

Description

FLEXIBLE CONTAINER

Technical Field

[0001]

The present invention relates to a flexible container used to transport and store granules and the like. In particular, it relates to a flexible container that includes an inside bag that can be deaerated to enable stable vertical stacking of two or three containers.

Background Art

[0002]

These days, flexible containers are used to transport and store several substances of any kind or shape, such as liquid and granules including resin pellets, chemical products, inorganic substances, minerals, grain and feed, in a wide variety of industries. The flexible container basically includes a cylindrical body, a top surface and a bottom surface sewed to the upper edge and the lower edge of the body, respectively, and a hanging belt attached to the body. The body has an input part in a middle region of the top surface and, as required, a discharge part in a middle region of the

bottom surface, and the input part and the discharge part are capable of being sealed.

[0003]

Depending on how it is used, the flexible container is classified as a running container supposed to be repeatedly used for a long time or a cloth container supposed to be filled and used only once or supposed to be used for one year. The running container includes base fabric of a polyester-based fiber and layers of an elastic material such as soft vinyl chloride, EVA, polyurethane, and rubber laminated on both front and back surfaces of the base fabric. The cloth container is mainly formed from cloth fabric of a polyolefin-based resin fiber and may or may not include an inside bag depending on the substance with which the cloth container is filled.

[0004]

For example, when the flexible container is filled with granules, in particular if the flexible container is a cloth container, the flexible container has a double structure in which an external bag formed from the cloth fabric accommodates an inside bag formed from one or more layers of plastic film such as a polyolefin film or a gas-barrier material film, in order to prevent spillage of the granules through the mesh or seams of the cloth fabric or in order to prevent contamination of the

content by foreign matter from the outside and contact of the content with steam or gas.

[0005]

However, when the flexible container is filled with granules, air is trapped with the granules depending on the size, shape and the like of the granules, and this leads to a reduced actual bulk density of the content in the flexible container. In particular, immediately after the filling, little load is applied from above on the flexible container, so that the bulk density markedly tends to be lower than the designed bulk density. As time goes after the filling, the height of the filling gradually lowers. The height of the filling can lower even by a dozen or so centimeters in several hours, and the filling volume of the content can also decrease (problem in terms of filling efficiency). When the input port of the inside bag is sealed after filling of the flexible container, air remains trapped in the container. If such flexible containers are stacked in layers on top of those laid flat, the flexible containers in the upper layers are tilted and very unstable. As a result, the flexible containers stacked in the upper layers cannot be brought into intimate contact with adjacent ones. This poses a problem that the storage space is wasted or a problem of safety that there is a risk of falling of flexible containers stacked in the upper layers and thus

the flexible containers have to be laid flat (problem in terms of filling shape).

[0006]

To solve the problems described above, a technique has been suggested as described in Patent Literature 1. The technique is to achieve deaeration by check valves provided for a plurality of through-holes formed in an inside bag of a flexible container. However, this technique has a problem that since each through-hole is provided with a check valve, ventilation through the valve is significantly inhibited, and the number of through-holes with check valves that can be provided is limited from the viewpoint of mechanical strength.

Citation List

Patent Literature

[0007]

Patent Literature 1

Japanese Patent Laid-Open No. 2001-199498

Summary of Invention

Technical Problem

[0008]

In view of the circumstances described above, an object of the present invention is to provide a stably stackable flexible container that solves the problems in terms of the filling efficiency and filling shape in

order to address the problems of safety and loss of storage space that arise due to a decrease in the amount of the matter filling the flexible container or unstable stacking of flexible containers.

Solution to Problem

[0009]

To achieve the object described above, the present invention provides a flexible container comprising an inside bag that is made of at least one layer of plastic film and has a deaeration mechanism, and an air permeable external bag that includes a body, a top surface and a bottom surface and accommodates the inside bag.

[0010]

The deaeration mechanism is not particularly limited as long as it may be of any type having a mechanism or structure capable of deaerating the air remaining in the inside bag without omission of matter for filling or contamination with foreign matter from the outside through the inside bag after the flexible container according to the present invention is filled with the matter for filling. The deaeration mechanism is preferably a group of a plurality of deaeration holes penetrating the inside bag from the inner side to the outer side, for example. The holes can be simply formed in the plastic film of the inside bag on the production

line at low cost since assembly of any other components is not needed.

[0011]

When a plurality of deaeration holes is used as the deaeration mechanism, the holes can be formed in at least a region of the inside bag. The expression "at least a region" does not mean only a partial region of the inside bag but includes the meaning of the entire region of the inside bag. When the plurality of deaeration holes is formed in the region, the holes can be formed and arranged in a certain continuous or intermittent regular pattern in the circumferential direction of the inside bag or in the direction perpendicular to the circumferential direction. The pattern can be arranged in an upper edge region of the body of the external bag or in an outer peripheral region of the top surface in the circumferential direction.

Advantageous Effects of Invention

[0012]

Since the flexible container according to the present invention has a double structure that includes an inside bag provided with a deaeration mechanism and an air-permeable external bag, the air remaining in the inside bag can be effectively deaerated while the rigidity required for hanging or transportation of the matter for filling is secured.

Brief Description of Drawings

[0013]

[Figure 1] Figure 1 is a perspective view showing an outer shape of a flexible container according to an embodiment of the present invention.

[Figure 2A] Figure 2A is a schematic diagram showing an example of a pattern of a plurality of deaeration holes.

[Figure 2B] Figure 2B is an enlarged view of the part in the box in Figure 2A.

[Figure 3A] Figure 3A is a schematic diagram showing another example of the pattern of a plurality of deaeration holes.

[Figure 3B] Figure 3B is a schematic diagram showing another example of the pattern of a plurality of deaeration holes.

[Figure 3C] Figure 3C is a schematic diagram showing another example of the pattern of a plurality of deaeration holes.

[Figure 4A] Figure 4A is a schematic diagram showing another example of the pattern of a plurality of deaeration holes;

[Figure 4B] Figure 4B is a schematic diagram showing another example of the pattern of a plurality of deaeration holes.

[Figure 4C] Figure 4C is a schematic diagram showing another example of the pattern of a plurality of deaeration holes.

[Figure 5] Figure 5 is a perspective view showing an outer shape of a flexible container according to another embodiment of the present invention.

Description of Embodiments

[0014]

Next, an embodiment of the present invention will be described in detail with reference to the accompanying drawings. Figure 1 is a perspective view of an example of a flexible container according to an embodiment of the present invention. Figure 2(a) is a schematic diagram showing an arrangement of deaeration holes in an inside bag of the flexible container shown in Figure 1, and Figure 2(B) is an enlarged view of the part in the box in Figure 2(a). In Figures 2, the inside bag folded along the direction perpendicular to the circumferential direction thereof (the direction corresponds to the direction from an input part to a discharge part and typically agrees with the up-and-down direction of the flexible container) is schematically shown as a rectangle.

[0015]

As shown in Figure 1, the flexible container 1 according to this embodiment includes an inside bag 20 that is formed from a layer of plastic film and is

provided with a deaeration mechanism and an external bag 10 that accommodates the inside bag 20.

[0016]

(1) Inside bag 20

The inside bag 20 is formed from at least one layer of plastic film. Specifically, the plastic film may be made of a polyolefin resin, an ethylene vinyl acetate copolymer, nylon, polyvinyl alcohol or polystyrene, for example. These materials can be appropriately used alone or in combination. The present invention is not limited to these materials, as far as the deaeration mechanism can be provided within the range of the thickness of the plastic film described later.

[0017]

Specific examples of the polyolefin resin include polyethylene and polypropylene, for example. When the polyethylene is used, low density polyethylene (LDPE), linear low density polyethylene (LLDPE), high density polyethylene (HDPE) or metallocene polyethylene, which have a density of 0.900 to 0.960, for example. These polyolefin resins can be used alone or in combination as a raw material.

[0018]

The raw material of the plastic film may further contain another resin (modifier) such as thermoplastic olefin elastomer (TPO). TPO contains polypropylene as a hard segment and at least one of some kinds of elastomer

(rubber) such as elastomer containing polyethylene, elastomer containing ethylene and a small amount of diene, ethylene-propylene-dien rubber (EPDM), ethylene-propylene rubber (EPR) or styrene-based elastomer as a soft segment and is made by, for example, simply mechanically mixing and blending the materials. The soft segment may be partially cross-linked by addition of an organic peroxide, or graft-modified with an unsaturated hydroxy monomer or an unsaturated carboxylic acid derivative. These various kinds of thermoplastic elastomer can be used alone, or two or more of these various kinds of thermoplastic elastomer can be used in combination.

[0019]

The content of TPO is preferably 0 to 40% by weight, provided that the content of the whole of the inside bag 20 is 100% by weight. This is because the physical strength of the inside bag 20 is poor if the content of TPO is higher than 40% by weight.

[0020]

In addition to the resins described above, the raw material of the plastic film may contain other resins or additives as required. For example, in order to modify the film, an additive such as a weathering agent, an antistatic agent or an antioxidant can be added as far as the own properties of the plastic film are not affected by the additive as required.

[0021]

The raw material prepared as described above is put into a heated cylinder from a hopper of an inflation molding machine. The raw material is then completely molten and fed by a screw while being mixed and passes through an annular die. Air is then blown into the raw material, and the raw material is extruded from a lip part of the die so as to be a cylindrical shape. The resulting product is then cooled in an air ring, lifted by pinch rolls and shaped into continuous polyethylene raw fabric in the shape of a collapsed cylinder (a cylindrical film). The blow ratio of the air blowing is an important factor that determines the balance of orientation of the film, and is preferably set at 1.0 to 3.0.

[0022]

As an alternative to the method of shaping the film into a cylinder, a film may be formed in advance in the well-known T-die molding method, calender molding method or drawing method, for example, and the film may then be shaped into a cylinder by heat-sealing both the longitudinal or lateral edges of the film to each other.

[0023]

The thickness of the resulting layer of plastic film can be set within a range from 30 to 200 μm , preferably from 30 to 170 μm , or more preferably from 30 to 150 μm . As described later, when MP holes are adopted as a plurality of deaeration holes, if the thickness is

greater than the range described above, a micro-perforation apparatus can hardly cut perforations, and if the thickness is smaller than the range, a crease or fracture can occur in the plastic film.

[0024]

(Deaeration Mechanism)

A group of a plurality of deaeration holes 29, 29, ... that penetrate the inside bag 20 from the inner side to the outer side to serve as a deaeration mechanism is formed in the cylindrical plastic film forming the inside bag 20. Such a group of deaeration holes is provided because they can be simply formed in the plastic film of the inside bag on the production line at low cost since assembly of any other components is not needed. The group of a plurality of deaeration groups 29, 29, ... is arranged in a band-like array 25 that has a predetermined width and extends in the direction perpendicular to the circumferential direction of the plastic film (the direction typically agrees with the up-and-down direction of the flexible container 1 according to the present invention). Each deaeration hole 29 is adapted to allow spontaneous deaeration of the air remaining in the inside bag 20 or deaeration of the air under pressure as the internal pressure of the inside bag 20 rises after the flexible container 1 according to the present invention is filled with matter for filling (not shown), and to prevent omission of the matter for filling

from the inside bag 20 or contamination by foreign matter from the outside.

[0025]

An average hole diameter of the deaeration holes 29 can be set at 0.1 mm or greater. Although the maximum value of the hole diameter of the deaeration hole 29 depends on the kind of the matter for filling of the flexible container 1 according to the present invention, if the matter for filling is lumps, the maximum value of the average hole diameter can be set at 10 mm.

[0026]

Generally speaking, when the flexible container 1 according to the present invention is filled with granules, a plurality of fine holes (referred to simply as MP holes, hereinafter) is preferably formed in the plastic film of the inside bag 20 by a perforation technique using a micro-perforation apparatus or a laser apparatus and used as deaeration holes. The micro-perforation apparatus is an apparatus that can form fine holes in a plastic film by passing the plastic film between a rubber roll and a needle roll with many fine needles embedded in the outer circumference thereof while pressing the needle roll against the rubber roll under a predetermined pressure. In this case, although the required average hole diameter of the MP holes 29 depends on the kind or grain size of the granules for filling, the average hole diameter can be typically set within a

range from 0.01 to 0.5 mm, preferably a range from 0.01 to 0.3 mm, or more preferably a range from 0.01 to 0.2 mm.

[0027]

When the group of deaeration holes is a group of MP holes, the air permeability of the group of MP holes 29, 29, ... in the array 25 according to the Gurley method can be set to be equal to or lower than 300 seconds, or preferably to fall within a range from 30 to 300 seconds. In order that the air permeability of the group of MP holes 29, 29, ... falls within the range described above, the average hole diameter of the MP holes can be increased with the number of MP holes per unit area kept fixed, or the number of MP holes can be increased with the average hole diameter of the MP holes kept fixed.

[0028]

When the group of deaeration holes is a group of MP holes, another index concerning deaeration, the air permeability rate, can also be used. In this case, the air permeability rate (ventilation rate) for 20 holes in any successive sub-regions in the region of the inside bag 20 can be set to be equal to or higher than 0.33 ml/s, or preferably to fall within a range from 0.33 to 2 ml/s. To adjust the air permeability rate of the group of MP holes 29, 29, ... to fall within the range, the average hole diameter of the MP holes 29 can be changed.

[0029]

The array 25 of the MP holes 29, 29, ... shown in Figures 1, 2A and 2B is obtained in the manufacturing process by successively forming the holes in the direction of flow of the plastic film forming the inside bag 20 (the direction agrees with the direction perpendicular to the circumferential direction of the plastic film) by the micro-perforation apparatus. In this case, since the plastic film is folded at the center thereof when it flows in the manufacturing process, the micro-perforation apparatus forms the holes in both the upper and lower layers of the plastic film at corresponding positions (see Fig. 1).

[0030]

The width of the array 25 depends on the width of the fine needles embedded in the needle roll of the micro-perforation apparatus (not shown). The width of the embedded needles is typically set within a range from 20 to 150 mm, preferably a range from 50 to 150 mm, or more preferably a range from 80 to 100 mm. However, the present invention is not limited to these ranges. When a target value of the amount ventilated (ventilation rate) of the MP holes 29, 29, ... in the array 25 is prescribed, the amount ventilated (ventilation rate) can be brought closer to the target value by changing the width of the array 25 with the hole diameter of or intervals between the group of MP holes 29, 29, ... kept fixed, or changing the hole diameter of or intervals between the group of MP

holes 29, 29, ... with the width of the array 25 kept fixed.

[0031]

The interval between adjacent MP holes in the array 25 can be set within a range from 5 mm to 15 mm, for example, taking into consideration the tradeoff between the strength of the inside bag 10 and the air permeability and the target amount ventilated.

[0032]

Whether the plastic film passing through the micro-perforation apparatus is folded at the center thereof or is not folded, the MP holes in the array 25 preferably have as uniform a shape as possible, in order to accurately grasp the average hole diameter described above or improve the precision of prediction of the target values of the air permeability and the air permeability rate. This also holds true when the flexible container provided with the inside bag with the array 25 is practically used. In order to improve the shape of the MP holes, depending on the material or thickness of the plastic film, the pressure with which the needle roll is pressed can be adjusted, or the surface hardness of the roll (receiving roll) against which the needle roll is pressed can be changed by changing the surface material. For example, when the inside bag is made of polyethylene and has a thickness of 0.07 μm , if the receiving roll is made of urethane and

has a surface hardness of 70, the pressure with which the needle roll is pressed is typically set at 3 kgf. When the inside bag is made of polyethylene and has a thickness of 0.05 mm, the pressure with which the needle roll is pressed is typically set at 2 kgf. As an alternative method of improving the shape of the MP holes, the surface material of the receiving roll may not be changed, but a cloth sheet of polyolefin such as polyethylene or polypropylene may be wound around the receiving roll to reduce the apparent surface hardness. The adjustment of the pressure and the change of the surface material or the winding of the cloth sheet around the receiving roll can be combined as appropriate.

[0033]

When the array 25 of MP holes is provided in a region of the inside bag 20, the array 25 is not limited to the implementation shown in Figures 1, 2A and 2B, but the MP holes can be continuously or intermittently arranged in a regular pattern in the circumferential direction of the inside bag 20 or the direction perpendicular thereto. Figures 3A to 3C and Figures 4A to 4C show other implementations of the array 25 of MP holes.

[0034]

Figure 3A shows an array 25 having a predetermined width arranged in the direction perpendicular to the direction of flow of the plastic film, Figure 3B shows an

array 25 having a predetermined width arranged in a zigzag pattern in the direction perpendicular to the direction of flow of the plastic film, and Figure 3C shows an array 25 having a predetermined width arranged in a dashed-line pattern in the direction perpendicular to the direction of flow of the plastic film. Of these arrays 25, the array 25 of the arrangement pattern shown in Figure 3A or 3C is preferably provided in an upper edge region of the body of the external bag 10 or circumferentially provided in an outer peripheral region of the top surface. Figure 5 shows a flexible container that is basically the same as that according to the embodiment shown in Figure 1 except that the array 25 is formed as shown in Figure 3.

[0035]

Figure 4A shows a continuous array 25 whose width continuously increases or decreases in the direction of flow of the plastic film, and Figure 4B shows a continuous array 25 having a predetermined width arranged in a zigzag pattern in the direction of flow of the plastic film. When the array 25 of the pattern shown in Figure 4A is provided on the inside bag 20, the air permeability (air permeability rate) per unit time and per unit area can be higher in a top surface 12 of the external bag 10 or regions closer to the top surface 12 than in regions closer to a bottom surface 16. Figure 4C shows an intermittent array 25 having a predetermined

width arranged in the direction of flow of the plastic film.

[0036]

According to the present invention, a wide variety of regular patterns other than those illustrated in Figures 3A to 3C and 4A to 4C can be formed by , for example, modifying the width of the needle roll or the arrangement of the needles embedded in the needle roll or modifying the micro-perforation apparatus so as to intermittently hold and perforate the plastic film and then passing the plastic film through the micro-perforation apparatus in the orientation perpendicular to the direction of flow of the plastic film. Furthermore, a plurality of patterns of MP holes can be repeatedly formed at different circumferential positions at regular intervals by displacing the micro-perforation apparatus or laser apparatus in the direction perpendicular to the direction of flow of the plastic film in the manufacturing process and passing the plastic film through the apparatus again. Similarly, when perforations are cut in the plastic film in the circumferential direction by the micro-perforation apparatus and the like, a plurality of patterns of MP holes can be repeatedly formed at regular intervals in the direction perpendicular to the circumferential direction of the plastic film by, for example, displacing the apparatus.

[0037]

The implementation of the plurality of MP holes (deaeration holes) 29, 29, ... is not limited to the implementations shown in Figures 1 to 4C in which the holes are provided in a region of the inside bag 10, but the plurality of MP holes can be provided over the entire surface of the inside bag 10. The air permeability of the pattern of the MP holes per unit time and per unit area can be higher in the top surface 12 of the external bag 10 or regions closer to the top surface 12 than in regions closer to the bottom surface 16.

[0038]

According to the present invention, the MP holes (deaeration holes) 29, 29, ... can be used in combination with other through-holes that are provided separately from the MP holes from the inner side to the outer side of the inside bag 20 and provided with a valve (which may be a check valve).

[0039]

(2) External bag 10

The external bag 10 includes a rectangular-cylindrical body 11, hanging belts 30, 30, 30, 30 for hanging the flexible container 1 according to the present invention, which are attached to the body 11 at four upper corners thereof via sewing parts 31, 31, 31, 31, the top surface 12 that closes the opening at the top of the body 11, and the bottom surface 16 that closes the

opening at the bottom of the body 11 (in this specification, the direction in which each hanging belt 30 extends from the body 11 is referred to as "upward direction", and the opposite direction in the opening through direction of the body 11 is referred to as a "downward direction"). With the external bag 10 according to this embodiment, the rectangular-cylindrical body 11, the top surface 12 and the bottom surface 16 have an air permeability. There is an opening in a middle region of the top surface 11. One open end of the cylindrical input part 13 is fixed in the opening, and top lids 14, 14, ... in a radially-cut structure are attached to the edge of the opening at their respective base ends. Similarly, there is an opening in a middle region of the bottom surface 16, one open end of the cylindrical discharge part 17 is fixed in the opening, and bottom lids 18, 18, ... in a radially-cut structure are attached to the edge of the opening at their respective base ends. The top lids 14, 14, ... and the bottom lids 18, 18, ... are provided with fastening tapes 15 and 19 at the tip ends thereof, respectively. The top lids 13 are configured to close the opening in the top surface 12 with the input part 13 trapped therein when the tape 15 is tightened, and the bottom lids 18 are configured to close the opening in the bottom surface 16 with the discharge part 17 trapped therein when the tape 19 is tightened. The outer shape of the external bag 10

is not limited to that according to this embodiment, and the discharge part 17 in the middle region of the bottom surface 16 below the rectangular-cylindrical body 11 may be omitted.

[0040]

The material of the external bag 10 is not particularly limited, and various materials used for well-known cloth containers and the like can be used. For example, yarn fabric produced by a loom weaving warp and weft of flat yarn made of a polyolefin resin such as polyethylene or polypropylene is suitable.

Example

[0041]

Next, the present invention will be described in more detail with regard to a preferred example of the flexible container according to the present invention.

[Fabrication of Inside bag]

A continuous band of MP holes having a width of 100 mm was formed in the inside bag made of polyethylene and having a thickness of 0.070 mm in the direction of flow of the inside bag by the micro-perforation apparatus as shown in Figures 1, 2A and 2B. The inside bag was manufactured in a cylindrical shape by the inflation film molding apparatus. The cylindrical film was passed through the micro-perforation apparatus in the state where the film was folded at the center thereof, thereby

forming a band-like array of MP holes having a width of 100 mm in each of the upper and lower layers of the film, that is, at circumferentially opposite positions in the inside bag. With this arrangement, the diameter of each MP hole was 0.100 mm, and the intervals between adjacent MP holes were 6 mm.

[0042]

[Fabrication of External bag]

Flat yarn of polypropylene was fabricated, and yarn fabric was produced by a loom weaving warp and weft of the flat yarn. The cylindrical body and the top input part were fabricated from the yarn fabric and sewed together by a sewing machine to produce the cylindrical external bag. The external bag corresponds to the common cloth container. The inside bag was accommodated in the external bag thus fabricated, thereby fabricating the flexible container having an inner/outer double structure.

[0043]

The resulting flexible container was filled with granules. Until the flexible container was filled halfway, the granules sank under their own weight and therefore the trapped air was spontaneously discharged through the filling port and the MP holes. As the flexible container was further filled, the compression effect of the weight of the granules decreased, and air remained trapped with the granules for filling. The input port of the top surface was closed with the top

lids to prevent contamination by foreign matter, and then, final deaeration of the entire flexible container was performed by applying a pressure from above to the flexible container, such as stacking another flexible container on the flexible container. In this way, the top surface of the flexible container was able to be flattened. Stable vertical stacking was able to be achieved in 2 to 3 minutes, or 5 minutes at most.

[0044]

As described above, the flexible container according to the present invention has a double structure that includes an inside bag that is formed from at least one layer of plastic film and has a deaeration hole as a deaeration mechanism and an external bag that has an air permeability and accommodates the inside bag, and therefore, spontaneous or effective deaeration can be achieved, and entry of foreign matter can be prevented. In particular, the flexible container can be manufactured continuously or in batches in the existing manufacturing process for the inside bag and is suitable for mass production. The finished flexible containers are less likely to vary in shape and have uniform qualities. The deaeration holes do not significantly affect the physical properties of the plastic film, so that the flexible container can be treated in the same way as the common inside bag.

[0045]

The present invention is not limited to the embodiments described above, and various modifications can be made to the constituent elements without departing from the spirit of the present invention. The present invention can also be applied to a flexible container integrated with a pallet or a flexible container that has a pocket capable of accommodating a fork of a forklift. The present invention is not limited to the application to the flexible container of the type that is provided with hanging belts and hung from above.

Reference Signs List

[0046]

- 1,2 flexible container
- 10 external bag
- 11 body
- 12 top surface
- 13 top surface inner lid
- 14 top lid
- 15 fastening tape
- 16 bottom surface
- 17 bottom surface inner lid
- 18 bottom lid
- 19 fastening tape
- 20 inside bag
- 21 cylindrical body
- 22 top surface of inside bag

- 23 input part
- 24 input port
- 25 array (of a group of deaeration holes)
- 26 bottom surface of inside bag
- 27 discharge part
- 28 discharge port
- 29 deaeration hole
- 30 hanging belt
- 31 sewing part

Claims

[Claim 1]

A flexible container, comprising:

an inside bag that is made of at least one layer of plastic film and has a deaeration mechanism in a region thereof, the deaeration mechanism comprising a group of a plurality of deaeration holes formed to penetrate the plastic film in a thickness direction thereof; and

an air-permeable external bag that includes a body, a top surface and a bottom surface and accommodates the inside bag,

wherein, in the plastic film, the group of deaeration holes is formed and arranged in succession at predetermined intervals in a direction perpendicular to a circumferential direction of the inside bag from the top surface or a region of the body close to the top surface to a region of the body close to the bottom surface, and

a group of deaeration holes arranged in the top surface or the region of the body close to the top surface has a greater average hole diameter and a higher air permeability per unit time and per unit area than a group of deaeration holes arranged in the region of the body close to the bottom surface.

[Claim 2]

The flexible container according to claim 1, wherein an average hole diameter of the group of deaeration holes falls within a range from 0.01 to 10 mm.

[Claim 3]

The flexible container according to claim 1 or 2, wherein an air permeability of the group of deaeration holes according to the Gurley method is equal to or lower than 300 seconds.

[Claim 4]

The flexible container according to claim 1 or 2, wherein an air permeability rate of the group of deaeration holes is equal to or higher than 0.33 ml/second for 20 holes in any successive sub-regions in the region.

[Claim 5]

The flexible container according to claim 1, wherein a material of the plastic film is a polyolefin resin.

[Claim 6]

The flexible container according to claim 1, wherein a thickness of the plastic film falls within a range from 30 to 200 μm .

[Claim 7]

The flexible container according to claim 1, wherein the width of the array of the deaeration holes continuously decreases in the direction perpendicular to the circumferential direction of the inside bag from the top surface or the region of the body close to the top surface to the region of the body close to the bottom surface.