

Specification

Title of Invention: FLEXIBLE CONTAINER

Technical Field

[0001]

The present invention relates to a flexible container for use in transporting and storing powder/granular materials, and the like.

Background Art

[0002]

In a wide range of industries, flexible containers are currently used for transporting and storing various materials, regardless of the type and shape, for example, powder/granular materials such as resin pellets, chemical products, inorganic materials, minerals, grains, feeds, and liquids. The flexible container basically comprises a cylindrical body portion having mainly a circular or square cross-sectional shape, a top surface and a bottom surface sewn to the respective upper and lower edges of the body portion, respectively, and a hanging belt attached to the body portion. A sealable loading portion is disposed in a central area of the top surface and a sealable unloading portion is disposed in a central area of the bottom surface as needed.

[0003]

The flexible container is, according to the use method, classified into a running container on the premise of repeated use for a long period of time and a cross container whose useful life is set to one year on the premise of only one use for filling. The former running container uses mainly a polyester fiber as the base fabric, and flexible soft vinyl chloride, EVA, polyurethane, rubber, and the like are stacked on the front and rear surfaces of the base fabric. Meanwhile, the latter cross container uses mainly a polyolefin resin fiber as the base fabric, and has an inner bag or does not have an inner bag inside the cross container according to the content to be filled.

[0004]

Particularly, when content is filled into the cross container, the base fabric of the body portion extends in a circumferential direction, and a middle portion of the cylindrical body portion in the vertical direction swells outward (hereinafter referred to as "body swelling"), and when viewed from above, the body swelling portion bulges out beyond the transport pallet. When flexible containers are loaded on a truck or a freight container, a body swelling prevents transportation pallets from being placed on a loading platform thereof without gaps, thereby causing a problem of a reduction in loading quantity. In addition, especially when stacking, the body swelling causes load shifting, which may cause a

flexible container to come into contact with or lean against a side wall of the truck and the like, which may make it difficult to do subsequent work.

[0005]

As the body swelling prevention means, there has been proposed a flexible container having partition walls which connect adjacent side walls and are provided on four corners inside a polygonal cylindrical flexible container body portion as disclosed in Patent Literature 1. Such a flexible container having partition walls, however, requires not only much manufacturing labor and cost, but also processing work inside the body portion such as sewing the partition walls. In addition, when content is filled, the partition wall blocks the interior of the body portion, which may make it difficult to flow the content. Further, when content is unloaded, the content remaining in a sewn portion of the partition walls acts as a foreign matter later when content is filled, which may cause inconvenience. Furthermore, a partition wall or a sewn portion thereof may be broken. Furthermore, when an inner bag is used in such a flexible container, it is difficult to install the inner bag, and the type of filling materials is restricted, which involves another problem.

[0006]

In addition, there has been proposed another flexible container formed into a multiple-cylinder shape

by welding or sewing a plurality of sheets constituting each side as disclosed in Patent Literature 2. The processing of the flexible container according to this proposal inherently has a problem that it takes time and labor and poor workability. Further, there is another problem that the body portion tends to swell by a pressure applied to a seat portion from inside toward outside due to the difference in elongation rate between the sewn portion and the seat portion.

Citation List

Patent Literature

[0007]

Patent Literature 1: Japanese Utility Model Laid-Open No. 48-103441

Patent Literature 2: Japanese Patent Laid-Open No. 2002-128186

Summary of Invention

Technical Problem

[0008]

In view of the above circumstances, the present invention has been made, and an object of the present invention is to provide a flexible container which can solve problems such as a reduction in filling volume due to body swelling of a flexible container, storage space loss caused by an upper-stage unstable flexible container

when stacked, and safety-related problems, thereby to reduce a change in filling shape, increase filling efficiency, and enable stable stacking.

Solution to Problem

[0009]

According to an aspect of the present invention, the above object is achieved by a flexible container comprising: a cylindrical side wall; a filling port formed on one end side in an opening direction thereof; a substantially polygonal bottom surface disposed on the other end side in a direction perpendicular to the opening direction; and a body portion having hanging belt supporting portions in at least two positions facing the side wall, wherein the bottom surface has a planar shape of a polygon with $(2n+2)$ sides (n is an integer of 1 to 5) in which each corner is chamfered; on the side wall, first reinforcing band portions having a band shape reaching both ends of the side wall in parallel to the opening direction being provided at a plurality of positions at predetermined intervals in a circumferential direction of the side wall; and the hanging belt supporting portion is provided on a surface of the first reinforcing band portion.

[0010]

The planar shape of the bottom surface may be specifically a square shape, a hexagonal shape, an

octagonal shape, a decagonal shape, and a dodecagonal shape, in which each corner is chamfered. The value of n is preferably set as small as possible within the above range, for example, $n = 1$ to 3 , particularly preferably $n = 1$ (that is, a square shape having chamfered corners). The reason for this is that if the value of n exceeds the above range, assuming that the planar shape of the obtained bottom surface is a regular polygon with $(2n+2)$ sides, the cross section of the side wall eventually approximates a circle, which increases dead space in relation to the shape of the pallet.

[0011]

Each of the first reinforcing band portions can be joined to an outer peripheral portion such that at least a part in a width direction of an end portion on a bottom surface side thereof is contained in the outer peripheral portion formed by chamfering corners of the bottom surface or extends from beyond the outer peripheral portion in a circumferential direction. In addition, each of the first reinforcing band portions may be composed of two strips. In other words, the first reinforcing band portions, each being composed of two strips, can be provided on all or part of the outer peripheral portion. In this case, it is preferable that each end portion on the bottom surface side of the first reinforcing band portions 13, each being composed of two strips, is joined so as to be contained in the outer

peripheral portion or is joined to the outer peripheral portion such that at least a part in the width direction of the end portion on the bottom surface side of one or both of the two strips extends from beyond both ends in the circumferential direction of the outer peripheral portion.

[0012]

On the side wall, a second reinforcing band portion can be provided in a band shape in parallel to the opening direction of the side wall so as to divide the side wall between the mutually adjacent first reinforcing band portions into a plurality of equal portions in the circumferential direction. In this case, the tensile strength characteristics of the second reinforcing band portion along the opening direction of at least the side wall is preferably set relatively smaller than that of the first reinforcing band portion.

[0013]

On one end side in an opening direction of the side wall, there is formed a top surface having the same shape and size as the bottom surface in a direction perpendicular to the opening direction. The filling port provided in a central area of the top surface can be set relatively smaller than an opening size of the side wall.

[0014]

On one end side in the opening direction of the side wall, instead of the top surface, there can be detachably

arranged a frame body having the same shape and size as the outer periphery of the bottom surface in a direction perpendicular to the opening direction. In this case, the frame body can have a structure such as an integral type and a divided-fit type. Further, this frame body can be configured such that the outer periphery can be expanded and contracted to an outer peripheral length substantially equal to the outer peripheral length of the side wall or slightly larger than the outer periphery. Such an expandable and contractible structure can be obtained by using a component such as a band-shaped shape-memory alloy or placing a spring, a leaf spring, or the like on at least part of the frame body.

Advantageous Effects of Invention

[0015]

According to the flexible container of the present invention, a substantially polygonal bottom surface is provided on one end side in the opening direction of the cylindrical side wall and further a plurality of first reinforcing band portions are provided on the side wall at predetermined intervals in the circumferential direction, which can prevent body swelling, can reduce the change in filling shape, can increase the filling efficiency, and enables stable stacking, too.

Brief Description of Drawings

[0016]

[Figure 1] Figure 1 is a perspective view illustrating a first embodiment of a flexible container of the present invention.

[Figure 2] Figure 2 is a bottom surface view of the embodiment illustrated in Figure 1.

[Figure 3] Figure 3 is a perspective view illustrating a second embodiment of the flexible container of the present invention.

[Figure 4] Figure 4 is a side view of the embodiment illustrated in Figure 3.

[Figure 5] Figure 5 is a plane view and a bottom surface view of the embodiment illustrated in Figure 3.

[Figure 6] Figure 6 is a perspective view illustrating a third embodiment of the flexible container of the present invention.

[Figure 7] Figure 7 is a perspective view illustrating a fourth embodiment of the flexible container of the present invention.

Description of Embodiments

[0017]

Hereinafter, an embodiment of the present invention will be described in detail with reference to the accompanying drawings. Note that in the following drawings, the same reference numerals or characters are assigned to the same or common components and the

duplicate description is omitted except as specifically required.

[0018]

First embodiment

Figure 1 is a perspective view illustrating a first embodiment of a flexible container of the present invention. Figure 2 is a bottom surface view of the embodiment illustrated in Figure 1. As illustrated in these figures, a flexible container 1 of the present embodiment comprises: a cylindrical side wall 12 whose upper portion is fully opened and which has a filling port 10b, which opens upward toward the Figure; a substantially square bottom surface 15 which is provided on a lower side in a direction perpendicular to an opening direction of the side wall 12; and a body portion 10 which includes hanging belt supporting portions 17 and 17 ... disposed on the side wall 12. In the present embodiment, the filling port 10b serves also as a discharge port, and thus the filling port 10b is referred to as "filling/discharging port 10b" (this is applied to a fourth embodiment illustrated in Figure 7).

[0019]

The side wall 12 is a cylindrical body made of a flexible material, and a flexible cylindrical cover material 10a having substantially the same outer peripheral length is provided in the filling/discharging port 10b. The cylindrical body 12 may be seamless or may

be one obtained by winding one sheet material and joining the ends to form a cylindrical shape. The outer peripheral length of the cylindrical body 12 is set substantially the same as the outer peripheral length of the bottom surface 15 to be described later. The height of the side wall 12 may be appropriately set by considering a designed filling volume of the flexible container of the present invention, the planar shape of the bottom surface 15, and the like.

[0020]

The flexible material of the cylindrical body 12 is not particularly limited, but various materials used for conventionally known cross containers or running containers can be used. Specific examples of the former include yarn fabric obtained by weaving a flat yarn as a warp and a weft on a loom. The flat yarn is made from a polyolefin resin such as polyethylene and polypropylene as a raw material. Specific examples of the latter include ethylene vinyl acetate copolymer (EVA), polyvinyl chloride (PVC), woven fabrics such as various rubbers and polyethylene, and the like. Any of these can be suitably used.

[0021]

The bottom surface 15 is a substantially square planar shape as illustrated in Figure 2 as an example of the planar shape of a polygon with $(2n+2)$ sides (n is an integer of 1 to 5) in which each corner is chamfered, and

in which each corner of the square shape ($n=1$) is chamfered in a circular arc shape (for convenience sake, the outer peripheral portion formed by chamfering the corners is denoted by reference numeral 15a). The bottom surface 15 is joined to one of the opening end portions of the side wall 12 by a method such as sewing, bonding, and fusing, and disposed in a direction perpendicular to the opening direction so as to block one end in the opening direction of the side wall 12.

[0022]

The ratio of the total length of the outer peripheral portion 15a formed by chamfering to the outer peripheral length of the bottom surface 15 is generally set about 20 to 62% by considering an increase in the designed filling volume and filling efficiency of the flexible container of the present embodiment. In the case of the flexible container of the present embodiment, this ratio can be obtained, for example, based on the following concept. The planar shape of the bottom surface 15 before chamfering is assumed to be a square with one side measuring 1050 mm, and each side is virtually equally divided into 3, 4, 6 and 8 respectively. Then, arc-shaped chamfering is performed only on the two sides (outer periphery) outside the squares located at the four corners of the bottom surface among the 9, 16, 36 and 64 squares obtained in each case. Assuming that the outer peripheral portion formed by chamfering each

corner is a quadrant, the total length of the outer peripheral portions of the four corners is the length of the circumference. Meanwhile, the total circumferential length of the bottom surface can be obtained by adding the total length of the straight outer peripheral portions to the length of the circumference. For example, when each side of the bottom surface 15 is equally divided into three, the length of the outer peripheral portion 15a formed by chamfering is 2198 mm and the total circumferential length of the bottom surface is 3598 mm. Thus, the ratio is 61.1%. Further, when each side of the bottom surface 15 is equally divided into four, the length of the outer peripheral portion 15a formed by chamfering is 1649 mm and the total circumferential length of the bottom surface is 3749 mm. Thus, the ratio is 44%. Similarly, when each side is equally divided into six, the ratio is 28.2%, and when each side is equally divided into eight, the ratio is 20.7%. When the ratio is equally further finely divided to reduce the ratio, the planar shape of the bottom surface 15 approximates a square shape. As a result, the size of the cross section of the flexible container of the present embodiment approximates that of a pallet to place the flexible container on. Thus, the reduced ratio is ideal as the filling efficiency, but there is a high possibility that a portion of the side wall 15 other than the portion corresponding to each corner of the bottom

surface 15 will swell from beyond the pallet when viewed from above due to body swelling. Moreover, when content is filled, there is formed a space which prevents content from being filled near each corner of the bottom surface 15, and as a result, the filling efficiency is lowered. On the other hand, if each side is equally divided into less than three, for example, two, the planar shape of the bottom surface 15 is circular (the cross sectional shape of the side wall is circular), which is undesirable because dead space increases in relation to the pallet.

[0023]

Note that Figures 1 and 2 illustrate an aspect in which each corner of the bottom surface is chamfered in an arc shape, but the chamfer shape is not limited to this and may be, for example, an elliptical shape or a parabolic shape. In addition to such a continuous outer peripheral shape, the chamfer shape may be an intermittent outer peripheral shape in which a plurality of bent portions in parallel to the opening direction of the side wall 12 are repeatedly provided. Further, the bottom surface 15 may be formed of the same or different sheet material (hereinafter may be referred to as a bottom surface material) as the side wall 12. Further, the planar shape of the bottom surface 15 is not limited to the substantially square shape as illustrated in Figures 1 and 2, but may be substantially hexagon ($n=2$), substantially octagonal shape ($n=3$), substantially

decagonal shape ($n=4$), and substantially dodecagonal shape ($n=5$), each having chamfered corners as described above.

[0024]

On the side wall 12, two strips of the first reinforcing band portions 13 and 13 are provided in portions 12a, 12a, 12a, and 12a mutually in parallel (in the opening direction of the side wall 12). Note that the portions 12a, 12a, 12a, and 12a (for convenience sake, hereinafter referred to as "corner corresponding band portion") have a band shape in parallel to the opening direction and include end portions joined to the outer peripheral portions 15a, 15a, 15a, and 15a formed by chamfering each corner of the bottom surface 15 on the bottom surface side. Each of the first reinforcing band portions 13 can be joined with an end portion thereof being contained in the outer peripheral portion 15a of the bottom surface 15 or extending from beyond the outer peripheral portion 15a in the circumferential direction. The reason for this is that the joining position of the first reinforcing band portions 13 is greatly influenced by the shape and size of the chamfered corners (the shape and size of the outer peripheral portion formed by chamfering), the width of the first reinforcing band portion 13 and the like. It is particularly desirable that the first reinforcing band portion 13 is arranged such that the end portion on the bottom surface side is

joined so as to partially extend from beyond the outer peripheral portion 15a, that is, at least a part in a width direction of the end portion is joined to the outer peripheral portion 15a and the remaining portion extends from beyond the outer peripheral portion 15 in the circumferential direction.

[0025]

The form of reinforcement in each of the first reinforcing band portions 13 is not particularly limited. For example, reinforcement can be made by sewing, fusing, or bonding the same or different sheet material to the front surface or rear surface of the side wall 12. Thus, the first reinforcing band portion 13 increases strength characteristics (particularly tensile strength characteristics) in the opening direction or the circumferential direction of the side wall 12 along the surface of at least the side wall 12 and suppresses elongation in each of the directions of the first reinforcing band portion 13. In the case of the above-described yarn fabric, as another form of reinforcement, the first reinforcing band portion 13 may be reinforced by weaving the flat yarn by increasing the number of yarns. The number of warp yarns in parallel to the opening direction of the side wall 12 placed within the width of the first reinforcing band portion 13 is increased relative to the number of the warps with the same width as the side wall 12 other than the first

reinforcing band portion 12. Then, the increased number of yarns is dispersed and overlapped within the width and is woven with weft yarns in a direction perpendicular to the opening direction of the side wall 12, thereby to form the first reinforcing band portion 13. Other forms of reinforcement other than increasing the number of warp yarns in the yarn fabric may include increasing the number of yarns per width by reducing the width of a warp arranged in the first reinforcing band portion 13 and weaving with a weft without overlapping, and increasing the thickness of a warp relative to that of a weft without increasing the number of warp yarns arranged in the first reinforcing band portion 13. The width in the circumferential direction of the side wall 12 of each of the first reinforcing band portions 13 can be appropriately set according to the form. For example, in the former case of reinforcing by increasing the number of flat yarns, it is preferable that the width of the first reinforcing band portion 13 is generally set 50 to 200 mm, the number of warp yarns within the set width is increased 30 to 100% relative to the number of warp yarns with the same width as the side wall 12 other than the first reinforcing band portion 13, and then the increased number of warp yarns is dispersed and overlapped within the width and is woven with the weft yarns thereby to form the first reinforcing band portion 13. If the ratio of the number of warp yarns is set less

than the above range, it is difficult for the side wall 12 to maintain the shape of the bottom surface 15. The first reinforcing band portion 13 reinforced by increasing the number of yarns increases the strength characteristics (particularly tensile strength characteristics) in the opening direction of the side wall 12 along the surface of at least the side wall 12 and suppresses elongation in each of the directions of the first reinforcing band portion 13.

[0026]

Figure 1 illustrates an example configuration in which each of the two strips of the first reinforcing band portions 13 and 13 is joined to the outer peripheral portion 15a of each corner of the bottom surface 15 as described above, but another configuration may be such that each strip of the first reinforcing band portion 13 is provided in each corner corresponding band portion 12a. Whether to provide two or more strips of the first reinforcing band portions 13 or only one strip of the first reinforcing band portion 13 in each corner corresponding band portion 12a can be appropriately set.

[0027]

As described above, when the bottom surface 15 has a planar shape of a polygon with six or more sides as described above, the first reinforcing band portion 13 can be placed in a position corresponding to all or part of the outer peripheral portions 15a of each corner of

the bottom surface 15 on the side wall 12. As used herein, the case of being placed in a position corresponding to part of the corner refers to, for example, a case in which the first reinforcing band portion 13 is placed in a position in which the hanging belt supporting portion 17 is placed on the side wall 12. In other words, even if the bottom surface has a planar shape of a polygon with six or more sides, the first reinforcing band portions 13, 13, 13, and 13 may be provided in the outer peripheral portions 15a, 15a, 15a, and 15a of at least four corners among them respectively.

[0028]

Both ends of the band-shaped hanging belt supporting portions 17 are sewn to the adjacent two strips of the first reinforcing band portions 13 so as to be closer to the filling port 10b and bridge the two strips and an intermediate portion thereof is formed in an inverted U shape extending toward the filling port 10b. The hanging belt supporting portion 17 can be made of the same material as a hanging belt 18 to be described later, for example.

[0029]

The hanging belt 18 is formed in a loop shape by folding back both ends thereof and sewing in the intermediate area of the belt, and the loop ends 18a are connected to the hanging belt supporting portions 17. Further, both ends (loop ends) 18a and 18a of a hanging

belt 18 are connected to the hanging belt supporting portions 17 and 17 placed at positions corresponding to the two corners of the bottom surface 15, and another hanging belt 18 is connected to the hanging belt supporting portions 17 and 17 placed at positions corresponding to the remaining two corners. The hanging belt 18 can be made of conventionally known various materials.

[0030]

As described above, in the first embodiment, the bottom surface 15 is formed in a substantially square planar shape, thereby to approximate the planar shape of a pallet to place the flexible container of the present embodiment on, and the end portions on the bottom surface side of the first reinforcing band portions 13 and 13, ... provided on the side wall 12 are joined to the positions corresponding to the outer peripheral portions 15a of each corner. This reinforced portion can reduce elongation in the opening direction and the circumferential direction of the side wall 12 after content is filled, and thus can suppress generation of a body swelling, as a result, can reduce a change in filling shape of the body portion 10 (without greatly changing the cross-sectional shape of the body portion 10), and can obtain a high filling efficiency. Further, stable stacking is enabled, working efficiency is improved, and safety problems hardly occur.

[0031]

Second embodiment

Figure 3 is a perspective view illustrating a second embodiment of the flexible container of the present invention. Figure 4 is a side view of the embodiment illustrated in Figure 3. Figure 5 is a plane view and a bottom surface view of the embodiment illustrated in Figure 3. As illustrated in these Figures, a substantially rectangular parallelepiped body portion 10 of a flexible container 2 of the second embodiment mainly comprises: a side wall 12; a top surface 11 formed on one end side in an opening direction thereof (upward toward the Figure) and including a filling port 20 in a central area thereof; and a bottom surface 15 formed on the other end side in the opening direction (downward toward the Figure) and including a discharge port 26 in a central area thereof. The bottom surface 15 has the same shape and size as that of the first embodiment. It should be noted that the components other than these components are substantially the same as those of the first embodiment.

[0032]

As illustrated in Figures 3 to 5, the top surface 11 has a substantially square planar shape having the same shape and size as those of the bottom surface 15, namely, a planner shape in which each corner of the square is chamfered in a circular arc shape (the outer peripheral portion formed by chamfering the corners is denoted by

reference numeral 11a). Then, the top surface 11 is joined to an opening end portion on an opposite side of the bottom surface 15 of the side wall 12 by a method such as sewing, bonding, and fusing, and disposed in a direction perpendicular to the opening direction of the side wall 12. Assuming that the outer peripheral portion 11a formed by chamfering the top surface 11 is, for example, a quadrant, the radius can be set in a range from 10 to 15%, preferably from 12 to 14% as the ratio of the top surface 11 to the outer peripheral by considering an increase in filling volume and filling efficiency, in the same manner as in the bottom surface 15. This top surface 11 may be formed of the same or different sheet material (hereinafter may be referred to as a top surface material) as the side wall 12.

[0033]

In a central area of the top surface 11, there is provided a filling port 20 (see Figure 5) penetrating inside and outside thereof and having a size relatively smaller than an opening size of the filling/discharging port 10b of the first embodiment. In the filling port 20, there is provided a skirt 21 extending outwardly therefrom. The skirt 21 has tying strings 22 and 23 attached thereto for squeezing and sealing the skirt. In order to cover the sealed skirt 21 from above and around, an upper lid (upper lid presser) 11b having an upper lid rope 14 is provided around the skirt 21.

[0034]

In the central area of the bottom surface 15, there is provided a discharge port 26 (see Figure 5) penetrating inside and outside and having substantially the same size as that of the filling port 20. In the discharge port 26, there is provided a skirt 27 extending outwardly therefrom. The skirt 27 has tying string 28 attached thereto for squeezing and sealing the skirt. In order to cover the sealed skirt 27 from below and around to be contained in the body portion 10, a lower lid (lower lid presser) 15b having a lower lid rope 25 is provided around the skirt 27.

[0035]

As described above, in the second embodiment, the top surface 11 and the bottom surface 15 are formed in a substantially square planar shape having the same shape and size, and the first reinforcing band portions 13 and 13, ... are provided on the side wall 12 in the same manner as in the first embodiment. This reinforced portion can reduce elongation in the opening direction and the circumferential direction of the side wall 12 after content is filled, and thus can suppress generation of a body swelling. As a result, there can be obtained a flexible container of the present invention which can reduce a change in filling the shape of the body portion 10 and can provide a high filling efficiency. Further,

stable stacking is enabled, working efficiency is improved, and safety problems hardly occur.

[0036]

Third embodiment

Figure 6 is a perspective view illustrating a third embodiment of the flexible container of the present invention. The third embodiment is substantially the same as the second embodiment except that the second reinforcing band portions 30 and 30, ... are provided between the adjacent first reinforcing band portions 13 and 13 in the mutually adjacent corner corresponding band portions 12a and 12a of the side wall 12.

[0037]

Each of the second reinforcing band portions 30 is provided in the middle between the first reinforcing band portions 13 and 13 provided in the adjacent corner corresponding band portions 12a and 12a so as to equally divide a part of the side wall 12 therebetween into two. The shape of each second reinforcing band portion 30 and the form of reinforcement are not particularly limited in the same way as in the first reinforcing band portion 13. For example, in the case of the above-described yarn fabric, the reinforcement may be made by increasing the number of warp or weft yarns or the thickness of warp or weft yarns more than the number of weft or warp yarns or the thickness of weft or warp yarns, or as another form of reinforcement, the reinforcement may be made by sewing,

fusing, or bonding the same or different sheet material to the front surface or rear surface of the side wall 12. Alternatively, the tensile strength characteristics along the opening direction of the side wall of the second reinforcing band portion 30 may be set smaller relative to that of the first reinforcing band portion. Further, the width in the circumferential direction of the side wall 12 of each of the second reinforcing band portions 13 may be appropriately set according to the form. Furthermore, Figure 6 illustrates an example configuration in which the second reinforcing band portion 30 is provided so as to equally divide a part of the side wall 12 between the adjacent first reinforcing band portions 13 and 13 into two parts, but, without being limited to this, the second reinforcing band portion 30 may be provided so as to equally divide the part into three or more parts.

[0038]

As described above, in the third embodiment, in addition to the configuration of the second embodiment, the second reinforcing band portions 30 and 30, ... are provided on the side wall 12. Therefore, the third embodiment can further reduce elongation in the opening direction and the circumferential direction of the side wall 12 after content is filled than the second embodiment, and thus can suppress generation of a body swelling. As a result, there can be obtained a flexible

container of the present invention which can reduce a change in filling shape of the body portion 10 and can provide a high filling efficiency. Further, stable stacking is enabled, working efficiency is improved, and safety problems hardly occur.

[0039]

Fourth embodiment

Figure 7 is a perspective view illustrating a fourth embodiment of the flexible container of the present invention. In the fourth embodiment, the second reinforcing band portions 30 and 30, ... similar to those in the third embodiment are provided in the flexible container of the first embodiment. Instead of the top surface 11 of the third embodiment, a frame body 40 having the same size as the outer periphery thereof is detachably provided. The fourth embodiment is substantially the same as the first embodiment except for the above configuration.

[0040]

The frame body 40 may be, for example, an annular integrated structure, which may be divided into an appropriate number of divided pieces in the circumferential direction, and these divided pieces are fitted or like to form an annular frame body. The thickness T and the width W of the frame body 40 may be appropriately set. The outer peripheral length of the frame body 40 can be configured in an expandable and

contractible manner so as to be substantially equal to the outer peripheral length of the sidewall 12 or slightly larger than the outer peripheral length. This expandable and contractible structure is not particularly limited, and for example, conventionally known various materials such as a band-shaped body made of a shape-memory alloy and a frame body having a spring, a leaf spring, or the like arranged in a part thereof may be applied. The adoption of such an expandable and contractible structure to the frame body 40 has an effect of suppressing a body swelling of an upper portion of the body portion 10 into a circular shape in the cross section.

[0041]

After content is filled into the flexible container of the fourth embodiment, the frame body 40 is inserted from the filling/discharging port 10b, and this is arranged in a direction perpendicular to the opening direction of the side wall 12 above the content, thereby to form a surface similar to the top surface 11 of the third embodiment.

[0042]

The fourth embodiment configured as above can basically have the same effect as the first embodiment, further can have a larger effect of suppressing a body swelling than the first embodiment, and can have the same

surface as the top surface of the second embodiment, which particularly can contribute to stable stacking.

Examples

[0043]

The present invention will now be described in more detail with reference to preferred examples of the flexible container of the present invention.

[0044]

[Example 1]

A top surface material and a bottom surface material are made of polypropylene having a substantially square planar shape in which each corner is chamfered (the area of each material is 0.99 m^2 , and has the same shape as that described in the second embodiment). A yarn fabric woven using polypropylene as a raw material and using a 2 mm wide flat yarn as warp and weft yarns are used to prepare a seamless cylindrical side wall material having a length of 1.3 m with the outer peripheral length shown in Table 1. Woven portions with an increased number of yarns (each of which corresponds to the corner corresponding band portion) are provided at four places at equal intervals in the circumferential direction, two strips thereof for each place. Each strip of the woven portions with an increased number of yarns has a width of 120 mm and the number of warp yarns within the width is two. The hanging belt supporting portion connecting the

hanging belt described in the second embodiment is sewn to each of the woven portions with an increased number of yarns. Further, the top surface material and the bottom surface material (the area of each material is 0.99 m^2) having the same shape as those of the second embodiment are sewn to both ends in the opening direction of the side wall material, thereby to prepare the body portion. The filling port and the discharge port are provided in the central area of each of the top surface material and the bottom surface material. The thus obtained size, inner volume, and the like of the flexible container of the first example (which corresponds to the second embodiment) are shown in Table 1.

[0045]

[Comparative examples 1 and 2]

The first comparative example of the flexible container is the same as the example 1 except that the planar shape of the top surface material and the bottom surface material is formed in a circular shape. Further, the comparative example 2 of the flexible container is the same as the example 1 except that the planar shape of the top surface material and the bottom surface material is formed in a regular octagonal shape. The inner volume of the comparative examples 1 and 2 is the same as that of the example 1 (see Table 1).

[0046]

The same content is filled in the example 1 and the comparative examples 1 and 2 by the filling volume shown in Table 1 and the width and the height after filling were measured (see Table 1). From this result, the filling volume equivalent to 1250 mm in height was calculated. The results are shown in Table 1.

[0047]

[Table 1]

	unit	First example	First comparative example	Second comparative example
Cross-sectional shape	-	Substantial square shape	Circular shape	Regular octagonal shape
Circumference	mm	3,600	3,600	3,600
Bottom area	m ²	0.99	1.03	0.98
Inner volume	Liter	1,290	1,290	1,290
Filling volume	kg	750	779	769
Width after filling	mm	1,150	1,180	1,165
Height after filling	mm	1,255	1,290	1,288
Filling volume equivalent to 1250 mm in height	kg	747	754	746
Filling volume equivalent to 1160 mm in width	kg	753	741	743

[0048]

Then, the flexible containers of the example 1 and the comparative example 2 were flat-stacked, and another flexible container was stacked on them. Then, the body

swelling ratio was calculated before and after stacking. The reason for this is that the condition of before and after stacking is more severe than the condition of before and after filling, and a large body swelling is obtained. As used herein, the body swelling ratio is expressed as a ratio between an elongation of the outer peripheral length after stacking and an outer peripheral length before stacking.

[0049]

[Table 2]

	Unit	first example	second comparative example
Cross-sectional shape	-	Substantial square shape	Regular octagonal shape
filling volume	kg	825	825
Diameter of body portion before stacking	mm	1,170	1,174
Diameter of body portion after stacking	mm	1,178	1,185
Body swelling ratio	%	0.3	1.6

[0050]

It is confirmed from the results in Table 1 that the filling volume equivalent to 1250 mm in height and the filling volume equivalent to 1160 mm in width of the flexible container of the example 1 are almost the same or slightly larger than those of the comparative examples 1 and 2. Further, it is confirmed from the results in Table 2 that the body swelling ratio before and after stacking of the flexible container of the example 1 is

smaller than that of the comparative example 2. In other words, it is clear that even if the first reinforcing band portion is provided on the side wall, the body swelling ratio can be further reduced by forming the planar shape of the bottom surface and the top surface in a substantially square shape than by forming the planar shape thereof in a regular octagonal planar shape.

[0051]

As described above, the flexible container of the present invention is configured such that the top surface and the bottom surface are formed in a substantially square planar shape and the first reinforcing band portion and the second reinforcing band portion are provided on the side wall. Thus, this configuration can suppress generation of a body swelling due to elongation in the opening direction and the circumferential direction of the side wall material after content is filled, as a result can reduce the change in filling shape, and can provide a high filling efficiency. Further, stable stacking is enabled, working efficiency is improved, and safety problems hardly occur.

[0052]

The present invention can be applied to both cross flexible containers and running flexible containers. Further, the flexible container of the present invention eliminates the need for a laborious and time-consuming step, particularly such as sewing the partition wall

inside the body portion, and can be manufactured at low cost with high production efficiency.

[0053]

Note that the flexible container of the present invention may include therein an inner bag in a nested state. The material and the shape of the inner bag are not particularly limited as long as the shape and the size closely adhere to the side wall and the top surface when content is filled in the flexible container of the present invention. For example, the inner bag may be subjected to perforation processing so as to penetrate inside and outside on the entire surface or a partial surface thereof. Further, the inner bag can also be made of a laminate in which a plurality of flexible resin bags are included in a nested state.

[0054]

Heretofore, several embodiments of the present invention have been described, but the present invention is not limited to these embodiments and each component in each embodiment can be replaced or another component may be added without departing from the subject matter of the present invention.

Reference Signs List

[0055]

1 to 4 flexible container of the present invention

10 body portion

- 11 top surface
- 11a outer peripheral portion formed by chamfering
- 12 side wall
- 12a corner corresponding band portion
- 13 first reinforcing band portion
- 15 bottom surface
- 15a outer peripheral portion formed by chamfering
- 17 hanging belt supporting portion
- 18 hanging belt
- 30 second reinforcing band portion
- 40 frame body

Claims

[Claim 1]

A flexible container comprising:

a cylindrical side wall;

a filling port formed on one end side in an opening direction thereof;

a substantially polygonal bottom surface disposed on the other end side in a direction perpendicular to the opening direction; and a body portion having hanging belt supporting portions in at least two positions facing the side wall,

wherein

the bottom surface has a planar shape of a polygon with $(2n+2)$ sides (n is an integer of 1 to 5) in which each corner is chamfered;

on the side wall, first reinforcing band portions reaching both ends of the side wall in parallel to the opening direction being provided at a plurality of positions at predetermined intervals in a circumferential direction of the side wall; and

the hanging belt supporting portion is provided on a surface of the first reinforcing band portion.

[Claim 2]

The flexible container according to claim 1, wherein the value of n is 1 to 3.

[Claim 3]

The flexible container according to claim 1, wherein the value of n is 1.

[Claim 4]

The flexible container according to any one of claims 1 to 3, wherein

each of the first reinforcing band portions is joined to an outer peripheral portion such that at least a part in a width direction of an end portion on the bottom surface side is contained in the outer peripheral portion formed by chamfering all or part of corners on the bottom surface or extends from beyond the outer peripheral portion in the circumferential direction.

[Claim 5]

The flexible container according to claim 4, wherein

each of the first reinforcing band portions is joined to the outer peripheral portion such that each end portion on the bottom surface side of each of two strips of the first reinforcing band portions is contained in all or part of the outer peripheral portion or at least a part in the width direction of one or both of end portions on the bottom surface side of each of the two strips of first reinforcing band portions extends from beyond both ends in the circumferential direction of the outer peripheral portion.

[Claim 6]

The flexible container according to any one of claims 1 to 5, wherein

in a case where the side wall is made of a yarn fabric and the first reinforcing band portion is reinforced by increasing the number of yarns, the first reinforcing band portion is formed such that the number of warp yarns arranged within the width is increased relatively 30 to 100% than the number of warp yarns with the same width as the side wall other than the first reinforcing band portion and the increased number of yarns is dispersed and overlapped within the width and is woven with weft yarns.

[Claim 7]

The flexible container according to any one of claims 1 to 5, wherein

on the side wall, a second reinforcing band portion is provided in a band shape in parallel to the opening direction of the side wall so as to divide the side wall between the mutually adjacent first reinforcing band portions into a plurality of equal portions in the circumferential direction.

[Claim 8]

The flexible container according to claim 7, wherein the second reinforcing band portion is configured such that the tensile strength characteristics of the second reinforcing band portion along the opening direction of at least the side wall is set relatively smaller than that of the first reinforcing band portion.

[Claim 9]

The flexible container according to any one of claims 1 to 8, wherein

on one end side in the opening direction of the side wall, there is formed a top surface having the same shape and size as the bottom surface in a direction perpendicular to the opening direction, and the filling port is provided in a central area of the top surface and the filling port has a size relatively smaller than an opening size of the side wall.

[Claim 10]

The flexible container according to any one of claims 1 to 8, wherein

on one end side in the opening direction of the side wall, there can be detachably arranged a frame body having the same shape and size as the outer periphery of the bottom surface in a direction perpendicular to the opening direction.

[Claim 11]

The flexible container according to claim 10, wherein

the frame body can be configured such that the outer periphery can be expanded and contracted to an outer peripheral length substantially equal to the outer peripheral length of the side wall or slightly larger than the outer periphery.

[Claim 12]

The flexible container according to any one of claims 1 to 11, wherein

the flexible container is a cross container or a running container.