



(51) International Patent Classification:
B29B 11/06 (2006.01) **B29C 49/42** (2006.01)

(21) International Application Number:
PCT/CA2009/001677

(22) International Filing Date:
25 November 2009 (25.11.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/138,752 18 December 2008 (18.12.2008) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

— with international search report (Art. 21(3))

(54) Title: A PREFORM AND A MOLD STACK FOR PRODUCING THE PREFORM

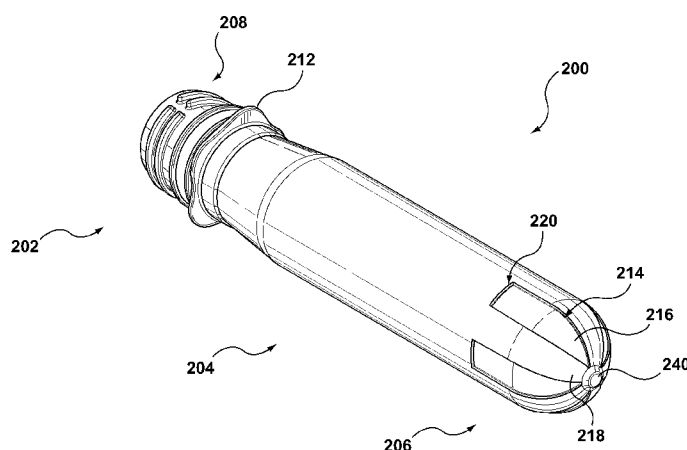


FIG. 2

(57) Abstract: According to embodiments of the present invention, there is provided a preform, a mold stack for producing the preform and a method of orienting the preform during blow molding. A preform (200, 300, 400) suitable for subsequent blow-molding into a final-shaped container (1002) is provided. The preform (200, 300, 400) comprises a neck portion (202, 302, 402); a gate portion (206, 306, 406); and a body portion (204, 304, 404) extending between the neck portion (202, 302, 402) and the gate portion (206, 306, 406); the gate portion (206, 306, 406) including: a pattern of depressions (214, 414) and a pattern of protrusions (218, 418) interdisposed therebetween; the pattern of protrusions (218, 418) being associated with a first thickness, the body portion (204, 304, 404) being associated with a second thickness along substantially the whole length thereof and the pattern of protrusions (218, 418) being associated with a third thickness; wherein the first thickness is substantially the same as the second thickness and the third thickness is smaller than the second thickness.



A PREFORM AND A MOLD STACK FOR PRODUCING THE PREFORM

FIELD OF THE INVENTION

5 The present invention generally relates to, but is not limited to, molding systems and processes, and more specifically the present invention relates to, but is not limited to, a preform, a mold stack for producing the preform and a method for orienting the preform during blow molding.

BACKGROUND OF THE INVENTION

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Molding is a process by virtue of which a molded article can be formed from molding material by using a molding system. Various molded articles can be formed by using the molding process, such as an injection molding process. One example of a molded article that can be formed, for example, from polyethylene terephthalate (PET) material (or other suitable molding material) is a preform that is capable of being subsequently blown into a beverage container, such as, a bottle and the like.

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As an illustration, injection molding of PET material involves heating the PET material to a homogeneous molten state and injecting, under pressure, the so-melted PET material into a molding cavity defined, at least in part, by a female cavity piece and a male core piece mounted respectively on a cavity plate and a core plate of a mold. The cavity plate and the core plate are urged together and are held together by clamp force, the clamp force being sufficient to keep the cavity and the core pieces together against the pressure of the injected PET material. The molding cavity has a shape that substantially corresponds to a final cold-state shape of the molded article to be molded. The so-injected PET material is then cooled to a temperature sufficient to enable ejection of the so-formed molded article from the mold. When cooled, the molded article shrinks inside of the molding cavity and, as such, when the cavity and core plates are urged apart, the molded article tends to remain associated with the core piece. Thereafter, the molded article can be ejected off of the core piece by use of one or more ejection structure. Ejection structures are known to assist in removing the molded articles from the core halves. Examples of the ejection structures include stripper plates, stripper rings and neck rings, ejector pins, etc.

With reference to Figure 1, a preform 100 is depicted, the preform 100 being an example of a typical prior art preform. The preform 100 consists of a neck portion 102, a gate portion 106 and a body portion 104 extending between the neck portion 102 and the gate portion 106.

5 The preform 100 has a number of additional structural features that fulfill one or more functions. For example, within the neck portion 102, there is provided a thread 108. The purpose for the thread 108 is to cooperate with a complementary thread of a closure device (not depicted) to maintain a substance (such as a beverage and the like) maintained within a final-shaped container produced from the preform 100 (when such a final-shaped container is blow-
10 molded and eventually filled with the substance). Furthermore, the neck portion 102 comprises a support ledge 112. The support ledge 112 performs multiple functions including, but not limited to, cooperating with various handling devices and structures during injection molding and blow molding stages of production of the preform 100 (for example, cooperation with guiding rails) and the final-shaped container from the preform 100 (for example, cooperation
15 with the blow-molding equipment to provide sealing, etc.).

It is worthwhile noting that in the implementation depicted in Figure 1, the body portion 104 is associated with a substantially constant thickness along its side wall.

20 Depending on the intended use for the final-shaped container, the base portion of the final-shaped container (and the preform 100) can be broadly classified into several categories. For example, it is typical to use a “champagne-style base” for final-shaped containers intended for soft drinks. It is also typical to use a “petaloid base” for final-shaped containers intended for carbonated drinks.

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US patent 7,083,059 issued to Le Guen on August 1, 2006 discloses an example of a petaloid-base container. More specifically, Le Guen discloses a thermoplastic container, such as a bottle, obtained by extrusion-blow or injection-blow molding and having a petaloid base (6, 7). The base includes a convex wall (7) hemispherical in shape; the wall (7) is linked to the wall
30 (2) forming the container body by a marginal zone (8) with a curve (R1, R2). Members (6) originate from the hemispherical wall (7) and are separated in pairs by a part thereof; the top end of each member is directly linked to the wall (2) forming the body.

US patent 6,769,561 issued to Futral et al. on August 3, 2004 discloses an example of a
35 champagne-style base. More specifically, Futral et al. teach molded plastic bottle that has a

base having an outside surface rotationally symmetric about a longitudinal axis of the bottle including a convex heel and a central concavity separated by a standing ring supporting the bottle on an underlying surface. The convex heel has an upper margin integrally formed with the sidewall of the bottle and a lower margin defining an outer portion of the standing ring. The central concavity includes a first surface having a lower most portion defining an inner portion of the standing ring. The standing ring inner portion and outer portion intersect in an abrupt edge with the inner portion of the standing ring generally being inclined with respect to the plane at an angle of between about 30 degrees and 50 degrees.

US patent 5,455,088 issued to Deemer on October 3, 1995 teaches a plastic bottle having a neck portion defining an opening, a generally tubular bottle body portion depending from the neck portion, and an integral bottle bottom structure closing a lowermost end of the bottle body portion including a continuous standing ring circumscribing a central push-up region that is blow molded from a preform which includes a generally tubular preform body portion having an outside wall face and an inside wall face and an integral preform bottom structure closing a lowermost end of the preform. The preform body includes a cylindrical thickened portion which upon blowing forms the continuous standing ring. The central push-up region of the plastic bottle is formed from that portion of the preform below the cylindrical thickened portion. The portion of the preform below the cylindrical thickened portion includes features contributing to enhanced bottle bottom strength while minimizing the amount of resin employed in the structure.

SUMMARY OF THE INVENTION

According to a first broad aspect of the present invention, there is provided a preform suitable for subsequent blow-molding into a final-shaped container. The preform comprises a neck portion; a gate portion; and a body portion extending between the neck portion and the gate portion; the gate portion including: a pattern of depressions and a pattern of protrusions interdisposed therebetween; the pattern of protrusions being associated with a first thickness, the body portion being associated with a second thickness along substantially the whole length thereof and the pattern of depressions being associated with a third thickness; wherein the first thickness is substantially the same as the second thickness and the third thickness is smaller than the second thickness.

According to a second broad aspect of the present invention, there is provided a gate insert for forming a preform suitable for subsequent blow-molding into a final-shaped container, the preform including a neck portion; a gate portion; and a body portion extending between the neck portion and the gate portion; the gate portion including on an external skin thereof a pattern of depressions and a pattern of protrusions interdisposed therebetween; the pattern of protrusions being associated with a first thickness, the body portion being associated with a second thickness along substantially the whole length thereof and the pattern of depressions being associated with a third thickness; the first thickness is substantially the same as the second thickness and the third thickness is smaller than the second thickness. The gate insert comprises a body defining: a nozzle receptacle for accepting, in use, a nozzle; a molding face, the molding face comprising a pattern of forming protrusions and a pattern of forming depressions; the pattern of forming protrusions and the pattern of forming depressions being configured to define, in use, the pattern of depressions and the pattern of protrusions, respectively

According to a third broad aspect of the present invention, there is provided a core insert for forming a preform suitable for subsequent blow-molding into a final-shaped container, the preform including a neck portion; a gate portion; and a body portion extending between the neck portion and the gate portion; the gate portion including on an external skin thereof a pattern of depressions and a pattern of protrusions interdisposed therebetween; the pattern of protrusions being associated with a first thickness, the body portion being associated with a second thickness along substantially the whole length thereof and the pattern of depressions being associated with a third thickness; the first thickness is substantially the same as the second thickness and the third thickness is smaller than the second thickness. The core insert comprises a core body portion configured for attachment, in use, to a core plate; a molding face configured to define, in use, an inner surface of the preform; the molding face comprising a defining pattern, the defining pattern including a pattern of forming protrusions and a pattern of forming depressions the pattern of forming protrusions and the pattern of forming depressions being configured to define, in use, the pattern of depressions and the pattern of protrusions, respectively

According to yet another broad aspect of the present invention, there is provided a method of orienting a preform during stretch-blow molding thereof into a final-shaped container, the final-shaped container having a petaloid base that includes feet and areas between feet, the preform including a neck portion including a support ledge having a flower-shape design; a

gate portion; and a body portion extending between the neck portion and the gate portion; the gate portion including on an external skin thereof a pattern of depressions and a pattern of protrusions interdisposed therebetween; the pattern of protrusions being associated with a first thickness, the body portion being associated with a second thickness along substantially the whole length thereof and the pattern of depressions being associated with a third thickness; the first thickness is substantially the same as the second thickness and the third thickness is smaller than the second thickness. The method comprises orienting the support ledge during stretch-blow molding to orient the pattern of protrusions and the pattern of depressions such that the pattern of protrusions to be oriented where feet of the final-shaped container are to be defined and the pattern of depressions is oriented where areas between feet are to be defined.

These and other aspects and features of non-limiting embodiments of the present invention will now become apparent to those skilled in the art upon review of the following description of specific non-limiting embodiments of the invention in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

A better understanding of the non-limiting embodiments of the present invention (including alternatives and/or variations thereof) may be obtained with reference to the detailed description of the non-limiting embodiments along with the following drawings, in which:

Figure 1 depicts a cross section view of a preform 100 implemented in accordance with known designs.

Figure 2 depicts a perspective view of a preform 200 implemented according to a non-limiting embodiment of the present invention.

Figure 3 depicts a perspective view of a preform 300 implemented according to another non-limiting embodiment of the present invention.

Figure 4 depicts a perspective view from the top of a preform 400 implemented in accordance with yet another non-limiting embodiment of the present invention.

Figure 5 and Figure 6 depict a non-limiting embodiment of a gate insert 502, the gate insert 502 suitable for producing the preform 200 and the preform 300 (Figure 2 and Figure 3,

respectively), in which Figure 5 depicts a perspective view thereof and Figure 6 depicts a cross section taken along a portion thereof.

Figure 7 depicts a core insert 702, implemented in accordance with a non-limiting embodiment of the present invention, the core insert 702 being suitable for producing the preform 400 of
5 Figure 4.

Figure 8 and Figure 9 depict a non-limiting embodiment of a cavity insert 802, implemented in accordance with a non-limiting embodiment of the present invention, the cavity insert 802 being suitable for producing the preform 200 and preform 300 (Figure 2 and Figure 3, respectively).

10 Figure 10 depicts a non-limiting embodiment of a portion of a final-shaped container 1002 produced from the preform 200, 300, 400.

Figure 11 depicts a bottom view of a final-shaped container 1100, implemented in accordance with known designs.

Figure 12 depicts a bottom view of the final-shaped container 1002 of Figure 10.

15 The drawings are not necessarily to scale and may be illustrated by phantom lines, diagrammatic representations and fragmentary views. In certain instances, details that are not necessary for an understanding of the embodiments or that render other details difficult to perceive may have been omitted.

20 DETAILED DESCRIPTION OF EMBODIMENTS

Inventors have developed embodiments of the present invention based, at least partially, on their appreciation of at least one problem associated with the prior art designs of the preform 100. Various features have been adopted in the prior art to strengthen the base portion of the final-shaped container. This has been done primarily for stability and/or rigidity of the final-
25 shaped container, for example, such that it resists internal pressure caused by a carbonated drink against the bottom portion of the final-shaped container. It is known to provide a larger amount of resin, for example in a form of ribs, within the base region in order to provide for the stability and/or rigidity of the final-shaped container. Particularly with the petaloid-base final-shaped containers, which typically include 5 “leaves” (also sometimes referred to as “petals” or

“feet”), inventors have appreciated that the stretch ratio, experienced during stretch-blow-molding, is unevenly distributed across the circumference of the base. More specifically, “feet” of the petaloid base get over-stretched, while areas between the feet are not stretched. As such, material used to define these areas gets “wasted”. Prior art attempt to “focus” more material in the areas where more material is required by providing ribs still results in addition of materials to the preform, which in turn results adding weight to the preform. With growing pressures on converters to lightweight the preforms, inventors have appreciated that there is a clear need to provide an alternative design for the preform.

Reference will now be made to Figure 2, which depicts a perspective view of a preform 200, implemented in accordance with a non-limiting embodiment of the present invention. The preform 200 consists of a neck portion 202, a gate portion 206 and a body portion 204 extending between the neck portion 202 and the gate portion 206.

The preform 200 has a number of additional structural features that fulfill one or more functions. For example, within the neck portion 202, there is provided a thread 208. The purpose for the thread 208 is to cooperate with a complementary thread of a closure device (not depicted) to maintain a substance (such as a beverage and the like) maintained within a final-shaped container produced from the preform 200 (when such a final-shaped container is blow-molded and eventually filled with the substance). Furthermore, the neck portion 202 comprises a support ledge 212. The support ledge 212 performs multiple functions including, but not limited to, cooperating with various handling devices and structures during injection molding and blow molding stages of production of the preform 200 (for example, cooperation with guiding rails) and the final-shaped container from the preform 200 (for example, cooperation with the blow-molding equipment to provide sealing, etc.). It is noted that within the specific non-limiting illustration provided within Figure 2, the support ledge 212 is implemented in a “flower-shape” or “petaloid-shape” manner. An example of such a design is disclosed in a co-owned patent application filed in the United States Patent Office on **March 26th, 2008** and bearing an application number **61/039,685** and having an attorney docket number **H-7223-0-US-P**, content of which in its entirety is incorporated herein by reference. However, in alternative non-limiting embodiments of the present invention, this needs not be so and the support ledge 212 can be implemented as a traditional full circular design or it can be omitted altogether in alternative implementations of the present invention.

According to non-limiting embodiments of the present invention, the gate portion 206 comprises a pattern of depressions 214 defined within an external surface thereof. In the specific non-limiting embodiment depicted herein, the pattern of depressions 214 includes a pattern of grooves 216. In the specific embodiment being depicted herein, the pattern of grooves 216 starts at a gate vestige 240 and extends outwardly. It is worthwhile noting that this needs not be so in every embodiment of the present invention and, as such, in alternative embodiments of the present invention the pattern of grooves 216 can start at a point remote from the gate vestige 240 and can extend outwardly from that point. The width of the pattern of grooves 216 flares outwardly, starting from the gate vestige 240 moving towards the body portion 204. Within the illustration, this flaring out continues right towards a split line (not separately numbered) defined between the gate portion 206 and the body portion 204.

It is noted that the number or the shape of some or all of the plurality of pattern of grooves 216 is not particularly limited and is generally considered to be an implementation consideration. For example, the pattern of grooves 216 may include grooves that can be longer or shorter, deeper or shallower, be of different shape, etc. By the same token, the number of the grooves within the pattern of grooves 216 may be different. By the same token, some of the grooves within the pattern of grooves 216 may include grooves that are implemented in a different form factor and/or length from others of the grooves within the pattern of grooves 216. Finally, some or all of the grooves within the pattern of grooves 216 may include grooves that have an irregular profile.

As is clearly seen in Figure 2, the pattern of grooves 216 results in material being “taken out” from the gate portion 206 vis-à-vis the implementation of the gate portion 106 of Figure 1. Inventor has performed a modeling exercise using CAD functionality to determine an example of weight savings. Within the embodiment of Figure 2, for a 50 gram preform suitable for a carbonated soft drink (CSD) application with a PCO neck finish (for more information, please refer to <http://closuremanufacturers.org>), the weight savings are estimated to be approximately 0.5 grams.

It is further noted that the pattern of depressions 214 (i.e. material being taken out from the gate portion 206) results in creation of a pattern of protrusions 218. In other words, construction of the gate portion 206 includes a given protrusion of the pattern of protrusions 218 disposed in-between two neighboring depressions of the pattern of depressions 214 and *vice versa*. It is also noted that the pattern of protrusions 218 is associated with a first thickness that is substantially

the same as a second thickness associated with the body portion 204. It is also noted that the body portion 204 is associated with the substantially same second thickness along substantially the whole length thereof. It is also noted that the pattern of depressions 214 is associated with a third thickness, which is smaller than the first thickness and the second thickness. Accordingly, it is noted that since the first thickness and the second thickness are substantially the same and the third thickness of the pattern of depressions 214 is somewhat smaller, the result is definition of the pattern of protrusions 218 (by virtue of the pattern of depressions 214), while taking some material out by virtue of pattern of depressions 214, resulting in overall weight savings.

In specific embodiments of the present invention, the preform 200 can be used for forming a final-shaped container having a petaloid base. However, in alternative non-limiting embodiments of the present invention, the preform 200 can be used for forming other types of final-shaped containers.

A technical effect of embodiments of the present invention (for example, when used for forming a final-shaped container having a petaloid base) includes providing more material (i.e. providing the first thickness of material associated with the pattern of protrusions 218), where higher stretch ratio is required, i.e. in the area where feet of the final-shaped container are to be defined and providing less material (i.e. providing a third thickness of material associated with the pattern of depressions 214), where lesser stretch ratio is required, i.e. where areas between feet of the final-shaped container are to be defined. This, in turn, results in ability to enjoy material weight savings, while still providing for stability and/or rigidity of the final-shaped container, where required.

It should be noted that the depth of the pattern of depressions 214 (i.e. the amount of material taken out and, therefore, the resultant third thickness) can be selected taking into account several considerations that include, but are not limited to: (a) cycle time considerations; (b) molding temperature or, in other words, temperature of the molding material; (c) type of the molding material used, such as its viscosity and/or its intrinsic viscosity, (d) available injection pressure; (e) surface of a molding stack that is used to define a molding cavity where the preform 200 is formed, and (f) desirable stretch ratio associated with the areas of the final-shaped container to be defined by the pattern of depressions 214. Taking into consideration some of these and/or different functional parameters, one skilled in the art will be able to determine the depth of the pattern of depressions 214, while ensuring that a minimum wall

thickness to enable molding material to flow by is maintained, while at the same time ensuring the strength of the final-shaped container manufactured from the preform 200, as defined by conventional tests (such as the top load test and/or burst resistance test and/or other tests that determine whether or not the final-shaped container meets some pre-determined characteristics).

It is noted that in the embodiment illustrated in Figure 2, the body portion 204 also comprises a body pattern of depressions 220, which are complementary in shape and location to the pattern of depressions 214, creating a “continuous pattern of depressions”. It is noted that this needs not be so in every embodiment of the present invention. For example, in alternative implementations (not depicted), the body pattern of depressions 220 can be omitted and in those embodiments of the present invention, the pattern of depressions 214 can terminate at a split line (not separately numbered) defined where the gate portion 206 meets the body portion 204. In yet further non-limiting embodiments of the present invention (not depicted), the body pattern of depressions 220 can extend along some or the whole length of the body portion 204.

It is also noted that within the implementation of the embodiment of Figure 2, the gate portion 206 is generally associated with what is known as a substantially semispherical shape thereof. This needs not be so in every embodiment of the present invention. An alternative implementation thereof will now be described in greater detail with reference to Figure 3, which depicts a perspective view of a preform 300 implemented in accordance with another non-limiting embodiment of the present invention.

With reference to Figure 3, the preform 300 consists of a neck portion 302, a gate portion 306 and a body portion 304 extending between the neck portion 302 and the gate portion 306. Within the illustration of Figure 3, the gate portion 306 is generally associated with a substantially conical shape. Other than for this difference in implementing the gate portion 306, preform 300 is implemented in substantially the same manner described above with reference to the preform 200 and, as such, this description will not be repeated herein.

It is noted that within embodiments of Figure 2 and Figure 3, the pattern of depressions 214 and the resultant pattern of protrusions 218 is defined within an external skin of the preform 200, 300. An alternative non-limiting implementation will now be described with reference to Figure 4. Figure 4 depicts a perspective view of a preform 400, looking from the top inside of the preform 400, the preform 400 being implemented in accordance with another non-limiting

embodiment of the present invention. Due to the particular view selected, certain features of the preform 400 (such as portions of the neck portion, portions of the body portion, etc.) are not visible, but can be implemented in a substantially the same manner as described above with reference to the preform 200 of Figure 2.

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What Figure 4 does show is an internal surface (also referred to, sometimes, as the “skin”) of a gate portion 406. According to non-limiting embodiments of the present invention, the gate portion 406 comprises a pattern of depressions 414 defined within the internal surface thereof. In the specific non-limiting embodiment depicted herein, the pattern of depressions 414 includes a pattern of grooves 416. In the specific embodiment being depicted herein, the pattern of grooves 416 starts at a gate vestige 440 and extends outwardly. It is worthwhile noting that this needs not be so in every embodiment of the present invention and, as such, in alternative embodiments of the present invention the pattern of depressions 414 can start at a point remote from the gate vestige 440 and can extend outwardly from that point. The width of the pattern of grooves 416 flares outwardly, starting from the gate vestige 440 moving towards the body portion (not visible and not separately numbered). Within the illustration, this flaring continues right towards the split line between the gate portion 406 and the body portion, which is not visible and not separately numbered.

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It is noted that the number or the shape of some or all of the plurality of pattern of grooves 416 is not particularly limited and is generally considered to be an implementation consideration. For example, the pattern of grooves 416 may include grooves that can be longer or shorter, deeper or shallower, be of different shape, etc. By the same token, the number of the grooves within the pattern of grooves 416 may be different. By the same token, some of the grooves within the pattern of grooves 416 may include grooves that can be implemented in a different form factor and/or length from others of the grooves within the pattern of grooves 416. Finally, some or all of the grooves within the pattern of grooves 416 may include grooves that have an irregular profile.

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As is clearly seen in Figure 4, the pattern of grooves 416 results in material being “taken out” from the gate portion 406 vis-à-vis the implementation of the gate portion 106 of Figure 1. Inventor has performed a modeling exercise using CAD functionality to determine an example of weight savings. Within the embodiment of Figure 4, for a 50 gram preform suitable for a carbonated soft drink (CSD) application with a PCO neck finish, the weight savings are

estimated to be approximately 0.3 grams (for a conical shape gate area implementation) and approximately 0.2 (for a semispherical shape gate area implementation).

It is further noted that the pattern of depressions 414 (i.e. material being taken out from the gate portion 406) results in creation of a pattern of protrusions 418. In other words, construction of the gate portion 406 includes a protrusion of the pattern of protrusions 418 disposed in-between two neighboring depressions of the pattern of depressions 414 and *vice versa*. It is also noted that the pattern of protrusions 418 is associated with a first thickness that is substantially the same as a second thickness associated with the body portion 404. It is also noted that the body portion 404 is associated with the substantially same second thickness along substantially the whole length thereof. It is also noted that the pattern of depressions 414 is associated with a third thickness, which is smaller than the first thickness and the second thickness. Accordingly, it is noted that since the first thickness and the second thickness are substantially the same and the third thickness of the pattern of depressions 414 is somewhat smaller, the result is definition of the pattern of protrusions 418 (by virtue of the pattern of depressions 414), while taking some material out by virtue of pattern of depressions 414, resulting in overall weight savings.

Accordingly, it has been shown that the preform 200, 300, 400 according to embodiments of the present invention includes a pattern of depressions 214, 414 defined within one of an internal skin or an external skin of the gate portion 206, 306, 406. We will now turn to describing a molding stack that can be used for implementing embodiments of the present invention.

Within those embodiments of the present invention, where the pattern of depressions 214 is defined on the external surface of the gate portion 206, 306; the pattern of depressions 214 can be defined by a gate insert 502, a non-limiting embodiment of which is depicted in Figure 5 and Figure 6, in which Figure 5 depicts a perspective view thereof and Figure 6 depicts a cross section taken along a portion thereof.

The gate insert 502 comprises a body 503. The body 503 defines a nozzle receptacle 504 configured to receive, in use, a nozzle (not depicted) of a hot runner (not depicted), for example. The body 503 also defines a molding face 506 for defining, in use, at least a portion of the gate portion 206, 306. The molding face 506 comprises a defining pattern 505. The defining pattern comprises a pattern of forming protrusions 508 and a pattern of forming

depressions 510. As will be appreciated, the pattern of forming protrusions 508 and the pattern of forming depressions 510 are mirror images of the pattern of depressions 214 and the pattern of protrusions 218, respectively, the preform 200, for example.

5 It is noted that within these embodiments of the present invention, a standard core (not depicted) is used. Accordingly, the depth of the pattern of forming protrusions 508 and the pattern of forming depressions 510 is so selected, such that the preform 200, 300 that is defined in use, is associated with the pattern of depressions 214 that has the aforementioned third thickness and the pattern of protrusions 218 that has the aforementioned first thickness,
10 whereby the third thickness that is smaller than the aforementioned first thickness (and the aforementioned second thickness, associated respectively with the body portion 204, 304).

Recalling that the body portion 204 also comprises a body pattern of depressions 220, the body pattern of depressions 220 can be defined by a cavity insert 802 depicted with reference to
15 Figure 8 and Figure 9, in which Figure 8 depicts a perspective view thereof and Figure 9 depicts a cross-sectional view thereof, taken along a longitudinal axis thereof. Cavity insert 802 comprises *inter alia* a molding face 804 for defining, in use, at least a portion of the body portion 204, 304. The molding face 804 comprises a defining pattern 805. The defining pattern 805 comprises a pattern of forming protrusions 808 and a pattern of forming depressions 810.
20 As will be appreciated, the pattern of forming protrusions 808 and the pattern of forming depressions 810 are mirror images of the pattern of depressions 814 and the pattern of protrusions 818, respectively.

It is noted that the depth of the body pattern of depressions 220 can be selected in a similar
25 manner to the depth of the pattern of forming protrusions 508 and the pattern of forming depressions 510 described above with reference to Figure 5 and Figure 6.

Within those embodiments of the present invention, where the pattern of depressions 414 is defined on the internal surface of the gate portion 406; the pattern of depressions 414 can be
30 defined by a core insert 702, a non-limiting embodiment of which is depicted in Figure 7.

The core insert 702 comprises a core body portion 703, configured for attachment, in use, to a core plate (not depicted), in a manner well-known to those of skill in the art. The core insert 702 further comprises a molding face 706, configured to define, in use, an inner surface of the
35 preform 400. The molding face 706 comprises a defining pattern 705. The defining pattern 705

comprises a pattern of forming protrusions 708 and a pattern of forming depressions 710. As will be appreciated, the pattern of forming protrusions 708 and the pattern of forming depressions 710 are mirror images of the pattern of depressions 414 and the pattern of protrusions 418, respectively.

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It is noted that within these embodiments of the present invention, a standard gate insert (not depicted) is used. Accordingly, the depth of the pattern of forming protrusions 708 and the pattern of forming depressions 710 is so selected, such that the preform 400 that is defined in use, is associated with the pattern of depressions 414 that has the aforementioned third

10 thickness and the pattern of protrusions 418 that has the aforementioned first thickness, whereby the third thickness that is smaller than the aforementioned first thickness (and the aforementioned second thickness, associated respectively with the body portion 404).

Recalling that in some embodiments of the present invention, the support ledge 212 can be

15 implemented in a “flower-shape” or “petaloid-shape” manner, a method of orienting the preform 200, 300, 400 during stretch-blow molding procedure in accordance with a non-limiting embodiment of the present invention can be implemented. Within these embodiments of the present invention, the support ledge is dimensioned for the petals of the support ledge 212 to match the pattern of depressions 214 and the pattern of protrusions 218 in such a

20 manner that by orienting the support ledge 212 during stretch-blow molding, the pattern of protrusions 218 is oriented where feet of the final-shaped container are to be defined and the pattern of depressions 214 is oriented where areas between feet are to be defined. In other words, the method includes using the flower-shape design of the support ledge to orient the pattern of protrusions 218 and the pattern of depressions 214 during stretch-blow molding such

25 that the pattern of protrusions 218 is oriented where feet of the final-shaped container are to be defined and the pattern of depressions 214 is oriented where areas between feet are to be defined.

Naturally, in those embodiments of the present invention, where other types of the support

30 ledge 212, traditional orientation techniques can be used, such as various features defined on the support ledge 212 (or elsewhere) to properly orient the preform 200, 300, 400 during stretch-blow molding.

Figure 10 depicts a non-limiting embodiment of a portion of a final-shaped container 1002

35 produced from the preform 200, 300, 400. The portion depicted in Figure 10 is a base portion

1004 thereof. The base portion 1004 comprises a plurality of feet 1006 and a plurality of areas between feet 1008 interdisposed therebetween. Of note, the plurality of feet 1006 has been formed from the pattern of protrusions 218, 418; while the plurality of areas between feet 1008 has been formed from the pattern of depressions 214, 414. A particular technical effect of
5 embodiments of the present invention will be illustrated with references to Figure 11 and Figure 12. Figure 11 depicts a bottom view of a final-shaped container 1100, implemented in accordance with known designs and Figure 12 depicts a bottom view of the final-shaped container 1002. In Figure 11, there is also depicted a region 1102, which comprises primarily amorphous material disposed between a plurality of feet and a plurality of areas between feet of
10 this known design. In Figure 12, there is shown a region 1202, which comprises primarily amorphous material disposed between the plurality of feet 1006 and a plurality of areas between feet 1008. It is clearly evident from the illustration of Figure 11 and Figure 12, that amorphous material within the final-shaped container 1002 is more evenly distributed and there is generally less of it and, therefore, less of a “wasted” material that is “wasted” in the prior art
15 design in the areas between the plurality of feet, where it is simply not needed.

Description of the non-limiting embodiments of the present inventions provides examples of the present invention, and these examples do not limit the scope of the present invention. It is to be expressly understood that the scope of the present invention is limited by the claims. The concepts described above may be adapted for specific conditions and/or functions, and may be
20 further extended to a variety of other applications that are within the scope of the present invention. Having thus described the non-limiting embodiments of the present invention, it will be apparent that modifications and enhancements are possible without departing from the concepts as described. Therefore, what is to be protected by way of letters patent are limited only by the scope of the following claims:

WHAT IS CLAIMED IS:

1. A preform (200, 300, 400) suitable for subsequent blow-molding into a final-shaped container (1002), the preform (200, 300, 400) comprising:

5 a neck portion (202, 302, 402);

a gate portion (206, 306, 406); and

a body portion (204, 304, 404) extending between said neck portion (202, 302, 402) and said gate portion (206, 306, 406);

the gate portion (206, 306, 406) including:

10 a pattern of depressions (214, 414) and a pattern of protrusions (218, 418) interdisposed therebetween;

the pattern of protrusions (218, 418) being associated with a first thickness, the body portion (204, 304, 404) being associated with a second thickness along substantially the whole length thereof and the pattern of depressions (214, 414) being associated with a third thickness; wherein

15 said first thickness is substantially the same as said second thickness and said third thickness is smaller than said second thickness.

2. The preform (200, 300) of claim 1, wherein said pattern of depressions (214) is defined on an external skin of said preform (200, 300).

3. The preform (400) of claim 1, wherein said pattern of depressions (414) is defined on an internal skin of said preform (400).

25 4. The preform (200, 300) of claim 1, wherein said body portion (204, 304, 404) further comprises a body pattern of depressions (220), complementary in shape and location to said pattern of depressions (214, 414) to form a continuous pattern of depressions.

5. The preform (200, 300) of claim 4, wherein said body pattern of depressions (220) extends over at least a portion of the body portion (204, 304).

35 6. The preform (200, 300, 400) of claim 1, wherein said pattern of depressions (214, 414) starts at a gate vestige (240, 440) of said gate portion (206, 306, 406) and extends outwardly towards a split line defined between said gate portion (206, 306, 406) and said body portion (204, 304, 404).

7. The preform (200, 300, 400) of claim 6, wherein a width of each one of said pattern of depressions (214, 414) flares outwardly starting from said gate vestige (240, 440) towards the split line.

5 8. The preform (200) of claim 1, wherein said gate portion (206) is associated with a substantially semispherical shape.

9. The preform (300) of claim 1, wherein said gate portion (306) is associated with a substantially conical shape.

10

10. The preform (200, 300, 400) of claim 1, said final-shaped container (1002) having a petaloid base that includes feet and areas between feet, wherein said neck portion (202, 302, 402) comprises a support ledge (212), said support ledge (212) having a flower-shape design, the flower-shape design of the support ledge (212) being matched to the pattern of depressions (214) and the pattern of protrusions (218) in such a manner that by orienting the support ledge (212) during stretch-blow molding, the pattern of protrusions (218) is oriented where feet of the final-shaped container (1002) are to be defined and the pattern of depressions (214) is oriented where areas between feet are to be defined.

15

20 11. A gate insert (502) for forming a preform (200, 300) suitable for subsequent blow-molding into a final-shaped container (1002), the preform (200, 300) including a neck portion (202, 302); a gate portion (206, 306); and a body portion (204, 304) extending between said neck portion (202, 302) and said gate portion (206, 306); the gate portion (206, 306) including on an external skin thereof a pattern of depressions (214) and a pattern of protrusions (218) interdisposed therebetween; the pattern of protrusions (218) being associated with a first thickness, said body portion (204, 304) being associated with a second thickness along substantially the whole length thereof and the pattern of depressions (214) being associated with a third thickness; said first thickness is substantially the same as said second thickness and said third thickness is smaller than said second thickness; the gate insert (502) comprising:

25

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a body (503) defining:

a nozzle receptacle (504) for accepting, in use, a nozzle;

a molding face (506), the molding face (506) comprising a pattern of forming protrusions (508) and a pattern of forming depressions (510); said pattern of forming protrusions (508) and said pattern of forming depressions (510) being configured to define, in use, the pattern of depressions (214) and the pattern of protrusions (218), respectively

35

12. The gate insert (502) of claim 11, wherein a respective depth associated with said pattern of forming protrusions (508) and said pattern of forming depressions (510) is selected such that, when in use in cooperation with a core insert, said pattern of forming protrusions (508) and said pattern of forming depressions (510) are configured to define said first thickness and said second thickness.

13. A core insert (702) for forming a preform (400) suitable for subsequent blow-molding into a final-shaped container (1002), the preform (400) including a neck portion (402); a gate portion (406); and a body portion (404) extending between said neck portion (402) and said gate portion (406); the gate portion (406) including on an external skin thereof a pattern of depressions (414) and a pattern of protrusions (418) interdisposed therebetween; the pattern of protrusions (418) being associated with a first thickness, said body portion (404) being associated with a second thickness along substantially the whole length thereof and the pattern of depressions (414) being associated with a third thickness; said first thickness is substantially the same as said second thickness and said third thickness is smaller than said second thickness; the core insert (702) comprising:

a core body portion (703) configured for attachment, in use, to a core plate;

a molding face (706) configured to define, in use, an inner surface of the preform (400);

the molding face (706) comprising a defining pattern (705), the defining pattern (705) including a pattern of forming protrusions (708) and a pattern of forming depressions (710) said pattern of forming protrusions (708) and said pattern of forming depressions (710) being configured to define, in use, the pattern of depressions (414) and the pattern of protrusions (418), respectively

14. The core insert (702) of claim 13, wherein a respective depth associated with said pattern of forming protrusions (708) and said pattern of forming depressions (710) is selected such that, when in use in cooperation with a gate insert, said pattern of forming protrusions (708) and said pattern of forming depressions (710) are configured to define said first thickness and said second thickness.

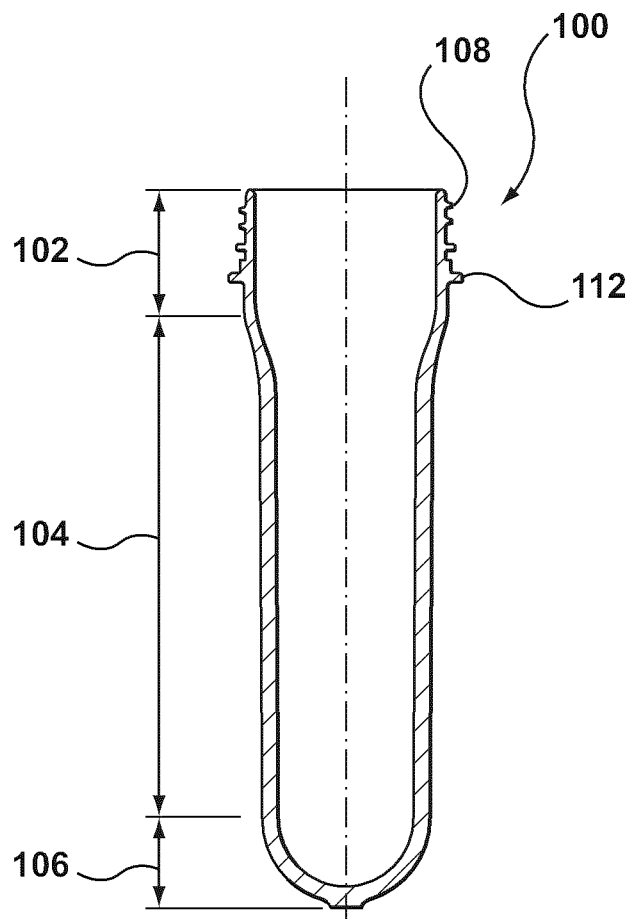
15. A method of orienting a preform (200, 300, 400) during stretch-blow molding thereof into a final-shaped container (1002), said final-shaped container (1002) having a petaloid base that includes feet and areas between feet, the preform (200, 300, 400) including a neck portion (402) including a support ledge (212) having a flower-shape design; a gate portion (406); and a body portion (404) extending between said neck portion (402) and said gate portion (406); the

gate portion (406) including on an external skin thereof a pattern of depressions (414) and a pattern of protrusions (418) interdisposed therebetween; the pattern of protrusions (418) being associated with a first thickness, said body portion (404) being associated with a second thickness along substantially the whole length thereof and the pattern of depressions (414) being associated with a third thickness; said first thickness is substantially the same as said second thickness and said third thickness is smaller than said second thickness; the method comprising:

orienting the support ledge (212) during stretch-blow molding to orient the pattern of protrusions (218) and the pattern of depressions (214) such that the pattern of protrusions (218) to be oriented where feet of the final-shaped container (1002) are to be defined and the pattern of depressions (214) is oriented where areas between feet are to be defined.

16. The final-shaped container (1002) manufactured from the preform (200, 300, 400) of claim 1.

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**FIG. 1** (PRIOR ART)

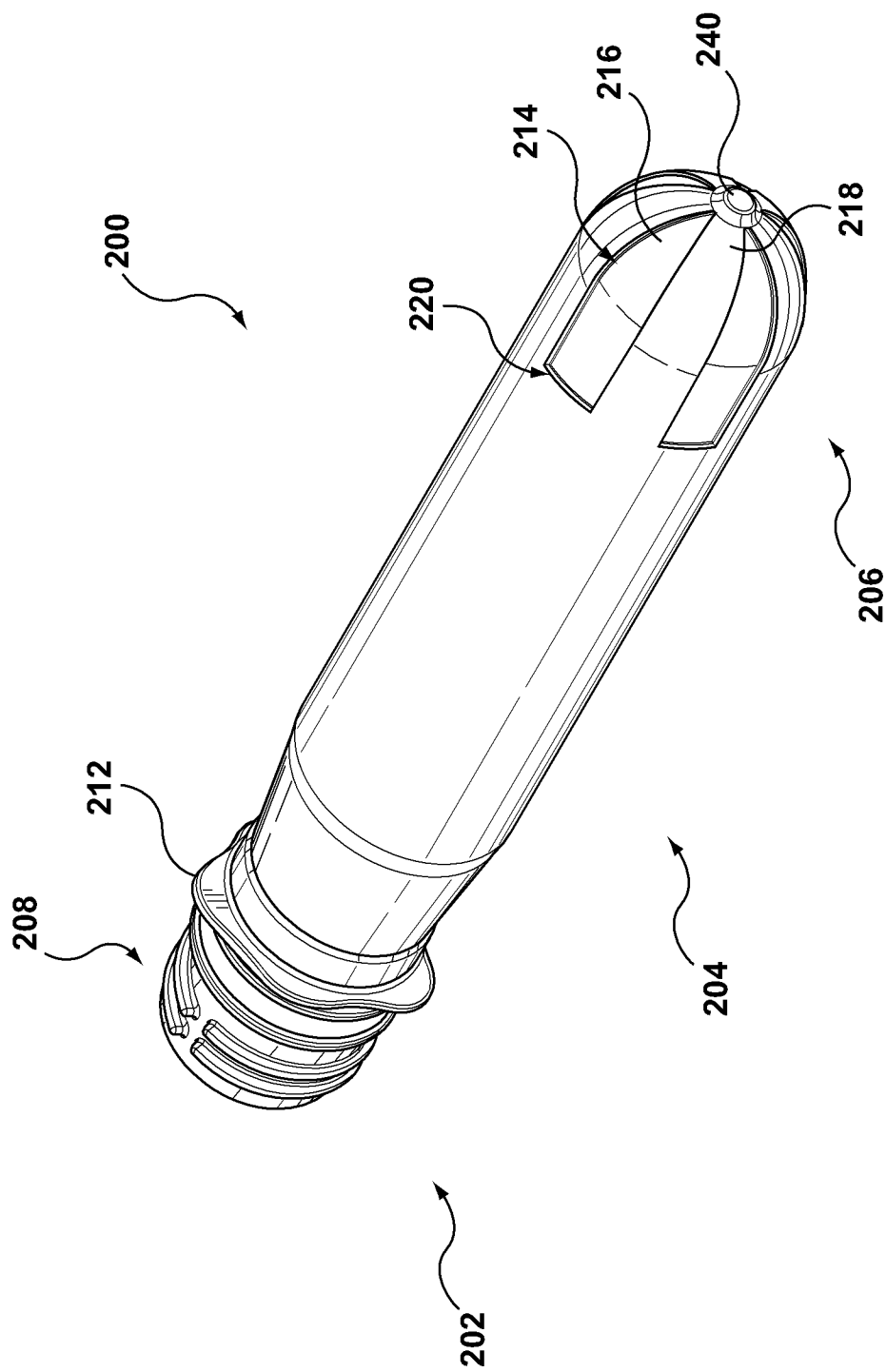


FIG. 2

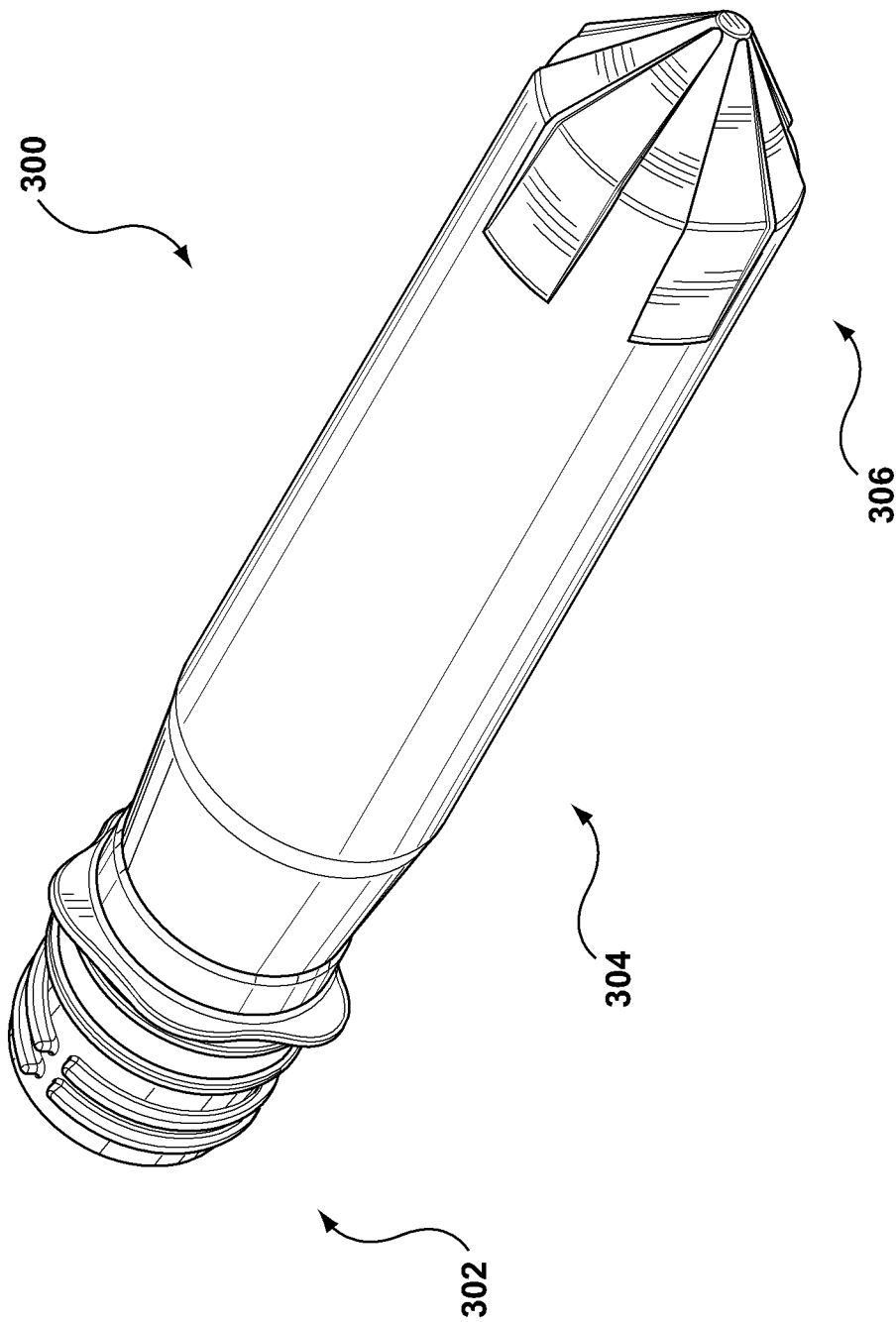
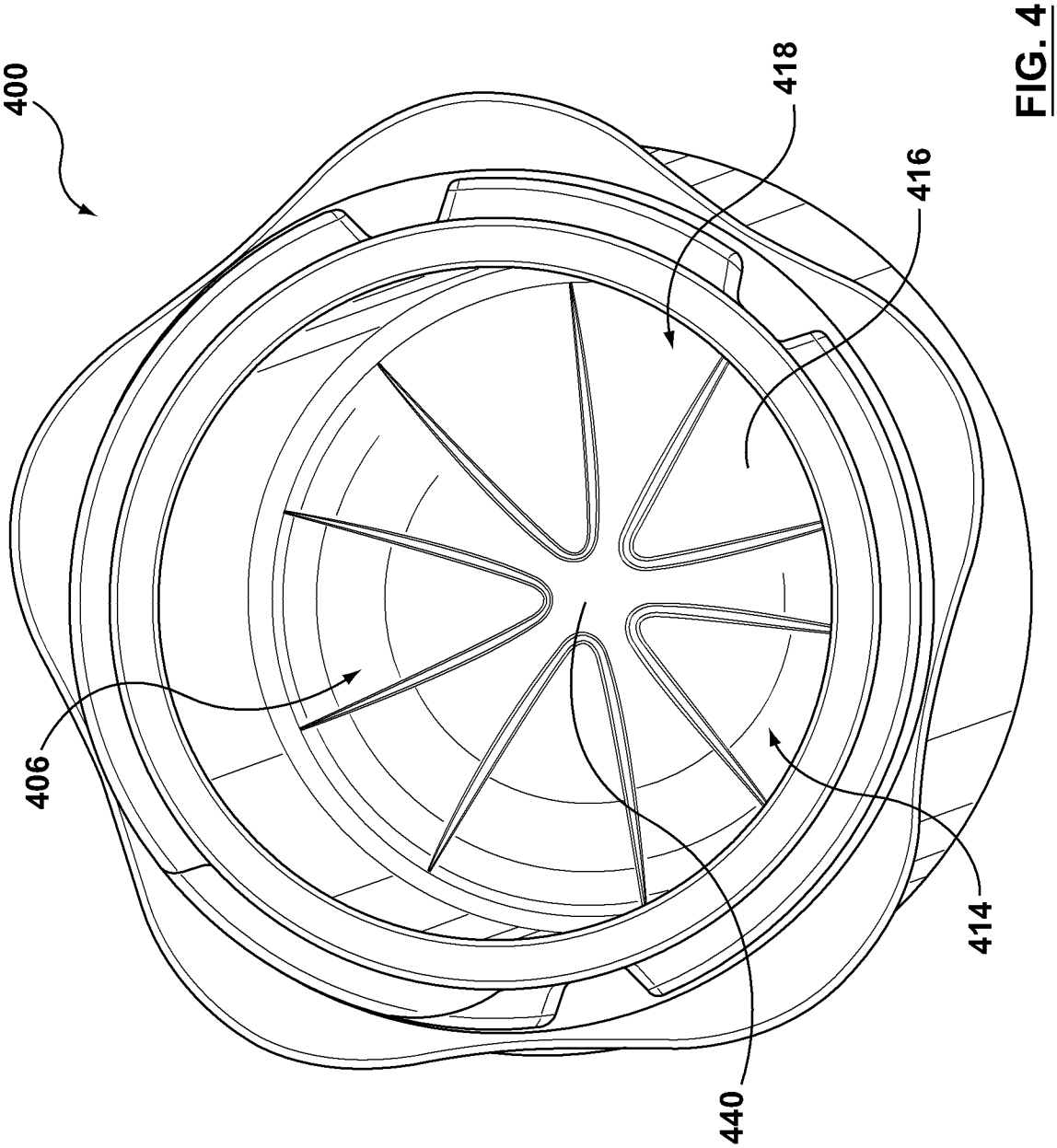


FIG. 3



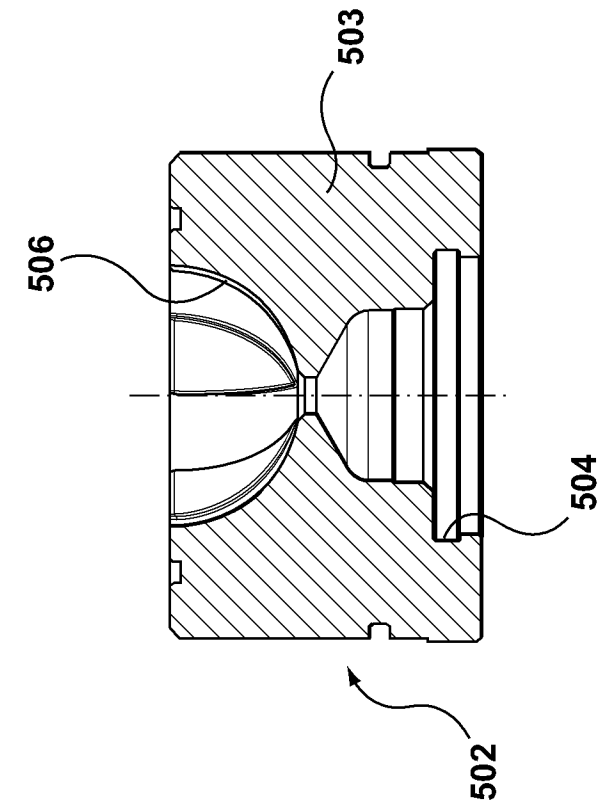


FIG. 6

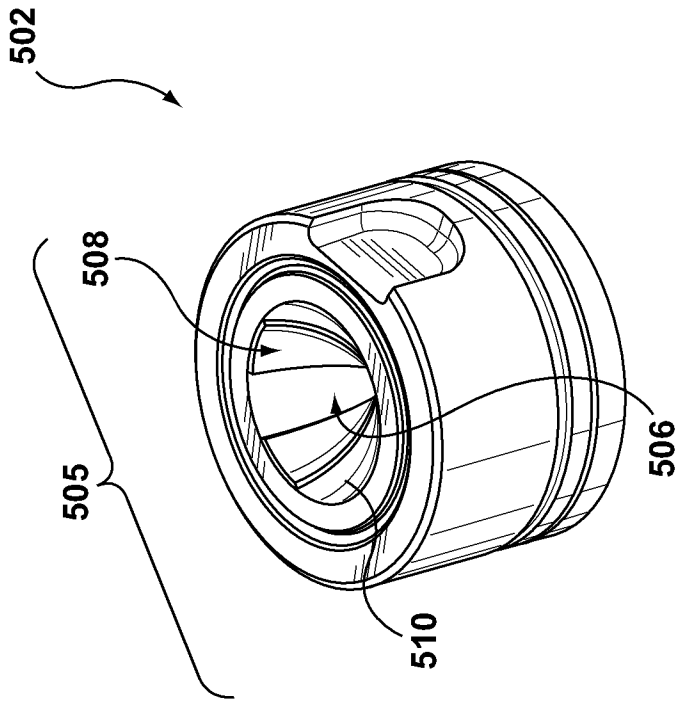


FIG. 5

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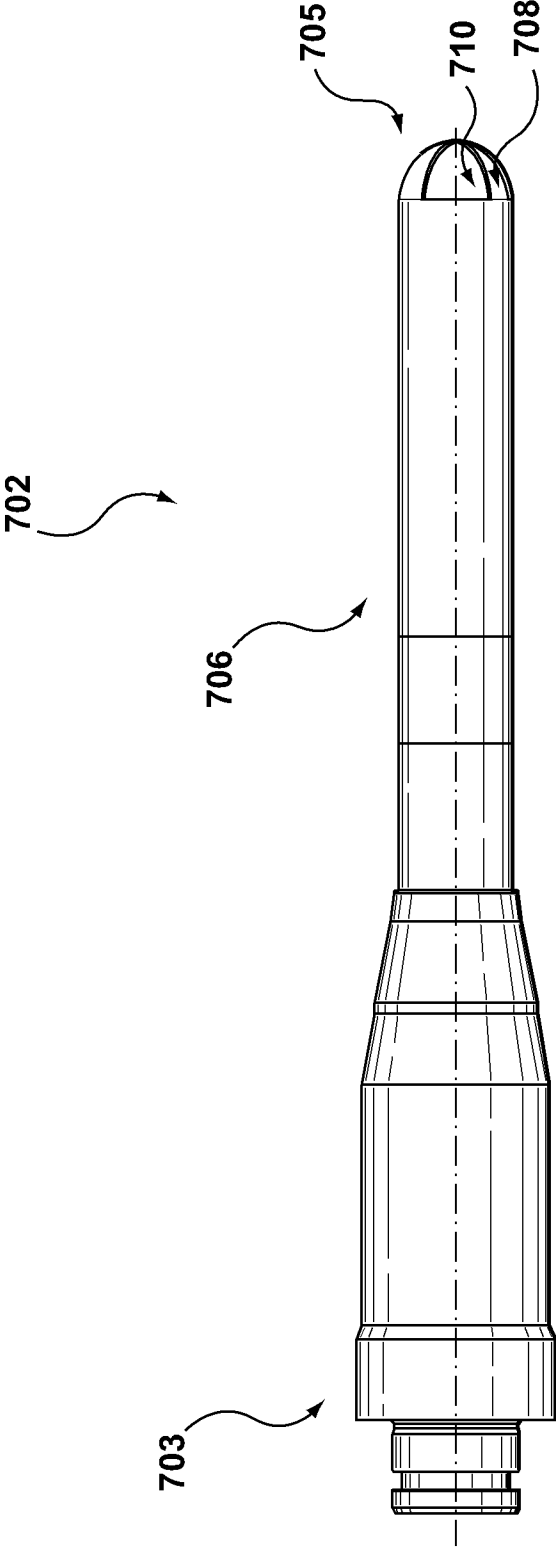


FIG. 7

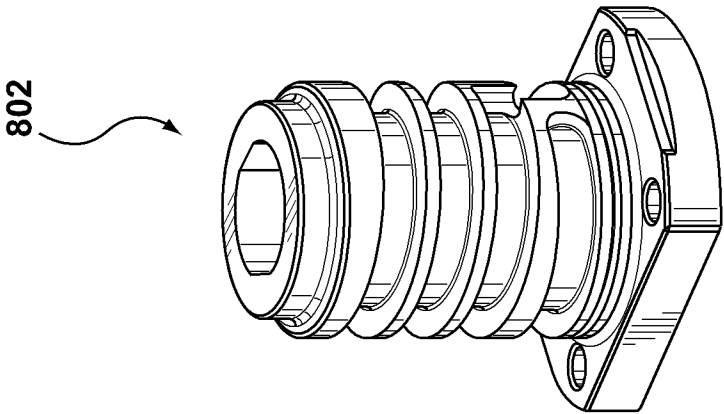


FIG. 8

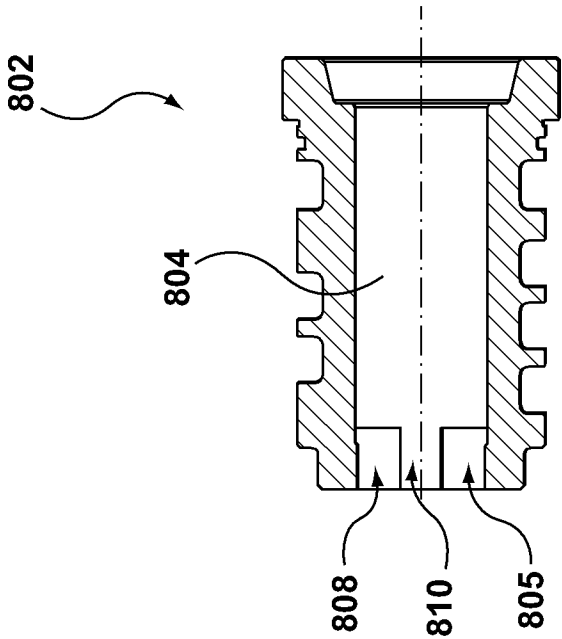


FIG. 9

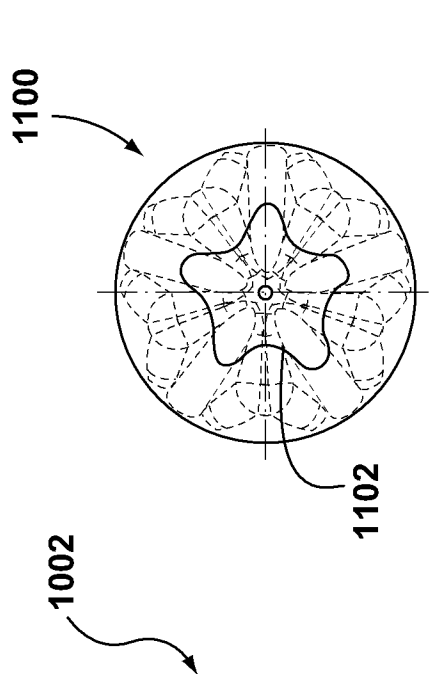


FIG. 11

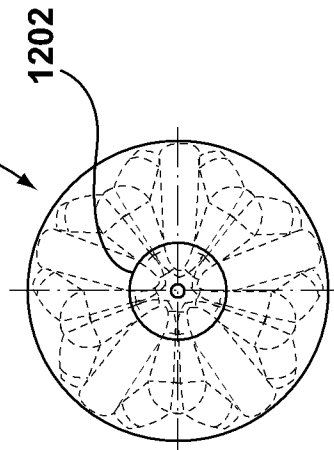


FIG. 12

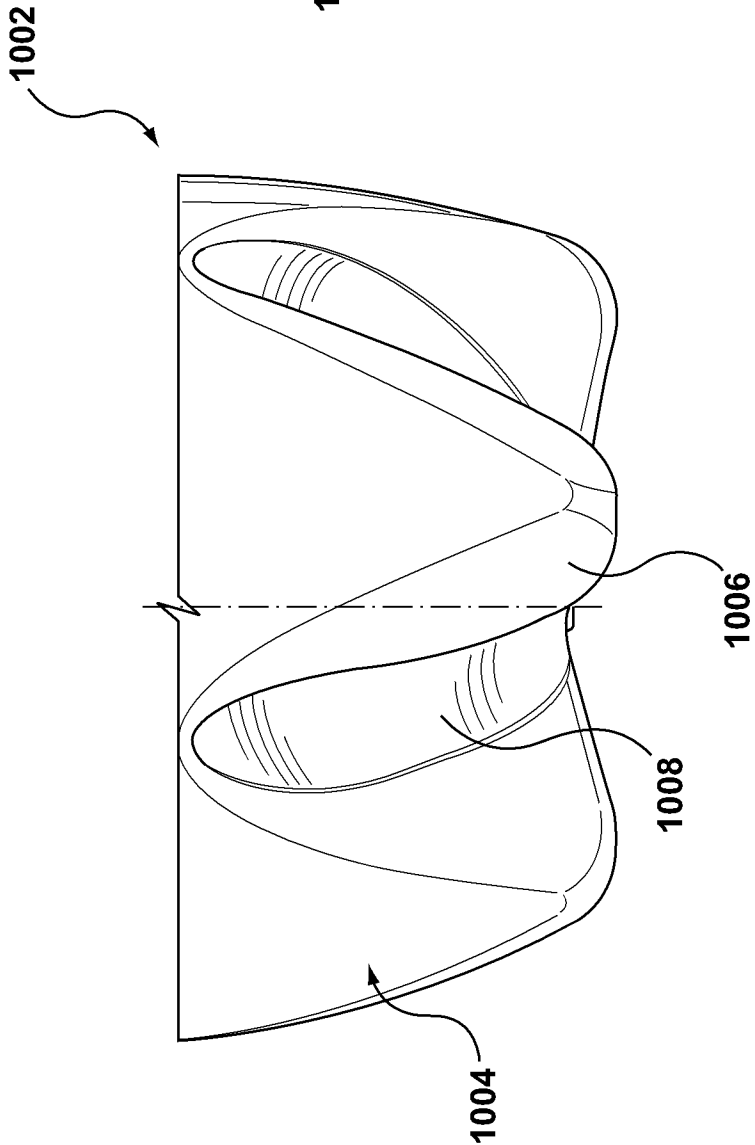


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2009/001677

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **B29B 11/06** (2006.01) , **B29C 49/42** (2006.01)
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)
IPC: **B29B 11/06** (2006.01), **B29C 49/*** (2006.01)

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Canadian Patent Database with key words, such as: preform, container, bottle, core/gate/insert and neck/gate/body portion.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5455088 A (DEEMER, D. A.) 3 October 1995 (03-10-1995) *cited by applicant*	1 - 10, 15 - 16
Y	*fig.3*	11 - 14
Y	CA 2624321 A1 (LI, G.) 26 April 2007 (26-04-2007) *figs. 2-5*	11 - 14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

26 January 2010 (26-01-2010)

Date of mailing of the international search report

8 February 2010 (08-02-2010)

Name and mailing address of the ISA/CA
Canadian Intellectual Property Office
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Gatineau, Quebec K1A 0C9
Facsimile No.: 001-819-953-2476

Authorized officer

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2009/001677

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
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US 5455088 A	03-10-1995	None	
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		EP 1940602B1	05-08-2009
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		US 2007092596A1	26-04-2007
		WO 2007045074A1	26-04-2007
