there is an obtuse angle between the third portion and the second portion.

In one embodiment, the thickness of the second portion of the cap is gradually reduced from the first portion to the third portion.

In one embodiment, the third portion of the cap further comprises a through-hole, in which an air valve is mounted, and the thickness of the third portion is gradually reduced from the second portion to the through-hole.

In one embodiment, the third portion of the cap further comprises vent holes, and the air valve comprises a knob, a first retaining disc, a cylindrical rod, a second retaining disc, and an air passageway, wherein the cylindrical rod penetrates through the through-hole and allows the air valve to be mounted on the third portion by means of the first retaining disc and the second retaining disc, and the vent holes are covered by the first retaining disc.

In one embodiment, the first portion of the cap further comprises an engaging portion, an extended portion and a pivot joint, wherein the engaging portion includes a groove, corresponding to the upper edge of the vessel, and the extended portion is extended outwards from the engaging portion and includes a snap-in element, and the pivot joint links the engaging portion and the extended portion together and has at least one through-hole.

In one embodiment, the cap further comprises a gasket, contained in the groove of the engaging portion of the first portion.

In one embodiment, the engaging portion of the first portion of the cap further comprises a notch, through which the gasket is exposed.

In one embodiment, the snap-in element of the extended portion of the first portion of the cap comprises a first section and a second section, which are basically perpendicular to each other.

In one embodiment, the vessel comprises a protruding edge, which is provided on the side wall of the vessel and is fitted with the snap-in element of the cap and has an engaging groove to accommodate the second section of the snap-in element of the cap.

Another embodiment of disclosure provides a vacuum container assembly, which can evacuate air to reach a vacuum state and comprises a vacuum container and an air extraction device. The vacuum container comprises a vessel and a cap, the vessel having an upper edge, and the cap defining a containment space jointly with the vessel and comprising a first portion, a second portion, a third portion, and an air valve. The first portion accommodates the upper edge of the vessel. The second portion can be deformed under an external force and can be restored to its original shape upon removal of the external force. The third portion and the first portion jointly surround the second portion, and the third portion is equipped with an air valve. The air extraction device comprises an opening, which is basically fitted with the third portion of the cap, wherein the thickness of the second portion of the cap adjacent to the third

portion is T1 and the thickness of the third portion adjacent to the second portion is T2, wherein $T2/T1$ is at least equal to or greater than 1.1. Air inside the containment space is evacuated through the third portion to create a vacuum inside the containment space by exerting an external force on the second portion and/or by driving the air valve with the air extraction device.

Another embodiment of the present disclosure comprises a cap, used to seal a vessel, comprising a first portion, a second portion, a third portion, and an air valve. The second portion can be deformed under an external force and can be restored to its original shape upon removal of the external force. The third portion and the first portion jointly surround the second portion, and the third portion is equipped with an air valve, wherein the thickness of the second portion of the cap adjacent to the third portion is T1 and the thickness of the third portion adjacent to the second portion is T2, wherein $T2/T1$ is at least equal to or greater than 1.1.

Brief descriptions of the figures

Figure 1 is an exploded view of an embodiment of the vacuum container assembly of the present invention.

Figure 2 is a cross-sectional view of the vessel at a-a' as shown in Figure 1.

Figure 3 is a cross-sectional view of the cap at a-a' as shown in Figure 1.

Figure 3a is a structural sketch of the details of the second and third portions of the cap as shown in Figure 3.

Figure 4 is a cross-sectional view of the air valve at a-a' as shown in Figure 1.

Figure 5 is a cross-sectional sketch of the vacuum container assembly of the present invention.

Figure 6 is a sketch showing the movement of the air valve during air extraction of the vacuum container assembly of the present invention.

Detailed description

Figure 1 is an exploded view of an embodiment of the vacuum container assembly 1. As shown in Figure 1, the vacuum container assembly 1 comprises a vacuum container 10 and an air extraction device 13. The vacuum container 10 comprises a vessel 11 and a cap 12. The vessel 11 has an upper edge 111, and the cap 12 and the vessel 11 jointly define a containment space 14. The cap 12 comprises a first portion 121, a second portion 122, a third portion 123, and an air valve 124. The first portion 121 can accommodate the upper edge 111 of the vessel 11. The second portion 122 can be deformed under an external force F1 and be restored to its original shape upon removal of the external force. The third portion 123 and the first portion 121 jointly surround the second portion 122, and the third portion 123 is equipped with an air valve 124. The extraction device 13 comprises an opening 130, which is basically fitted with the third portion 123 of the cap 12.

Figure 2 is a cross-sectional view of the vessel at a-a' as shown in Figure 1. The vessel 11 has a bottom 112 and a side wall 113 extended upwards from the bottom 112. The upper edge 111 of the vessel 11 is an edge opposite to a lower edge connecting the side wall 113 and the bottom 112. In this

embodiment, the vessel is a rectangular structure, and the upper edge 111 of the vessel 11 can also be a rectangle. However, it can be understood that there are no special restrictions to vessel 11's shape. In other words, the vessel 11 of the present invention can be in any shape having a capacity of accommodation, such as a cylinder or triangular prism, and the shape of the bottom 112 may be different from the shape of the opening defined by the upper edge 111. Moreover, the vessel 11 comprises a protruding edge 114, which is provided on the side wall 113 near the upper edge 111, and is extended from the side wall 113 in a direction approximately parallel to the bottom 112, and its free end is bended towards the bottom 112 to form an engaging groove 115. In this embodiment, the protruding edge 114 continuously surrounds the side wall 113. However, in other embodiments, the protruding edge 114 may be discontinuously provided on the side wall 113.

Figures 3 and 4 are cross-sectional views of the cap and its air valve respectively at a-a' as shown in Figure 1. The cap 12 can completely cover the opening of the vessel 11 to define a containment space 14 jointly with the vessel 11. In this embodiment, both the vessel 11 and the cap 12 may be made of plastic materials, such as polypropylene (PP), but are not limited to such a material. The cap 12 comprises the first portion 121, the second portion 122, the third portion 123, and the air valve 124. The three portions from the first portion 121 to the third portion 123 are sequentially arranged inwards from the outer edge of the cap 12. In this embodiment, the three portions from the first portion 121 to the third portion 123 of the cap 12 provide different functions respectively, and any two adjacent two portions are divided by a boundary at a clearly bent position on the upper and lower surfaces of the cap 12. However, it should be understood that the boundaries between various portions of the 12 cap are not restricted to the afore-mentioned borders.

The first portion 121 of the cap 12 is mainly functioned to contact the vessel 11 and to maintain the shape and structural strength of the cap 12 as a rigid frame. The first portion 121 of the cap 12 further comprises an engaging portion 1211, an extended portion 1213 and a pivot joint 1215. The engaging portion 1211 has a groove 1212, which is corresponding to the upper edge 111 of the vessel, so that the cap 12 can accommodate the upper edge 111 of the vessel 11 to define the containment space 14 (as shown in Figure 5). In addition, the engaging portion 1211 contains a sufficiently rigid material to support the cap 12 and avoid deformation of the cap 12 when the containment space 14 comes under vacuum, which would affect air tightness between the cap 12 and the vessel 11. In some embodiments, the cap 12 can also include a sealing gasket 125, which is, but not limited to, e.g., an elastic hollow rubber sealing gasket. The sealing gasket 125 can be accommodated in the groove 1212 at the engaging portion 1211 of the first portion 121, and the engaging portion 1211 includes a notch 1214, which is provided along the wall of the groove 1212 so that the sealing gasket 125 is partially exposed at the notch and user can easily take out the sealing gasket 125 from the groove 1212. The extended portion 1213 is extended outwards from the engaging portion 1211. In this embodiment, the cap is in a rectangular shape and includes four extended portions 1213 extended respectively from the four sides of the cap 12 to form four protruding wings. However, the number and design of the extended portions 1213 are not limited thereto. For example, in some embodiments, the rectangular cap can be equipped with the extended portions only

on two opposite sides. The extended portions 1213 have a snap-in element 1216, and the snap-in element 1216 includes a first section 1216a and a second section 1216b, wherein the first section 1216a is connected to the extended portion 1213, and the second section 1216b is a free end and is essentially vertical to the first section 1216a. The pivot joint 1215 is located between the engaging portion 1211 and the extended portion 1213 to connect the engaging portion 1211 and the extended portion 1213, and the thickness of the pivot joint 1215 is less than that of the extended portion 1213 so that the extended portion 1213 can pivot around the pivot joint 1215 relative to the engaging portion 1211. Furthermore, the pivot joint 1215 has a through-hole 1217. In this embodiment, there is at least one through-hole 1217 corresponding to the pivot joint 1215 of each extended portion 1213 to facilitate rotation of the extended portion 1213 relative to the engaging portion 1211 by means of the through-hole 1217.

In Figure 3, the second portion 122 of the cap 12 is situated between the first portion 121 and the third portion 123, and has sufficient flexibility. The second portion 122 can be temporarily deformed under an external force F1 and be restored to its original shape upon removal of the external force to function as a press portion of the cap. In this embodiment, the proportion of the second portion 122 relative to the cap 12 is larger than the proportion of the first portion 121 and the third portion 123 relative to the cap 12, and the second portion 122 is tilted upwards from the first portion 121 to the third portion 123. In other words, the portion of the second portion 122 near the center of the cap 12 is higher than the portion of the second portion 122 near the edge of the cap 12. Moreover, the thickness of the second portion 122 adjacent to the third portion 123 is T1. The term “adjacent” as used herein means “near”, “nearby” or “adjoining”. In other words, the thickness of the second portion 122 near the third portion 123 is T1 (as shown in Figure 3a). Moreover, in this embodiment, the thickness of the second portion 122 may be gradually reduced in a tiny degree from the first portion 121 to the third portion 123. In other words, the second portion 122 gradually becomes thinner and thinner from the outer edge to the center of the cap 12 to provide a better feel when it is pressed. However, it should be understood that there are no restrictions to the thickness of the second portion 122 as long as it can be pressed by a user and be temporarily deformed under an external force F1 and be restored to its original shape upon removal of the external force F1.

The third portion 123 of the cap 12 is situated approximately in the center of the cap 12, and the third portion 123 and the first portion 121 jointly surround the second portion 122 to provide sufficient rigidity to support the second portion 122 of the cap 12 and provide a space for mounting an air valve 124. In this embodiment, the third portion 123 comprises a through-hole 1231 and vent holes 1232, wherein the through-hole 1231 is essentially situated in the center of the third portion 123, and the vent holes 1232 are provided around the through-hole 1231. In this embodiment there are two vent holes 1232, but there is no restriction to the number of the vent holes. Moreover, there is an obtuse angle A between the third portion 123 and the second portion 122. The third portion 123 is declined from the second portion 122 to the through-hole 1231, i.e., the portion of the third portion 123 near the center of the cap 12 is relatively lower than the portion near the edge of the cap 12, so that the third portion 123 is approximately in a shape of a bowl. The thickness of the third portion 123 adjacent to the second portion 122 is T2. The

tern “adjacent” as used herein means “near”, “nearby” or “adjoining”. In other words, the thickness of the third portion 123 near the second portion 122 is T2 (as shown in Figure 3a). Moreover, the thickness of the third portion 123 may optionally be gradually reduced by minute degrees from the second portion 122 to the through-hole 1231. In other words, the third portion 123 gradually becomes thinner and thinner from the outer edge to the center of the cap 12. In this embodiment, the ratio of the thickness T2 of the third portion 123 adjacent to the second portion 122 to the thickness T1 of the second portion 122 adjacent to the third portion 123 is at least equal to or greater than 1.1. For example, the ratio of T2/T1 can be 1.10, 1.15, 1.20, 1.25, 1.30, 1.35, 1.39, 1.40, 1.45, 1.50, 1.55, or 1.60, but not limited to these numbers.

The air valve 124 comprises a knob 1241, a first retaining disc 1242, a cylindrical rod 1243, a second retaining disc 1244, and an air passageway 1245. The first retaining disc 1242 is approximately the shape of an umbrella, which is flexible and can be deformed. The cylindrical rod 1243 is situated between the first retaining disc 1242 and the second retaining disc 1244, with a height approximately equal to the thickness of the third portion of the cap 12 near the circumference of the through-hole 1231. In this embodiment, the second retaining disc 1244 can be a plurality of protrusions extended from the cylindrical rod 1243 in a radial pattern, thus the air valve 124 can be mounted on the third portion 123 of the cap 12 by means of the first retaining disc 1242 and the second retaining disc 1244 (as shown in Figure 5). The air passageway 1245 is extended through the second retaining disc 1244 and the cylindrical rod 1243 to reach the lower edge of the first retaining disc 1242, but not reaching the outer edge of the first retaining disc 1242. Therefore, when the air valve 124 is mounted at the through-hole 1231 of the third portion 123 of the cap 12, the air passageway 1245 can be connected to the containment space 14, but cannot be connected to the outside. In this embodiment, the air valve 124 can be made of elastic materials such as, but not limited to, rubber.

Figure 5 is a cross-sectional sketch of the vacuum container assembly. As shown in Figure 5 with reference to Figures 2-4, the cylindrical rod 1243 of the air valve 124 of the cap 12 penetrates through the through-hole 1231 of the third portion 123, and allows the air valve 124 to be mounted on the third portion 123 of the cap 12 by means of the first retaining disc 1242 and the second retaining disc 1244. The vent holes 1232 on the third portion 123 are covered by the first retaining disc 1242 of the valve 124. When the vessel 11 is covered by the cap 12, the upper edge 111 of the vessel 11 can be accommodated accordingly by the groove 1212 of the first portion 121, and the extended portion 1213 can pivot around the pivot joint 1215 towards the side wall 113 so that the snap-in element 1216 of the extended portion 1213 can approach the protruding edge 114 of the vessel 11, and the second portion 1216a of the snap-in element 1216 can be inserted in the engaging groove 115 of the protruding edge 114 of the vessel 11 so that the cap 12 can be tightly engaged with the vessel 11. Moreover, in some embodiments, since the cap 12 has a sealing gasket 125, the air tightness between the cap 12 and the vessel 11 can be improved by means of the sealing gasket 125.

The air extraction device 13 comprises a first sleeve 131, a gasket 132, a rod element 133, a second sleeve 134 and a grip handle 135, wherein the second sleeve 134 is a hollow tube, which can

accommodate the gasket 132 and the rod element 133. The outer wall of rod element 133 and the inner wall of second sleeve 134 define a gap 136. The grip handle 135 can be connected with the rod element 133 and partially emerged at the end opposite to the other end where the second sleeve 134 and the first sleeve 131 are connected. The first sleeve 131, which is also a hollow tube and preferably made of a soft material, can be assembled with the second sleeve 134. In addition, the opening 130 of the first sleeve 131 of the air extraction device 13 is fitted with the third portion 123 of the cap 12. In other words, the cross-sectional profile of the first sleeve 131 in the vertical axial direction approximately matches the profile of the third portion 123 of the cap 12 so that the first sleeve 131 can form a continuous and uninterrupted interface with the third portion 123 of the cap 12, and can set around the air valve 124, which is mounted on the third portion, at the opening 130.

Figure 6 is a sketch showing the movement of the air valve during air evacuation of the vacuum container assembly of the present invention. When a user chooses to create a vacuum manually in the vacuum container 10, the user can exert an external force F1 on the second portion 122 of the cap 12. In other words, the user can push down the second portion 122 towards the bottom 112 of the vessel 11, so that the air inside the containment space 14 can be pressurized and released from the containment space 14 through the air passageway 1245 of the air valve 124 (as shown by the dotted line and arrow in Figure 6) while slightly pushing up the first retaining disc 1242. When the external force F1 is removed, the first retaining disc 1242 resumes its original shape and blocks the connection between the air passageway 1245 and the atmosphere outside of the containment space 14. Therefore, the air outside the containment space 14 is unable to enter the containment space 14 so that vacuum is created inside the containment space 14. The second portion 122 of the cap 12 is surrounded by the first portion 121 and the third portion 123, and the first portion 121 is made of a sufficiently rigid material. The thickness T2 of the third portion 123 near the second portion 122 is basically greater than the thickness T1 of the second portion 122 near the third portion 123. Therefore, the third portion 123 has sufficient structural strength not only to help support the second portion 122, but also to avoid deformation of the third portion 123 and failure of tight fitting of the opening 130 of the air extraction device 13 with the third portion 123 of the cap 12 when the user is pressing the second portion 122.

When a user chooses to evacuate air from the containment space 14 by using an air extraction device 13, since the opening 130 of the air extraction device 13 is basically fitted with the third portion 123 of the cap 12, i.e., the first sleeve 131 of the air extraction device 13 can set around the air valve 124 at the opening 130, when the user exerts a pulling force F2 to pull the rod element 133 by means of the grip handle 135 of the air extraction device 13, the rod element 133 moves away from the cap 12 so that the gasket 132 is pressed against the lower edge of the groove 1331 of the rod element 133, and the air pressure inside the space defined by the second sleeve 134, the first sleeve 131, the rod element 133 and the cap 12 is reduced to cause deformation of the first retaining disc 1242 in the direction away from the second retaining disc 1244 so that the air inside the containment space 14 can be extracted out through the air passageway 1245 (as shown by the dotted line and arrow in Figure 6). When the rod element 133 moves towards the cap 12, the gasket 132 is pressed against the upper edge of the groove 1331 of the rod

element 133 so that the extracted air can be evacuated through the gap between the rod element 133 and the gasket 132 and the gap 136 of the air extraction device. At this moment, the external force F2 is eliminated and the first retaining disc 1242 will resume to its original shape and block the connection between the air passageway 1245 and the outside atmosphere, as well as block the vent holes 1232. As a result, outside air cannot return to the containment space 14, and vacuum inside the containment space 14 of the vacuum container 10 can be ensured, which is favorable for preserving perishable substances (e.g. food). Moreover, the vacuum quality inside the containment space 14 can be increased by repeatedly exerting external forces F1 and F2. The first portion 121 of the cap 12 can provide sufficient rigidity to support the second portion 122, and the third portion 123 can also help support the second portion 122, and the third portion 123 and the second portion 122 are designed to have a difference in thickness, which can prevent the situation that deformation of the third portion 123 affects normal use of the air extraction device when the containment space 14 is under vacuum.

When the user wants to destroy the vacuum in the containment space 14 of the vacuum container so that the cap 12 of the vacuum container 10 can be lifted relative to the vessel 11, the user can slightly pull up the knob 1241 of the air valve 124, and the first retaining disc 1242 will rise accordingly so that the air passageway 1245 can be connected to the outside and the vent holes 1232 are relatively open to allow outside air to enter the containment space 14 and the pressure inside the containment space 14 can be balanced with the outside pressure so that the cap 12 can be lifted.

Therefore, the vacuum container provides the user with the option to achieve the objective of creating vacuum in the containment space of the vacuum container by manually pressing and/or by using a vacuum extraction device. Moreover, the vacuum container takes into consideration both the pressing function and structural strength of the cap by design of the cap, so as to avoid deformation of the cap which would result in failure to press down and failure to achieve air tightness between the air extraction device and the cap.

However, the present invention is not limited to the above embodiment. For example, the vacuum container can be in other shapes in addition to the rectangular one. Moreover, the second portion of the cap of the vacuum container can have an even thickness. In other words, the thickness of the second portion can be equal throughout from the boundary adjacent to the second portion up to the boundary adjacent to the through hole. The third portion of the cap can also have an even thickness. In other words, the thickness of the third portion can be equal throughout from the boundary adjacent up to the second portion to the boundary adjacent to the through hole. In other embodiments, the second portion of the cap can be horizontal without a slope.

The above description is used to illustrate, not to limit the present invention. The protection scope of the present invention is defined by the appended claims. All equivalent changes and modifications according to the claims of the present invention should fall within the protection scope of the present invention.

Claims

1. A vacuum container, comprising:

a vessel, the vessel having an upper edge, and

a cap, which defines a containment space jointly with the vessel, and comprises:

a first portion, which accommodates the upper edge of the vessel,

a second portion, which can be deformed under an external force and be restored to its original shape upon removal of the external force,

a third portion, which surrounds the second portion jointly with the first portion, and is equipped with an air valve;

wherein the thickness of the second portion of the cap adjacent to the third portion is T1 and the thickness of the third portion adjacent to the second portion is T2, wherein $T2/T1$ is at least equal to or greater than 1.1, and air inside the containment space is evacuated to create vacuum inside the containment space by exerting an external force on the second portion and/or the third portion.

2. The vacuum container according to claim 1, wherein the second portion is tilted upwards from the first portion to the third portion, and there is an obtuse angle between the third portion and the second portion.

3. The vacuum container according to claim 1, wherein the thickness of the second portion of the cap is gradually reduced from the first portion to the third portion.

4. The vacuum container according to claim 1, wherein the third portion of the cap further comprises a through-hole, in which the air valve is mounted, and the thickness of the third portion is gradually reduced from the second portion to the through-hole.

5. The vacuum container according to claim 4, wherein the third portion of the cap further comprises vent holes, and the air valve comprises a knob, a first retaining disc, a cylindrical rod, a second retaining disc, and an air passageway, wherein the cylindrical rod penetrates through the through-hole and allows the air valve to be mounted on the third portion by means of the first retaining disc and the second retaining disc, and the vent holes are covered by the first retaining disc.

6. The vacuum container according to claim 1, wherein the first portion of the cap further comprises:

an engaging portion, which includes a groove, corresponding to the upper edge of the vessel,

an extended portion, which is extended outwards from the engaging portion and includes a snap-in element, and

a pivot joint, which links the engaging portion and the extended portion together and has at least one through-hole.

7. The vacuum container according to claim 6, wherein the cap further comprises a gasket, contained in the groove of the engaging portion of the first portion.

8. The vacuum container according to claim 7, wherein, the engaging portion of the first portion of the cap further comprises a notch, through which the gasket is exposed.

9. The vacuum container according to claim 6, wherein the snap-in element of the extended portion of the first portion of the cap comprises a first section and a second section, which are basically perpendicular to each other.

10. The vacuum container according to claim 9, wherein the vessel comprises a protruding edge, which is provided on the side wall of the vessel and is fitted with the snap-in element of the cap and has an engaging groove to accommodate the second section of the snap-in element of the cap.

11. A vacuum container assembly, which can evacuate air to reach a vacuum state and comprises:

a vacuum container, comprising:

a vessel, the vessel having an upper edge, and

a cap, which defines a containment space jointly with the vessel, and comprises:

a first portion, which accommodates the upper edge of the vessel,

a second portion, which can be deformed under an external force and be restored to its original shape upon removal of the external force,

a third portion, which surrounds the second portion jointly with the first portion, and is equipped with an air valve;

an air extraction device, which comprises an opening, which is basically fitted with the third portion of the cap.

wherein the thickness of the second portion of the cap adjacent to the third portion is T1 and the thickness of the third portion adjacent to the second portion is T2, wherein $T2/T1$ is at least equal to or greater than 1.1, and air inside the containment space is evacuated through the third portion to create vacuum inside the containment space by exerting an external force on the second portion and/or by driving the air valve with the air extraction device.

12. The vacuum container assembly according to claim 11, wherein the second portion is tilted upwards from the first portion to the third portion, and there is an obtuse angle between the third portion and the second portion.

13. The vacuum container assembly according to claim 11, wherein the thickness of the second portion of the cap is gradually reduced from the first portion to the third portion.

14. The vacuum container assembly according to claim 11, wherein the third portion of the cap further comprises a through-hole, in which the air valve is mounted, and the thickness of the third portion is gradually reduced from the second portion to the through-hole.

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15. The vacuum container assembly according to claim 14, wherein the third portion of the cap further comprises vent holes, and the air valve comprises a knob, a first retaining disc, a cylindrical rod, a second retaining disc, and an air passageway, wherein the cylindrical rod penetrates through the through-hole and allows the air valve to be mounted on the third portion by means of the first retaining disc and the second retaining disc, and the vent holes are covered by the first retaining disc.

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16. The vacuum container assembly according to claim 11, wherein the first portion of the cap further comprises:

an engaging portion, which includes a groove, corresponding to the upper edge of the vessel,

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an extended portion, which is extended outwards from the engaging portion and includes a snap-in element, and

a pivot joint, which links the engaging portion and the extended portion together and has at least one through-hole.

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17. The vacuum container assembly according to claim 16, wherein the cap further comprises a gasket, contained in the groove of the engaging portion of the first portion.

18. The vacuum container assembly according to claim 17, wherein, the engaging portion of the first portion of the cap further comprises a notch, through which the gasket is exposed.

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19. The vacuum container assembly according to claim 16, wherein the snap-in element of the extended portion of the first portion of the cap comprises a first section and a second section, which are basically perpendicular to each other.

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20. The vacuum container assembly according to claim 19, wherein the vessel comprises a protruding edge, which is provided on the side wall of the vessel and is fitted with the snap-in element of the cap and has an engaging groove to accommodate the second section of the snap-in element of the cap.

21. A cap, which is used to seal a vessel and comprises:

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a first portion,

a second portion, which can be deformed under an external force and be restored to its original shape upon removal of the external force, and

a third portion, which surrounds the second portion jointly with the first portion, and is equipped with an air valve;

wherein the thickness of the second portion of the cap adjacent to the third portion is T1 and the thickness of the third portion adjacent to the second portion is T2, wherein $T2/T1$ is at least equal to or greater than 1.1.

22. The cap according to claim 21, wherein the second portion is tilted upwards from the first portion to the third portion, and there is an obtuse angle between the third portion and the second portion.

23. The cap according to claim 21, wherein the thickness of the second portion of the cap is gradually reduced from the first portion to the third portion.

24. The cap according to claim 21, wherein the third portion of the cap further comprises a through-hole, in which the air valve is mounted, and the thickness of the third portion is gradually reduced from the second portion to the through-hole.

25. The cap according to claim 24, wherein the third portion of the cap further comprises vent holes, and the air valve comprises a knob, a first retaining disc, a cylindrical rod, a second retaining disc, and an air passageway, wherein the cylindrical rod penetrates through the through-hole and allows the air valve to be mounted on the third portion by means of the first retaining disc and the second retaining disc, and the vent holes are covered by the first retaining disc.

26. The cap according to claim 21, wherein the first portion of the cap further comprises:

an engaging portion, which includes a groove,

an extended portion, which is extended outwards from the engaging portion and includes a snap-in element, and

a pivot joint, which links the engaging portion and the extended portion together and has at least one through-hole.

27. The cap according to claim 26, wherein the cap further comprises a gasket, contained in the groove of the engaging portion of the first portion.

28. The cap according to claim 27, wherein the engaging portion of the first portion of the cap further comprises a notch, through which the gasket is exposed.

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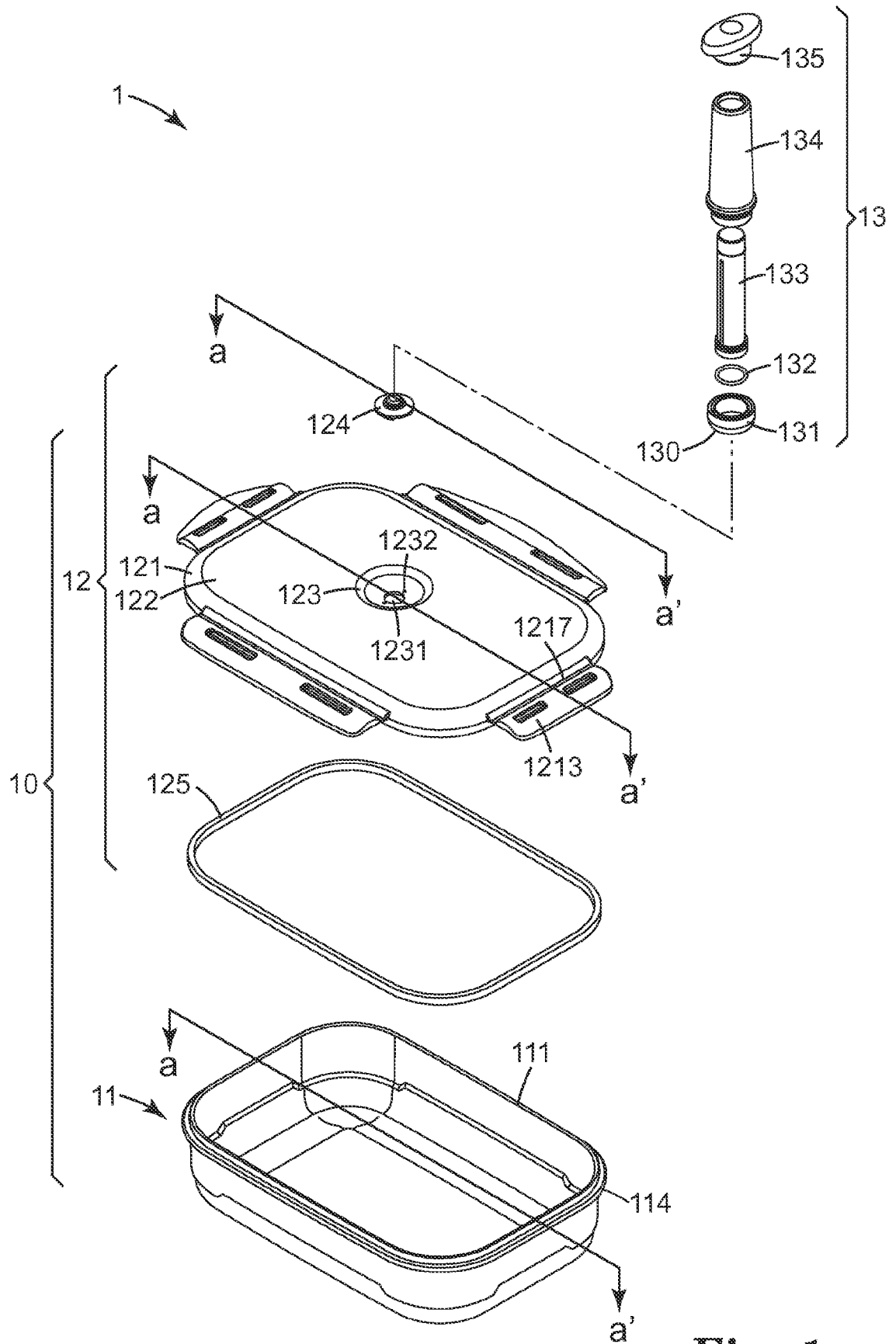


Fig. 1

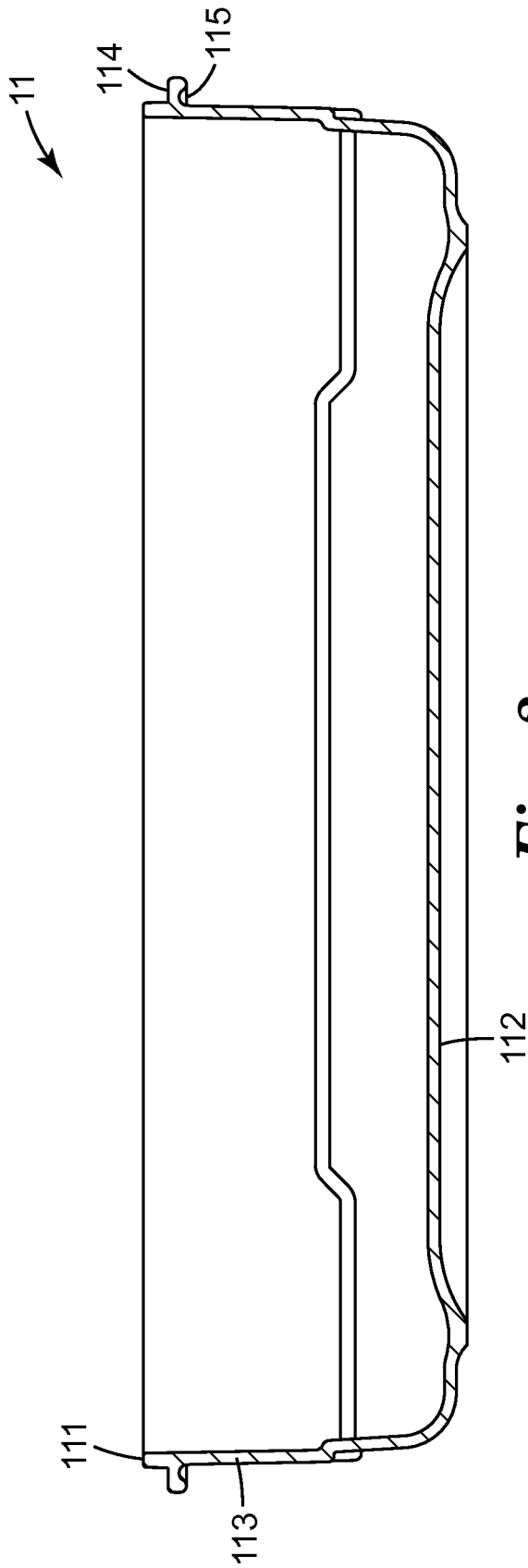


Fig. 2

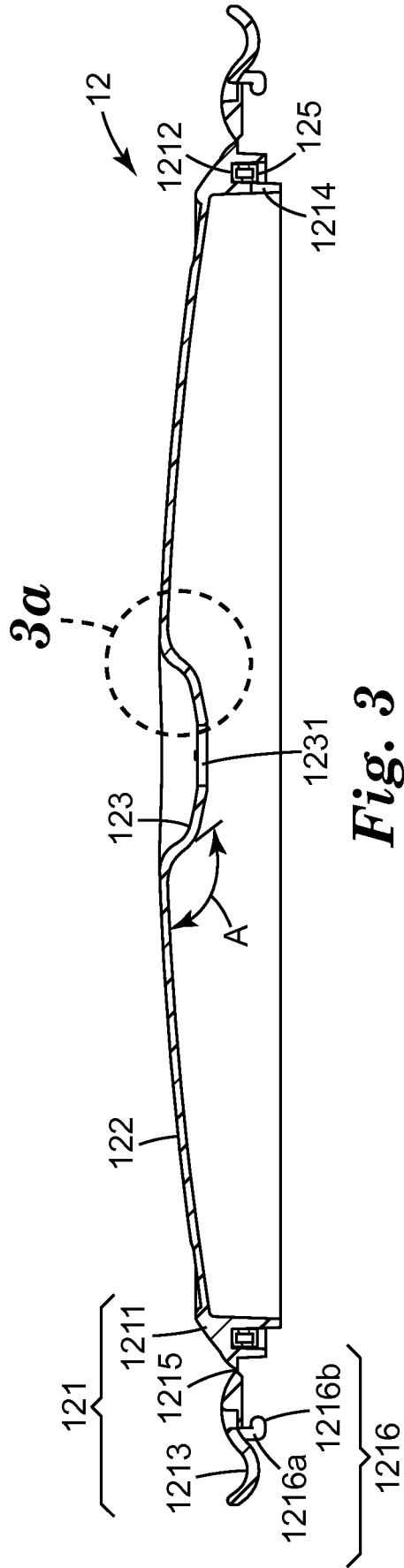


Fig. 3

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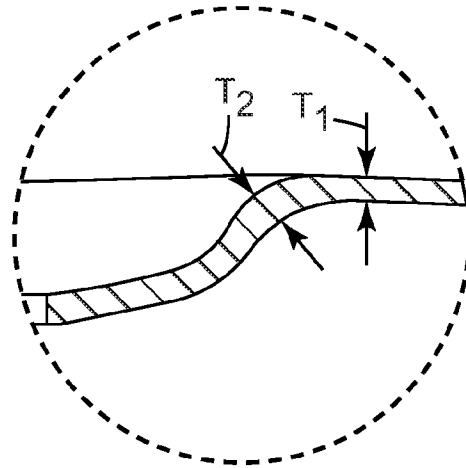


Fig. 3a

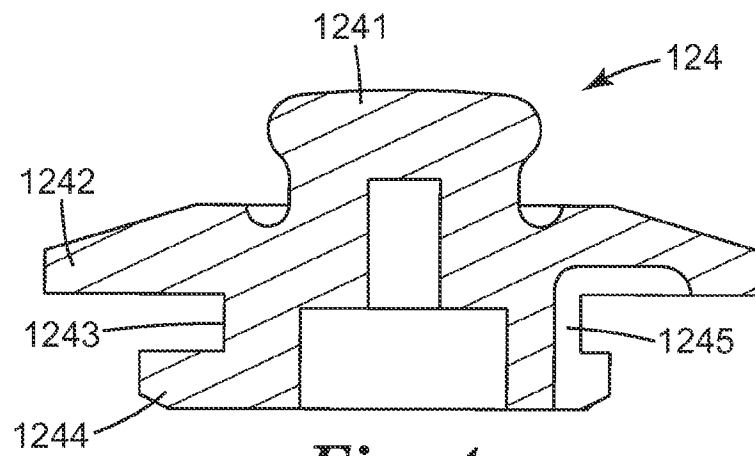


Fig. 4

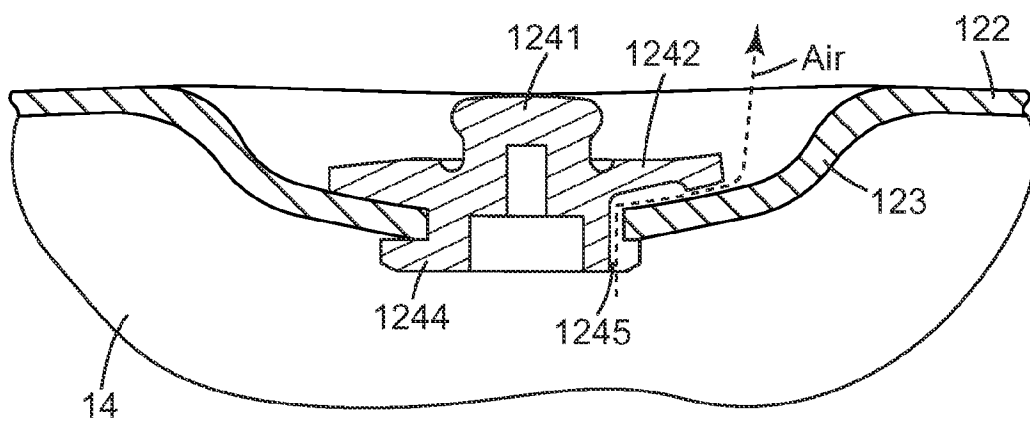


Fig. 6

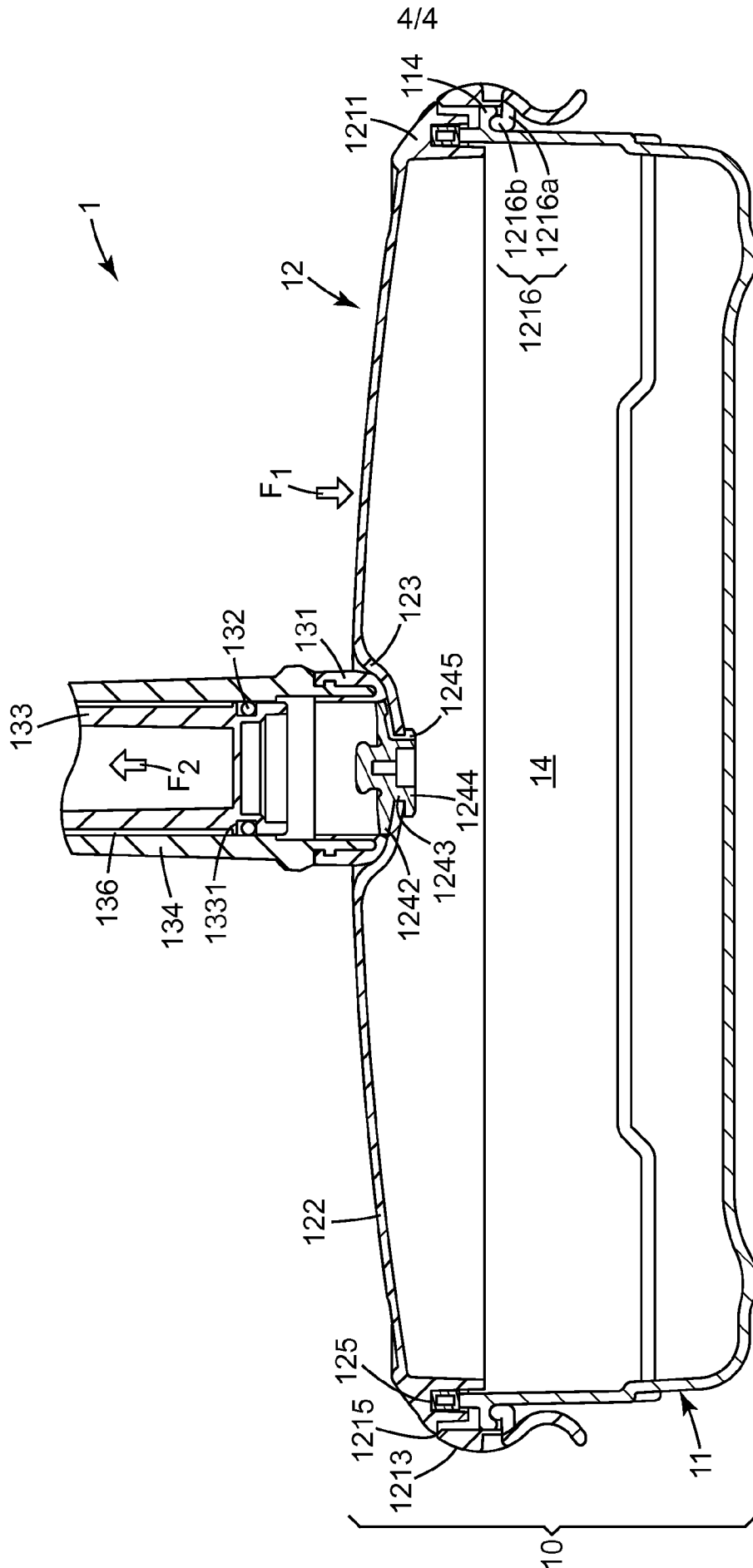


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/031444**A. CLASSIFICATION OF SUBJECT MATTER****B65D 51/16(2006.01)i, B65D 81/20(2006.01)i, B65D 43/02(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D 51/16; B65B 31/04; B65D 43/04; B65D 41/16; B65D 81/20; B65D 43/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: container, vacuum, cap, force, air, extraction, and valve

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007-0095849 A1 (KIM, CHANG-HO) 03 May 2007 See paragraphs [0016]–[0022] and figure 1.	1–4, 21–24
Y		5–20, 25–28
Y	US 2007-0175896 A1 (BURSZTEIN, SLAWOMIR) 02 August 2007 See paragraph [0008], claim 2 and figure 3.	5, 15, 25
Y	US 2009-0218360 A1 (SUK, JONG CHEUL) 03 September 2009 See paragraphs [0026]–[0029] and figures 5A–5B.	6–10, 16–20, 26–28
Y	US 2006-0231556 A1 (WEI, HONG HWA) 19 October 2006 See paragraphs [0029]–[0038] and figure 2.	11–20
A	US 5405038 A (CHUANG, HSIAO-CHENG) 11 April 1995 See column 1, lines 55–68, column 2, lines 1–6 and figures 3, 5.	1–28



Further documents are listed in the continuation of Box C.



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"&" document member of the same patent family

Date of the actual completion of the international search

23 July 2014 (23.07.2014)

Date of mailing of the international search report

24 July 2014 (24.07.2014)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/031444

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US 5405038 A	11/04/1995	None	