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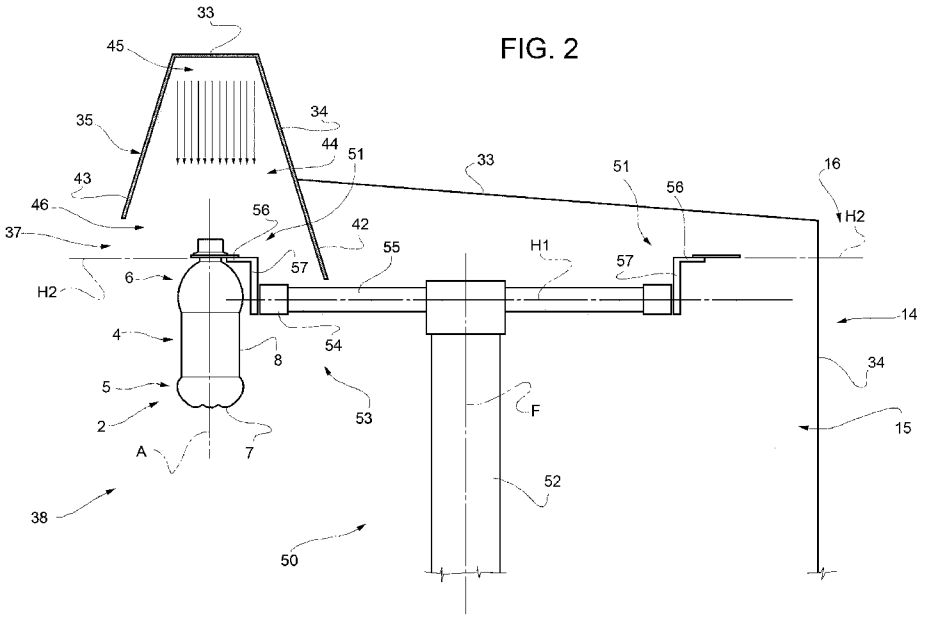
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(54) **Title:** FILLING PLANT AND STAR WHEEL FOR A FILLING PLANT

FIG. 2



(57) **Abstract:** There is described a filling plant (1) for the filling of receptacles (2) comprising at least an isolation chamber (14) having an inner space (15), a conditioning device for controlling the gas atmosphere within the inner space (15), a filling apparatus (18) for filling the receptacles (2) and a conveying device (19) for advancing the receptacles (2) along an advancement path (P) to and/or away from the filling apparatus (18). The isolation chamber (14) comprises at least one isolation channel (35; 36) arranged downstream or upstream from the filling apparatus (18) along the advancement path (P) and the conditioning unit controls a flow of a gas within the isolation channel (35; 36). The conveying device (19) comprises at least one conveyor (50) for advancing the receptacles (2) along at least a portion of the advancement path (P) and through at least a portion of the isolation channel (35; 36) and having a plurality of gripping assemblies (51), each gripping assembly (51) configured to arrange one respective receptacle (2) such that at least a portion

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(6) of the respective receptacle (2) is arranged within the isolation channel (35; 36).

FILLING PLANT AND STAR WHEEL FOR A FILLING PLANT

TECHNICAL FIELD

The present invention relates to a filling plant for filling receptacles with a pourable product, in particular a pourable food product.

Advantageously, the present invention also relates to a star wheel for the advancement of receptacles.

BACKGROUND ART

Filling plants for the filling of receptacles such as bottles with a pourable product, in particular a pourable food product, are known.

A typical filling plant comprises at least a filling apparatus configured to fill the receptacles and having a plurality of star wheels configured to advance the empty receptacles to and the filled receptacles from the filling apparatus.

Some filling plants also comprise a molding apparatus configured to blow or compression mold preforms so as to obtain the receptacles. Some of the star wheels being arranged such to advance the empty receptacles from the molding apparatus to the filling apparatus.

Typically, the filling apparatus, the star wheels and the molding apparatus are at least partially arranged within an isolation chamber so that the receptacles are advanced within a controlled atmosphere, which is necessary in order

to maintain the sterility of at least the inner of the receptacles to be filled with the pourable product.

Even though, the known filling plants work satisfyingly well, it is the desire to further improve the filling plants and their operation.

In particular, it is a desire to reduce as much as possible the risk that contaminations may enter into the bottles during the advancement of the bottles.

DISCLOSURE OF INVENTION

It is therefore an object of the present invention to provide in a straightforward and low-cost manner an improved filling plant for filling receptacles with a pourable product.

It is therefore a further object of the present invention to provide in a straightforward and low-cost manner an improved star wheel for a filling plant.

According to the present invention, there is provided a filling plant according to the independent claim 1.

Further advantageous embodiments of the filling plant are specified in the claims being directly or indirectly dependent on claim 1.

According to the present invention, there is also provided a star wheel for a filling plant according to claim 11.

Further advantageous embodiments of the star wheel are

specified in the claims being directly or indirectly dependent on claim 11.

BRIEF DESCRIPTION OF THE DRAWINGS

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic top-view of a filling plant according to the present invention, with parts removed for clarity;

Figure 2 shows a schematic side-view of details of the filling plant of Figure 1, with parts removed for clarity.

BEST MODES FOR CARRYING OUT THE INVENTION

Referral number 1 indicates as a whole a filling plant for at least filling receptacles, such as bottles 2, in particular plastic bottles, with a pourable product, even more particular a pourable food product such as carbonated liquids (e.g. sparkling water, soft drinks and beer) or non-carbonated liquids (e.g. still water, juices, teas, sport drinks, liquid cleaners, wine, emulsions, suspensions, high viscosity liquids and beverages containing pulps).

The following description will refer without any limitative scope to the receptacles being bottles 2 being made from a polymer such as polytetrafluoroethylene (PET), glass, aluminum, steel or composites.

With particular reference to Figures 1 and 2, each bottle 2 extends along a longitudinal axis A and comprises

a pouring/inlet opening 3 allowing for the introduction and the outpouring of the pourable product respectively into and out of bottle 2. In particular, each bottle 2 also comprises a hollow main body 4 having a bottom portion 5 and a top portion 6 opposite to bottom portion 5 and carrying pouring/inlet opening 3.

According to a preferred non-limiting embodiment, hollow main body 4 is bounded by a bottom wall 7, sidewalls 8 extending from bottom wall 7 and along axis A and by a top neck 9 delimiting pouring/inlet opening 3 and being arranged opposite to bottom wall 5.

Preferentially but not necessarily, bottom portion 5 comprises bottom wall 7 and top portion 6 comprises top neck 9.

According to a preferred non-limiting embodiment, filling plant 1 is also configured to produce bottles 2 from preforms 10.

With particular reference to Figure 1, filling plant 1 comprises at least:

- an isolation chamber 14 for separating an inner space 15 (of isolation chamber 14 itself) from an outer environment 16;

- a conditioning device configured to provide for a defined and/or controlled (sterile) gas atmosphere, in particular a sterile air atmosphere, within inner space 15;

- a filling apparatus 18 configured to fill bottles 2

with the pourable product and being at least partially arranged within isolation chamber 14 so that, in use, the filling of bottles occurs and/or is executed within inner space 15 (i.e. under a controlled gas atmosphere); and

- a conveying device 19, in particular at least partially arranged within isolation chamber 14 and, being configured to advance bottles 2 along an advancement path P, in particular within inner space 15, to and/or away from filling apparatus 18.

According to a preferred non-limiting embodiment, with the term "a defined and/or controlled (sterile) gas atmosphere" is intended to express that the gas atmosphere presents a reduced load of contaminants (such as microbes, bacteria, viruses and others), in particular for allowing a treating and/or processing of preforms 10 and/or bottles 2 in a sterile environment. Preferentially but not necessarily, the term "a defined and/or controlled (sterile) gas atmosphere" also expresses that the temperature and/or humidity of the gas atmosphere is controlled.

According to a preferred non-limiting embodiment, filling plant 1 also comprises a molding apparatus 20 configured to form and/or mold bottles 2 from preforms 10 and being at least partially arranged within isolation chamber 14 so that bottles 2 are formed and/or molded from preforms 10 within inner space 15. In particular, molding

apparatus 20 is arranged upstream from filling apparatus 18 along advancement path P and conveying device 19 is configured to advance bottles 2, in particular along a first portion P1 of advancement path P, from molding apparatus 20 to filling apparatus 18.

According to a preferred non-limiting embodiment, filling plant 1 also comprises a conveying assembly 21 (only partially shown) configured to advance preforms 10 along an advancement path Q and to molding apparatus 20. In particular, conveying assembly 21 is interposed between filling plant 1 and molding apparatus 20.

According to a preferred non-limiting embodiment, filling plant 1 also comprises a capping apparatus 22 configured to apply at least one closure onto each (filled) bottle 2 and being arranged downstream from filling apparatus 18 along advancement path P.

According to a preferred non-limiting embodiment, conveyor device 19 is configured to advance (the filled) bottles 2 (filled with the pourable product) along a second portion P2 of advancement path P from filling apparatus 18 to capping apparatus 22.

According to a preferred non-limiting embodiment, filling plant 1 also comprises a preform sterilization apparatus 24 being at least partially arranged within isolation chamber 14 and being configured to sterilize at

least the inner portion of preforms 10. In particular, sterilization apparatus 24 is configured to introduce a sterilization agent into preforms 10 so as to sterilize at least the inner portion of preforms 10 (and in consequence of bottles 2).

According to a preferred non-limiting embodiment, sterilization apparatus 24 is arranged upstream of molding apparatus 20 along advancement path Q and conveying assembly 21 is configured to advance preforms 10 within inner space 15 from sterilization apparatus 24 to molding apparatus 20.

With particular reference to Figure 1, filling apparatus 18 comprises a conveying carousel 28 rotatable around a rotation axis B, in particular having a vertical orientation, for advancing bottles 2 along a filling path and a plurality of filling units (not shown and known as such) arranged on conveying carousel 28 and configured to retain and fill one respective bottle 2 during advancement of bottles 2 along the filling path. In particular, conveying carousel 28 and the filling units are arranged within inner space 15.

Preferentially but not necessarily, the filling units are peripherally arranged on the conveying carousel 28 and equally spaced around rotation axis B.

According to a preferred-non-limiting embodiment, molding apparatus 20 comprises:

- a conveying carousel 29 rotatable around a rotation axis C, in particular having a vertical orientation, for advancing preforms 10 prior to their formation into bottles 2 and bottles 2 after their formation along respectively a final preform advancement path and an initial bottle advancement path; and

- a plurality of molding units 30 arranged on conveying carousel 29 and configured to retain preforms 10, to mold preforms 10 into bottles 2 during advancement of preforms 10 along the final preform advancement path and to retain the formed bottles 2 along the initial bottle advancement path.

According to a preferred non-limiting embodiment, conveying carousel 29 and molding units 30 are arranged within inner space 15.

Preferentially but not necessarily, molding units 31 are peripherally arranged on conveying carousel 29 and equally spaced around rotation axis C.

According to a preferred non-limiting embodiment, capping apparatus 22 comprises:

- a conveying carousel 31 rotatable around a rotation axis E, in particular having a vertical orientation, for advancing (filled) bottles 2 along a capping path; and

- a plurality of capping units (not shown) arranged on

conveying carousel 31 and each one configured to retain one respective (filled) bottle 2 and to apply one respective closure onto the respective (filled) bottle 2 during its advancement along the capping path.

According to a preferred non-limiting embodiment, conveying carousel 31 and the capping units are arranged within inner space 15.

Preferentially but not necessarily, the capping units are peripherally arranged on conveying carousel 31 and equally spaced around rotation axis E.

With particular reference to Figures 1 and 2, isolation chamber 14 is configured to be arranged on a (substantially horizontal) surface (e.g. a floor of a production site) and comprises at least an upper wall 33 distanced from the surface and a plurality of lateral walls 34 connected to upper wall 33 so as to enclose and/or delimit inner space 15. In particular, lateral walls 34 protrude from upper wall 33 towards the surface.

It should be noted that upper wall 33 is not necessarily parallel to the surface and upper wall 33 may comprise varying portions some being arranged on a higher elevation level than others (with respect to the surface). It should also be noted that lateral walls 34 (see e.g. Figure 2) can extend from e.g. a first portion of upper wall 33 to a second portion of upper wall 33 being below the first portion.

Advantageously, isolation chamber 2 comprises at least a first isolation channel 35 extending within inner space 15 and at least downstream from filling apparatus 18 along advancement path P. In particular, isolation channel 35 is configured to receive at least a portion, in particular the respective top portions 6, of bottles 2 during advancement of bottles 2 along at least a portion of advancement path P. In other words, in use, during advancement of (empty) bottles 2 (i.e. bottles 2 not being filled with the pourable product) along advancement path P, the respective top portions 6 advance within isolation channel 35.

According to a preferred non-limiting embodiment, isolation channel 35 is interposed between filling apparatus 18 and molding apparatus 20.

According to a preferred non-limiting embodiment, isolation chamber 14 also comprises a second isolation channel 36 similar to isolation channel 35 and extending within inner space 15 and at least upstream from filling apparatus 18 along advancement path P. In particular, isolation channel 36 is configured to receive at least a portion, in particular the respective top portions 6, of (filled) bottles 2 (i.e. bottles 2 filled with the pourable product) during advancement of bottles 2 along advancement path P.

According to a preferred non-limiting embodiment,

isolation channel 36 is interposed between filling apparatus 18 and capping apparatus 22.

Preferentially but not necessarily, isolation channel 35 is arranged within an upper section 37 of inner space 15. In particular upper section 37 being adjacent to, even more particular being at, upper wall 33. In particular, inner space 15 also comprises a lower section 38 opposed to upper section 37, in particular lower section 38 being positioned adjacent to, in particular at, the surface.

According to a preferred non-limiting embodiment, isolation channel 35 comprises a first lateral wall 42 and a second lateral wall 43 spaced apart from one another and laterally delimiting an advancement space 44 of isolation channel 35 and for receiving at least portion 6 of bottles 2 (i.e. in use, during advancement of (empty) bottles 2 along advancement path P, the respective top portions 6 advance within advancement space 44).

Preferentially but not necessarily, lateral walls 42 and 43 extend from upper wall 33 into inner space 15 and, in particular are arranged within upper section 37. In more detail, lateral walls 42 and 43 are connected to upper wall 33 and protrude towards lower section 38, in particular towards the surface.

According to the non-limiting embodiment shown, each one of lateral walls 42 and 43 also defines at least a

respective portion of one respective lateral wall 34.

According to a preferred non-limiting embodiment shown, advancement space 44 comprises an upper portion 45 and a lower portion 46 opposed to upper portion 45. In particular, upper portion 45 being positioned adjacent to, even more particular at, upper wall 33. In use, the respective top portions 6 are positioned within lower portion 46 and advance within lower portion 46.

As isolation channel 36 is similar to isolation channel 35 regarding the details of isolation channel 36 we refer to the description with respect to isolation channel 35 using the same references for similar or equivalent parts.

In particular, isolation channel 36 differs from isolation channel 35 in that isolation channel 36 receives, in use, filled bottles 2, i.e. bottles 2 being filled with the pourable product.

Advantageously, the conditioning device is configured to control and/or determine and/or create a flow of (sterile) gas within isolation channel 35, and preferentially but not necessarily also in isolation channel 36. In particular, the conditioning device is configured to control the flow of gas from the respective upper portion 45 to the respective lower portion 46. In particular, in this manner, in use, the flow of gas is directed onto the respective top portions 6 and from top portions 6 to the respective bottom portions 5. In

this manner, it is ensured that contaminations present on outer surfaces of bottles 2 are kept away from pouring/inlet opening 3.

According to a preferred non-limiting embodiment, the conditioning unit is configured to control the flow of gas such that the flow of gas is substantially a laminar (top-bottom) flow.

Preferentially but not necessarily, the conditioning unit is also configured to control a gas pressure within isolation chamber 14 such that the gas pressure at least in the section housing filling apparatus 20 and, in particular the ones housing isolation chamber 35 and/or isolation chamber 36 and/or capping apparatus 22, is above the ambient pressure.

Preferentially but not necessarily, the conditioning unit is also configured to control the gas pressure within isolation chamber 14 such that the gas pressure equals the ambient pressure within the section(s) housing molding apparatus 20 and/or sterilization apparatus 24.

According to a preferred non-limiting embodiment, the conditioning unit is configured to control a flow of (sterile) gas within inner space 15, in particular for obtaining a (substantially laminar) flow of gas from upper section 37 to lower section 38, in this section of isolation chamber 14 housing filling apparatus 18, and in particular

molding apparatus 20.

According to a preferred non-limiting embodiment, the conditioning unit comprises one or more filter elements (e.g. HEPA or ULPA filters) for filtering the gas to be introduced into isolation chamber 14.

With particular reference to Figures 1 and 2, conveying device 19 is configured to at least advance the empty bottles 2 along a first portion P1 of advancement path P, in particular from molding apparatus 20 to filling apparatus 18. Preferentially but not necessarily, conveying device 19 is also configured to advance the filled bottles 2 along a second portion P2 of advancement path P, in particular from filling apparatus 18 to capping apparatus 22. In particular, the filling path is interposed between portions P1 and P2.

In particular, conveying device 19 comprises a plurality of conveyors, in particular a plurality of star wheels 50, configured to advance bottles 2 within inner space 15 and along a respective portion of advancement path P (i.e. along a respective portion of portion P1 or a respective portion of P2).

In more detail, each star wheel 50 is rotatable around a respective rotation axis F, in particular having a vertical orientation, and each being configured to advance bottles 2 along the respective portion of advancement path P and, in particular each one being at least partially arranged within

isolation chamber 14 so that bottles 2 advance within inner space 15 (i.e. within a controlled gas atmosphere).

According to an alternative embodiment not shown, the conveyors could be of the linear-conveying type (i.e. bottles 2 advance along a linear path when being advanced by a conveyor of the linear-conveying type).

According to another alternative embodiment, conveying device 19 comprises a plurality of star wheels 50 and a plurality of conveyors of the linear-conveying type.

Advantageously, each conveyor, in particular each star wheel 50, comprises a plurality of gripping assemblies 51, each one configured to retain one respective bottle 2 during advancement of the respective bottle 2 along the respective portion of advancement path P.

According to a preferred non-limiting, each star wheel 50 further comprises:

- a drive shaft 52 rotatable around the respective rotation axis F;

- an actuator configured to actuate rotation of drive shaft 52 around the respective rotation axis F; and

- a support structure 53 fixed to drive shaft 52 and carrying gripping assemblies 51.

According to a preferred non-limiting embodiment, the respective gripping assemblies 51 are arranged along and on a peripheral portion 54 of support structure 53 and, in

particular are angularly spaced apart from one another around the respective rotation axis F.

In particular, each peripheral portion 54 extends within a respective first plane H1 transversal, in particular perpendicular, to the respective rotation axis F.

According to a preferred non-limiting embodiment, each support structure 53 comprises a disc 55, in particular an annular disc, carrying the respective peripheral portion 54. In particular, the respective disc 55 extends within the respective first plane H1.

Advantageously, each gripping assembly 51 is configured to arrange the respective bottle 2 during advancement along the respective portion of advancement path P such that at least a portion, in particular the respective top portion 6, of the respective bottle 2 is arranged and/or advances within isolation channel 35 or isolation channel 36, in particular so that at least top portion 6 advances, in use, within the respective advancement space 44. In particular, when advancing, in use, along portion P1 the respective top portions 6 are arranged and/or advance within isolation channel 35, and even more particular when advancing, in use, along portion P2 the respective top portions 6 are arranged and/or advance within isolation channel 36.

In this way, it is guaranteed that the flow of gas determined by the conditioning unit "hits" the top portions

6 in the desired manner without that the, in use, varying rotating parts of filling plant 1 influence the flow of gas within isolation channel 35 in a significant manner. In particular, the laminar flow of the gas can be substantially maintained without the generation of significant turbulences.

According to a preferred non-limiting embodiment, each gripping assembly 51 further comprises:

- a gripper 56 configured to retain the respective bottle 2 during advancement along the respective portion of the advancement path P; and

- a support frame 57 carrying the respective gripper 56 and being connected and/or mounted to the respective peripheral portion 54.

In particular, each gripper 56 extends within a second plane H2 transversal, in particular perpendicular, to the respective rotation axis F.

In particular, each support frame 57 is designed such that the respective gripper 56 is arranged or is arrangeable at a position so that the respective second plane H2 is spaced apart, in particular is arranged above, from first plane H1.

In particular, each plane H2 is interposed between isolation channel 35 and plane H1 and/or plane H1 is interposed between the surface and each plane H2.

In particular, in use (i.e. during advancement of the respective bottle 2 along advancement path P), each gripper 56 is positioned such that the respective second plane H2 is spaced apart, in particular is arranged above, plane H1.

According to a preferred non-limiting embodiment, each support frame 57 transversally, in particular perpendicularly, extends from the respective peripheral portion 54.

According to an embodiment not shown, each gripping assembly 51 could comprise an adjustment unit configured to adjust and/or control the position of the respective plane H2 (i.e. the distance between plane H1 and the respective plane H2).

In use, filling plant 1 at least fills bottles 2 with the pourable product.

Operation of filling plant 1 comprises at least the first step of

- advancing empty bottles 2 within inner space 15, along advancement path P, in particular portion P1, and to filling apparatus 18; and

- filling bottles 2 by means of filling apparatus 18 with the pourable product.

Preferentially but not necessarily, operation of filling plant 1 also comprises the steps of:

- advancing preforms 10 within inner space 15, along

advancement path Q and to molding apparatus 20; and

- forming bottles 2 from preforms 10 within molding apparatus 20.

Preferentially but not necessarily, operation of filling plant 1 also comprises the steps of:

- advancing filled bottles 2 within inner space 15, along advancement path P, in particular along portion P2, and to capping apparatus 22; and

- applying closures onto bottles 2 by means of capping apparatus 22.

According to a preferred non-limiting embodiment, operation of filling plant 1 also comprises the step of conditioning inner space 15.

In more detail, during the step of advancing empty bottles 2 at least the respective top portions 6 advance within isolation channel 35, in particular within the respective advancement space 44, and in particular from molding apparatus 20 to filling apparatus 18.

In even more detail, during the step of advancing empty bottles 2, each bottle 2 is retained by one respective gripping assembly 51, in particular the respective gripper 56. During advancement of bottles 2 along advancement path P, in particular portion P1, the respective grippers 56 extend within the respective plane H2 being spaced apparat, in particular being above, plane H1.

In more detail, during the step of advancing filled bottles 2 at least top portions 6 advance within isolation channel 36, in particular the respective advancement space 44, and in particular from filling apparatus 18 to capping apparatus 20.

In even more detail, during the step of advancing filled bottles 2, each bottle 2 is retained by one respective gripping assembly 51, in particular the respective gripper 56. During advancement of bottles 2 along portion P2, the respective grippers 56 extend within the respective plane H2 being spaced apparat, in particular being above, plane H1.

According to a preferred non-limiting embodiment, during the step of conditioning, the conditioning device controls and/or determines and/or creates the flow of gas within isolation channel 35, in particular also within isolation channel 36. In particular, the flow of gas is controlled such that the flow of gas is from the respective upper portion 45 towards the respective lower portion 46.

The advantages of filling plant 1 according to the present invention will be clear from the foregoing description.

In particular, filling plant 1 comes along with a reduced risk of contaminations entering into bottles 2 during advancement of bottles 2 to filling apparatus 18 and/or from filling apparatus 18 to capping apparatus 22. This is

possible by providing for isolation channel 35 and/or isolation channel 36 and having gripping assemblies 51, which arrange bottles 2 such that top portions 6 advance within respectively isolation channel 35 and/or isolation channel 36. The presence of isolation channels 35 and/or 36 suppresses the formation of possible turbulences within the respective advancement spaces 44, which otherwise may in some rare instances lead to contaminations to enter bottles 2. Thus, filling plant 1 comes along with an overall improved sterile performance.

Clearly, changes may be made to filling plant 1 as described herein without, however, departing from the scope of protection as defined in the accompanying claims.

CLAIMS

1.- Filling plant (1) for the filling of receptacles (2) with a pourable product comprising at least:

- an isolation chamber (14) having an inner space (15);

- a conditioning device configured to provide for a defined and/or controlled gas atmosphere within the inner space (15);

- a filling apparatus (18) configured to fill the receptacles (2) with the pourable product and being at least partially arranged within the isolation chamber (14) so that, in use, the receptacles (2) are filled within the inner space (15); and

- a conveying device (19) configured to advance the receptacles (2) along an advancement path (P) to and/or away from the filling apparatus (18);

wherein the isolation chamber (14) comprises at least one isolation channel (35; 36) extending within the inner space (15) and being arranged downstream or upstream from the filling apparatus (18) along the advancement path (P);

wherein the conditioning unit is configured to control a flow of a gas within the isolation channel (35; 36);

wherein the conveying device (19) comprises at least one conveyor (50) being configured to advance the receptacles (2) along at least a portion of the advancement path (P) and through at least a portion of the isolation channel (35;

36);

wherein the conveyor (50) comprises a plurality of gripping assemblies (51), each gripping assembly (51) being configured to retain one respective receptacle (2) during advancement of the respective receptacle (2) along the portion of the advancement path (P);

wherein each gripping assembly (51) is configured to arrange the respective receptacle (2) such that at least a portion (6) of the respective receptacle (2) is arranged within the isolation channel (35; 36).

2.- Filling plant according to claim 1, wherein the conveyor is a star wheel (50);

wherein the star wheel (50) further comprises:

- a drive shaft (52) rotatable around a rotation axis (F);

- an actuator configured to actuate rotation of the drive shaft (52) around the rotation axis (F); and

- a support structure (53) fixed to the drive shaft (52) and having a peripheral portion (54);

wherein the plurality of gripping assemblies (51) is arranged along and on the peripheral portion (54) and, in particular angularly spaced apart from one another around the rotation axis (F);

wherein the peripheral portion (54) extends within a first plane (H1) transversal, in particular perpendicular,

to the rotation axis (F);

wherein each gripping assembly (51) further comprises a gripper (56) configured to retain the respective receptacle (2) and a support frame (57) carrying the respective gripper (56) and being connected to the peripheral portion (54);

wherein each support frame (57) is designed such that the respective gripper (56) is arranged or is arrangeable at a position so that the respective gripper (56) extends within a respective second plane (H2) being transversal, in particular perpendicular, to the rotation axis (F) and such that the second plane (H2) is spaced apart from the first plane (H1).

3.- Filling plant according to claim 2, wherein each second plane (H2) is interposed between the isolation channel (35; 36) and the first plane (H1).

4.- Filling plant according to claim 2 or 3, wherein the rotation axis (F) has a vertical orientation and each second plane (H2) is arranged above the first plane (H1).

5.- Filling plant according to any one of claims 2 to 4, wherein the support structure (53) comprises a disc (55), in particular an annular disc, carrying the peripheral portion (54);

wherein the disc (55) extends within the first plane (H1).

6.- Filling plant according to any one of claims 2 to

5, wherein the support frame (57) transversally, in particular perpendicularly, extends from the peripheral portion (54).

7.- Filling plant according to any one of the preceding claims, wherein the isolation channel (35; 36) comprises a first lateral wall (42) and a second lateral wall (43) spaced apart from one another and laterally delimiting an advancement space (44) for said portion (6) of the receptacles (2).

8.- Filling plant according to any one of the preceding claims, wherein each gripping assembly (51) is configured to arrange the respective receptacle (2) such that said portion (6) of the receptacle (2) is arranged within a lower portion (46) of an advancement space (44) of the isolation channel (35; 36);

wherein the conditioning device is configured to direct the gas from an upper portion (45) of the advancement space (44) to the lower portion (46).

9.- Filling plant according to any one of the preceding claims, wherein the isolation channel (35; 36) is arranged within an upper section (37) of the inner space (15).

10.- Filling plant according to any one of the preceding claims, further comprising a molding apparatus (20) configured to form and/or mold the receptacles (2) from preforms (10);

wherein the molding apparatus (20) is at least partially arranged within the isolation chamber (14) so that, in use, the receptacles (2) are formed from the preforms (10) within the inner space (15);

wherein the molding apparatus (20) is arranged upstream from the filling apparatus (18) along the first advancement path (P); and

wherein the isolation channel (35) is interposed between the filling apparatus (18) and the molding apparatus (20).

11.- Star wheel (50) for the advancement of receptacles (2) along at least a portion of an advancement path (P) and within a filling plant (1) comprising:

- a drive shaft (52) rotatable around a rotation axis (F);

- an actuator configured to actuate rotation of the drive shaft (52) around the rotation axis (F);

- a support structure (53) fixed to the drive shaft (52) and having a peripheral portion (54);

- a plurality of gripping assemblies (51) being arranged along and on the peripheral portion (54) and, in particular angularly spaced apart from one another around the rotation axis (F);

wherein the peripheral portion (54) extends within a first plane (H1) transversal, in particular perpendicular,

to the rotation axis (F);

wherein each gripping assembly (51) is configured to retain one respective receptacle (2) during its advancement along the portion of the advancement path (P);

wherein each gripping assembly (51) comprises:

- a gripper (56) configured to grip the respective receptacle (2) for retaining the respective receptacle (2) during advancement along the portion of the advancement path (P); and

- a support frame (57) carrying the gripper (56) and being connected to the peripheral portion (54);

wherein the support frame (57) is designed such that the respective gripper (56) is arranged or arrangeable at a position so that the respective gripper (56) extends within a respective second plane (H2) being transversal, in particular perpendicular, to the rotation axis (F) and such that the second plane (H2) is spaced apart from the first plane (H1).

12.- The star wheel according to claim 11, wherein the rotation axis (F) has a vertical orientation and each second plane (H2) is arranged above the first plane (H1).

13.- The star wheel according to claim 12 or 13, wherein the support structure (53) comprises a disc (55), in particular an annular disc, carrying the peripheral portion (54);

wherein the disc (55) extends within the first plane (H1).

14.- The star wheel according to any one of the preceding claims 11 to 13, wherein the support frame (57) transversally, in particular perpendicularly, extends from the peripheral portion (54).

15.- Filling plant (1) for the filling of receptacles (2) with a pourable product comprising at least one star wheel according to any one of claims 11 to 14.

FIG. 1

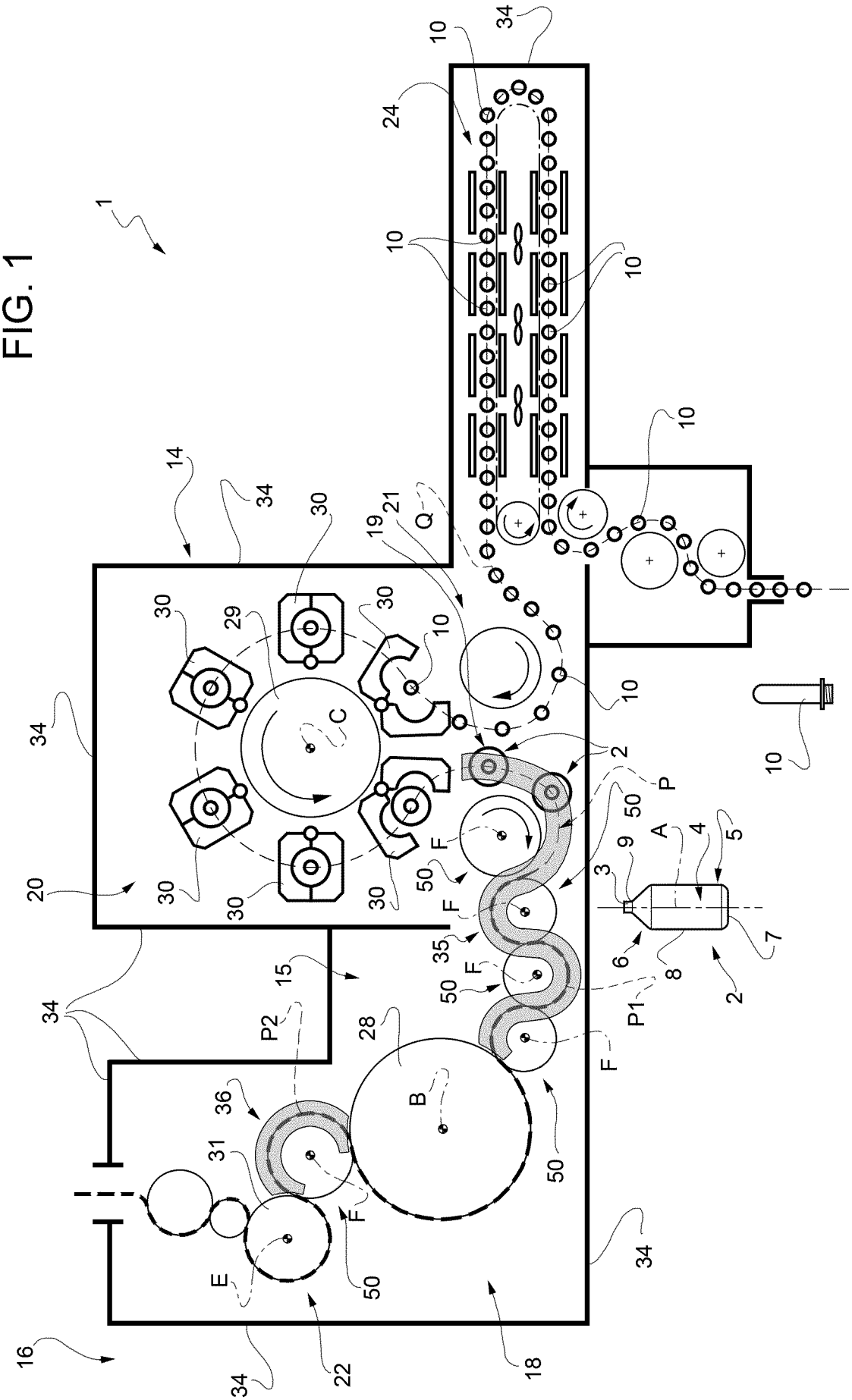
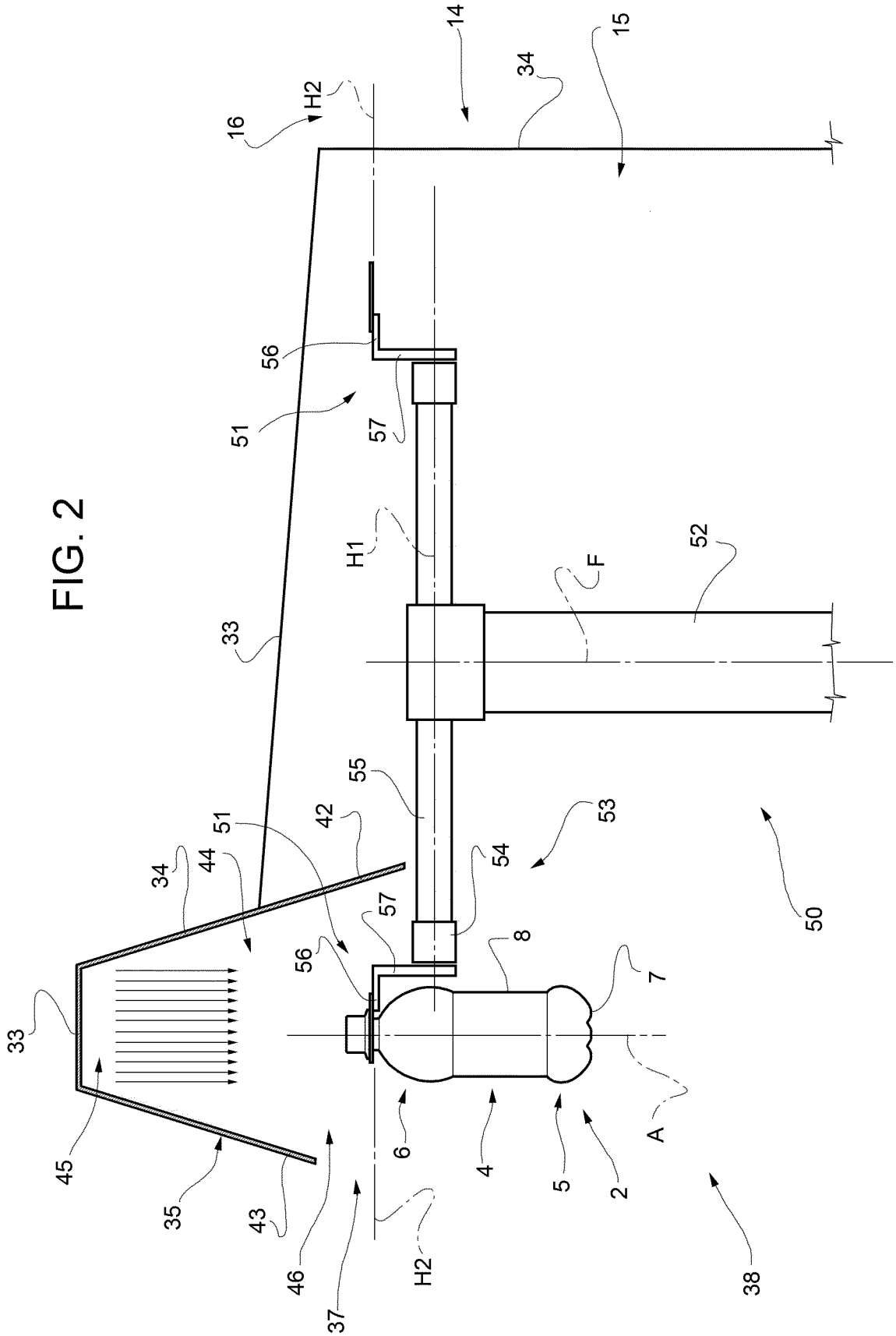

1
10
24
34
14
30
19
21
Q
29
C
2
P
50
A
4
5
9
3
F
35
6
8
7
15
P2
28
B
36
31
E
22
18
16
20
P1

FIG. 2


14
15
34
H2
16
56
57
51
H1
F
52
33
55
42
53
54
44
50
8
7
45
35
43
46
37
H2
6
4
5
2
A
38

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/050653

A. CLASSIFICATION OF SUBJECT MATTER
INV. B67C7/00 B65G47/84
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)
B67C B65G

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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/026732 A1 (KHS GMBH [DE]) 20 February 2014 (2014-02-20) abstract; figures 1-4 page 5, line 1 - page 9, line 5	1-15
X	EP 3 428 077 A1 (DAINIPPON PRINTING CO LTD [JP]) 16 January 2019 (2019-01-16) abstract; figures 1-8 paragraphs [0027] - [0075]	1-15

☐ 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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 February 2020	11/03/2020

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

Information on patent family members

International application No
PCT/EP2020/050653

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