

[DESCRIPTION]

[Title of Invention] DOUBLE-WALLED CONTAINER AND METHOD FOR MANUFACTURING DOUBLE-WALLED CONTAINER

[Technical Field]

[0001]

The present invention relates to a double container and a method for manufacturing the same.

[Background Art]

[0002]

Conventionally, double containers comprising a container body having an outer shell and an inner bag are known. For example, PTL 1 discloses a double container formed by performing biaxial stretch blow molding with an outer shell preform and an inner bag preform stacked together.

[Citation List]

[Patent Literature]

[0003]

[PTL 1] JP-A-2019-10741

[Summary of Invention]

[Technical Problem]

[0004]

By the way, when recycling such a double container, it is desirable to separate the outer shell and the inner bag in cases where the outer shell and the inner bag are formed of different materials, or when contents adhere to the inside of the inner bag after use.

[0005]

It is assumed that the outer shell and the inner bag are separated by pulling the inner bag out from the container body, and there is a demand to reduce the force required to separate the inner bag from the container body.

[0006]

The present invention has been made in view of such circumstances, and provides a double container in which the force required to separate the inner bag from the container body can be reduced.

[Solution to Problem]

[0007]

According to the present invention, the following inventions are provided.

[1] A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein the inner bag is configured to be pullable from the container body, and a constricted part is provided on an outer surface of the outer shell at a first height position, which is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body.

[2] A double container comprising a container body having an inner bag and an outer shell

arranged to cover the inner bag, wherein the inner bag is configured to be pullable from the container body, the container body comprises a mouth part, a body part, and a bottom part; the mouth part is a tubular portion having an opening end; the body part is arranged adjacent to the mouth part on a side further from the opening end than the mouth part and has an outer diameter larger than that of the mouth part; and the bottom part is configured to close a lower end of the body part, the body part comprises a shoulder part whose outer diameter increases with distance from the mouth part, the mouth part is provided with a flange, and a constricted part is provided between the flange and the shoulder part.

[3] The double container of [1] or [2], wherein, where a wall thickness of the outer shell at the first height position is $T1o$ and a depth of the constricted part is D , $D/T1o$ is 0.1 to 0.8.

[4] The double container of [1] or [2], wherein a depth of the constricted part is 0.2 to 1.0 mm.

[5] The double container of [1] or [2], wherein a wall thickness of the inner bag is 0.30 mm or less at a second height position that is 2.5 mm away from the first height position from an opening end of the container body.

[6] The double container of [1] or [2], wherein, where a wall thickness of the inner bag at a second height position that is 2.5 mm away from the first height position from an opening end of the container body, is $T2i$, and an average wall thickness of the inner bag within a height range of 5 mm from the first height position toward the opening end of the container body is $T3$, $T2i/T3$ is 0.60 or less.

[7] A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein the inner bag is configured to be pullable from the container body, and a wall thickness of the inner bag is 0.30 mm or less at a second height position that is 2.5 mm away from a first height position, which is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body.

[8] A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein the inner bag is configured to be pullable from the container body, and where a wall thickness of the inner bag at a second height position, which is 2.5 mm away from a first height position that is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body, is $T2i$, and an average wall thickness of the inner bag within a height range of 5 mm from the first height position toward an opening end of the container body is $T3$, $T2i/T3$ is 0.60 or less.

[9] A method for manufacturing a double container, comprising a step of manufacturing a container body by biaxially stretch blow molding a preform using a forming mold, wherein the container body has an inner bag and an outer shell arranged to cover the inner bag, the preform comprises an inner preform corresponding to the inner bag and an outer preform corresponding to the outer shell, the outer preform comprises a non-stretch portion where a wall thickness reduction rate during the biaxial stretch blow molding is less than 10%, and a stretch portion where the wall thickness reduction rate is 10% or more, and the forming mold

comprises a circumferentially extending protruding part at a position that abuts an outer surface of the outer preform in an adjacent part of the stretch portion, the adjacent part being a part adjacent to the non-stretch portion.

[10] A method for manufacturing a double container, comprising a step of manufacturing a container body by biaxially stretch blow molding a preform using a forming mold, wherein the container body has an inner bag and an outer shell arranged to cover the inner bag, the preform comprises an inner preform corresponding to the inner bag and an outer preform corresponding to the outer shell, the outer preform comprises a non-stretch portion where a wall thickness reduction rate during the biaxial stretch blow molding is less than 10%, and a stretch portion where the wall thickness reduction rate is 10% or more, and the forming mold comprises a flange receiving part for receiving a flange of the preform and a shoulder forming surface for forming a shoulder part of the container body, and further comprises a circumferentially extending protruding part at a position that abuts an outer surface of the outer preform between the flange receiving part and the shoulder forming surface.

[11] The method of [9] or [10], wherein a height of the protruding part is 0.2 to 1.0 mm.

[Advantageous Effects of Invention]

[0008]

The inventors found that the force required to separate the inner bag becomes large when the wall thickness of an undercut part, which becomes an undercut when pulling the inner bag from the container body, is large. They also found that by providing a constricted part on the outer surface of the outer shell at a first height position, which is the starting point of the undercut part, it is possible to move the first height position in a direction away from the opening end of the container body, as compared to a case without a constricted part. Since the wall thickness of the inner bag tends to decrease with increasing distance from the opening end of the container body, the inventors discovered that, according to the present invention, the wall thickness of the inner bag at the undercut part can be reduced, thereby reducing the force required to separate the inner bag from the container body, leading to the completion of the present invention.

[Brief Description of Drawings]

[0009]

FIG. 1 is a perspective view of a double container 1 according to a first embodiment of the present invention. The dash-dotted lines in the figure represent boundary lines where the curvature of the surfaces constituting the surface shape changes. The same applies to other figures.

FIG. 2 is a perspective view of the container body 2 in FIG. 1.

FIG. 3 is an enlarged view of region A in FIG. 2.

FIG. 4 is an exploded perspective view of FIG. 3. As to the inner bag 4, Only a part near the opening end 5c is shown.

FIG. 5 is a perspective view of the vicinity of the opening end of the outer shell 3.

FIG. 6A is a longitudinal cross-sectional view of the container body 2 of FIG. 2, passing

through the center of the mouth part 5. FIG. 6B is an enlarged view of region B in FIG. 6A.

FIG. 7A is a view corresponding to FIG. 6A for a container body 2x as a comparative example of the present invention. FIG. 7B is an enlarged view of region B in FIG. 7A.

FIG. 8 is a perspective view showing a state where an inner preform 14 and an outer preform 13 are separated.

FIG. 9 is a perspective view of a preform 15 constructed by placing the outer preform 13 over the inner preform 14.

FIG. 10 is a cross-sectional view showing a state where the preform 15 is mounted on a mouth support mold 21 and brought close to a heater 32.

FIG. 11 is a cross-sectional view showing a state after the preform 15 has been transferred to a forming mold 23 from the state of FIG. 10.

FIG. 12 is a cross-sectional view showing a state after a bottom support mold 22 has supported a bottom part 13c of the outer preform 13 from the state of FIG. 11.

FIG. 13 is a cross-sectional view showing a state after the preform 15 has been first-axis stretched by extending a stretching rod 25 and retracting the bottom support mold 22 from the state of FIG. 12.

FIG. 14A is an enlarged view of region A in FIG. 13. FIG. 14B is a view showing the forming mold 23 extracted from FIG. 14A.

FIG. 15 shows a comparative example of the present invention, and FIGS. 15A to 15B are views corresponding to FIGS. 14A to 14B, respectively.

FIG. 16 is a cross-sectional view showing a preform 15 used in Example 1 and Comparative Example 1.

FIG. 17 is a diagram reproducing the shape of the container body 2 in a photograph taken by cutting the container body 2 obtained in Example 1.

[Description of Embodiments]

[0010]

Hereinafter, embodiments of the present invention will be described. Various features shown in the embodiments described below can be combined with each other. In addition, an invention can be independently established for each feature.

[0011]

1. First Embodiment

1-1. Configuration of Double Container 1

<Basic Configuration>

As shown in FIG. 1, a double container 1 according to a first embodiment of the present invention comprises a container body 2 and a mouth-part mounting member 8.

[0012]

As shown in FIGS. 2 to 3, the container body 2 comprises a mouth part 5, a body part 6, and a bottom part 7. The mouth part 5 is a tubular (preferably cylindrical) portion having an opening end 5c. The mouth part 5 comprises an engagement part 4m to which the mouth-part mounting member 8 can be attached. Details of the engagement part 4m will be described later.

The mouth-part mounting member 8 is a cap 8a in this embodiment, but may be a pump. The mouth part 5 is provided with a flange 5b. The flange 5b can be used to support the mouth part 5 when the mouth-part mounting member 8 is attached to the mouth part 5.

[0013]

The body part 6 is arranged adjacent to the mouth part 5 on a side further away from the opening end 5c than the mouth part 5. The body part 6 has an outer diameter (in this specification, "outer diameter" means the equivalent circle diameter if the cross section is not circular) larger than that of the mouth part 5. The body part 6 is tubular, and the bottom part 7 is provided at the lower end of the body part 6 and closes the lower end of the body part 6. The body part 6 comprises a shoulder part 6b whose outer diameter increases with distance from the mouth part 5. The body part 6 also comprises a main body part 6c on the bottom part 7 side of the shoulder part 6b. The main body part 6c has, for example, a shape whose outer diameter is substantially constant toward the bottom part 7, or a shape whose diameter decreases toward the bottom part 7.

[0014]

As shown in FIG. 4, the container body 2 comprises an inner bag 4 and an outer shell 3 arranged to cover the inner bag 4. The inner bag body 4d of the inner bag 4, other than a protruding part 4c, is housed within the outer shell 3. In the following description, portions of the inner bag 4 corresponding to the mouth part 5, the body part 6, and the bottom part 7 of the container body 2 are referred to as the mouth part 5, the body part 6, and the bottom part 7 of the inner bag 4, respectively. The same applies to the outer shell 3.

[0015]

The average wall thickness of the outer shell 3 at the center in the height direction of the body part 6 is, for example, 200 to 800 μm , and preferably 250 to 500 μm . This wall thickness is, for example, specifically 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800 μm , and may be within a range between any two of the values exemplified here.

[0016]

The average wall thickness of the inner bag 4 at the center in the height direction of the body part 6 is, for example, 50 to 250 μm , and preferably 50 to 100 μm . This wall thickness is, for example, specifically 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250 μm , and may be within a range between any two of the values exemplified here or not more than any of them. In this specification, the average wall thickness at a predetermined height position means the average value of measurements at eight measurement points set at equal intervals in the circumferential direction at that height position.

[0017]

When the mouth-part mounting member 8 is not provided with a check valve, the inner bag 4 does not shrink even after the contents of the inner bag 4 are discharged, making it difficult to pull out the inner bag 4 through the mouth part 5 of the outer shell 3. Since the present invention facilitates pulling out the inner bag 4 through the mouth part 5 of the outer

shell 3, the significance of applying the present invention is particularly remarkable when the mouth-part mounting member 8 is not provided with a check valve.

[0018]

The inner diameter of the mouth part 5 of the outer shell 3 is, for example, 20 to 50 mm, and preferably 25 to 40 mm. The inner diameter of the mouth part 5 of the outer shell 3 is, for example, specifically 20, 25, 30, 35, 40, 45, 50 mm, and may be within a range between any two of the values exemplified here. The length of the mouth part 5 is, for example, 15 to 45 mm, and specifically, for example, 15, 20, 25, 30, 35, 40, 45 mm, and may be within a range between any two of the values exemplified here.

[0019]

<Detailed Structure of Outer Shell 3 and Inner Bag 4>

As shown in FIGS. 3 to 4, the inner bag 4 comprises a protruding part 4c that protrudes from the opening end 3a of the outer shell 3. The protruding part 4c comprises a protruding tube 4c1, an engagement protrusion 4c2, an annular protrusion 4c5, and an abutment flange 4c4.

[0020]

The annular protrusion 4c5 engages with the mouth-part mounting member 8 in the axial direction. The engagement protrusion 4c2 engages with the mouth-part mounting member 8 in the circumferential direction. In this specification, the "axial direction" is the direction in which the central axis C of the mouth part 5 extends, in other words, the direction in which the inner bag 4 is pulled out from the container body 2. The "circumferential direction" is the direction of rotation around the central axis C of the mouth part 5, in other words, the direction in which the inner bag 4 is rotated relative to the outer shell 3 at the mouth part 5.

[0021]

It is preferable that a plurality of engagement protrusions 4c2 (eight in this embodiment) are provided, spaced apart in the circumferential direction. The engagement protrusion 4c2 is disposed on the annular protrusion 4c5 and is provided so as to protrude radially outward from the annular protrusion 4c5. The annular protrusion 4c5 and the engagement protrusion 4c2 are provided with tapered surfaces 4c8 and 4c3 on their upper surfaces. This makes it easier for an annular protrusion (not shown) provided on the mouth-part mounting member 8 to ride over the annular protrusion 4c5 and the engagement protrusion 4c2.

[0022]

The abutment flange 4c4 is an annular portion disposed at a position where it abuts the opening end 3a and has a larger diameter than the protruding tube 4c1. The abutment of the abutment flange 4c4 against the opening end 3a prevents the inner bag 4 from falling into the outer shell 3.

[0023]

As shown in FIG. 4, a cam protrusion 4g is provided on the outer peripheral surface of the inner bag body 4d. The lower surface of the cam protrusion 4g is inclined so as to approach the opening end 5c as it proceeds counterclockwise when viewed from the opening end 5c side

of the mouth part 5.

[0024]

As shown in FIG. 5, a cam rail 3l and an engagement recess 3m are provided on the inner peripheral surface of the outer shell 3. The engagement recess 3m is provided such that the lower surface of the engagement recess 3m is continuous with the upper surface of the cam rail 3l. The upper surface of the cam rail 3l and the lower surface of the engagement recess 3m are inclined so as to approach the opening end 3a as they proceed counterclockwise when viewed from the opening end 3a side.

[0025]

In the state before the inner bag 4 is pulled out from the container body 2, the cam protrusion 4g is disposed within the engagement recess 3m, and the lower surface of the cam protrusion 4g is in contact with the upper surface of the cam rail 3l. A cam mechanism 31 is constituted by the cam protrusion 4g and the cam rail 3l. In this embodiment, the engagement recess 3m is a through hole, but it may be a non-through hole. When the inner bag 4 is rotated counterclockwise, the inner bag 4 moves in a direction to exit the container body 2 by the action of the cam mechanism 31. At this time, the inner bag 4 is twisted and its diameter is reduced.

[0026]

<Pulling out the Inner Bag 4>

The mouth-part mounting member 8 is configured to be attachable to the mouth part 5 of the container body 2 by a snap-on method, and the mouth-part mounting member 8 can be engaged with and attached to the mouth part 5 by pressing the mouth-part mounting member 8 in the direction of the bottom part 7 while it covers the mouth part 5.

[0027]

The mouth-part mounting member 8 is engaged with the mouth part 5 of the inner bag 4 in the circumferential and axial directions, and is configured such that the inner bag 4 rotates relative to the outer shell 3 with the rotation of the mouth-part mounting member 8. Then, by the action of the cam mechanism 31 provided between the inner bag 4 and the outer shell 3, the inner bag 4 is configured to move in a direction to exit the container body 2 with the rotation of the inner bag 4.

[0028]

According to such a configuration, by rotating the mouth-part mounting member 8, the inner bag 4 can be moved in a direction to exit the container body 2 while being twisted, and thereafter, the inner bag 4 can be pulled out from the container body 2 by pulling the mouth-part mounting member 8. Note that the inner bag 4 may be separated from the container body 2 by pulling it in the axial direction without twisting. Even in that case, according to the configuration of the present invention, the force required to separate the inner bag 4 is reduced.

[0029]

<Undercut Part>

FIG. 7 shows the configuration of a container body 2x as a comparative example of the

present invention. In the mouth part 5 of the container body 2x, an inner surface 3b and an outer surface 3c of the outer shell 3 each extend parallel to a central axis C of the mouth part 5 in a first region 5d adjacent to a wall thickness reduction start height position Ha, where the wall thicknesses of the outer shell 3 and the inner bag 4 begin to decrease, on the side closer to an opening end 5c. On the other hand, in a second region 5e adjacent to the height position Ha on the side away from the opening end 5c, the outer surface 3c remains parallel to the central axis C, and the wall thickness of the outer shell 3 gradually decreases with distance from the opening end 5c of the container body 2x. For this reason, the inner surface 3b of the outer shell 3 becomes an inclined surface whose diameter increases with distance from the opening end 5c of the container body 2x. Since an outer surface 4v of the inner bag 4 has a shape along the inner surface 3b of the outer shell 3, a portion of the inner bag 4 existing in the second region 5e has an undercut part 4u where the inner bag 4 interferes with the outer shell 3 when the inner bag 4 is pulled out from the container body 2x. A portion closer to the outer shell 3 than a vertical plane V in FIG. 7 becomes the undercut part 4u. In the container body 2x, the wall thickness reduction start height position Ha coincides with a first height position H1, which is the starting point of the undercut part 4u.

[0030]

The undercut part 4u is a factor that increases the force required to separate the inner bag 4 from the container body, and the effect is greater as the wall thickness of the inner bag 4 at the height position having the undercut part 4u is larger. In the form of FIG. 7, the first height position H1, which is the starting point of the undercut part 4u, coincides with the wall thickness reduction start height position Ha, and in a portion immediately below the first height position H1, the wall thickness reduction of the inner bag 4 is insufficient, and the undercut part 4u significantly increases the force required to separate the inner bag 4 from the container body.

[0031]

Next, the container body 2 of this embodiment will be described with reference to FIG. 6. The main difference between the container body 2 of this embodiment and the comparative example of FIG. 7 is that a constricted part 3d is provided on an outer surface 3c of the outer shell 3. The container body 2 of this embodiment is common to the form of FIG. 7 in that the wall thicknesses of the outer shell 3 and the inner bag 4 gradually decrease in a second region 5e, but in this embodiment, because the constricted part 3d is provided, a wall thickness reduction start height position Ha does not become a first height position H1, which is the starting point of an undercut part 4u, and the first height position H1 is at a height position farther from an opening end 5c than the wall thickness reduction start height position Ha. In the second region 5e, the wall thickness of the inner bag 4 decreases with distance from the opening end 5c, so that by setting the first height position H1 at a position farther from the opening end 5c than the wall thickness reduction start height position Ha, the wall thickness of the inner bag 4 in a portion immediately below the first height position H1 becomes smaller than in the case where the constricted part 3d is not present as shown in FIG. 7. Therefore, by

providing the constricted part 3d, it is possible to reduce the force required to separate the inner bag 4 from the container body.

[0032]

The constricted part 3d is a recess provided to extend in the circumferential direction of the outer surface 3c of the outer shell 3. The constricted part 3d may be provided in a part of the circumference of the outer surface 3c, but is preferably provided over the entire circumference. The constricted part 3d is preferably provided between the flange 5b and the shoulder part 6b. It is preferable that there is a portion without the constricted part 3d between the constricted part 3d and the lower surface of the flange 5b. It is preferable that the constricted part 3d connects to the shoulder part 6b without a step.

[0033]

Where the wall thickness of the outer shell 3 at the first height position H1 is T1o and the depth of the constricted part 3d is D, it is preferable that $D/T1o$ is 0.1 to 0.8. If the constricted part 3d is too shallow, the effect of reducing the wall thickness of the inner bag 4 at the height position having the undercut part 4u may be insufficient. If the constricted part 3d is too deep, the force required to separate the inner bag 4 may be increased by the undercut caused by the constricted part 3d. The depth D means the depth from the outer surface 3c in the first region 5d. The depth D can be calculated, for example, by (outer diameter of the outer shell 3 in the first region 5d - outer diameter of the outer shell 3 at the constricted part 3d)/2. $D/T1o$ is preferably 0.2 to 0.7, and specifically, for example, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, and may be in a range between any two of the values exemplified here.

[0034]

T1o is, for example, 0.8 to 2.0 mm, and specifically, for example, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0 mm, and may be within a range between any two of the values exemplified here. D is, for example, 0.2 to 1.0 mm, and specifically, for example, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 mm, and may be within a range between any two of the values exemplified here. The wall thickness T1i of the inner bag 4 at the first height position H1 is, for example, 0.15 to 0.35 mm, and specifically, for example, 0.15, 0.16, 0.17, 0.18, 0.19, 0.20, 0.21, 0.22, 0.23, 0.24, 0.25, 0.26, 0.27, 0.28, 0.29, 0.30, 0.31, 0.32, 0.33, 0.34, 0.35 mm, and may be within a range between any two of the values exemplified here.

[0035]

The wall thickness T2i of the inner bag 4 at a second height position H2, which is 2.5 mm away from the first height position H1 from the opening end 5c, is preferably 0.30 mm or less, and more preferably 0.20 mm or less. The smaller this wall thickness is, the more the increase in the force required to separate the inner bag 4 due to the undercut part 4u is suppressed. The wall thickness T2i is, for example, specifically 0.05, 0.06, 0.07, 0.08, 0.09, 0.10, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.20, 0.21, 0.22, 0.23, 0.24, 0.25, 0.26, 0.27, 0.28, 0.29, 0.30 mm, and may be within a range between any two of the values exemplified here or not more than any of them. The wall thickness T2o of the outer shell 3 at the second height position H2 is, for example, 0.5 to 1.5 mm, and specifically, for example, 0.5, 0.6, 0.7, 0.8, 0.9,

1.0, 1.1, 1.2, 1.3, 1.4, 1.5 mm, and may be within a range between any two of the values exemplified here.

[0036]

Where the average wall thickness of the inner bag 4 within a height range of 5 mm on the opening end 5c side from the first height position H1 is T3, it is preferable that $T2i/T3$ is 0.60 or less. $T2i/T3$ indicates the degree of reduction in the wall thickness of the inner bag 4 at the height position having the undercut part 4u. The smaller $T2i/T3$ is, the more remarkable the reduction in the wall thickness of the inner bag 4 at the height position having the undercut part 4u, and the more the increase in the force required to separate the inner bag 4 due to the undercut part 4u is suppressed.

[0037]

1-2. Method for Manufacturing Double Container 1

As shown in FIGS. 8 to 14, the container body 2 can be manufactured by biaxially stretch blow molding a preform 15 using a forming mold 23.

[0038]

<Configuration of Inner Preform 14, Outer Preform 13, and Preform 15>

The preform 15 comprises an inner preform 14 that becomes the inner bag 4, and an outer preform 13 that becomes the outer shell 3.

[0039]

As shown in FIG. 8, the inner preform 14 has a bottomed tubular shape and comprises a mouth part 14a, a body part 14b, and a bottom part 14c. A protruding part 14d is provided at the opening end of the mouth part 14a. The protruding part 14d becomes the protruding part 4c with its shape unchanged without being deformed during molding. Therefore, the matters described for the protruding part 4c also apply to the protruding part 14d. An engagement part 14m is provided on the protruding part 14d. The engagement part 14m becomes the engagement part 4m after molding and is used for pulling out the inner bag 4. The bottom part 14c is provided to close the lower end of the body part 14b.

[0040]

As shown in FIG. 8, the outer preform 13 has a bottomed tubular shape and comprises a mouth part 13a, a body part 13b, and a bottom part 13c. The bottom part 13c is provided to close the lower end of the body part 13b. An annular protrusion 13d is provided on the bottom part 13c.

[0041]

As shown in FIG. 9, the preform 15 can be formed by placing the outer preform 13 over the inner preform 14. In the preform 15, the mouth part 14a and the mouth part 13a face each other, and the body part 14b and the body part 13b face each other.

[0042]

The mouth parts 13a and 14a become a mouth part 15a of the preform 15, the body parts 13b and 14b become a body part 15b of the preform 15, and the bottom parts 13c and 14c become a bottom part 15c of the preform 15. The body part 15b and the bottom part 15c are

mainly stretched in the biaxial stretch blow molding.

[0043]

<Materials and Manufacturing Method for Inner Preform 14, Outer Preform 13, and Preform 15>

The inner preform 14 and the outer preform 13 can be formed by direct blow molding or injection molding of a thermoplastic resin such as polyester (e.g., PET) or polyolefin (e.g., polypropylene, polyethylene). In one example, the inner preform 14 is made of a polyolefin (e.g., polypropylene), and the outer preform 13 is made of PET. The polyolefin used for the inner preform 14 is preferably polypropylene rather than polyethylene. This is because polypropylene has a temperature suitable for biaxial stretch blow molding that is closer to that of PET than polyethylene.

[0044]

The preform 15 may be constructed by manufacturing the inner preform 14 and the outer preform 13 separately and then placing the outer preform 13 over the inner preform 14, or it may be manufactured by multilayer injection molding or two-color molding. By either method, a preform 15 is obtained in which the inner preform 14 and the outer preform 13 are laminated.

[0045]

In multilayer injection molding, a multilayer preform 15 having layers corresponding to the inner preform 14 and the outer preform 13 can be manufactured in a single injection molding process.

[0046]

In two-color molding, one of the inner preform 14 and the outer preform 13 is molded in a first molding step, and the other of the inner preform 14 and the outer preform 13 is molded in a second molding step. The first molding step may be direct blow molding or injection molding. The second molding step is preferably injection molding.

[0047]

<Biaxial Stretch Blow Molding>

The biaxial stretch blow molding can be performed, for example, by a heating step, a first stretching step, and a second stretching step. The heating step can be performed using a heating device 35 shown in FIG. 10, and the first and second stretching steps can be performed using a blow molding apparatus 36 shown in FIGS. 11 to 13.

[0048]

<Heating Step>

In the heating step, the preform 15 is heated and softened to a softened state. The heating step can be performed, for example, by bringing the preform 15 close to a heater 32 with the preform 15 mounted on a mouth support mold 21 as shown in FIG. 10, thereby heating the preform 15. The heating step is performed by heating a body part 15b and a bottom part 15c with a flange 15e provided on the preform 15 covered by a heat shield part 33. This softens the body part 15b and the bottom part 15c. On the other hand, the flange 15e and a mouth part 15a covered by the heat shield part 33 are subjected to little or no heat from the heater 32 and

are not softened. In addition, a portion 15f of the body part 15b adjacent to the flange 15e is difficult to soften because heat from the heater 32 is somewhat blocked by the heat shield part 33, and even if heat from the heater 32 is applied, the heat easily escapes to the flange 15e and the mouth part 15a, which have a relatively low temperature. In one example, the preform 15 can be heated while being rotated. In another example, the heater 32 is composed of a plurality of rod-shaped heaters arranged along the side surface of the preform 15, but other configurations are also possible.

[0049]

<First Stretching Step>

In the first stretching step, the preform 15 is stretched along a first axial direction (i.e., the vertical direction). The first axis is, for example, a direction parallel to the central axis C of the mouth part 5, which is the vertical direction in FIG. 11. This step can be performed, for example, by setting the heated preform 15 in a forming mold 23 as shown in FIG. 11, and extending a stretching rod 25 by pressing it against the inner bottom surface of the inner preform 14 while a bottom part 13c of the outer preform 13 is supported by a bottom support mold 22, as shown in FIGS. 12 to 13. At this time, it is preferable to retract the bottom support mold 22 in synchronization with the extension of the stretching rod 25. This allows the preform 15 to be stretched stably.

[0050]

The preform 15 can be transferred from the heating device 35 to the blow molding apparatus 36 while being supported by the mouth support mold 21. In the blow molding apparatus 36, the mouth support mold 21 can be set on a pedestal 34. The first stretching step can be performed with the mouth support mold 21 brought into contact with the forming mold 23 by moving the pedestal 34 toward the forming mold 23. The forming mold 23 is composed of a splittable mold that can be opened and closed, and has a cavity surface 23a corresponding to the outer surface shape of the container body 2.

[0051]

<Second Stretching Step>

In the second stretching step, from the state shown in FIG. 13, air is blown into the inner preform 14 to stretch (i.e., expand) the preform 15 in a second axial direction (i.e., the lateral direction) and shape it to the shape of the cavity surface 23a, thereby obtaining the container body 2 shown in FIG. 2. The air can be blown through an air passage 26 between the mouth support mold 21 and the stretching rod 25, but for example, an air passage may be provided inside the stretching rod 25 to blow air from the side of the stretching rod 25.

[0052]

By the way, the outer preform 13 has a portion where the wall thickness is greatly reduced and a portion where the wall thickness is hardly or not at all reduced during biaxial stretch blow molding. Here, a portion where the wall thickness reduction rate, defined by (wall thickness of the outer shell 3 / wall thickness of the outer preform 13) for the corresponding portion, is less than 10% is defined as a non-stretch portion, and a portion where it is 10% or

more is defined as a stretch portion. The outer preform 13 comprises a non-stretch portion where the wall thickness reduction rate during biaxial stretch blow molding is less than 10%, and a stretch portion where the wall thickness reduction rate is 10% or more.

[0053]

FIG. 15 shows a forming mold 23x as a comparative example of the present invention. By molding using this forming mold 23x, the container body 2x shown in FIG. 7 is obtained. In an adjacent part 15g on the bottom part 15c side of a boundary B in FIG. 15A, the outer shapes of the outer preform 13 and the outer shell 3 coincide, so the adjacent part 15g is not stretched in the second stretching step, but is stretched and thinned in the first stretching step. Then, due to this thinning, an undercut part 4u with a large wall thickness of the inner bag 4 is formed, as described with reference to FIG. 7.

[0054]

FIG. 14 shows a forming mold 23 of the embodiment of the present invention. The difference from the comparative example is that the forming mold 23 is provided with a circumferentially extending protruding part 23b at a position that abuts the outer surface of the outer preform 13 in an adjacent part 15g of the stretch portion. The adjacent part 15g is adjacent to the non-stretch portion. By providing the protruding part 23b on the forming mold 23, the constricted part 3d shown in FIG. 6 is formed, and the inner bag 4 is thinned at the height position having the undercut part 4u. The protruding part 23b may be provided on a part of the circumference, but is preferably provided on the entire circumference. The protruding part 23b is preferably provided between a flange receiving part 23c for receiving the flange 15e and a shoulder forming surface 23d for forming the shoulder part 6b. It is preferable that there is a portion without the protruding part 23b between the protruding part 23b and the flange receiving part 23c. It is preferable that the protruding part 23b connects to the shoulder forming surface 23d without a step.

[0055]

Where the wall thickness of the outer preform 13 at the boundary B is T_b and the height of the protruding part 23b is H , it is preferable that H/T_b is 0.1 to 0.8. If the protruding part 23b is too low, the effect of reducing the wall thickness of the inner bag 4 at the height position having the undercut part 4u may be insufficient. If the protruding part 23b is too high, the constricted part 3d becomes too deep, which may in turn increase the force required to separate the inner bag 4 due to the constricted part 3d. The height H means the height from an adjacent region 23e on the opening end side of the boundary B.

[0056]

T_b is, for example, 0.8 to 2.0 mm, and specifically, for example, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0 mm, and may be within a range between any two of the values exemplified here. H is, for example, 0.2 to 1.0 mm, and specifically, for example, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 mm, and may be within a range between any two of the values exemplified here.

[0057]

2. Other Embodiments

Focusing on the point that the wall thickness of the inner bag 4 at the height position having the undercut part 4u is small, the present invention can be defined as follows. In this case, the constricted part 3d is not essential. Instead of forming the constricted part 3d, for example, the wall thickness of the inner bag 4 at the height position having the undercut part 4u can be reduced by changing the shape of the preform 15.

[0058]

A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag,

wherein the inner bag is configured to be pullable from the container body, and

wherein a wall thickness of the inner bag is 0.30 mm or less at a second height position that is 2.5 mm away from a first height position, which is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body.

[0059]

A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein

the inner bag is configured to be pullable from the container body, and

where a wall thickness of the inner bag at a second height position, which is 2.5 mm away from a first height position that is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body, is T_{2i} , and an average wall thickness of the inner bag within a height range of 5 mm from the first height position toward an opening end of the container body is T_3 , T_{2i}/T_3 is 0.60 or less.

[0060]

Furthermore, focusing on the point that the constricted part 3d is provided between the flange 5b and the shoulder part 6b, the present invention can be defined as follows.

[0061]

A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein

the inner bag is configured to be pullable from the container body,

the container body comprises a mouth part, a body part, and a bottom part; the mouth part is a tubular portion having an opening end; the body part is arranged adjacent to the mouth part on a side further from the opening end than the mouth part and has an outer diameter larger than that of the mouth part; and the bottom part is configured to close a lower end of the body part,

the body part comprises a shoulder part whose outer diameter increases with distance from the mouth part,

the mouth part is provided with a flange, and

a constricted part is provided between the flange and the shoulder part.

[0062]

Furthermore, focusing on the point that the protruding part 23b is provided between the flange receiving part 23c for receiving the flange 15e of the preform 15 and the shoulder forming surface 23d for forming the shoulder part 6b, the present invention can be defined as follows.
[0063]

A method for manufacturing a double container, comprising a step of manufacturing a container body by biaxially stretch blow molding a preform using a forming mold, wherein the container body has an inner bag and an outer shell arranged to cover the inner bag, the preform comprises an inner preform corresponding to the inner bag and an outer preform corresponding to the outer shell,

the outer preform comprises a non-stretch portion where a wall thickness reduction rate during the biaxial stretch blow molding is less than 10%, and a stretch portion where the wall thickness reduction rate is 10% or more, and

the forming mold comprises a flange receiving part for receiving a flange of the preform and a shoulder forming surface for forming a shoulder part of the container body, and further comprises a circumferentially extending protruding part at a position that abuts an outer surface of the outer preform between the flange receiving part and the shoulder forming surface.

[EXAMPLE]

[0064]

1. Manufacture and Wall Thickness Measurement of Container Body

<Example 1>

A container body 2 (internal volume 300 mL) having the shape shown in FIGS. 1 to 6 was obtained by performing the biaxial stretch blow molding described above using a preform 15 having the shape shown in FIG. 16 and an apparatus having the structure shown in FIGS. 10 to 14. The wall thickness of the inner preform 14 was about 0.7 mm within a range of 20 to 40 mm from the opening end of the preform 15. The wall thickness of the outer preform 13 was about 1.9 mm at a distance of 20 mm from the opening end of the preform 15, and about 1.3 mm within a range of 27.5 to 40 mm.

[0065]

The inner preform 14 was manufactured by direct blow molding a propylene-ethylene random copolymer (model: WINTEX, manufactured by Japan Polypropylene Corporation). The outer preform 13 was manufactured by injection molding PET (model: titanium-based catalyst grade, manufactured by Teijin Limited) at 300°C to form the shape of the outer preform, followed by rapid cooling to 20°C. The molten PET was made amorphous by the rapid cooling. In the heating step, the preform 15 was heated to 110°C (temperature at the center in the longitudinal direction of the preform 15). The height of the protruding part 23b and the depth of the constricted part 3d were each set to 0.5 mm. The protruding part 23b was provided such that the distance in the first axial direction from the opening end of the preform 15 to the top surface of the protruding part 23b was 31.6 mm, with the preform 15 set in the forming mold 23.

[0066]

Next, for the obtained container body 2, the wall thickness was measured at various measurement positions at different distances from the opening end 5c. The wall thickness was measured using a micrometer at two locations with an angle of 90 degrees from the parting line, and the average value was calculated. FIG. 17 shows the cross-sectional shape of the container body 2 and the relationship of the measurement positions. FIG. 17 is a diagram reproducing the shape of the container body 2 in a photograph taken by cutting the obtained container body 2.

[0067]

[Table 1]

Table 1	wall thickness of inner bag (mm)			wall thickness of outer shell (mm)		
distance from opening end (mm)	PL90-1	PL90-2	average value	PL90-1	PL90-2	average value
20.0	0.736	0.712	0.724	1.919	1.891	1.905
22.5	0.629	0.61	0.620	-	-	-
25.0	0.584	0.511	0.548	-	-	-
27.5	0.454	0.433	0.444	1.464	1.229	1.347
30.0	0.389	0.333	0.361	1.422	1.073	1.248
32.5	0.282	0.249	0.266	1.213	1.142	1.178
35.0	0.170	0.160	0.165	1.166	0.781	0.974
37.5	0.120	0.114	0.117	0.680	0.438	0.559
40.0	0.098	0.087	0.093	0.379	0.363	0.371
average value	0.427	0.382	0.404	1.366	1.148	1.257

[0068]

Referring to FIG. 17, it can be seen that the position at a distance of 32.5 mm from the opening end 5c is the first height position H1, which is the starting point of the undercut part 4u. Referring to Table 1, the wall thickness T1o of the outer shell 3 at the first height position H1 is 1.178 mm, and as described above, the depth D of the constricted part 3d is 0.5 mm, so $D/T1o$ is 0.34.

[0069]

The second height position H2, which is 2.5 mm away from the first height position H1 from the opening end 5c, is at a distance of 35.0 mm from the opening end 5c, and the wall thickness T2i of the inner bag 4 at this position is 0.165 mm. The range of 5 mm on the opening end 5c side from the first height position H1 is the range of 27.5 to 32.5 mm, and the average wall thickness T3 of the inner bag 4 within this range is 0.357 mm, so $T2i/T3$ is 0.46.

[0070]

Also, comparing the wall thickness of the outer shell 3 in Table 1 with the wall thickness of the outer preform 13, it can be seen that the wall thickness reduction rate is about 5% at a distance of 30.0 mm from the opening end 5c, and the wall thickness reduction rate becomes about 10% near 32.5 mm. Since the protruding part 23b is provided from a position of 31.6 mm from the opening end to the shoulder forming surface 23d, it can be seen that it is provided

at a position that abuts the outer surface of the outer preform 13 in the adjacent part of the stretch portion of the outer preform 13 adjacent to the non-stretch portion.

[0071]

<Comparative Example 1>

A container body 2x was manufactured and its wall thickness was measured in the same manner as in Example 1, except that the forming mold 23 was changed to the forming mold 23x shown in FIG. 15. The results are shown in Table 2. FIG. 7 is a diagram reproducing the shape of the container body 2x in a photograph taken by cutting the container body 2x obtained in Comparative Example 1.

[0072]

[Table 2]

Table 2	wall thickness of inner bag (mm)			wall thickness of outer shell (mm)		
	PL90-1	PL90-2	average value	PL90-1	PL90-2	average value
20.0	0.754	0.765	0.760	1.914	1.88	1.897
22.5	0.653	0.665	0.659	-	-	-
25.0	0.570	0.557	0.564	-	-	-
27.5	0.494	0.480	0.487	1.410	1.475	1.443
30.0	0.447	0.398	0.423	1.279	1.394	1.337
32.5	0.369	0.316	0.343	0.843	1.210	1.027
35.0	0.164	0.193	0.179	0.629	0.764	0.697
37.5	0.097	0.094	0.096	0.512	0.603	0.558
40.0	0.076	0.077	0.077	0.355	0.445	0.400
average value	0.470	0.438	0.454	0.838	0.982	1.269

[0073]

In Comparative Example 1, it can be seen that the wall thickness of the outer shell 3 rapidly decreases from a distance of 30.0 mm from the opening end 5c, and this position is the first height position H1, which is the starting point of the undercut part. Referring to Table 2, the second height position H2, which is 2.5 mm away from the first height position H1 from the opening end 5c, is at a distance of 32.5 mm from the opening end 5c, and the wall thickness T2i of the inner bag 4 at this position is 0.343 mm. The range of 5 mm on the opening end 5c side from the first height position H1 is the range of 25.0 to 30.0 mm, and the average wall thickness T3 of the inner bag 4 within this range is 0.491 mm, so T2i/T3 is 0.70.

[0074]

<Consideration>

In Example 1, compared to Comparative Example 1, the wall thickness of the inner bag 4 at the second height position H2 was smaller, and the value of T2i/T3 was smaller.

[0075]

2. Torque Measurement

The cap 8a of the above embodiment was attached to the mouth part 5 of the container

bodies 2, 2x of the example and comparative example, and with the container bodies 2, 2x fixed, the peak value when the cap 8a was rotated 180 degrees counterclockwise (in the direction of rotation when separating the inner bag 4 from the container bodies 2, 2x) was recorded as the rotational torque. This rotational torque corresponds to the force required to pull the inner bag 4 out from the container bodies 2, 2x. Five measurement samples were prepared for each of the example and comparative example, and measurements were performed for each. The results are shown in Table 3.

[0076]

Referring to Table 3, it was found that in Example 1, the rotational torque was smaller than in Comparative Example 1, and the force required to separate the inner bag 4 from the container body 2 was reduced.

[0077]

[Table 3]

Table 3	rotational torque [N·cm]	
No.	Ex.1	Comp. Ex.1
1	123	146
2	123	183.5
3	125	142
4	117.5	155.5
5	126	152.5
average value	122.9	155.9

[Reference Signs List]

[0078]

1: double container, 2: container body, 2x: container body of comparative example, 3: outer shell, 3a: opening end, 3b: inner surface, 3c: outer surface, 3d: constricted part, 3l: cam rail, 3m: engagement recess, 4: inner bag, 4c: protruding part, 4c1: protruding tube, 4c2: engagement protrusion, 4c3: tapered surface, 4c4: abutment flange, 4c5: annular protrusion, 4c8: tapered surface, 4d: inner bag body, 4g: cam protrusion, 4m: engagement part, 4u: undercut part, 4v: outer surface, 5: mouth part, 5b: flange, 5c: opening end, 5d: first region, 5e: second region, 6: body part, 6b: shoulder part, 6c: main body part, 7: bottom part, 8: mouth-part mounting member, 8a: cap, 13: outer preform, 13a: mouth part, 13b: body part, 13c: bottom part, 13d: annular protrusion, 14: inner preform, 14a: mouth part, 14b: body part, 14c: bottom part, 14d: protruding part, 14m: engagement part, 15: preform, 15a: mouth part, 15b: body part, 15c: bottom part, 15e: flange, 15f: portion, 15g: adjacent part, 21: mouth support mold, 22: bottom support mold, 23: forming mold, 23x: forming mold of comparative example, 23a: cavity surface, 23b: protruding part, 23c: flange receiving part, 23d: shoulder forming surface, 23e: adjacent region, 25: stretching rod, 26: air passage, 31: cam mechanism, 31a: end surface, 32: heater, 33: heat shield part, 34: pedestal, 35: heating device, 36: blow molding apparatus, B: boundary, C: central axis, H1: first height position, H2: second height position, Ha: wall thickness reduction start height position

[CLAIMS]

[Claim 1]

A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein

the inner bag is configured to be pullable from the container body, and

a constricted part is provided on an outer surface of the outer shell at a first height position, which is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body.

[Claim 2]

A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein

the inner bag is configured to be pullable from the container body,

the container body comprises a mouth part, a body part, and a bottom part; the mouth part is a tubular portion having an opening end; the body part is arranged adjacent to the mouth part on a side further from the opening end than the mouth part and has an outer diameter larger than that of the mouth part; and the bottom part is configured to close a lower end of the body part,

the body part comprises a shoulder part whose outer diameter increases with distance from the mouth part,

the mouth part is provided with a flange, and

a constricted part is provided between the flange and the shoulder part.

[Claim 3]

The double container of claim 1 or 2, wherein, where a wall thickness of the outer shell at the first height position is T_{1o} and a depth of the constricted part is D , D/T_{1o} is 0.1 to 0.8.

[Claim 4]

The double container of claim 1 or 2, wherein a depth of the constricted part is 0.2 to 1.0 mm.

[Claim 5]

The double container of claim 1 or 2, wherein a wall thickness of the inner bag is 0.30 mm or less at a second height position that is 2.5 mm away from the first height position from an opening end of the container body.

[Claim 6]

The double container of claim 1 or 2, wherein, where a wall thickness of the inner bag at a second height position that is 2.5 mm away from the first height position from an opening end of the container body, is T_{2i} , and an average wall thickness of the inner bag within a height range of 5 mm from the first height position toward the opening end of the container body is T_3 , T_{2i}/T_3 is 0.60 or less.

[Claim 7]

A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein

the inner bag is configured to be pullable from the container body, and

a wall thickness of the inner bag is 0.30 mm or less at a second height position that is 2.5 mm away from a first height position, which is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body.

[Claim 8]

A double container comprising a container body having an inner bag and an outer shell arranged to cover the inner bag, wherein

the inner bag is configured to be pullable from the container body, and

where a wall thickness of the inner bag at a second height position, which is 2.5 mm away from a first height position that is a starting point of an undercut part where the inner bag interferes with the outer shell when pulling the inner bag from the container body, is T_{2i} , and an average wall thickness of the inner bag within a height range of 5 mm from the first height position toward an opening end of the container body is T_3 , T_{2i}/T_3 is 0.60 or less.

[Claim 9]

A method for manufacturing a double container, comprising a step of manufacturing a container body by biaxially stretch blow molding a preform using a forming mold, wherein

the container body has an inner bag and an outer shell arranged to cover the inner bag,

the preform comprises an inner preform corresponding to the inner bag and an outer preform corresponding to the outer shell,

the outer preform comprises a non-stretch portion where a wall thickness reduction rate during the biaxial stretch blow molding is less than 10%, and a stretch portion where the wall thickness reduction rate is 10% or more, and

the forming mold comprises a circumferentially extending protruding part at a position that abuts an outer surface of the outer preform in an adjacent part of the stretch portion, the adjacent part being a part adjacent to the non-stretch portion.

[Claim 10]

A method for manufacturing a double container, comprising a step of manufacturing a container body by biaxially stretch blow molding a preform using a forming mold, wherein

the container body has an inner bag and an outer shell arranged to cover the inner bag,

the preform comprises an inner preform corresponding to the inner bag and an outer preform corresponding to the outer shell,

the outer preform comprises a non-stretch portion where a wall thickness reduction rate during the biaxial stretch blow molding is less than 10%, and a stretch portion where the wall thickness reduction rate is 10% or more, and

the forming mold comprises a flange receiving part for receiving a flange of the preform and a shoulder forming surface for forming a shoulder part of the container body, and further comprises a circumferentially extending protruding part at a position that abuts an outer surface of the outer preform between the flange receiving part and the shoulder forming surface.

[Claim 11]

The method of claim 9 or 10, wherein a height of the protruding part is 0.2 to 1.0 mm.