



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
24.07.2019 Bulletin 2019/30

(51) Int Cl.:
B65D 1/02 (2006.01)

(21) Application number: **16916290.6**

(86) International application number:
PCT/JP2016/077560

(22) Date of filing: **16.09.2016**

(87) International publication number:
WO 2018/051509 (22.03.2018 Gazette 2018/12)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

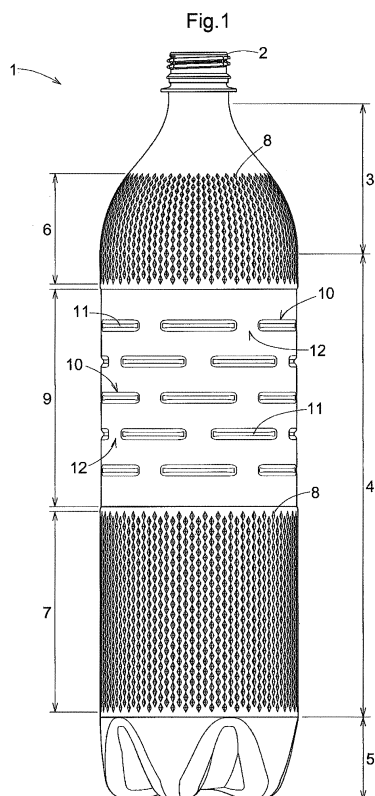
(72) Inventors:
• **SATOU Wataru**
Tokyo 135-8631 (JP)
• **KOBAYASHI Toshiya**
Tokyo 135-8631 (JP)
• **KIKUCHI Daisuke**
Tokyo 135-8631 (JP)

(71) Applicant: **Suntory Holdings Limited**
Osaka-shi, Osaka 530-8203 (JP)

(74) Representative: **Vossius & Partner**
Patentanwälte Rechtsanwälte mbB
Siebertstrasse 3
81675 München (DE)

(54) **RESIN-MADE BOTTLE**

(57) A plurality of depressions (8) each having a surface area of 1-100 mm² are provided in a predetermined pattern in at least a partial region of a resin-made bottle (1).



Description

TECHNICAL FIELD

[0001] This invention relates to a resin-made bottle.

BACKGROUND ART

[0002] A resin-made bottle filled with a drink as a beverage can sometimes experience build-up of inner pressure when e.g. filled with carbonated drink or placed under a certain high temperature (e.g. about 40°C) in the course of its commercial distribution in the market. As a result, the resin-made bottle may suffer deformation of its bottle shape due to expansion resulting from inner pressure build-up during/after the commercial distribution. Accordingly, a reinforcing rib is provided generally in order to suppress such bottle shape deformation.

SUMMARY OF THE INVENTION

Problems to be Solved by Invention

[0003] In recent years, an advantageous aesthetic design effect is sought for by providing an ornamentation in the bottle per se. However, due to deformation of the bottle shape resulting from inner pressure build-up, such aesthetic effect by ornamentation may sometimes be lost.

[0004] Thus, it is desired to realize a resin-made bottle capable of suppressing bottle shape deformation while providing intended aesthetic effect.

Solution

[0005] A resin-made bottle according to the present invention comprises a plurality of depressions each having a surface area of 1-100 mm² provided in a predetermined pattern in at least a partial region thereof.

[0006] With this arrangement, the bottle shape deformation due to inner pressure build-up can be effectively suppressed by the plurality of depressions. In addition, aesthetic effect can be provided also by a predetermined pattern as described.

[0007] Some preferred embodiments of the resin-made bottle according to the invention will be explained hereinafter. It is understood however that the scope of the invention is not to be limited by the preferred embodiments described below.

[0008] According to one preferred embodiment, a surface of each depression is embossed.

[0009] By embossing the surface of each depression, the bottle shape deformation due to inner pressure build-up can be even more effectively suppressed. Further, the embossed surface makes each depression appear more conspicuous, thus improving visibility, so the aesthetic effect due to the depression can be further enhanced. It is necessary to press resin firmly against a

mold at time of blow molding in order to form such embossed surface. With this embodiment, the embossed surface can be formed in a favorable manner because the resin is caused to follow a protruding portion of the mold and pressed hard against the protruding portion of the mold during forming of the embossed surface in the depression.

[0010] According to one preferred embodiment, each depression has a polygonal shape or a round shape.

[0011] With the above arrangement, each depression is provided with a highly symmetrical shape, so that the bottle shape deformation due to the inner pressure build-up can be even more effectively suppressed. Moreover, the aesthetic effect can be even more enhanced as well.

[0012] According to one preferred embodiment, the depressions are formed throughout in one or more band-like regions that occupy a predetermined area of the whole bottle.

[0013] With formation of the depressions throughout a band-like region(s), the bottle shape deformation due to the inner pressure build-up can be even more effectively suppressed.

[0014] According to one preferred embodiment, a rib region having a plurality of ribs juxtaposed with each other is formed in a predetermined region in a height direction of the bottle where no depressions are provided.

[0015] With the plurality of depressions, the bottle shape deformation due to the inner pressure build-up can be suppressed. Notwithstanding, the depressions will bulge out in the event of exceeding an allowable range, thus impairing the aesthetic appearance. Then, according to the above-described arrangement, instead of merely providing the depressions all over the bottle, a rib region is provided. With this, in the event of inner pressure build-up, deformation occurs firstly in the rib region, prior to the depressions. Thus, bulging of the depressions can be suppressed and the bottle shape deformation due to the inner pressure build-up can be even more effectively suppressed.

[0016] According to one preferred embodiment, the rib region is formed in a region in the height direction where a label is provided.

[0017] With the above-described arrangement, since the rib region inferior in the aesthetic effect is concealed by the label, it is possible to maintain the aesthetic effect while suppressing the bottle shape deformation due to the inner pressure build-up.

[0018] According to one preferred embodiment, the respective rib in the rib region is a discontinuous rib with a plurality of recesses each having a predetermined length being included therein and spaced apart from each other and provided continuously in the extending direction of the rib.

[0019] With the above-described arrangement, since the rib is formed of discontinuous rib, it is possible to effectively suppress elongation of the rib in the extending direction with discontinuous portions present between the recesses. Thus, the bottle shape deformation due to

the inner pressure build-up can be suppressed even more effectively.

[0020] According to one preferred embodiment, the rib region is formed such that in a juxtaposing direction of the discontinuous rib, discontinuous portions between the recesses in the discontinuous rib are formed not to be overlapped with the discontinuous portions of the discontinuous rib adjacent thereto.

[0021] If the recess and the discontinuous portion were overlapped in the juxtaposing direction, the recess would act like a spring, thus providing risk of bottle strength reduction. On the other hand, with the above-described arrangement, since the discontinuous portions are provided not to be overlapped with each other in the adjacent discontinuous ribs, it is possible to effectively suppress occurrence of the problem due to overlapping of the recess and the discontinuous portion in the juxtaposing direction.

[0022] According to one preferred embodiment, in the rib region, the rib is formed to extend in a circumferential direction.

[0023] With the above-described arrangement, by causing the rib to extend in the circumferential direction, it is possible to effectively suppress expansion of the bottle in the radial direction.

[0024] According to one preferred embodiment, the resin-made bottle is for carbonated drink.

[0025] With the above-described arrangement, even for a bottle for carbonated drink tending to be subject to inner pressure build-up, the bottle shape deformation due to the inner pressure build-up can be suppressed even more effectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Fig. 1 is a front view of a resin-made bottle,
Fig. 2 is an enlarged view of depressions,
Fig. 3 is a front view of a resin-made bottle according to a further embodiment,
Fig. 4 is a front view of a resin-made bottle according to a further embodiment, and
Fig. 5 is an enlarged view of depressions in the further embodiment.

EMBODIMENTS

[0027] Embodiments of a resin-made bottle relating to the invention will be explained with reference to the accompanying drawings. A resin-made bottle 1 relating to this embodiment, as shown in Fig. 1, includes a mouth portion 2 as a liquid spout, a shoulder portion 3 continuous with the mouth portion 2 and having a progressively increasing diameter toward a bottom face direction, a cylindrical body portion 4 continuous with the shoulder portion 3 and a bottom portion 5 forming the bottom of the resin-made bottle 1. The resin-made bottle 1 relating

to this embodiment is made for a carbonated drink; and in order to suppress buckling phenomenon due to inner pressure build-up, the bottom portion 5 is provided with a so-called petaloid shape. Moreover, the resin-made bottle 1 relating to this embodiment implements an arrangement capable of effectively suppressing deformation of the bottle shape while providing advantageous aesthetic effect. The resin-made bottle 1 relating to this embodiment will be explained in details hereinafter.

[0028] Firstly, the resin-made bottle 1 relating to this embodiment can be integrally molded by a stretch molding technique such as a biaxial stretch blow molding technique with using a thermosetting resin such as polyethylene, polypropylene, polyethylene terephthalate, etc. as its main material. The capacity of the resin-made bottle 1 is about 1.5 liters in this particular embodiment. However, the capacity is not particularly limited, but may range from 200 milliliters to 2 liters approximately as often used commercially. Further, the liquid to be charged in the resin-made bottle 1 is not particularly limited. The liquid can be, aside from a carbonated drink, a beverage such as drinking water, tea, juice, coffee, chocolate, soft drink, alcoholic (hard) drink, milk-based drink, and soup, or a liquid seasoning such as sauce and soy sauce, etc.

[0029] As shown in Fig. 1, in the resin-made bottle 1 relating to the instant embodiment, in at least a partial region, more particularly, in throughout a plurality of (two) circumferential band-like regions 6, 7 occupying a predetermined region of the bottle as a whole, a plurality of depressions 8 are provided. The band-like region 6 corresponds to the region extending from the lower side portion of the shoulder portion 3 to the upper side portion of the body portion 4. The band-like region 7 corresponds to the region extending to the lower side portion of the body portion 4, more particularly extending from the vicinity of the center of the body portion 4 to the border between the body portion 4 and the bottom portion 5. Therefore, the body portion 4 is provided with the depressions 8 throughout, except for a rib region 9 to be described later. Further, each depression 8 has a rhombus shape having diagonal dimensions of 4 mm (vertical) $\times$ 2 mm (horizontal) and having a depth of 0.5 mm. Furthermore, as shown in Figs. 1 and 2, the respective depressions 8 are spaced apart from each other and arranged in a regular hexagonal lattice pattern.

[0030] With such depressions 8 described above, it is possible to effectively suppress deformation of the bottle shape due to inner pressure build-up. Moreover, as each depression 8 has the rhombus shape, i.e. a polygonal shape and the respective depressions 8 are arranged in the hexagonal lattice pattern, a large number of such depressions 8 are densely provided in the band-like regions 6, 7, thereby to further enhance the deformation suppressing effect. In addition, the arrangement of such symmetric-shaped rhombus shapes in the regular pattern serves to improve the advantageous aesthetic effect also.

[0031] Further, the dimensional arrangement of each

depression 8 defined by the diagonal sizes of 4 mm (vertical) $\times$ 2 mm (horizontal) approximately serves to secure large curvature at the border portions of the depressions 8. This further enhances the deformation suppressing effect. Incidentally, preferably, the dimensions of each depression 8 can be diagonal lengths respectively ranging from 1 to 10 mm. and the area may be from 1 to 100 mm². Namely, if the area is equal to or smaller than 100 mm², the curvature at the border portion of the depression 8 is large, so that the deformation suppressing effect can be enhanced. On the other hand, with an area below 1 mm², accurate forming of the depression 8 would be difficult with molding techniques such as blow molding. Also, its depth is not limited to 0.5 mm, but can range from 0.2 to 3 mm.

[0032] Further, in the surface of each depression 8, an embossed surface (fine unevenness pattern) is formed. This embossed surface can be formed by pressing an amount of resin against a mold at time of blow molding, the mold being provided with corresponding embossed surfaces at protruding portions corresponding to the depression 8. As the embossed surfaces are formed by pressing resin hard against protruding portions of the mold, the embossed surfaces can be formed favorably. With formation of such embossed surfaces, the deformation of the bottle due to inner pressure build-up can be suppressed even more effectively. Also, the embossed surfaces causes the depression 8 to appear more conscious, thus providing improvement in the aesthetic effect, so that the aesthetic effect due to the depressions 8 can be enhanced as well.

[0033] Moreover, in the resin-made bottle 1 relating to the instant embodiment, in a predetermined region in the height direction having no depressions 8 (specifically, a height-wise region where a label is to be provided), there is provided a "rib region" 9 having a plurality of ribs 10 extending in the circumferential direction and juxtaposed with each other. The plurality of depressions 8 allow effective suppression of bottle shape deformation due to inner pressure build-up as described above. However, in the event of excess of an allowable range, each depression 8 will bulge, thus impairing the advantageous aesthetic effect. Then, by providing the rib region 9, this rib region 9 will be deformed prior to each depression 8 with inner pressure build-up, and such bulging phenomenon of each depression 8 can be suppressed. Further, as the ribs 10 extend in the circumferential direction, bulging of the resin-made bottle in the radial direction due to inner pressure build-up can be effectively suppressed.

[0034] The respective rib 10 in the rib region 9 is a discontinuous rib with a plurality of recesses 11 each having a predetermined length being interposed to space the rib (portions) 10 from each other, the recesses 11 being provided continuously in the extending direction (in this embodiment, the circumferential direction) of the rib 10. Furthermore, in the juxtaposing direction (in this embodiment, the height direction) of the discontinuous rib 10, discontinuous portions 12 between the recesses

11 in the discontinuous rib 10 are formed in such a manner not to be overlapped with the discontinuous portions 12 in the adjacent discontinuous rib 10. More particularly, an arrangement is provided such that a center position of the respective recess 11 in the discontinuous rib 10 is aligned with a center position of the corresponding discontinuous portion 12 of the adjacent discontinuous rib 10. Thus, the recesses 11 and the discontinuous portions 12 alternate each other in the adjacent discontinuous ribs 10. As the rib 10 is formed as such discontinuous rib, the presence of the discontinuous portion 12 between the recesses 11 allows effective suppression of elongation of the rib 10 in the extending direction, so that the deformation of the bottle shape due to inner pressure build-up can be suppressed even more effectively. On the other hand, if the recess 11 and the discontinuous portion 12 were overlapped with each other in the juxtaposing direction, the recess 11 would act like a spring, thus inviting risk of bottle strength deterioration. However, in the above arrangement, as the discontinuous portions 12 are provided not to be overlapped with each other in the juxtaposing direction in the adjacent discontinuous ribs 10, the problem resulting from overlapping of the recess 11 and the discontinuous portion 12 in the juxtaposing direction can be suppressed effectively.

[0035] Further, in the resin-made bottle 1 of this embodiment, the rib region 9 is formed in the height-wise region where a label is to be provided. With this, since the rib region 9 poor in the aesthetic effect is concealed by the label, it is possible to maintain the advantageous aesthetic effect while suppressing the bottle shape deformation due to the inner pressure build-up.

[0036] As described above, with the resin-made bottle 1 of the instant embodiment, due to the provision of the depressions 8 of a predetermined size in a predetermined pattern, it is possible to suppress deformation of the bottle shape due to inner pressure build-up while providing advantageous aesthetic effect. Moreover, with provision of the rib region 9 in addition to the plurality of depressions 8, bulging of the respective depression 8 can be suppressed, so that it is possible to suppress the deformation of the bottle shape even more effectively, while maintaining the advantageous aesthetic effect thanks to the plurality of depressions 8.

[Other Embodiments]

[0037] Lastly, other embodiments of the resin-made bottle relating to the present invention will be explained. Incidentally, it is understood that arrangements to be disclosed in the respective following embodiment can be used in combination with the arrangements disclosed in the other embodiments as long as contradiction does not result from such combinations.

(1) In the foregoing embodiment, there was explained, as one example, an arrangement that the plurality of depressions 8 are formed in the band-like

regions 6, 7 throughout, i.e. entirely. However, the embodiment of the present invention is not limited thereto. Instead, it will suffice for the plurality of depressions 8 to be provided in at least a partial region of the resin-made bottle 1. Further, in the foregoing embodiment, the plurality of depressions 8 are formed in a part of the shoulder portion 3, but not in the bottom portion 5. However, when a band-like region is to be formed of such depressions 8, the band-like region can have any desired shape and can be provided at any desired region also. For instance, as shown in Fig. 3, the band-like regions 6, 7 may be provided in the entire region of the circumferential faces of the shoulder portion 3, the body portion 4 and the bottom portion 5, except for the rib region 9. Further alternatively, as shown in fig. 4, band-like regions 13 formed by the depressions 8 may be provided equidistantly in the circumferential direction, so that stripe patterns formed of the band-like regions 13 may appear on the resin-made bottle 1.

(2) In the foregoing embodiment, there was explained, as one example, an arrangement that a plurality of rhombus-shaped depressions 8 are arranged to be spaced apart from each other regularly in a hexagonal lattice pattern. However, the embodiment of the present invention is not limited thereto. For instance, each depression 8 can have any other polygonal shape or a round shape, or any still other shape. Incidentally, in such case, preferably, each depression 8 has an area ranging from 1 to 100 mm². Further alternatively, as shown in Fig. 5, the respective depressions 8 may be connected to each other. Further alternatively, the depressions 8 may be arranged not in such hexagonal lattice pattern, by may be in a lattice pattern or in any other regular or irregular pattern.

(3) In the foregoing embodiment, there was explained, as one example, an arrangement that in a predetermined region in the height direction having no depressions 8, which also is a height-wise region where a label is to be provided, there is provided a rib region 9 having a plurality of discontinuous ribs 10 extending in the circumferential direction and juxtaposed with each other. However, the present invention is not limited thereto. For instance, the rib region 9 may not be provided, or a plurality of depressions 8 may be provided in an area where the rib region 9 was provided. Further, the rib 10 is not limited to the rib extending in the circumferential direction, but may extend in the height direction or an oblique direction. Still further, unlike the foregoing embodiment, the discontinuous portions 12 may be provided to be overlapped with each other in the juxtaposing direction in the adjacent ribs 10. Further, the rib 10 may not be the discontinuous rib and may be without the discontinuous portion 12.

(4) Regarding the other arrangements too, it is understood that the embodiments disclosed in this de-

tailed disclosure are only exemplary in all respects, and the scope of the present invention is not limited thereby. One skilled in the art could readily understand that modifications can be made within a scope not departing from the essence of the present invention. Therefore, it is as a matter of course that other embodiments modified within such range not departing from the essence of the invention are also encompassed within the claimed scope of the present invention.

INDUSTRIAL APPLICABILITY

[0038] The present invention is applicable to e.g. a resin-made bottle.

DESCRIPTION OF SIGNS

[0039]

- 1: resin-made bottle
- 6, 7: band-like region
- 8: depression
- 9: rib region
- 10: rib (discontinuous rib)
- 11: recess
- 12: discontinuous portion
- 13: band-like region

Claims

1. A resin-made bottle comprising a plurality of depressions each having a surface area of 1-100 mm² provided in a predetermined pattern in at least a partial region thereof.
2. The resin-made bottle of claim 1, wherein a surface of each depression is embossed.
3. The resin-made bottle of claim 1 or 2, wherein each depression has a polygonal shape or a round shape.
4. The resin-made bottle of any one of claims 1-3, wherein the depressions are formed throughout in one or more band-like regions that occupy a predetermined area of the whole bottle.
5. The resin-made bottle of any one of claims 1-4, wherein a rib region having a plurality of ribs juxtaposed with each other is formed in a predetermined region in a height direction of the bottle where no depressions are provided.
6. The resin-made bottle of claim 5, wherein the rib region is formed in a region in the height direction where a label is provided.

7. The resin-made bottle of claim 5 or 6, wherein the respective rib in the rib region is a discontinuous rib with a plurality of recesses each having a predetermined length being included therein and spaced apart from each other and provided continuously in the extending direction of the rib. 5
8. The resin-made bottle of claim 7, wherein the rib region is formed such that in a juxtaposing direction of the discontinuous rib, discontinuous portions between the recesses in the discontinuous rib are formed not to be overlapped with the discontinuous portions of the discontinuous rib adjacent thereto. 10
9. The resin-made bottle of any one of claims 5-8, wherein in the rib region, the rib is formed to extend in a circumferential direction. 15
10. The resin-made bottle of any one of claims 1-9, wherein the resin-made bottle is for carbonated drink. 20

25

30

35

40

45

50

55

Fig.1

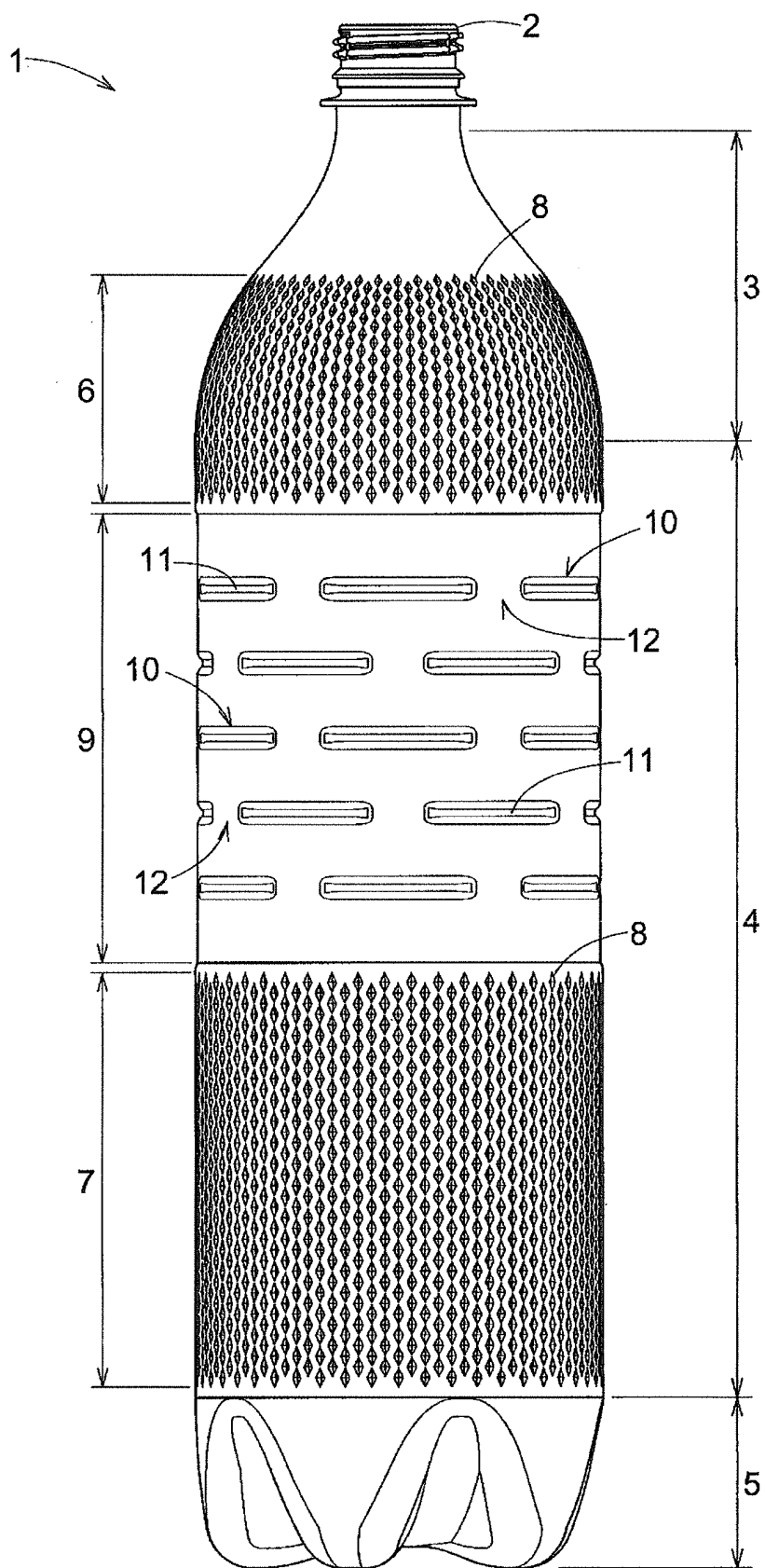


Fig.2

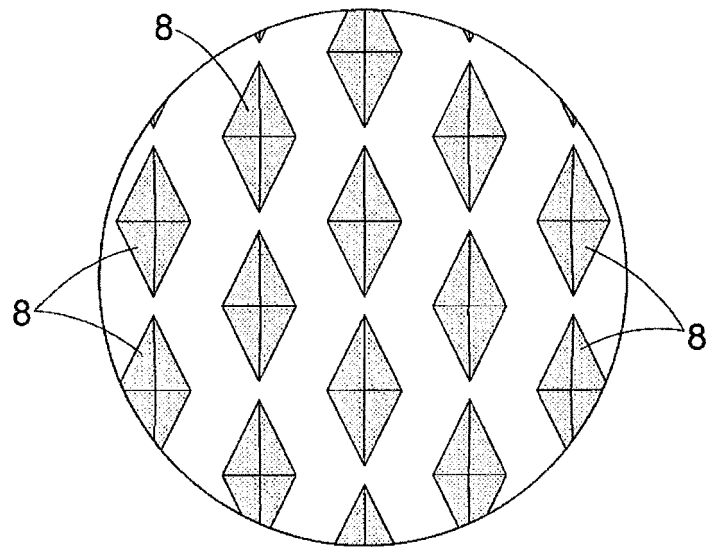


Fig.3

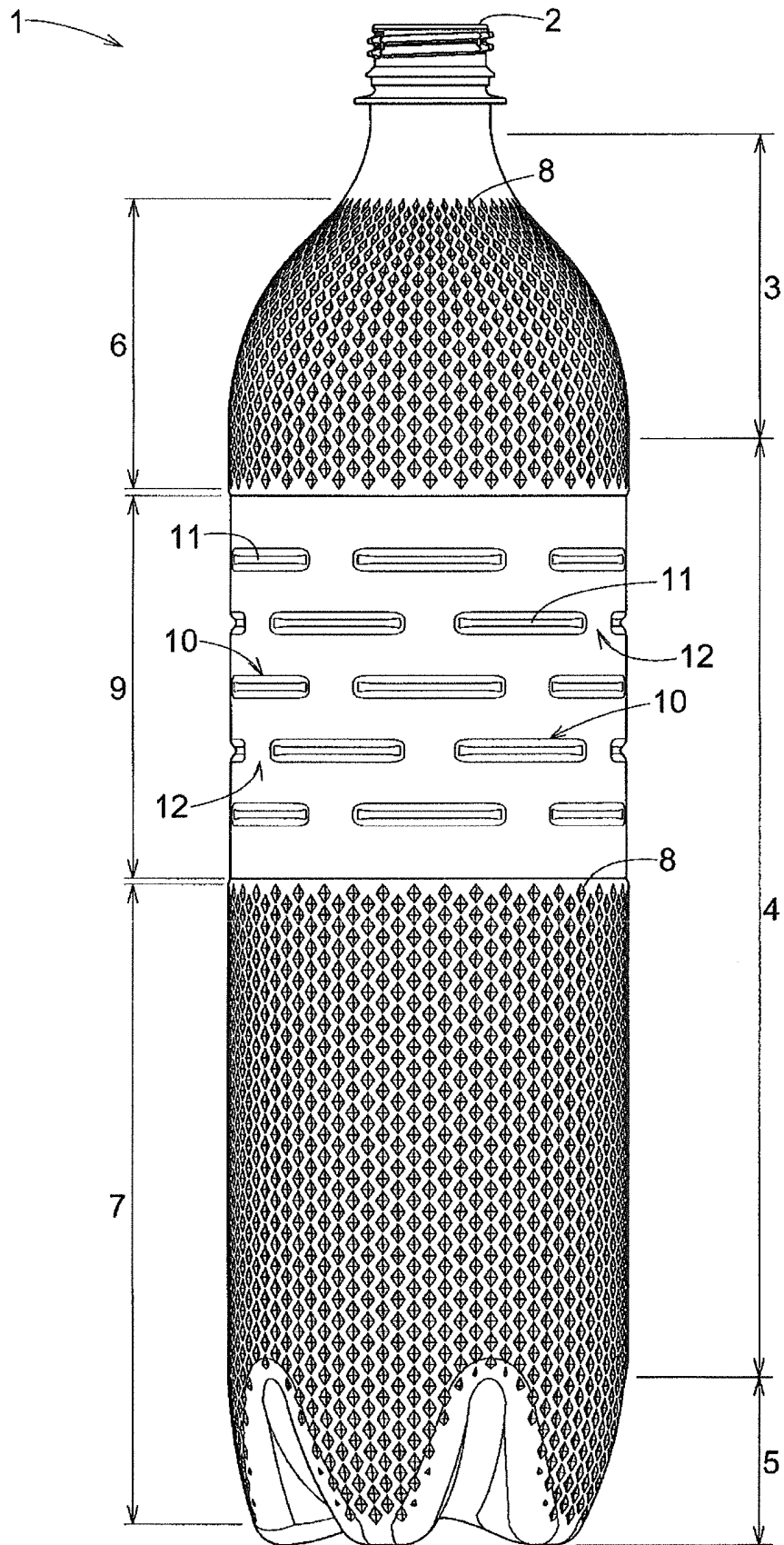


Fig.4

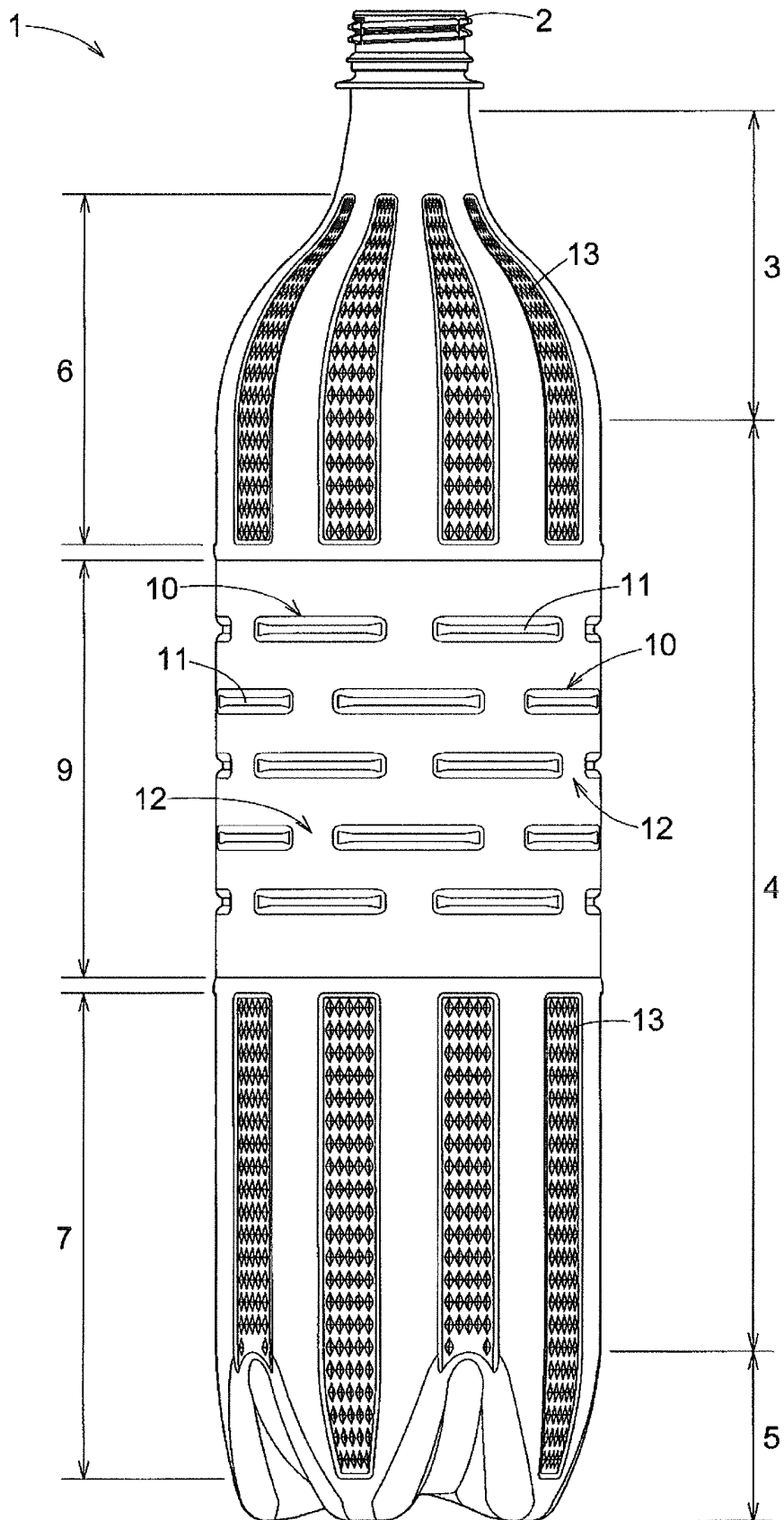
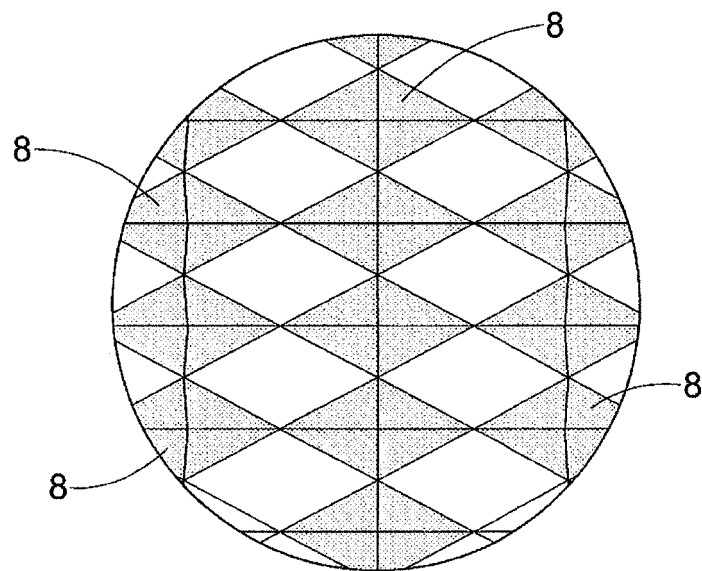


Fig.5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/077560

A. CLASSIFICATION OF SUBJECT MATTER

B65D1/02(2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D1/02, B65D23/00, B65D25/20

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2016

Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 3088764 U (Toyo Shoki Kabushiki Kaisha), 27 September 2002 (27.09.2002), paragraphs [0003], [0008] to [0010], [0021], [0026] to [0033]; fig. 3 to 5 (Family: none)	1, 3-4 1-10
X Y	JP 2009-102029 A (Yoshino Kogyosho Co., Ltd.), 14 May 2009 (14.05.2009), paragraphs [0007], [0012], [0014] to [0016], [0024] to [0025]; fig. 1 to 2 (Family: none)	1, 3-4 1-10

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
30 November 2016 (30.11.16)Date of mailing of the international search report
13 December 2016 (13.12.16)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/077560

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-507539 A (Sidel Participations), 11 March 2010 (11.03.2010), paragraphs [0006], [0009], [0024] to [0029], [0038] to [0044]; fig. 1 to 5 & US 2010/0000962 A1 paragraphs [0006], [0009], [0024] to [0029], [0038] to [0044]; fig. 1 to 5 & FR 2907763 A1 & CN 101646604 A	1-10
Y	JP 2013-159380 A (Toyo Seikan Kaisha, Ltd.), 19 August 2013 (19.08.2013), paragraphs [0002], [0010] to [0011]; fig. 1 to 3 (Family: none)	2-10
Y	JP 2013-184722 A (Dainippon Printing Co., Ltd.), 19 September 2013 (19.09.2013), paragraphs [0003], [0006], [0010], [0023]; fig. 1 (Family: none)	5-10
Y	JP 2009-241940 A (Yoshino Kogyosho Co., Ltd.), 22 October 2009 (22.10.2009), paragraph [0012] (Family: none)	10

Form PCT/ISA/210 (continuation of second sheet) (January 2015)