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(54) Title: PROCESS AND APPARATUS FOR THE PRODUCTION OF BLOWN DOUBLE WALLED CONTAINERS

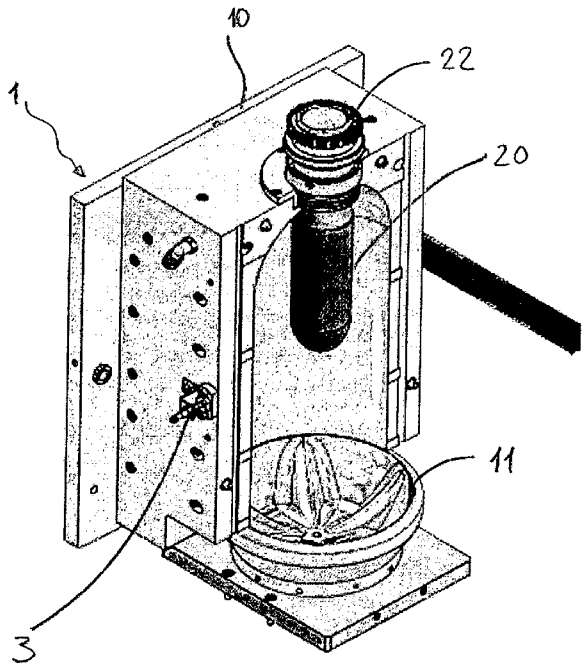


FIG. 1

(57) Abstract: An apparatus for the production of a container (2) obtained from the blowing of at least one preform (20) inserted into a mold (1) and by blowing inside thereof a pressurized gas, the mold including at least two half-molds (10), and (3) for verifying the final status or the value of the final pressure inside of said container (2) inside the mold (1) before the opening of said mold (1), controlling means for controlling said verifying means (3), and a control unit for controlling said controlling means and said verifying means (3), the arrangement being such that the opening of the mold (1) occurs only after said control unit receives an enabling signal from said verifying means (3) relevant to the status or the values of the final pressure inside of the container (2).

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"PROCESS AND APPARATUS FOR THE PRODUCTION OF BLOWN DOUBLE WALLED CONTAINERS"

DESCRIPTION

Field of the Invention

The present invention relates to a process and an apparatus for producing containers from blown preforms and, more specifically to a process and an apparatus for the production of double-walled containers obtained from two and preforms inserted one inside the other.

The present invention finds particular application in the field of linear blow molding machines for PET bottles, and/or polypropylene, a combination thereof, or multilayer blown container.

State of the Art

To date, several methods are already known and / or apparatus for molding / blow molding of containers starting from preforms.

In. particular, there is a known technology so-called "bottle to bottle" which relates the production of double-walled containers. According to this technology, there is provided the blowing of two preforms placed one inside the other at the same time, and within a forming mould, and with the aim of obtaining a container having a thickness which is constituted of a double wall.

This solution is particularly used for products that require an effective barrier agents such oxygen, carbon dioxide, and light, i.e. such as the beer, fruit-based juices, food, and products currently used in metal cans with the presence of gas for the easy pouring of the product itself.

From this technology, however, some drawbacks were found with regard to process safety, since it has been found that the inner preform may break inside the bottle during the blowing step inside the mould. In this condition, the evacuation of the blown air will be inhibited, and the air being at pressures values of about 40 bar.

Consequently, at the end of the cycle, the apparatus receives the signal coming from the control unit for the opening of the mold, but at the same time the bottle is still under pressure. This of course leads to a safety problem. The consequence of this is the stop of the production cycle for the removal of obstruction involving the failure, and in order to spill the gas from the container inside the mold.

Therefore, the aim of the present invention is to solve the abovementioned drawbacks.

Brief description of the invention

The present invention provides a process for the production of blown containers

starting from blown preforms, and wherein there are provided two preforms one inside the other, which process includes a step of checking the status of the final pressure inside the bottle within the mould before the opening of the latter by verifying means, and a step of confirming/not confirming the opening of the mold by control means.

Another object of the present invention is to provide a process for the production of blown containers starting from preforms, which process includes a step of identifying the type of bottle to be formed depending on the type of mold, and then a subsequent step starting the sequence of production steps inherent the type of bottle to be formed.

A further object of the present invention is to provide an apparatus to perform the above processes for the production of blown containers starting from preforms.

Thus, the present invention provides a process and an apparatus for producing blown containers starting from blown preforms substantially according to the annexed claims.

Detailed description of the invention

It will now be provided a detailed description of a preferred embodiment of the method and apparatus for the production of double-walled containers according to the present invention, given by way of example and without limiting, with reference to the annexed drawings, wherein:

Figure 1 is a generic perspective view partially illustrating a mold for the production of a double-walled container, according to the present invention;

Figure 2 is a top plan view showing a part of the mold for the production of a double-walled container of Figure 1, and according to the present invention;

Figure 3 is a partial view taken along a longitudinal section of the mold for the production of a double-walled container, according to the present invention;

Figure 4 is a top plan view and partially in section illustrating the mold for the production of a double-walled container according to the present invention, and

Figure 5 is a flowchart of the flow chart operating the process for producing a double-walled container according to the present invention.

With reference now to Figures 1 to 4, there is partially shown therein a mold for the production of a double-walled container, according to the present invention.

According to the invention, there is provided a mold 1 for the making of a double walled container 2, the latter being constituted starting from a pair of preforms 20 and 21, which are initially placed one inside the other (in figure only being visible the outer preform 20). The mold 1 is composed of half-shells 10 (only one of them being shown) and typically provided with piping and ducts for the temperature control, and for the operation of all the actuators.

In addition, there is a bottom half-shell mold 11 for the forming of the bottom of the container 2.

It has to be pointed out here that the detailed description and operation of all the actuators and all functional components typical for the operating of the mold 1 of the present invention will be here omitted for the sake of clarity, since this function is already known to the skilled men of the related art.

The preforms 20 and 21 are mounted at the top part of the mold 1 on a annular supporting part 22 which acts to support themselves in a coaxial position. It is necessary to point out that according to this arrangement, the preforms are not mutually attached, i.e. the inner preform and the outer preform are simply inserted one into the other.

So, according to the present process, after the preforms 20 and 21 have been mounted onto the annular frame 22 and have been inserted in the relevant half-shell mold 10, there is provided that the mold halves are closed 1 each in a sealed manner, and the blowing of the preforms 20 and 21 is carried out in the provided manner and as already known to reach the final pressure of about 35-40 bar.

After the blow molding and the related forming of the containers internally to mold halves 10 and 11, it is possible to evacuate the blown gas to bring the mold 1 at room pressure and then open it for extracting the so formed container 2 (not shown in the figures).

With particular reference now to Figure 4 and according to the present invention, there is provided an additional control device for the controlling of the relevant process and for verifying the integrity of the container 2 at the end of the blowing step and before the opening of the mold 1.

More precisely and according to the invention, there is provided a pressure sensing device 3 for sensing the pressure inside the mold 1 and/or the container 2, and which consists of a pressure transducer 30.

As can be seen in Figure 4, the transducer 30 includes a rod 31 connected with a pressure sensor 32. The shaft 31 is mounted in a sliding manner inside a half-shell mold 11, and the tip of the rod 31 faces inside the mold 1 and at the wall of the container 2 when the latter it is formed. In this way, the tip of the rod 31 is in contact with the wall of the container 2 when it is fully formed inside the mold 1.

Thus, the pressure sensor can be operated in such a way to transmit and detect the movement action to the rod 31, and therefore sensing the pressure or resistance to deform the wall of the container 2.

As will be evident to men skilled in the field of the relevant art, the arrangement of the device 3 is such that the resulting step of sensing the pressure/movement of the

rod 31 on the wall of the container 2 after the blowing thereof, and based on the value of resistance that the same wall offers to deformation of the latter, it is determined whether the container 2 is filled with blowing gas or if it is empty. So, based on the value of the signal coming from the transducer 30, can be decided if the opening of the mold 1 can be carried out or not.

Furthermore, according to the present invention, it is advantageously provided that each type of mold 1 (varying according to different forms and applications) be equipped with a identification microchip that incorporates an identification code for the type of blow molding process to carry out. More precisely, the identification code ID can be related to a standard blowing process, or a "bottle to bottle" blowing process type, or for large preforms, or for preforms in a non-standard material, etc.. In all these cases, the apparatus "identifies" the code relevant to the mounted mold, and automatically starts the relevant blowing cycle according to the type of container to be carried out.

The microchip (not shown in the figures) is adapted for "interfacing" with the blowing apparatus through different data transmission technologies, i.e. by means of a simple electrical connection through the circuit, or alternatively "transponder" technology, or wi-fi technology, bluetooth technology, etc..

With reference now to Figure 5, it is therein shown a flowchart of the logical steps related to the operation of the whole process according to the present invention. It is necessary here to point out that according to the illustration in Figure 5, the same refers to a process and an apparatus for the blow molding of "bottle in a bottle" containers or "standard bottles", but it will be apparent to the relevant men skilled in the art that the process of present invention may also refer to processes other than shown here below.

Therefore, according to the process of the present invention, there are provided the following steps:

Step (1)

The apparatus carries out the recognition of the process to be carried out by interfacing with the microchip mounted on the mold 1. For example, the blow molding process recognized can be a "standard bottle", or a "bottle in bottle", or else, etc..

Step (2)

If identification of process-type "bottle to bottle" is enabled, the operation of the rod 3 and the control thereof is enabled.

Step (3)

The apparatus runs a control loop of the proper functioning of the mechanical rod 3.

Step (4)

At the end of the control loop of the rod 3, the blowing step is performed and the relevant exhaust of the blown gas at the end of the step is carried out.

Step (5)

At the end of the blowing step, the rod unit 3 sends a digital signal of control to the apparatus, the digital signal can be of the following type:

Value 1 = no pressure in the mold, or

Value 0 = presence of pressure inside the mold. In the case "0" signal value, the opening of the mold 1 is automatically inhibited, and the obstruction which blocks the escape of pressurized blowing gas is removed by means of the movement of the withdrawal rod. This step can be repeated several times cycling, until the consent of the rod 3 gives a value of "1", which authorizes the controller to open the mold 1 of the apparatus.

After the mold 1 is opened, the formed container 2 can be withdrawn and conveyed to the next process steps provided after the formation of the latter, and as already known in the art.

Subsequently, the machine is ready to perform a new production cycle for blowing and forming another container once the relevant preforms (or pair of preforms) are inserted into the open mold.

The present invention is not limited to the shown embodiment, but it also includes different embodiments that fall within the scope of the appended claims.

CLAIMS

1. Apparatus for the production of a container (2) obtained from the blowing of at least one preform (20) inserted into a mold (1) and by blowing inside thereof a pressurized gas, the mold including at least two half-molds (10), and

characterized in that it further comprises:

- verifying means (3) for verifying the final status or the value of the final pressure inside of said container (2) inside the mold (1) before the opening of said mold (1),
- controlling means for controlling said verifying means (3), and
- à control unit for controlling said controlling means and said verifying means (3),

the arrangement being such that the opening of the mold (1) occurs only after said control unit receives an enabling signal from said verifying means (3) relevant to the status or the values of the final pressure inside of the container (2).

2. Apparatus for the production of a container (2) obtained from the blowing of at least one preform (20) inserted into a mold (1) according to the preceding claim, further comprising identifying means for identifying the type of container to be formed, said identifying means being arranged onto said mold (1).

3. Apparatus for the production of a container (2) obtained from the blowing of at least one preform (20) inserted into a mold (1) according to claim 1 or 2, wherein said container (2) is a double-walled container, and wherein said at least one preform comprises two preforms (20,21) inserted one inside the other.

4. Apparatus for the production of a container (2) according to any of the preceding claims, wherein said verifying means includes a pressure transducer (30).

5. Apparatus for the production of a container (2) according to the preceding claim, wherein said transducer (30) includes a rod (31) connected with a pressure sensor (32), the arrangement being such that said rod (31) is mounted in a sliding manner inside one half mold (11), and such that one end of said rod (31) is facing inside the mold (1) at a position corresponding to the an outer wall of the container (2) after the forming thereof, and in a contacting arrangement with said outer wall of the container (2) only when the latter is fully formed inside the mold (1).

6. Apparatus for the production of a container (2) according to the preceding claim, wherein said transducer (30) detects the pressure value or the deforming stress value of the outer wall of the container (2).

7. Apparatus for the production of a container (2) according to any of the preceding claims, wherein said identifying means for identifying the type of container

includes a identification microchip incorporating an identification code which corresponds to the type of blow molding process to achieve.

8. Apparatus for the production of a container (2) according to the preceding claim, wherein said microchip is suitable to communicate with said control unit via a data transmission technology of the type selected from the following group: electrical connection through circuit, transponder technology, Wi-Fi technology, and Bluetooth technology.

9. A process for producing a container (2) obtained from the blowing of at least one preform (20) inserted into a mold (1) and wherein there is provided a blowing apparatus according to previous claims,

characterized in that it comprises the following steps:

- identifying the type of container to be formed by activating said identifying means onto said mold (1);

- enabling and checking the functionality of said verifying means (3) of the status of the final pressure within the container (2) inside the mold (1);

- carrying out the blowing process and exhausting of the gas blown at the end of the blowing operation;

- reading through said verifying means (3) the pressure value inside the mold (1) and/or the container (2), and

- sending a digital signal to said control unit of said apparatus coming from said verifying means (3), said digital signal corresponding to the pressure value read inside the mold (1);

wherein said digital signal can have a first value (value 1) corresponding to an absence of pressurized gas inside the mold, or a second value (value 0) corresponding to the presence of a pressurized gas inside the mold (1),

wherein if the signal value is (value 0) it is automatically blocked the opening of the mold (1), and are automatically operated means for removing an obstruction that blocks the exhausting of said pressurized gas, said removal operation of operating the means for removing is repeated several times by cyclic consensus of said verifying means (3) until a value (value 1) is obtained through said verifying means (3), and

wherein the opening of said mold (1) is carried out only when said digital signal from such verifying means (3) has a value (value 1).

10. Process for producing a container (2) obtained from the blowing of at least one preform (20) inserted into a mold (1) according to the preceding claim, wherein said container (2) is a double walled container, and said at least one preform comprises two preforms (20,21) inserted one inside the other.

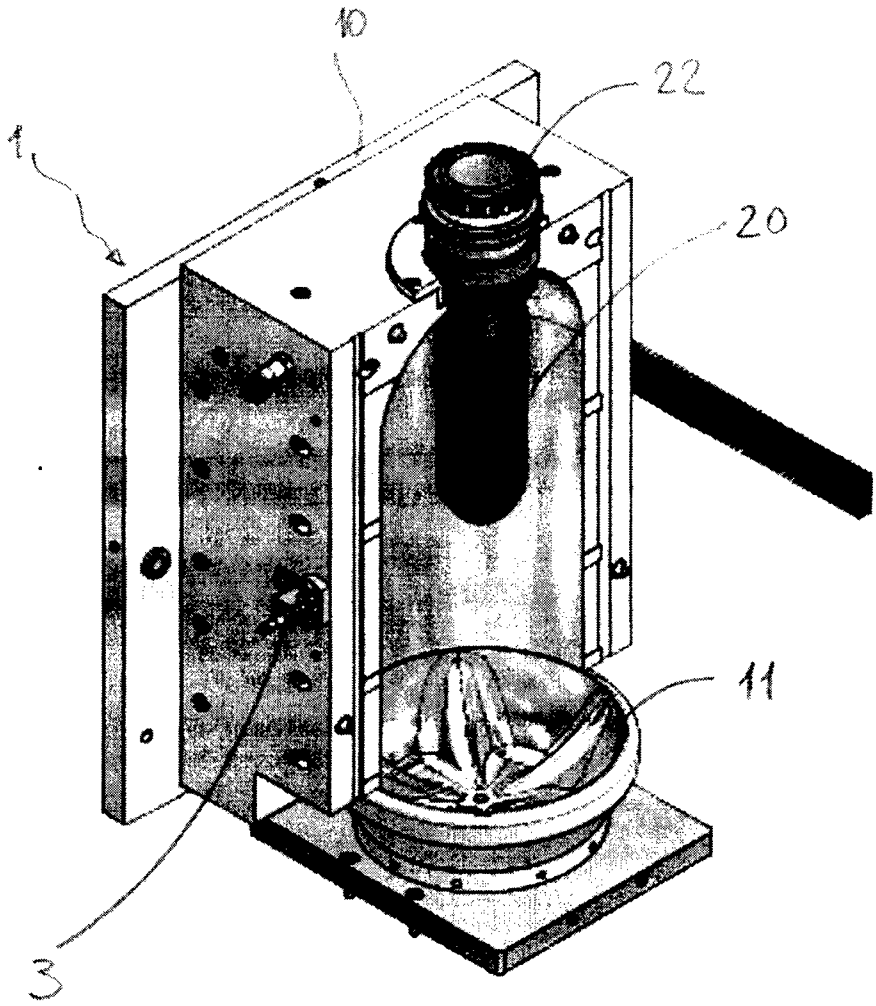


FIG. 1

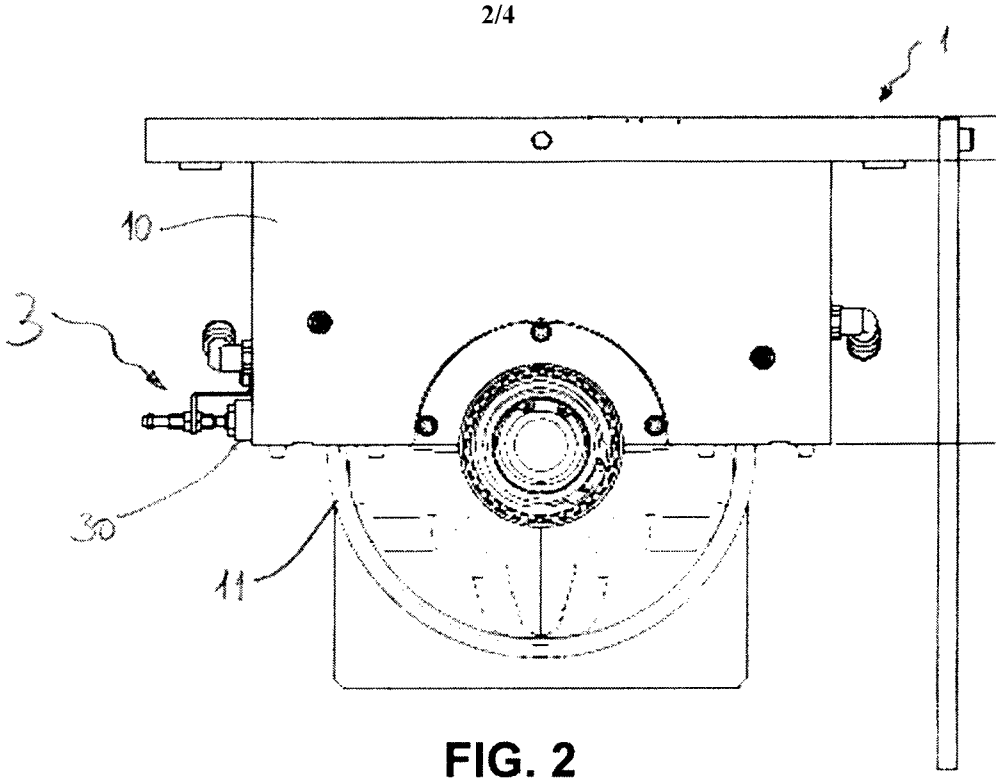


FIG. 2

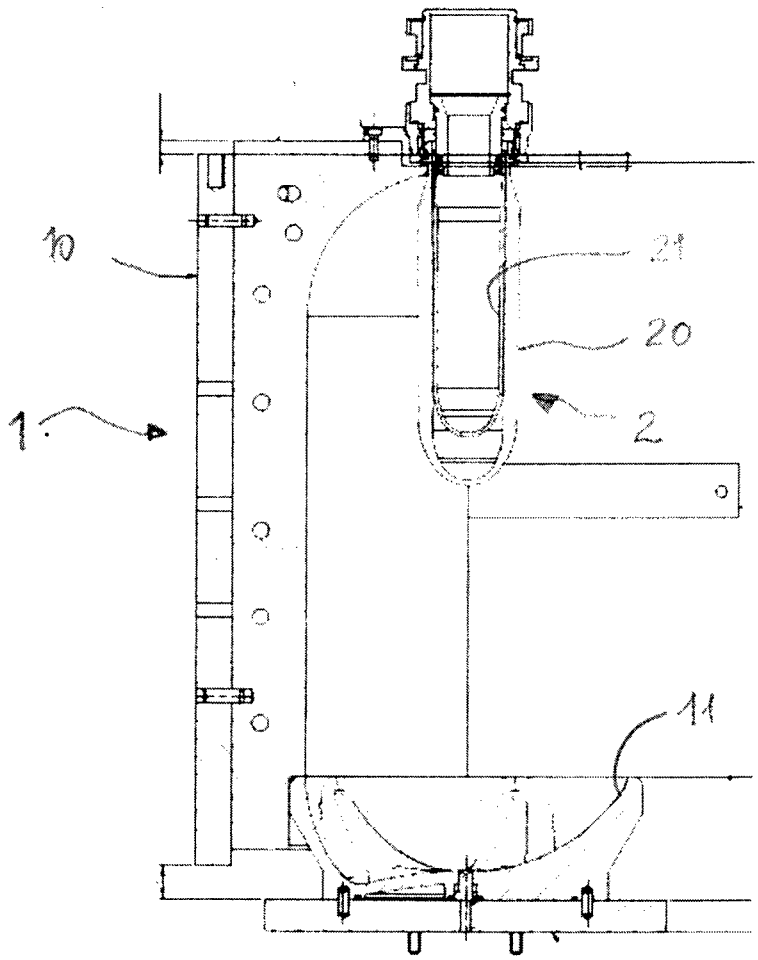


FIG. 3

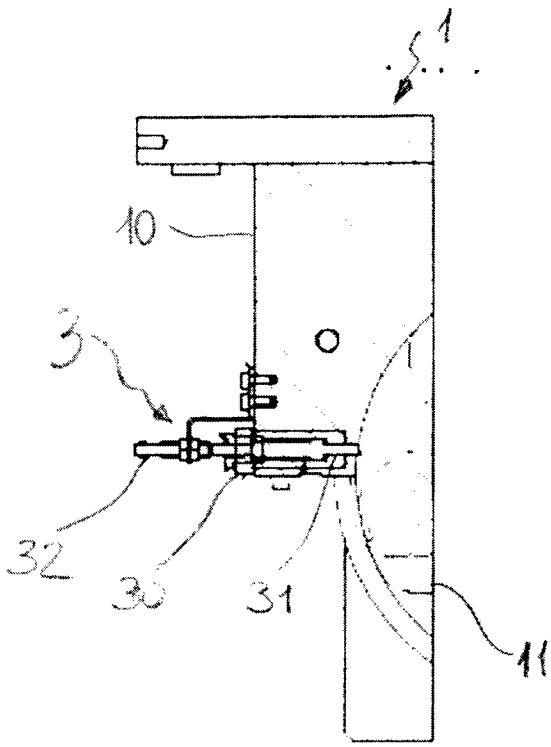


FIG. 4

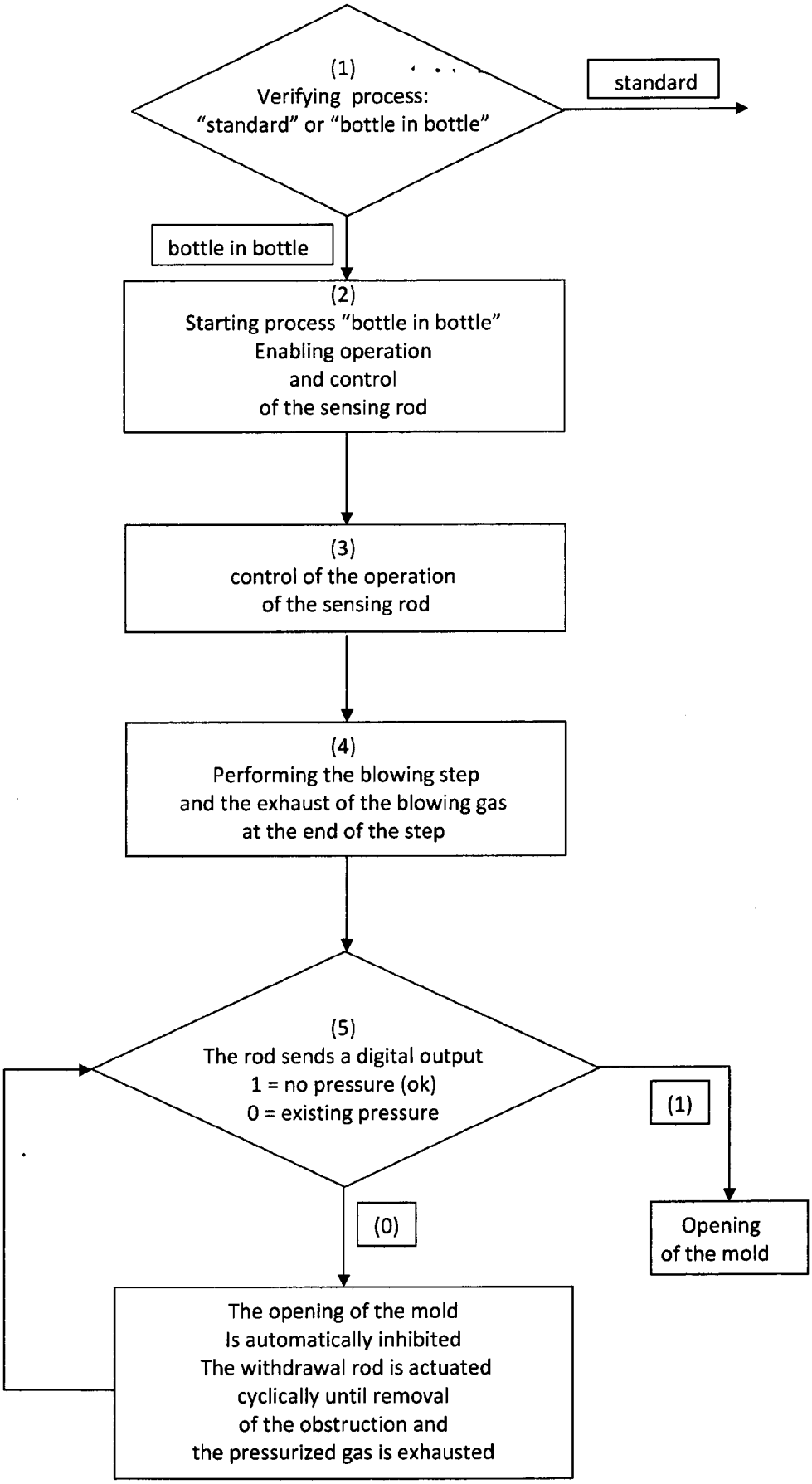

(1)
Verifying process:
"standard" or "bottle in bottle"
standard
bottle in bottle
(2)
Starting process "bottle in bottle"
Enabling operation
and control
of the sensing rod
(3)
control of the operation
of the sensing rod
(4)
Performing the blowing step
and the exhaust of the blowing gas
at the end of the step
(5)
The rod sends a digital output
1 = no pressure (ok)
0 = existing pressure
(1)
Opening
of the mold
(0)
The opening of the mold
Is automatically inhibited
The withdrawal rod is actuated
cyclically until removal
of the obstruction and
the pressurized gas is exhausted

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/002521

A. CLASSIFICATION OF SUBJECT MATTER
INV. B29C49/78
ADD.

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 10 2008 013419 A1 (KHS CORPOPLAST GMBH & CO KG [DE]) 10 September 2009 (2009-09-10) paragraphs [0063], [0065], [0072], [0073]; figures 6,7	1,9
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A	JP 6 055622 A (UBE INDUSTRIES) 1 March 1994 (1994-03-01) abstract; figure 1	5

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

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
5 January 2012	16/01/2012

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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