

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
15 February 2007 (15.02.2007)

PCT

(10) International Publication Number
WO 2007/016959 A1

(51) International Patent Classification:

B29C 49/70 (2006.01) **B29C 49/48** (2006.01)

B29C 33/46 (2006.01)

(21) International Application Number:

PCT/EP2005/009211

(22) International Filing Date: 28 July 2005 (28.07.2005)

(25) Filing Language: English

(26) Publication Language: English

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

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, 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, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

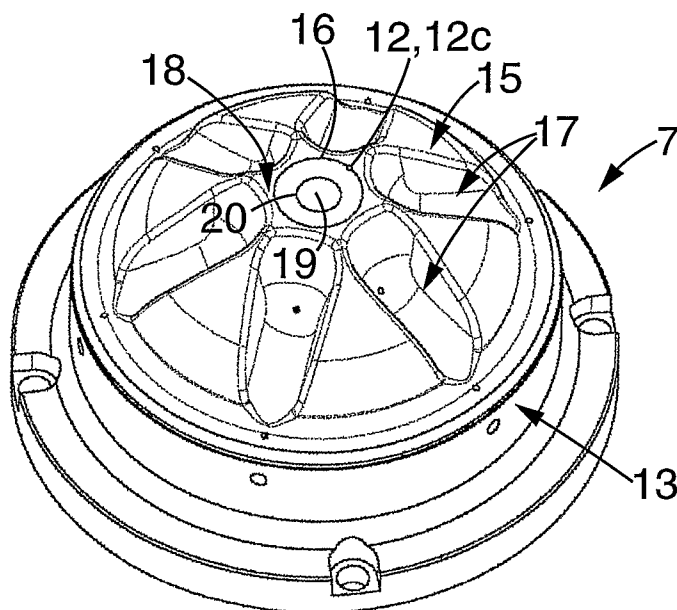
— of inventorship (Rule 4.17(iv))

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: MOLD FOR A CONTAINER BLOW MOLDING MACHINE, COMPRISING A GROOVED MOLD BOTTOM



(57) Abstract: Mold for a blow molding machine for manufacturing containers from parisons, said mold comprising a lateral wall and a mold bottom (7) together defining a cavity for receiving parison, said cavity being generally symmetrical with respect to a main axis, said mold bottom (7) being provided with a gas conduit (12) opening into the cavity for injecting into the same a pressurized gas in order to facilitate withdrawing of the blow molded container, wherein the mold further comprises a groove (16) provided on an internal face (15) of the mold bottom (7), said groove (16) extending along a closed contour around the main axis, and wherein said conduit (12) opens into said groove (16).

**Mold for a container blow molding machine, comprising a
grooved mold bottom**

Field of the invention

The invention relates to the blow molding of containers. More specifically, it relates to a mold for a machine for the manufacturing of containers by blow molding. The blow molding is achieved by introducing into the mold a parison (generally made of a thermoplastic material) which has previously been heated, and then blowing the parison in order to give it a target shape in the mold.

Such a mold comprises a lateral wall and a bottom which together define a cavity into which the parison is introduced.

Background of the invention

It is known in the art that the blow molding operations depend upon the future utilizations of the container. For example, should the container be filled with a hot liquid (e.g. with drinks such as tea, pasteurized fruit juice, etc.), it is necessary to heat the mold in order to subject the container to a thermal treatment during the blow molding, thereby making it resistant to thermal shocks which will occur during the filling. Such a blow molding and the corresponding container are called "HR" (heat resistant) in the common terminology.

One drawback of such a method is that, by the end of the blow molding, the bottom of the container, which is still soft because of the thermal treatment, tends so stick to the mold bottom.

To overcome this problem, it is known to provide the mold bottom with a conduit which opens in the cavity in order to inject pressurized air into the cavity by the end of the blowing, thereby helping separation of the container from the mold.

However, this is not enough to allow for a quick separation of the container. Furthermore, there is a risk that pressurized air leaves a mark on the still soft container bottom, thereby locally weakening the container. In addition, such a mark happens to be unaesthetic.

Summary of the invention

It is one object of the invention to overcome the above-mentioned problems, providing a mold the design of which further facilitates the withdrawing of the container by the end of the blow molding.

The invention therefore provides a mold for a blow molding machine for manufacturing containers from parisons, said mold comprising a lateral wall and a bottom together defining a cavity for receiving a parison, said cavity being generally symmetrical with respect to a main axis, said bottom being provided with a gas conduit opening into the cavity for providing the same with a pressurized gas in order to facilitate withdrawing of the blow molded container, wherein the mold further comprises a groove provided on an internal face of the mold bottom, said groove extending along a closed contour around the main axis, and wherein said conduit opens into said groove.

Accordingly, the injection of gas into the mold through the gas conduit by the end of the blow molding results, thanks to the groove, by a substantially uniform thrust exerted vertically on the container, which is thereby easily separated from the mold bottom. As a result, the container is quickly, and with no mark leaved on it, withdrawn from the mold.

According to one embodiment, the groove extends along a circular contour, which has a diameter comprised e.g. between 10 mm and 20 mm. Preferably, the groove has a depth less than 0.5 mm and is V-shaped in radial section. In addition, at the level of the internal face of the mold

bottom, the groove has a width preferably less than 0.5 mm. Moreover, the gas conduit preferably has, at his junction with said groove, a diameter less than 1 mm.

According to one embodiment, the mold further comprises a piston mounted in the mold bottom along the main axis, said piston being movable between a retracted position in which it is flush with the internal face of the mold bottom, and a deployed position in which it projects outward from the mold bottom into the cavity, said groove extending around and at a distance from said piston.

In a preferred embodiment, the mold bottom is generally curved toward said cavity and has a series of recesses distributed around an apex centered on the main axis, the groove being provided in said apex.

The above and other objects and advantages of the invention will become apparent from the detailed description of preferred embodiments of the invention, considered in conjunction with the accompanying drawings.

Brief description of the drawings

- Figures 1 and 2 are schematic views showing blow molding operations of a container, starting from a parison.
- Figure 3 is a perspective view showing the mold bottom.
- Figure 4 is a top view showing the mold bottom.
- Figure 5 is an elevational radial section view of the mold bottom.
- Figure 6 is an enlarged elevational radial section view of the mold bottom.

Detailed description

Referring now to figures 1 and 2, there is shown a mold 1 for a blow molding machine (not shown) for manufacturing containers 2, starting from parisons 3 (here made of

performs) in a thermoplastic material, e.g. PET.

The mold 1 has a lateral wall 4 comprised of two complementary half molds 5, 6 and a mold bottom 7. The half molds 5, 6 and the bottom 7 together define a cavity 8 in which the perform 3, after having been heated at a temperature around 120°C (around 250°F), is inserted while the mold 1 is open.

Mold 1 is closed, and the preform 3 is stretched and blow molded by means of a stretch-blow rod 9 provided with side holes through which a pressurized gas (e.g. air), at a pressure up to 40 bars (580 psi), is injected in the preform 3 to blow the same against the mold 1 into the shape of the final container 2.

The cavity is substantially revolution symmetrical around a main axis 10, the final container 2 having a substantially cylindrical shape.

The mold 1 is thereafter opened, the container 2 being withdrawn from the mold 1 to be either stored or immediately filled.

In order to facilitate withdrawal of the container 1 from the mold 2 and, more precisely, separation of the container bottom 11 from the mold bottom 7, a pressurized gas (e.g. air) is injected between the mold bottom 7 and the container bottom 11 while the mold 1 is opened.

To this end, the mold bottom 7 is provided with a gas conduit 12 for injecting pressurized gas into the cavity 8. The gas conduit 12 is comprised of three portions, i.e.:

- a first portion 12a, extending vertically (i.e. parallel to the main axis) in the vicinity of a periphery 13 of the mold bottom 7, and opening on a lower face 14 of the mold bottom 7. A pressurized gas inlet (not shown) is connected to the first portion 12a;
- a second portion 12b, inclined with respect to the main axis 10, having a diameter substantially equal to the

diameter of the first portion 12a;

- a third portion 12c, vertically extending in the vicinity of the main axis 10 and opening in the cavity 8 on an internal face 15 of the mold bottom 7. The third portion has a diameter lower than the diameter of the first and second portions 12a, 12b.

As depicted on figure 3, the mold 1 has a groove 16, provided on the internal face 15 of the mold bottom 7, in which groove 16 the gas conduit 12 opens. Groove 16 extends along a closed contour around the main axis 10, whereby air injected through the conduit 12 flows and circulates into the groove 16, thereby permitting a substantially uniform separation of the container bottom 11 from the mold bottom 7.

The contour of the groove 16 may have loops (for example, it may be flower-shaped), for example in function of the shape of the mold bottom 7. In the depicted example, the contour of groove 16 is circular, thereby allowing for easy grinding of the groove 16 and quick circulation of the air flowing from the conduit 12.

As depicted on figures 3 and 5, the mold bottom 7 is curved toward the cavity 8, thereby providing the container bottom 11 with a hollow shape enhancing its mechanical strength.

In the depicted example, the mold bottom 7 further comprises a series of recesses 17 distributed around an apex 18 centered on the main axis 10, thereby forming on the container bottom 11 bulbous stiffeners.

As depicted on figures 3-5, groove 16 is provided in the apex 18 without encroaching upon the recesses 17, in order for the pressurized air flow to be vertically oriented, thereby maximizing the separation force exerted on the container 2.

According to one embodiment, in which the container 2 has a diameter of 110 mm more or less, the contour of the

groove 16 has a diameter comprised between 10 mm and 20 mm, e.g. of approximately 15 mm. Such values are sufficient to allow for an efficient separation of the container 2 from the mold bottom 7.

As depicted on figure 6, in radial section, groove 16 is preferably V-shaped, possibly rounded at its bottom. Groove 16 has a depth preferably less than 0.5 mm, whereas at the level of the internal face 15 of the mold bottom 7 its width is preferably less than 0.5 mm. In addition, the conduit 12 preferably has, at its junction with the groove 16, a diameter less than 1 mm (in other words, the third portion 12c has a diameter of 1 mm).

As the thickness of the blown container is comprised between 0.2 and 0.3 mm, the shape and dimensions disclosed hereabove prevent the container material from flowing into the groove 16, or even into the conduit 12, during the blow molding. Accordingly, on the one hand, the container bottom 11 is not marked by the groove, and on the other hand air coming from the conduit 12 freely flows into, through and along the groove 16.

According to one depicted embodiment, the mold 1 further comprises a piston 19 mounted in a corresponding bore 20 formed in the mold bottom 7 and centered on the main axis 10.

Piston 19 is movable, with respect to the mold bottom 7, between a retracted position (in plain line on figure 5) in which it is flush with the internal face 15 of the mold bottom 7, and a deployed position (in dashed line on figure 5) in which it projects outward from the mold bottom 7 into the cavity 8.

For example, the piston 19 is pneumatically actuated during the mold opening. In its deployed position, the piston exerts on the container bottom 11 an upwardly oriented force, thereby adding a mechanical effect to the separation of the container 2 from the mold bottom 7.

CLAIMS

1. Mold (1) for a blow molding machine for manufacturing containers (2) from parisons (3), said mold (1) comprising a lateral wall (4) and a mold bottom (7) together defining a cavity (8) for receiving a parison (3), said cavity (8) being generally symmetrical with respect to a main axis (10), said mold bottom (7) being provided with a gas conduit (12) opening into the cavity (8) for injecting into the same a pressurized gas in order to facilitate withdrawing of the blow molded container (2), wherein the mold (1) further comprises a groove (16) provided on an internal face (15) of the mold bottom (7), said groove (16) extending along a closed contour around the main axis (10), and wherein said conduit (12) opens into said groove (16).

2. Mold (1) according to claim 1, wherein the groove (16) extends along a circular contour.

3. Mold (1) according to claim 2, wherein the contour of the groove (16) has a diameter comprised e.g. between 10 mm and 20 mm.

4. Mold (1) according to any of claims 1-3, wherein the groove (16) has a depth lower than 0.5 mm

5. Mold (1) according to any of claims 1-4, wherein the groove (16) is V-shaped in radial section.

6. Mold (1) according to any of claims 1-5, wherein, at the level of the internal face (15) of the mold bottom (7), the groove (16) has a width lower than 0.5 mm.

7. Mold (1) according to any of claims 1-6, further comprising a piston (19) mounted in the mold bottom (7) along the main axis (10), wherein said piston (19) is movable between a retracted position in which it is flush with the internal face (15) of the mold bottom (7), and a deployed position in which it projects outward from the mold bottom (7) into the cavity (8), and wherein said

groove (16) extends around and at a distance from said piston (19).

8. Mold (1) according to any of claims 1-7, wherein the mold bottom (7) is generally curved toward said cavity (8) and has a series of recesses (17) distributed around an apex (18) centered on the main axis (10), and wherein said groove (16) is provided in said apex (18).

9. Mold (1) according to any of claims 1-8, wherein the gas conduit (12) has, at its junction with said groove (16), a diameter lower than 1 mm.

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FIG. 1

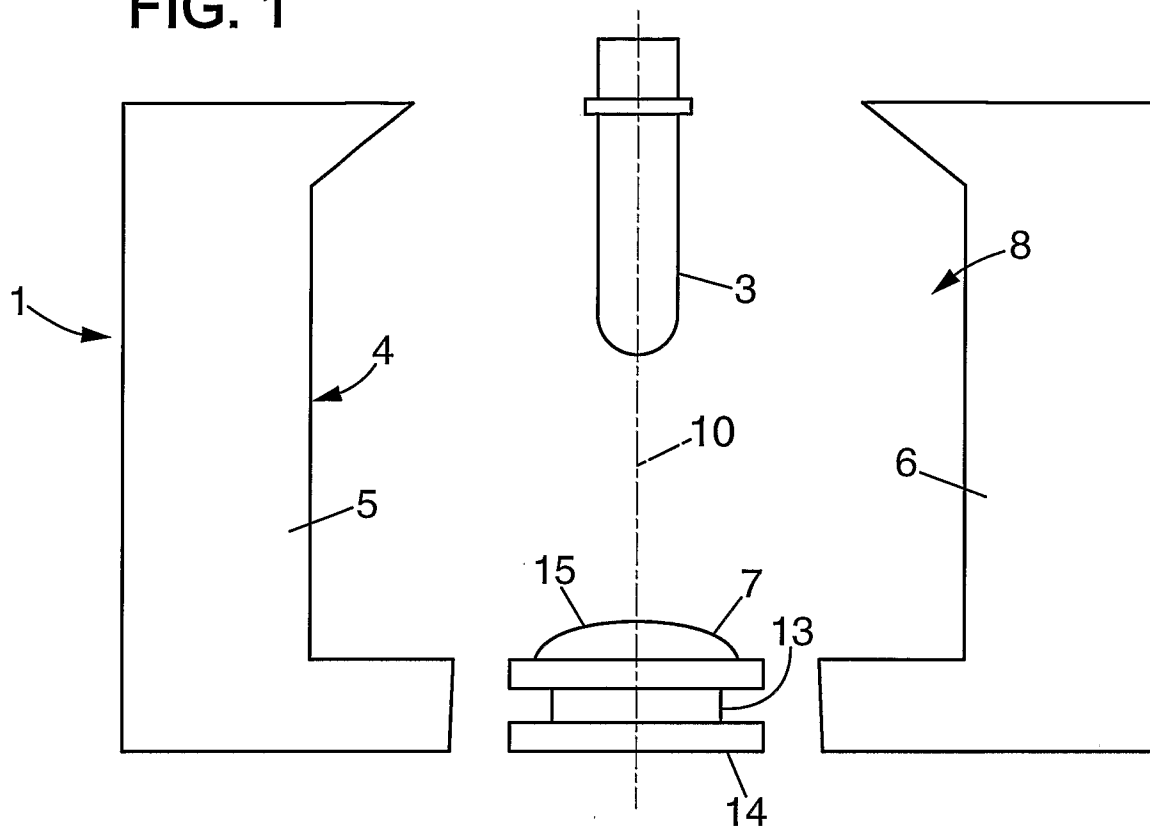
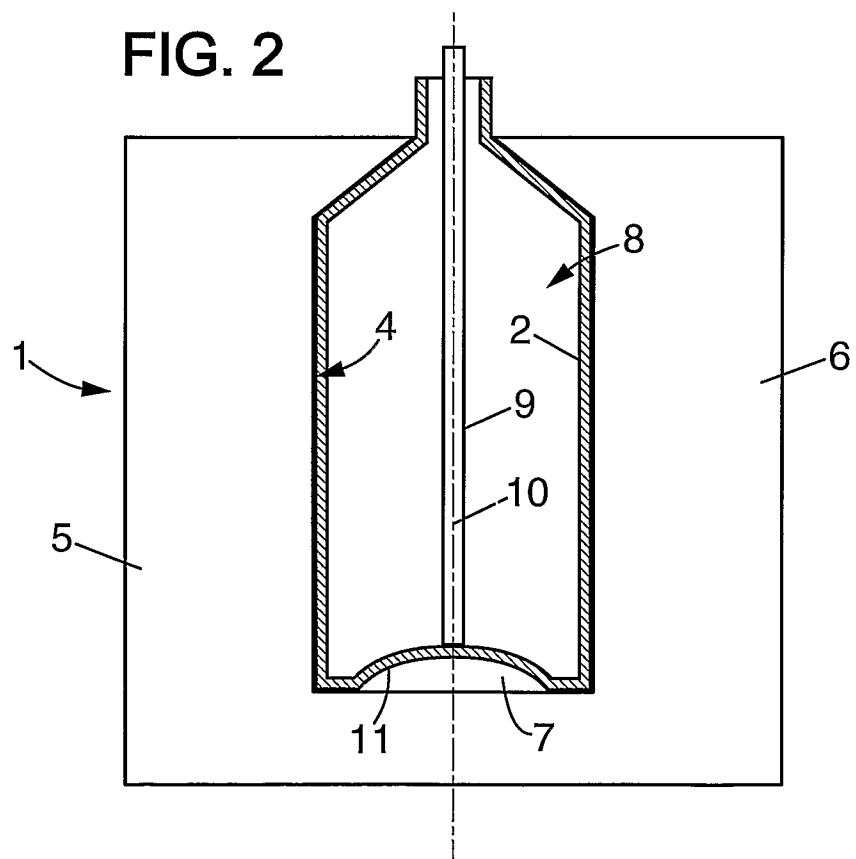


FIG. 2



2/3

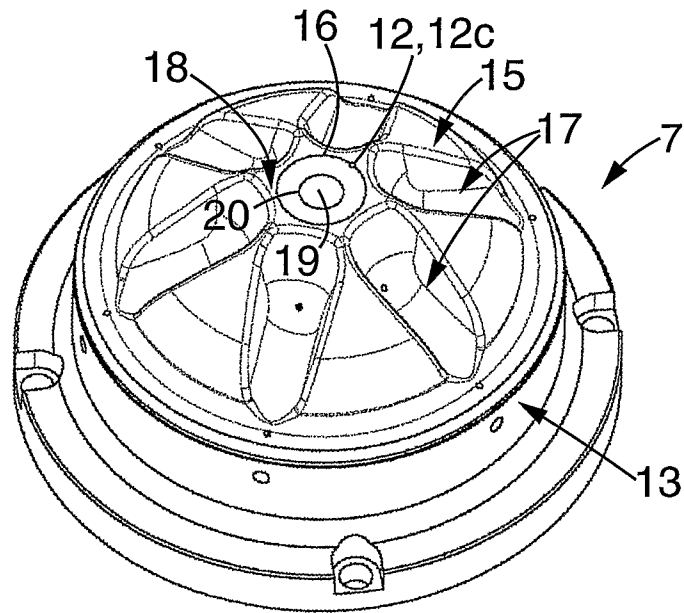


FIG. 3

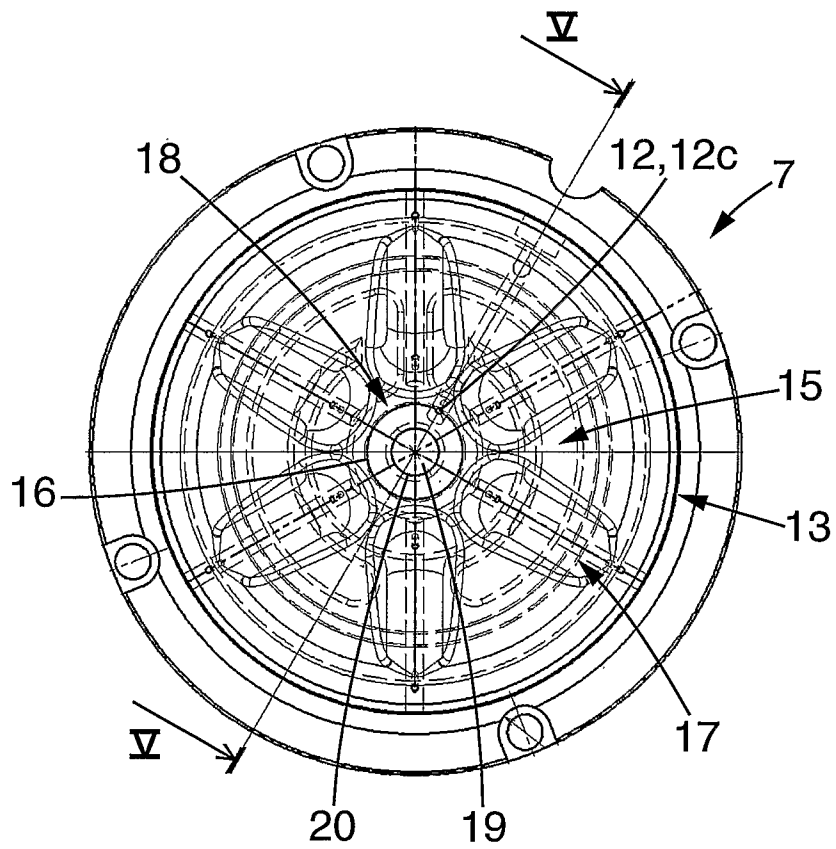


FIG. 4

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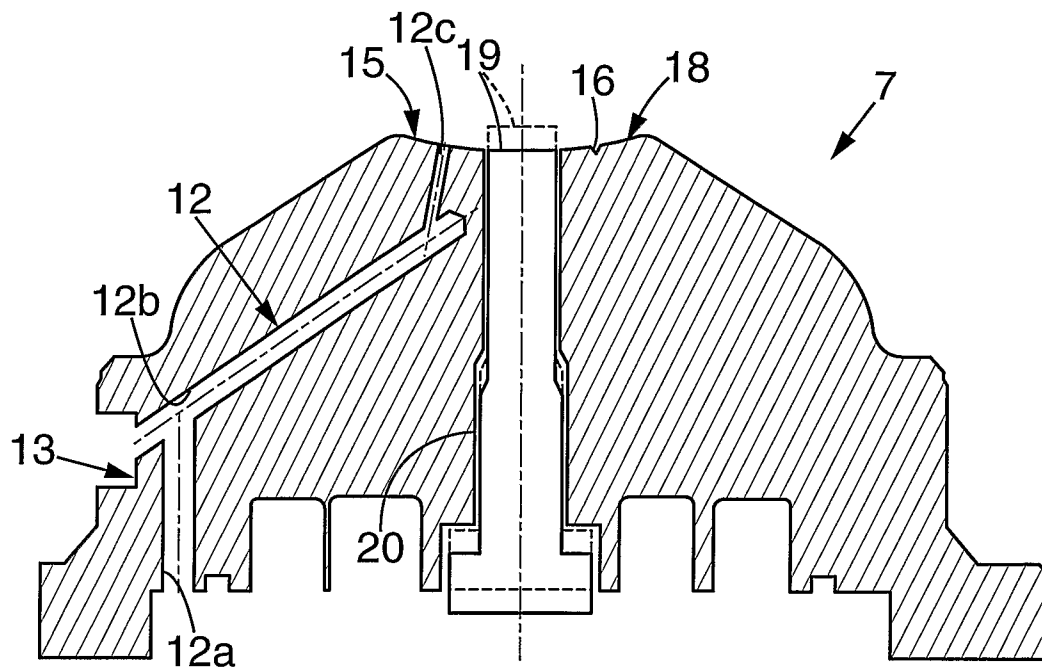


FIG. 5

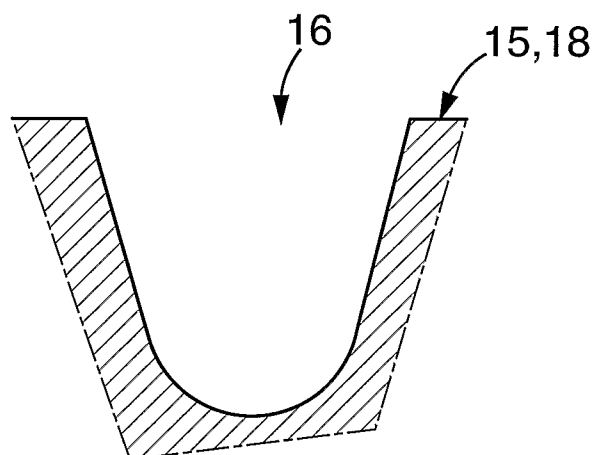


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2005/009211

A. CLASSIFICATION OF SUBJECT MATTER
INV. B29C49/70 B29C33/46
ADD. B29C49/48

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)
B29C B65D

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

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

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 008, no. 083 (M-290), 17 April 1984 (1984-04-17) & JP 59 001226 A (YOSHINO KOGYOSHO:KK), 6 January 1984 (1984-01-06) abstract; figure 2	1-7,9
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 186 (M-1585), 30 March 1994 (1994-03-30) & JP 05 345350 A (DENKI KAGAKU KOGYO KK), 27 December 1993 (1993-12-27) abstract; figure 1 ----- -/-	1-7,9

☒ 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 document 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

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"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

14 July 2006

Date of mailing of the international search report

15/09/2006

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2005/009211

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 395 (M-1299), 21 August 1992 (1992-08-21) & JP 04 131220 A (DAINIPPON PRINTING CO LTD), 1 May 1992 (1992-05-01) abstract; figure 1 -----	1-7,9
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A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 21, 3 August 2001 (2001-08-03) & JP 2001 088202 A (HOKKAI CAN CO LTD), 3 April 2001 (2001-04-03) abstract; figures -----	1-7,9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2005/009211

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
1-7, 9
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☒ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6,9

Mold for a blow molding machine for manufacturing containers from parisons, wherein the mold bottom comprises a groove with specific shape and dimensions.

2. claims: 1,7

Mold for a blow molding machine for manufacturing containers from parisons, wherein the mold bottom comprises a piston.

3. claims: 1,8

Mold for a blow molding machine for manufacturing containers from parisons, wherein the mold bottom is generally curved toward the mold cavity and has a series of recesses distributed around an apex centered on the main axis.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2005/009211

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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