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Description

FIELD OF THE INVENTION

The present invention relates to a biaxially blow-molded bottle-shaped container made of synthetic resin, and more particularly, to a construction of portions of the bottle which contact with each other when bottle-shaped containers in accordance with the invention are stood upright so as to be adjacent to each other.

PRIOR ART

Biaxially blow-molded bottle-shaped containers made of synthetic resin (hereinafter referred to as "blow-molded bottle-shaped containers") such as polyethylene terephthalate resin are each filled with contents, sealed by a cap, applied with a label and packed in a corrugated card-board box by a packer for transportation.

Most of such blow-molded bottle-shaped containers are relatively large. Accordingly, their whole weight, filled with contents, is very heavy.

It is desired that the quantity of synthetic resin material required to mold a bottle-shaped container be made as small as possible to form a bottle-shaped container at less cost. Accordingly, the blow-molded bottle-shaped container is molded by sufficiently orienting a parison and ensuring that the wall thickness of a body of the bottle-shaped container which forms a main portion of a content-receiving portion is very thin.

In a blow-molded bottle-shaped container molded by sufficiently orienting a parison, there cannot always be obtained an uprightness with high accuracy (when a bottle-shaped container is stood upright on a horizontal surface, the larger the angle of inclination with respect to a vertical line of a center axis of the container, the poorer is the uprightness of the container due to an internal strain or the like caused by orientation, and the bottle-shaped container is stood upright in a slightly inclined attitude. Particularly, in case of a blow-molded bottle-shaped container molded as a heat-resistant bottle-shaped container, the inferiority of the uprightness tends to increase.

Since the blow-molded bottle-shaped container is heavy when it is filled with a content liquid, if the container is slidably moved, even on a smooth plane, a considerable sliding resistance occurs. Since the wall thickness of the body which forms a main portion of a bottle-shaped container is thin, when a strong lateral load is applied to the body it becomes easily depressed and deformed. Since the uprightness of the bottle-shaped container is not good, when a number of blow-molded bottle-shaped containers are arranged to be adjacent to

each other in an upright attitude, portions of the body contacted with the adjacent blow-molded bottle-shaped containers are not constant.

Where the bottle-shaped containers are slidably conveyed, the sliding resistance produced between the conveying surface and the blow-molded bottle-shaped container is high. When a number of blow-molded bottle-shaped containers arranged to be adjacent to each other along a constant conveying line are pressed from the back and slidably conveyed on the conveying surface, a great lateral load acts on the body contacted with the adjacent blow-molded bottle-shaped container. The central portion of the body is not always sufficient in mechanical strength with respect to the lateral load. When the high lateral load acts on the central portion of the body, this gives rise to an occurrence of depressed deformation in the central portion of the body. Furthermore, since the uprightness of the blow-molded bottle-shaped containers is not good, when a plurality of containers placed so as to be adjacent to each other are pressed and slidably conveyed, the uprightness of each of the blow-molded bottle-shaped containers becomes unstabilized. Accordingly, an accurate detection of the position of a bottle-shaped container becomes impossible. In some cases, bottle-shaped containers being conveyed fall over so that the operation of moving them has to be discontinued.

In a conventional blow-molded bottle-shaped container of this kind, in order to overcome the aforementioned inconveniences, a diameter of a lower portion contacted with a leg is made sufficiently larger than other portions of the body so that, when the blow-molded bottle-shaped containers are arranged to be adjacent to each other, the lower end portions of the bodies make contact with each other. Since the lower end of the body having a large diameter is close to the leg, the lower end of the body has relatively high mechanical strength. The lower end of the body receives a lateral load exerted when a plurality of bottle-shaped containers are slidably conveyed. Since the lower end of the body is positioned at the lower end of the blow-molded bottle-shaped container, a moment acting on a blow-molded bottle-shaped container to make it fall is reduced due to the sliding resistance and the pressure conveying force when the plurality of bottle-shaped containers are slidably conveyed.

As described above, in the prior art the lower end of the body is made to have a large diameter, and the blow-molded bottle-shaped containers stood upright and arranged to be adjacent to each other are made to contact with each other at their lower ends of the bodies, whereby a number of blow-molded bottle-shaped containers can be slidably conveyed in an upright and stabilized attitude. However, recently, many blow-molded bot-

tle-shaped containers have been subjected to processing such as filling with liquids per unit time. Therefore, the lateral load acting on the lower end of the body when the containers are upright and adjacent to each other and are pressed and slidably conveyed becomes more powerful. Accordingly, the mechanical durability of the lower end of the body with respect to the lateral load needs to be increased.

The simplest countermeasure to the aforesaid demand is to sufficiently increase the wall thickness of the lower end of the body. However, when the wall thickness of the lower portion of the body is increased, the quantity of an expensive synthetic resin material required to mold a blow-molded bottle-shaped container increases by that increased portion, resulting in an increase in price of the blow-molded bottle-shaped container. Therefore, this countermeasure is not desirable.

The countermeasure considered to be the most effective in the prior art and which fulfills the aforesaid demand is to control a wall thickness of the container when a blow-molded bottle-shaped container is biaxially blow-molded so that the wall thickness of the lower end of the body is made greater than the wall thickness of other body portions. This conventional means is intended to increase the wall thickness of the lower end of the body to thereby increase the mechanical strength of the lower portion of the body. The conventional means can obtain an effect of increasing the mechanical strength of the lower portion of the body. However, the wall thickness of the other portions of the body is to be reduced by a portion having increased wall thickness of the lower portion of the body. Because of this, it gives rise to an important problem of considerably lowering fundamental functions of the blow-molded bottle-like container as a container, such as the durability of the body with respect to the lateral load, the durability of other body portions with respect to the lateral load, the shape stability of the body with respect to a gripping force during handling, the constantness and stability of pressure reduction absorbing deformation in a heat resistant bottle-shaped container, and the like.

SUMMARY OF THE INVENTION

The present invention has been devised in order to overcome the above-mentioned problems encountered in the prior art. A principal aim of the present invention is to considerably increase the mechanical strength with respect to a lateral load at a lower portion of a body of a container without reducing the wall thickness of other portions of the body and without increasing the amount of synthetic resin material required to mold a bottle-

shaped container.

The present invention starts from GB-A- 1 074 162 by providing a biaxially blow-molded bottle-shaped container made of synthetic resin having a body and a leg of the body, the container including a circumferential rib in the lower end of the body, the circumferential rib having the largest diameter of the container. According to the invention, a container differs from this prior art by having the features set forth in the characterising portion of claim 1.

In the present invention, therefore, a circumferential recessed groove having a small groove width (a sufficiently smaller groove width than a longitudinal width of a circumferential rib) is interposed between circumferential ribs so that two or more circumferential ribs are disposed in parallel. Accordingly, the circumferential ribs of adjacent containers make contact with each other so that the blow-molded bottle-shaped containers can stand upright adjacent to each other. A pressing force for pressure-conveyance acting on an upstream blow-molded bottle-shaped container to adjacent blow-molded bottle-shaped containers during slidable conveyance of blow-molded bottle-shaped containers directly acts on the circumferential ribs.

Since the circumferential ribs adapted to directly receive the pressing force from the adjacent blow-molded bottle-shaped container are designed to have upper and lower rib walls in the form of tapered walls, rib walls act as reinforcing ribs. Accordingly, the pressing force exerted from the adjacent blow-molded bottle-shaped container is received with sufficient mechanical strength to considerably increase the mechanical durability with respect to the lateral load of the whole lower end of the body.

The circumferentially-recessed groove positioned between the circumferential ribs prevents a circumferential rib of a blow-molded bottle-shaped container from being moved onto a circumferential rib of the adjacent blow-molded bottle-shaped container to greatly incline the other blow-molded bottle-shaped container during conveyance.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front view of a polyethylene terephthalate bottle-shaped container not falling within the scope of the present invention;

Fig. 2 is a view showing a contour line of essential parts of the container shown in Fig 1;

Fig. 3 is a view showing a contour line of essential parts of a container in accordance with the present invention in an enlarged longitudinal section; and

Fig. 4 is a front view of a polyethylene terephthalate bottle-shaped container in accordance

with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 shows a bottle-shaped container 1 provided with a single circumferential rib. This is outside the scope of the present invention. The biaxially blow-molded polyethylene terephthalate bottle-shaped container 1 has a volume of approximately 1 to 1.5 liters. The container 1 includes a body 2 and a leg 7. Longitudinally extending absorbing panel walls 3 are circumferentially provided in parallel in a tubular wall portion from a center to a lower portion of the body 2. Reduced pressure is produced within the container 1 when said container 1 is cooled after the container is filled with a content liquid, sealed and heated to a high temperature at approximately 85 °C. The reduced pressure is absorbed by depression and deformation of the absorbing panel wall 3. A diameter of a lower end 4 of the body is largest in the container. The wall thickness of the body 2 including the lower end 4 is uniformly 0.4 mm without applying wall-thickness adjusting means thereto.

Fig. 2 shows a contour line in a partly enlarged longitudinal section of the above-described container in which a single circumferential rib 5 is circumferentially provided in the lower end 4 of the body. The circumferential rib 5 has rib walls 5a on both upper and lower end walls in the form of a tapered tubular wall.

In Fig. 2, the broken line indicates a contour line of prior art. The circumferential rib 5 is not formed as a part of a curved surface smoothly continuous to the outer circumferential surface of the lower end 4 of the body as in the prior art. In the circumferential rib 5, the largest diameter portion is left as the circumferential rib 5, and the diameter of portions of the lower end 4 other than the circumferential rib 5 is reduced. The reason why the circumferential rib 5 is formed by leaving the largest diameter portion of the lower end 4 of the body in the prior art is to prevent the diameter of the lower portion 4 of the body from being increased more than as needed by the provision of the circumferential rib 5. The reason why the height of the circumferential rib 5 is relatively large is because the pressed adjacent containers 1 is always placed in contact with each other at the circumferential ribs 5 even if the upright attitude is slightly inclined.

In the container shown in Fig. 2, when a lateral load of 5 Kg was applied to the container, a distortion of the lower end 4 of the body in a radial direction was 1.20 mm. On the other hand, when a lateral load of 5 Kg was applied to a container not provided with the circumferential rib 5 at the lower

end 4 of the body, a distortion of the lower end 4 of the body in a radial direction was 1.50 mm. Accordingly, the distortion of the lower end 4 of the body in a radial direction can be considerably reduced and an occurrence of buckling deformation can be completely eliminated.

Fig. 3 shows the improvement of the present invention in which two circumferential ribs 5 are provided in parallel. The height of each circumferential rib 5 is smaller than that of the circumferential rib 5 shown in Fig. 2. However, the sum of the height of both the circumferential ribs 5 is larger than the height of the circumferential rib in Fig. 2.

The test for lateral load was conducted with respect to the container shown in Fig. 3 under the same conditions as noted above. The distortion of the lower end 4 of the body in a radial direction was 1.09 to 1.12 mm, and the distortion can be further considerably reduced. Moreover, the occurrence of the buckling deformation can be completely eliminated.

The wall thickness of the lower end 4 controlled by the wall thickness controlling means was 0.55 mm, which is larger by 0.15 mm than that of the container 1 according to the present invention. When the aforementioned lateral load test was conducted with respect to this container, the distortion of the lower end of the body in a radial direction was 1.13 mm, and thus the container exhibits an excellent durability. However, as previously mentioned, since the wall thickness of the body 2 other than the lower end 4 is small, the function of the whole container was deteriorated.

Another embodiment of the present invention is shown in Fig. 4. In this embodiment, the largest diameter portions of a biaxially blow-molded bottle-shaped container 1 made of synthetic resin include an upper end of a body 2 which is an upper end of the main portion of the body and a lower end 4 of a body connecting with a leg 7 of the body. The diameter of the upper end of the body is equal to that of the lower end of the body. Both the upper and lower ends of the body are circumferentially provided with the circumferential ribs 5, respectively.

As described above, two circumferential ribs 5 are provided on both the upper and lower portions of the body 2. Accordingly, the pressing force for conveyance acting on a container from an adjacent container is divided into upper and lower portions. Because of this, a lateral load acting on a single circumferential rib is reduced by half, and therefore, the mechanical durability with respect to high lateral load on the whole container is exhibited.

Circumferential ribs 5 having the largest diameter are positioned at both upper and lower ends of the main portion of the body 2. Accordingly, when

containers are pressed and placed so as to be adjacent to each other, the containers are pressed and make contact with each other at both upper and lower circumferential ribs. Portions of the body other than the circumferential ribs which are weak with respect to the lateral load are positively prevented from being directly pressed, so that those portions are neither depressed nor deformed. In other words, adjacent containers are pressed and make contact with each other at both the upper and lower circumferential ribs. Accordingly, even if there is a container which is poor in uprightness, the container is supported at four points by adjacent containers, and therefore, the upright attitude of each container during pressing and slidable conveyance can be held at a stabilized constant state.

The bottle-shaped container shown in Fig. 4 has a diameter at an upper end 8 of the body 2 which is the largest in the container and which is equal to a diameter of the lower end 4 of the body 2. Two circumferential ribs 5 are provided in parallel as shown in Fig. 3 on the lower end 4 of the body of the container shown in Fig. 4. Two circumferential ribs 5 are provided in parallel on the upper end 8 of the body of the container shown in Fig. 4. The height of each circumferential rib 5 is smaller than that of the circumferential rib 5 shown in Fig. 2. However, the sum of the height of both the circumferential ribs 5 are larger than that of that circumferential rib 5.

The lateral load test was conducted under the same conditions as noted above with respect to the previously-described container. The distortion of the lower end 4 of the body in a radial direction was 0.54 to 0.56 mm. The distortion can be further considerably reduced and the occurrence of buckling deformation was completely eliminated.

Containers according to the present invention accordingly have circumferential ribs which act as reinforcing ribs. Accordingly, the mechanical durability of the lower end of the body (and the upper end of the body) with respect to the lateral load can be considerably increased. Moreover, the occurrence of the buckling deformation of the lower end of the body (and the upper end of the body) when the container is pressed and slidably conveyed can be prevented.

The circumferential ribs are formed and externally swelled by bending a wall having a substantially same wall thickness of the lower end of the body (and the upper end of the body). Accordingly, it is not necessary to increase the wall thickness of the lower end of the body (and the upper end of the body) partially to be projected. There occurs no inconvenience that the wall thickness of the other portions of the body of the container is reduced so as to lower the fundamental function of the container as a container. Since it is not necessary that

synthetic resin material be further added to partially increase the wall thickness of the lower end of the body (and the upper end of the body), the unit price of containers is not increased due to the increase in material cost for molding containers.

Since a container can be molded with a uniform wall thickness for the body of the container, wall thickness controlling means are not required. Accordingly, the molding operation for the container is simple.

Portions to be contacted by an adjacent container are specified by the circumferential ribs. Accordingly, the mode of transmission of the pressing force as the conveying force of the containers is constant, whereby the upright attitude of the containers pressed and slidably conveyed is stabilized.

Claims

1. A biaxially blow-molded bottle-shaped container (1) made of synthetic resin having a body (2) and a leg (7) of the body, the container (1) including a circumferential rib (5) in a lower end (4) of the body, the circumferential rib (5) having the largest diameter of the container, characterised in that :
 - (a) two or more circumferential ribs (5) are provided in the lower end (4) of the body,
 - (b) each of the circumferential ribs (5) has upper and lower portions, each of which comprises a rib wall (5a) in a form of a tapered wall, and
 - (c) a circumferential recessed groove (6) having a small width is provided between the circumferential ribs (5).
2. A container according to claim 1, wherein :
 - (a) a circumferential rib (5) is provided in an upper end (8) of the body, and
 - (b) the circumferential rib (5) has a diameter equal to that of the circumferential rib (5) in the lower end (4) of the body.
3. A container according to claim 3, wherein :
 - (a) two or more circumferential ribs (5) are provided in the upper end (8) of the body, and
 - (b) a circumferential recessed groove (6) having a small width is provided between the circumferential ribs (5).
4. A container according to claim 1, wherein the synthetic resin of which the container is made is polyethylene terephthalate.

Patentansprüche

1. Biaxial blasgeformter, flaschenförmiger Kunststoffbehälter (1) mit einem Körper (2) und einem Fuß (7) des Körpers, wobei der Behälter (1) eine Umfangsrippe (5) in seinem unteren Ende aufweist, die ihrerseits den größten Durchmesser des Behälters aufweist, dadurch **gekennzeichnet**,
 - a) daß zwei oder mehr Umfangsrippen (5) am unteren Ende (4) des Körpers vorgesehen sind, 10
 - b) daß jede der Umfangsrippen (5) einen oberen und einen unteren Teil hat, von denen jeder eine Rippenwand (5a) in Form einer geneigten Wand hat, und 15
 - c) daß zwischen den Umfangsrippen (5) eine vertiefte Umfangsnut (6) vorgesehen ist, die eine geringe Breite hat. 20
2. Behälter nach Anspruch 1, wobei
 - a) eine Umfangsrippe (5) am oberen Ende (8) des Körpers vorgesehen ist, und
 - b) die Umfangsrippe (5) einen Durchmesser hat, der dem der Umfangsrippe (5) am unteren Ende des Körpers gleich ist. 25
3. Behälter nach Anspruch 3, wobei
 - a) zwei oder mehr Umfangsrippen (5) am oberen Ende (8) des Körpers vorgesehen sind, und 30
 - b) zwischen den Umfangsrippen (5) eine vertiefte Umfangsnut (6) vorgesehen ist, die eine geringe Breite hat. 35
4. Behälter nach Anspruch 1, wobei der Kunststoff, aus dem der Behälter hergestellt ist, Polyethylentheraphthalat ist.

Revendications

1. Récipient (1) en forme de bouteille, moulé par soufflage biaxial et réalisé en résine synthétique, comprenant un corps (2) et un pied (7) du corps, le récipient (1) comportant une nervure circonférentielle (5) à une extrémité inférieure (4) du corps, la nervure circonférentielle (5) ayant le diamètre le plus grand du récipient, caractérisé en ce que :
 - (a) deux nervures circonférentielles ou davantage (5) sont réalisées dans la partie inférieure (4) du corps, 45
 - (b) chacune des nervures circonférentielles (5) comprend une partie supérieure et une partie inférieure, chacune d'elles comportant une cloison de nervure (5a) en forme d'une cloison conique et 55

(c) une gorge (6) formant un évidement circonférentiel et ayant une faible largeur est réalisée entre les nervures circonférentielles (5).

2. Récipient selon la revendication 1, dans lequel :

(a) une nervure circonférentielle (5) est réalisée dans une extrémité supérieure (8) du corps, et

(b) la nervure circonférentielle (5) a un diamètre égal à celui de la nervure circonférentielle (5) de l'extrémité inférieure (4) du corps.

3. Récipient selon la revendication 3, dans lequel :

(a) deux nervures circonférentielles ou davantage (5) sont réalisées dans l'extrémité supérieure (8) du corps, et

(b) une gorge (6) formant un évidement circonférentiel et ayant une faible largeur est réalisée entre les nervures circonférentielles (5).

4. Récipient selon la revendication 1, pour lequel la résine synthétique dont il est constitué est du téréphtalate de polyéthylène.

FIG. 1

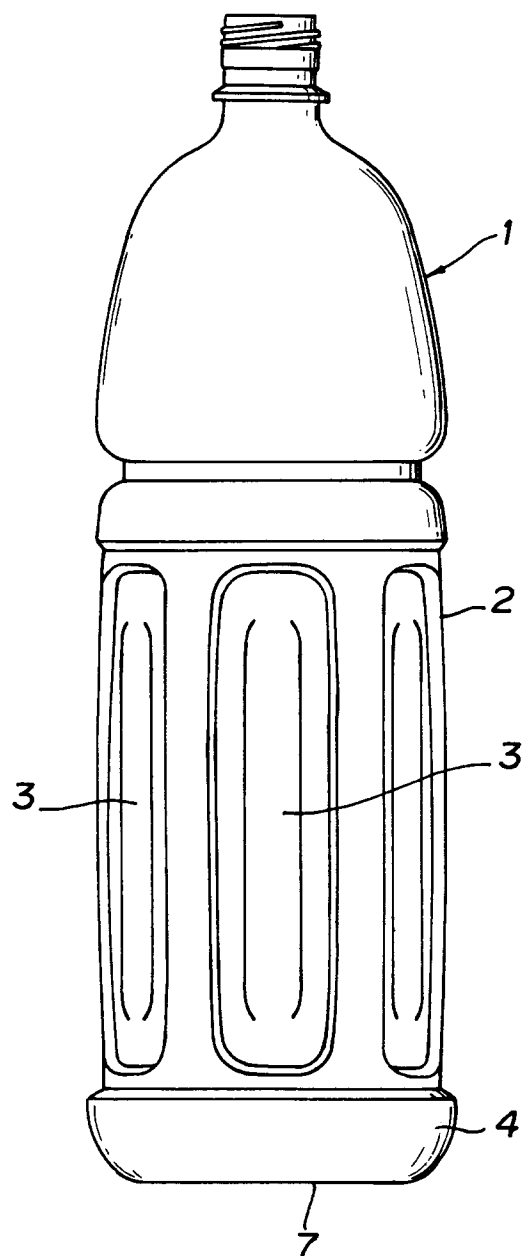


FIG. 2

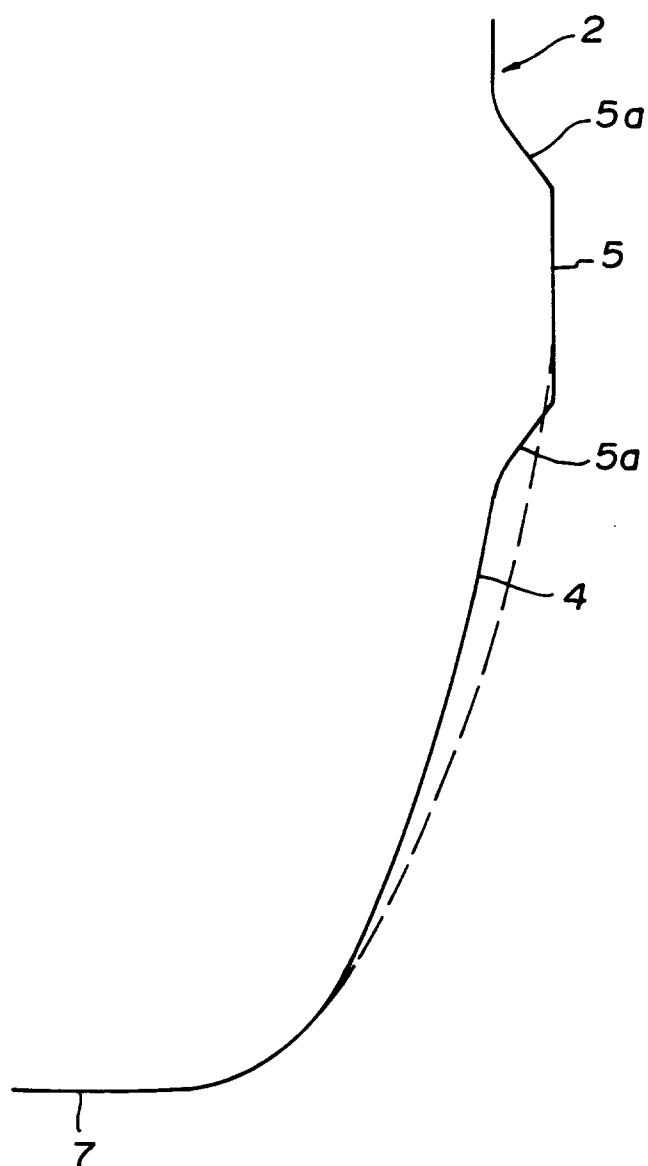


FIG. 3

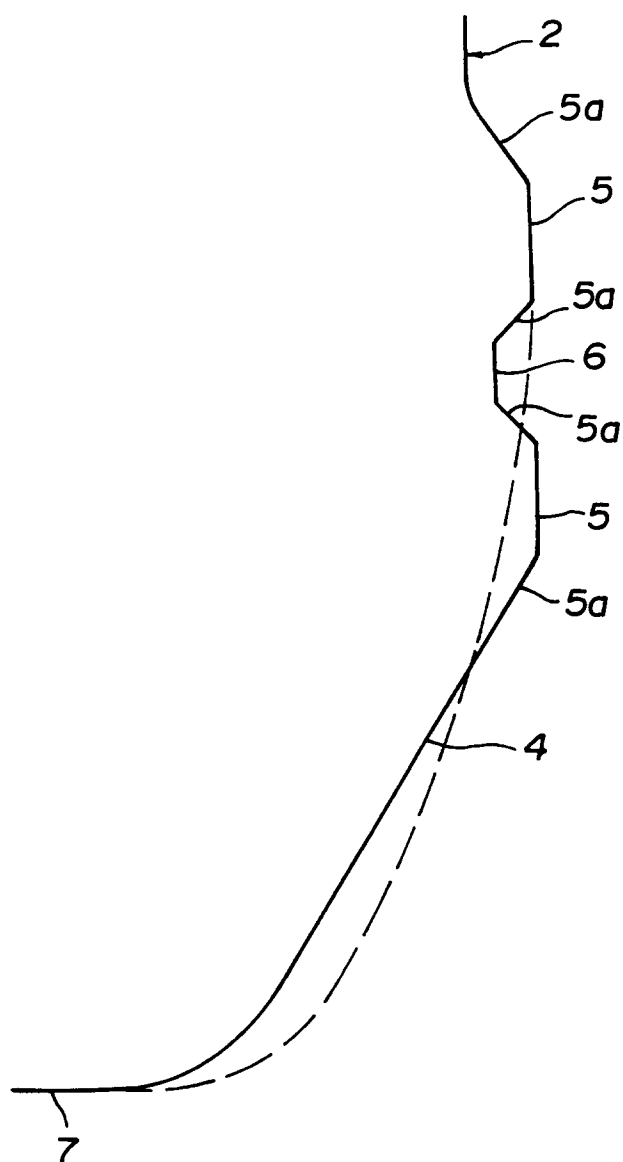


FIG. 4

