(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 851 334 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.03.2015 Bulletin 2015/13

(51) Int Cl.:
B67C 3/04 *(2006.01)* ***F25D 25/04*** *(2006.01)*

(21) Application number: **13185244.4**

(22) Date of filing: **19.09.2013**

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

(71) Applicant: **Sidel S.p.a. Con Socio Unico**
Parma (IT)

(72) Inventor: **Le Guen, Vincent**
43100 PARMA (IT)

(74) Representative: **D'Angelo, Fabio et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

(54) Container handling apparatus and method

(57) The invention relates to a container handling apparatus (1) provided with a cooling station (7), having an inlet portion (19) for receiving a plurality of filled and closed containers (2) and an outlet portion (20) for releasing a plurality of cooled containers (2), and a deforming station (8) for deforming a base (12) of each container (2) inwardly of the container (2) so as to reduce the internal volume thereof; the deforming station (8) is arranged at the outlet portion (20) of the cooling station (7) so that the containers (2) are transferred from the cooling station (7) to the deforming station (8) without any intermediate conveyor located therebetween.

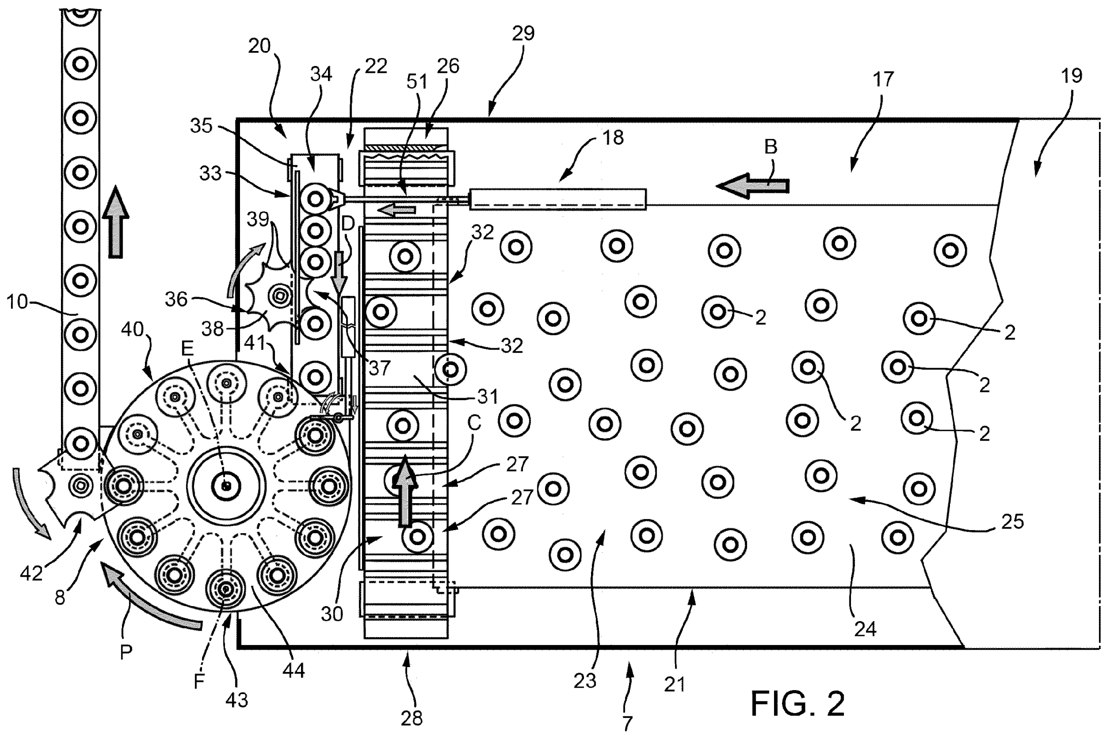

FIG. 2

Printed by Jouve, 75001 PARIS (FR)

Description

TECHNICAL FIELD

[0001] The present invention relates to a container handling apparatus and method, more specifically to an apparatus and method for cooling filled and closed containers, such as for example plastic bottles, and for transforming them into the desired configuration.

[0002] The present invention is advantageously but not exclusively applicable in the sector of plastic hot fill containers, which the following description will refer to, although this is in no way intended to limit the scope of protection as defined by the accompanying claims.

BACKGROUND ART

[0003] As known, the containers of the above-mentioned type, after having been filled with hot - for example at about 85°C - pourable products or liquids, are first subjected to a capping operation and then cooled so as to return to a room temperature. By effect of the capping operation, the heated air present in the top portion ("head space") of the container expands causing a stress tending to produce a general swelling of the container at the side wall and at the base wall.

[0004] The following cooling to which the container is subjected, causes, vice versa, a reduction of the volume of air and minimally of the liquid product contained in the container; a depression is therefore created, which tends to pull the side walls and the base wall of the container inwards. This may determine deformations in the walls of the container if these are not rigid enough to resist the action of the above disclosed stresses.

[0005] In order to contain the depressive stresses generated during the cooling of the product within the containers without generating undesired deformations of the containers, they are typically provided, at the side wall, with a series of vertical panels, known as "vacuum panels". These panels, in the presence of depressive stresses, are deformed inwardly of the container allowing it to resist to the hot fill process without generating undesired deformations in other areas of the container.

[0006] Likewise, the known containers intended to be subjected to a hot fill process can also have an optimised lower portion or base adapted to be deformed upwards under the action of the depressive stresses.

[0007] Even though the disclosed solutions allow to "relieve" the pressure stresses on specific parts of the containers, i.e. the vertical vacuum panels or the base, thus avoiding the occurrence of undesired deformations in other parts of the containers, they do not allow the cancellation of the above said stresses; in other words, the containers remain in any case subject to internal depressive stresses and must therefore be provided with a structure capable of resisting such stresses.

[0008] Patent application WO2006/068511 shows a container having a deformable base, which can have two different configurations: a first unstable configuration, in which this base has a central area projecting downwards with respect to the outermost annular area immediately adjacent thereto, and a second stable configuration, in which the central area is retracted inwardly of the container, i.e. is arranged in a higher position with respect to the adjacent annular area.

[0009] Following the filling with the hot pourable product, the base of the container has the first unstable configuration and must be supported by a special cup element to which it is coupled. Thereby, the downward deformation of the base of the container can be maximised without compromising the stable support of the container, since such a support is provided by the cup element. Following the cooling, the containers are transferred, through a plurality of conveyors, to a deforming or inverting station, in which the base can be displaced by an external action, for example a vertical thrust upwards performed by a rod or plunger, in the second stable configuration with the subsequent possibility of removing the cup element.

[0010] The displacement of the base of the container from the first to the second configuration determines a considerable reduction of the containment volume of the container, much higher than would be obtained in the known containers simply by the deformation of the base by the effect of the sole depressive stresses; the final effect is therefore substantially the cancellation of the depressive stresses acting on the inside of the container.

[0011] A new type of bottle has been recently developed, which defines a planar resting surface even in the first configuration of its base. In particular, this new type of bottle has a peripheral annular area defining the planar resting surface ensuring a stable support, and a central recessed area that, in both first and second configuration, does not project downwards beyond the peripheral annular area. This kind of bottle does not need the use of the special cup elements mentioned above, but can be transported by planar support elements or conventional conveyors.

[0012] During the transfer from the cooling station to the deforming station, containers have to be put at right sequence and timing to be fed to the deforming station; it is therefore necessary to generate at least one accumulation of the containers before them being released at requested time intervals towards the deforming station.

[0013] Due to the effect of the depressive stresses generated by the cooling operation, containers leaving the cooling station have non-well defined or random geometries, which further vary due to subsequent lowering of the temperature to the room temperature. This makes difficult their transportation to the deformation station, requiring sophisticated conveying systems; even using the bottles having a planar resting surfaces in both first and second configurations, non-symmetrical deformations of the bases thereof may produce undesired inclinations of such bottles, with consequent difficulties in conveying and accumulating them.

[0014] In particular, due to the fact that these containers have non-circumferential contact lines, a good and well-ordered accumulation pattern is prevented. These problems impact line efficiency as well as line filling.

[0015] Furthermore, in the beverage or liquid packing industry, there is a general demand for reducing complexity of the plant layout.

DISCLOSURE OF INVENTION

[0016] It is an object of the present invention to find a straightforward and cost-effective solution to solve the above described problem and to meet the above demand.

[0017] This object is achieved by a container handling apparatus as claimed in claim 1.

[0018] The present invention further relates to a container handling method as claimed in claim 10.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] A preferred embodiment is hereinafter disclosed for a better understanding of the present invention, by mere way of non-limitative example and with reference to the accompanying drawings, in which:

- Figure 1 is a schematic plan view of a container handling apparatus according to the present invention;
- Figure 2 is a larger-scale plan view of part of the apparatus of Figure 1, with parts removed for clarity;
- Figure 3 is a larger-scale, partial sectional side view of an operative unit of a deforming station of the apparatus of Figures 1 and 2, in a first condition; and
- Figure 4 is a larger-scale, partial sectional side view of the operative unit of Figure 3, in a second condition.

BEST MODE FOR CARRYING OUT THE INVENTION

[0020] With reference to Figure 1, numeral 1 indicates as a whole a handling apparatus for performing a plurality of operations on containers, in particular plastic bottles 2, so as to transform them in a final configuration, in which they are filled with a pourable product, such as a non-carbonated liquid product, closed with respective caps 3 and labelled with respective labels 4.

[0021] In particular, apparatus 1 comprises:

- a filling machine 5 (known per se and not described in detail) for filling bottles 2 with the pourable product, which is preferably a hot pourable product;
- a capping machine 6 (known per se and not described in detail), arranged downstream of filling machine 5 and adapted to close bottles 2 with respective caps 3;
- a cooling station 7, arranged downstream of capping machine 6 and adapted to cool the product contained in closed bottles 2;
- a deforming station 8 for transforming the cooled bottles 2 into the desired final configuration;
- a labelling machine 9 (known per se and not described in detail) for applying respective labels 4 on the bottles 2 arriving from the deforming station 8; and
- a plurality of conveyors 10, of the star or linear type, for transferring bottles 2 within apparatus 1.

[0022] As may be seen in detail in Figures 3 and 4, each bottle 2 has a longitudinal axis A, a base 12 and a neck 13 defining an opening (not visible) for pouring the product contained in bottle 2.

[0023] In the example shown, base 12 has an annular area 15 having axis A, radially external and defining an annular resting surface of relative bottle 2, and a central recessed area 16, surrounded by annular area 15 and arranged normally higher along axis A with respect to annular area 15 in a vertical position of bottle 2, i.e. with neck 13 placed above base 12; in other words, central area 16 is arranged at a distance from neck 13 along axis A smaller than the distance, along the same axis, between neck 13 and annular area 15.

[0024] Base 12 is deformable and can have two different configurations, shown in Figures 3 and 4. In the first configuration (Figure 3), central area 16 of base 12 is deformed and swollen downwards, i.e. it is arranged at a maximum distance from neck 13 along axis A so as to define a maximum internal volume of bottle 2; in the second configuration (Figure 4), central area 16 is instead retracted inwardly of relative bottle 2 with respect to the first configuration, i.e. central area 16 is arranged at a smaller distance along axis A from neck 13 with respect to the first configuration. It is apparent that bottles 2 have, in the second configuration of base 12, a containing volume smaller than that in the first configuration.

[0025] Bottles 2 are fed to filling machine 5 in an open condition and in a vertical position, i.e. with bases 12 arranged below respective necks 13.

[0026] After being filled with the pourable product at filling machine 5 and closed with a relative cap 3 at capping machine 6, each bottle 2 is fed in the vertical position to cooling station 7, in which its temperature is lowered to a given value close.

[0027] The cooled bottles 2 are fed to the deforming station 8 with their bases 12 in the first configurations, i.e. deformed and swollen downwards, and within the bottles 2 there are depressive stresses which tend to displace the bases 12 towards the second configuration.

[0028] In deforming station 8, base 12 of each bottle 2 is deformed into the second configuration so as to reduce its containment volume and cancel the depressive stresses acting on the inside of the bottle 2.

[0029] Bottles 2 are then released from deforming station 8 in the second configuration, which corresponds to the desired final configuration, in which application of labels 4 can be performed.

[0030] With particular reference to Figure 2, cooling station 7 basically comprises a cooling tunnel 17 and transportation means 18 for advancing bottles 2 inside the cooling tunnel 17. More specifically, cooling tunnel 17 has an inlet portion 19 for receiving a plurality of filled and closed bottles 2 from capping machine 6 and an outlet portion 20 for releasing a plurality of cooled bottles 2.

[0031] Deforming station 8 is advantageously arranged at outlet portion 20 of cooling tunnel 17 so that bottles 2 are transferred from cooling tunnel 17 to deforming station 8 without any intermediate conveyor located therebetween.

[0032] In particular, in the example shown, deforming station 8 is partially housed inside outlet portion 20 of cooling tunnel 17.

[0033] According to a possible alternative, not shown, deforming station 8 may be completely housed inside outlet portion 20 of cooling tunnel 17 or even integrated into outlet portion 20.

[0034] According to another possible alternative, not shown, deforming station 8 may be arranged externally adjacent to outlet portion 20 of cooling tunnel 17.

[0035] In all these cases, the deforming operation is started at the end of the cooling operation; it is pointed out that, in the present description and in the claims, the expression "at the end" means:

- either that the deforming operation is started immediately after the end of the cooling operation, as necessarily occurs when the deforming station 8 is externally adjacent to outlet portion 20 of cooling tunnel 17,
- or that the deforming operation is started while the cooling operation is being completed, as may occur when at least part of deforming station 8 is housed inside outlet portion 20 of cooling tunnel 17.

[0036] In the example shown in Figure 2, transportation means 18 basically comprise:

- a linear conveyor 21 receiving bottles 2 at inlet portion 19 of cooling tunnel 17 and advancing the bottles 2 towards outlet portion 20; and
- a sequencing assembly 22 receiving bottles 2 from conveyor 21 and configured to put the bottles 2 in a given sequence to be fed to deforming station 8.

[0037] In particular, conveyor 21 advances bottles 2 along a first direction B from inlet portion 19 towards outlet portion 20 of cooling tunnel 17, whilst sequencing assembly 22 moves bottles 2 orthogonally to direction B.

[0038] More specifically, conveyor 21 is of belt- or chain-type and comprises an endless transport element 23 moved continuously along a closed loop path and having a work portion 24, parallel to direction B, and a return portion (not shown). Transport element 23 is wound in a known manner around respective pulleys (known per se and not shown), at least one of which is powered.

[0039] In the example shown, work portion 24 defines a horizontal transport plane 25 for receiving bottles 2 in random positions and multiple rows and for transferring them parallel to direction B.

[0040] Sequencing assembly 22 comprises a linear conveyor 26, which defines a plurality of bottle receiving seats 27, aligned along a direction C orthogonal to direction A, and is arranged immediately downstream of conveyor 21; in this way, bottles 2 are continuously transferred from transport plane 25 to receiving seats 27 of conveyor 24.

[0041] As indicated by arrows in Figure 2, conveyor 26 advances bottles 2, arranged in receiving seats 27, along direction C from a side wall 28 of cooling tunnel 17 to an opposite side wall 29 of the same cooling tunnel 17.

[0042] Conveyor 26 is of belt- or chain-type and comprises an endless transport element 30 moved continuously along a closed loop path and having a horizontal work portion 31, coplanar with work portion 24 of conveyor 21, and a return portion (not shown). Transport element 30 is wound in a known manner around respective pulleys (known per se and not shown), at least one of which is powered.

[0043] Transport element 30 is provided with a plurality of equally spaced, protruding paddles 32, which extend parallel to direction B and define respective receiving seats 27 for bottles 2 coming from conveyor 21.

[0044] Sequencing assembly 22 comprises a further linear conveyor 33, which is arranged in a position adjacent and parallel to conveyor 26 for advancing bottles 2 coming from conveyor 26 along a direction D, opposite to direction C, from side wall 29 of cooling tunnel 17 to deforming station 8. More specifically, conveyor 33 is arranged on opposite side of conveyor 26 with respect to conveyor 21.

[0045] Analogously to conveyors 21 and 26, conveyor 33 is of belt- or chain-type and comprises an endless transport element 34 moved continuously along a closed loop path and having a horizontal work portion 35, coplanar with work portion 31 of conveyor 26, and a return portion (not shown). Transport element 34 is wound in a known manner around respective pulleys (known per se and not shown), at least one of which is powered.

[0046] Sequencing assembly 22 further comprises an actuator element 51 located adjacent to side wall 29 of cooling tunnel 17 and acting parallel to direction B for displacing each bottle 2 from conveyor 26 to conveyor 33.

[0047] Sequencing assembly 22 finally comprises a stop and release device 36 for feeding bottles 2 to deforming station 8 at given time intervals. In practice, stop and release device 36 comprises interacting means 37 periodically acting on bottles 2 advanced by conveyor 33 so as to stop them at a given point along direction D and release one of them at a time after a given time interval; in practice, stop and release device 36 generates a given spacing between each bottle 2 and the following one corresponding to the spacing at which bottles 2 are received by deforming station 8.

[0048] In the example shown, stop and release device

36 comprises a wheel 38 arranged on a side of work portion 35 of conveyor 33 and having a plurality of equally spaced interacting portions 39 periodically protruding above work portion 35 for cooperating with bottles 2 and stopping them.

[0049] With reference to Figures 2 to 4, deforming station 8 basically comprises a carousel 40 mounted to rotate about a vertical central axis E orthogonal to directions B, C and D. Carousel 40 receives a sequence of bottles 2 in the first configuration by conveyor 33, which cooperates with carousel 40 at a first transfer section 41, and releases a sequence of bottles 2 in the second configuration to an outlet conveyor 10, which cooperates with carousel 40 at a second transfer section 42.

[0050] Carousel 40 comprises a plurality of operative units 43 (only one of which shown in detail in Figures 3 and 4), which are uniformly distributed about axis E and are mounted at a peripheral portion of carousel 40.

[0051] Operative units 43 are displaced by carousel 40 along a circular processing path P which extends about axis E and through transfer sections 41 and 42.

[0052] As may be seen in Figures 2 to 4, operative units 43 are fixed to a horizontal rotating table 44 of carousel 40, have respective axes F parallel to axis E and orthogonal to path P, and extend coaxially through respective through-holes 45 of rotating table 44 and on both sides thereof.

[0053] Each operative unit 43 is adapted to receive a relative bottle 2 in a vertical position, i.e. having its axis A coaxial to relative axis F with neck 13 placed above base 12, and to retain this bottle 2 in the above said position along path P from transfer section 41 to transfer section 42.

[0054] Since operative units 43 are identical to one another, only one will be disclosed in detail hereinafter for clarity and simplicity; it is evident that the features that will hereinafter disclosed are common to all operative units 43.

[0055] In particular, operative unit 43 basically comprises, above rotating table 44, a support plate 46 fixed to the rotating table 44 and adapted to define a horizontal support for base 12 of a relative bottle 2. In greater detail, support plate 46 extends orthogonally to axis F and has, on top, a horizontal resting surface 47 for supporting base 12 of relative bottle 2. In practice, annular area 15 is the only part of bottle 2 contacting resting surface 47, being central area 16 retracted along axis A with respect to annular area 15 in both first and second configuration of base 12.

[0056] As can be seen in Figures 3 and 4, each bottle 2, when housed on relative operative unit 43, is also locked on top by a retaining member 48 cooperating with cap 3 of bottle 2.

[0057] Support plate 46 has a through opening 49 coaxial to axis F, and operative unit 43 also comprises a plunger 50, borne by rotating table 44 of carousel 40 on the opposite side of support plate 46 with respect to bottle 2, which is selectively displaceable along axis F, with respect to support plate 46, to act, through opening 49, on base 12 of relative bottle 2 and deform it from the first to the second configuration.

[0058] In particular, plunger 50 is selectively displaceable between a first resting position, in which it is spaced from base 12 of bottle 2 borne by support plate 46, and a second operative position, in which it engages opening 49 of support plate 46 and cooperates with base 12 of bottle 2 to deform it from the first to the second configuration.

[0059] Preferably, plunger 50 is axially actuated by a fluidic actuator (known per se and not shown), for example of pneumatic type, carried by rotating table 44. According to other possible variants (not shown), plunger 50 may be coupled to, or be defined, by a linear motion mobile member or may be driven by an electric motor coupled with a worm screw.

[0060] Bottles 2 exiting from carousel 40 of deformation station 8 are then transferred, by one or more conveyors 10, to labelling machine 9 for application of labels 4.

[0061] According to a possible alternative not shown, operative units 43 of carousel 40 may be incorporated in labelling machine 9, and this modified labelling and deforming machine may be advantageously arranged at outlet portion 20 of cooling tunnel 17 so that bottles 2 are transferred from cooling tunnel 17 to said modified machine without any intermediate conveyor located therebetween.

[0062] In use, bottles 2 are filled on filling machine 5 with a hot pourable product, for example a liquid food product at about 85°C. In practice, empty bottles 2 are fed to filling machine 5 by an inlet conveyor 10, in the case shown a star conveyor, and after being filled, exit filling machine 5 through an outlet conveyor 10, also of the star type. From here bottles 2 reach capping machine 6, where they are closed with respective caps 3.

[0063] By the effect of the capping operation, heated air present in the top portion of each bottle 2, between the product and relative cap 3, expands causing a stress that tends to produce a general swelling of bottle 2.

[0064] At this point, bottles 2 are fed to cooling station 7 where the product contained therein is taken to the desired temperature. During this step, depressive stresses are generated within bottles 2 and tend to shrink them.

[0065] In particular, bottles 2 are advanced and sequenced inside cooling tunnel 17 by conveyors 21, 26 and 33 and are fed at appropriate time intervals to deformation station 8 by stop and release device 36.

[0066] Bottles 2 are directly transferred to carousel 40 of deformation station 8 by conveyor 33 within outlet portion 20 of cooling tunnel 17. In particular, bottles 2 reach in a sequence the different operative units 43 of carousel 40 of deformation station 8.

[0067] Each bottle 2 is transferred to deforming station 8 with its base 12 in the first configuration. It may be noted, also in the above said first deformed configuration, that central area 16 of base 12 does not project downwards beyond adjacent annular area 15; thereby, annular area 15 always ensures a stable support for relative bottle 2.

[0068] Each bottle 2 is arranged resting on support plate 46 of a relative operating unit 43. Bottles 2 are fed to deforming station 8 in a vertical position, with axes A thereof parallel to central axis E and coaxial to axes F of respective operating units 43.

[0069] During the movement of bottles 2 from transfer section 41 to transfer section 42, respective plungers 50 are activated to bring relative bases 12 from the first to the second configuration and thus cancel the depressive stresses acting within bottles 2.

[0070] After this operation, bottles 2 have well-defined geometries and therefore can be easily transferred to labelling machine 9 and to subsequent operating machines by using standard conveyors.

[0071] As it appears from the above description, the integration or location of the deforming station 8 into outlet portion 20 of cooling tunnel 17 permits to simplify transportation of bottles 2 from cooling station 7 to subsequent stations or machines, such as deforming station 8 and labelling machine 9.

[0072] In addition, the new arrangement allows to limit the need for bottles 2 to be accumulated and to reduce the number and extension of conveyors 10 used in the apparatus 1.

[0073] Plus, by limiting the extension of the zones of the apparatus 1 in which it is necessary to convey bottles 2 having random/non symmetrical shapes, an improvement in line efficiency and line filling can be achieved with respect to known solutions.

[0074] Furthermore, the new solution permits to reduce footprint and complexity of the apparatus 1 with respect to known apparatus.

[0075] Finally, it is clear that modifications and variants to apparatus 1 and the method disclosed and shown herein can be made without departing from the scope of protection of the claims.

Claims

1. A container handling apparatus (1) comprising:

- a cooling station (7) having an inlet portion (19) for receiving a plurality of filled and closed containers (2) and an outlet portion (20) for releasing a plurality of cooled containers (2); and
- a deforming station (8) for deforming a base (12) of each container (2) inwardly of the container (2) so as to reduce the internal volume thereof;

characterized in that said deforming station (8) is arranged at the outlet portion (20) of said cooling station (7) so that the containers (2) are transferred from said cooling station (7) to said deforming station (8) without any intermediate conveyor located therebetween.

2. The apparatus as claimed in claim 1, wherein said deforming station (8) is at least partially housed inside said outlet portion (20) of said cooling station (7).

3. The apparatus as claimed in claim 1 or 2, wherein said cooling station (7) comprises a cooling tunnel (17) and transportation means (18) for advancing said containers (2) inside said cooling tunnel (17).

4. The apparatus as claimed in claim 3, wherein said transportation means (18) comprise:

- first conveying means (21) receiving said containers (2) at said inlet portion (19) and advancing the containers (2) towards said outlet portion (20); and
- second conveying means (26, 33) receiving said containers (2) from said first conveying means (21) and configured to put said containers (2) in a given sequence to be fed to said deforming station (8).

5. The apparatus as claimed in claim 4, wherein said first conveying means (21) define a first advancing direction (B) of said containers (2), and wherein said second conveying means (26, 33) define at least one second advancing direction (C, D) of said containers (2), transversal to said first advancing direction (B).

6. The apparatus as claimed in claim 5, wherein said first conveying means comprise a first linear conveyor (21) defining a transport plane (25) for transferring randomly said containers (2) parallel to said first advancing direction (B), wherein said second conveying means comprise a second linear conveyor (26) defining a plurality of container receiving seats (27) aligned along said second advancing direction (C).

7. The apparatus as claimed in claim 6, wherein said second conveying means comprise a third linear conveyor (33) adjacent and parallel to said second conveyor (26), receiving said containers (2) from said second conveyor (26) and feeding them to said deforming station (8) along a third advancing direction (D) opposite said second advancing direction (C); said apparatus (1) further comprising a stop and release device (36) for generating a given spacing between each container (2) and the following one corresponding to the spacing at which containers (2) are to be received by said deforming station (8).

8. The apparatus as claimed in any one of the foregoing claims, wherein said deforming station (8) comprises a carousel (40) provided with a plurality of receiving units (43) for respective containers (2).

9. The apparatus as claimed in claim 8, wherein each receiving unit (43) comprises one plunger (50) movable transversally to the base (12) of the container (2) to deform.

10. A method for handling filled and closed containers (2), said method comprising the steps of:

- cooling said containers (2) at a cooling station (7); and
- deforming a base (12) of each container (2) inwardly of the container (2) at a deforming station (8) so as to reduce the internal volume of each container (2);

characterized in that said step of deforming is started at the end of said step of cooling, and **in that** said containers (2) are transferred from said cooling station (7) to said deforming station (8) without any intermediate conveyor located therebetween.

11. The method as claimed in claim 10, wherein said step of deforming is started during the last part of said step of cooling.

12. The method as claimed in claim 10, wherein said step of cooling is started immediately after said step of cooling.

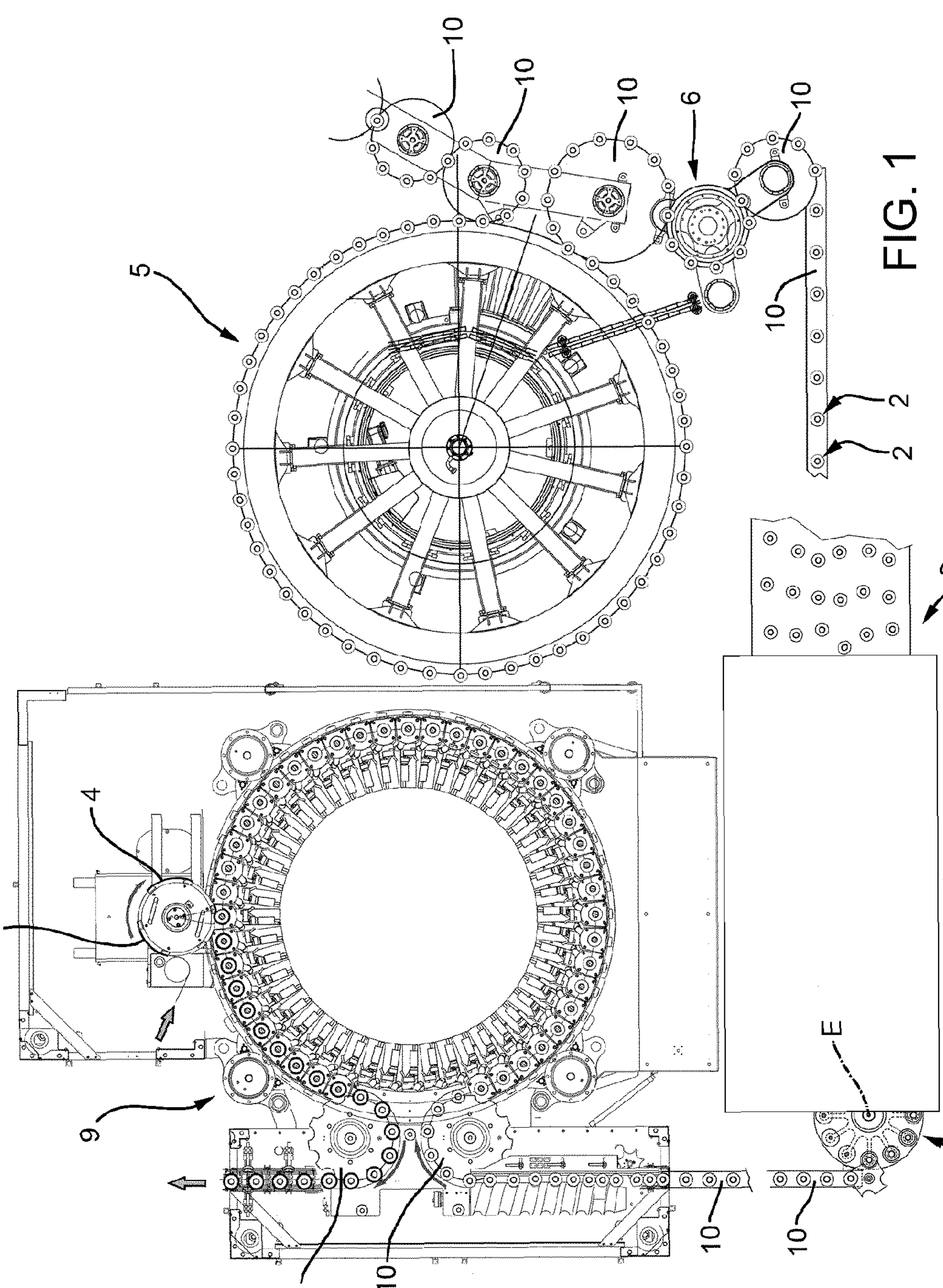

FIG. 1

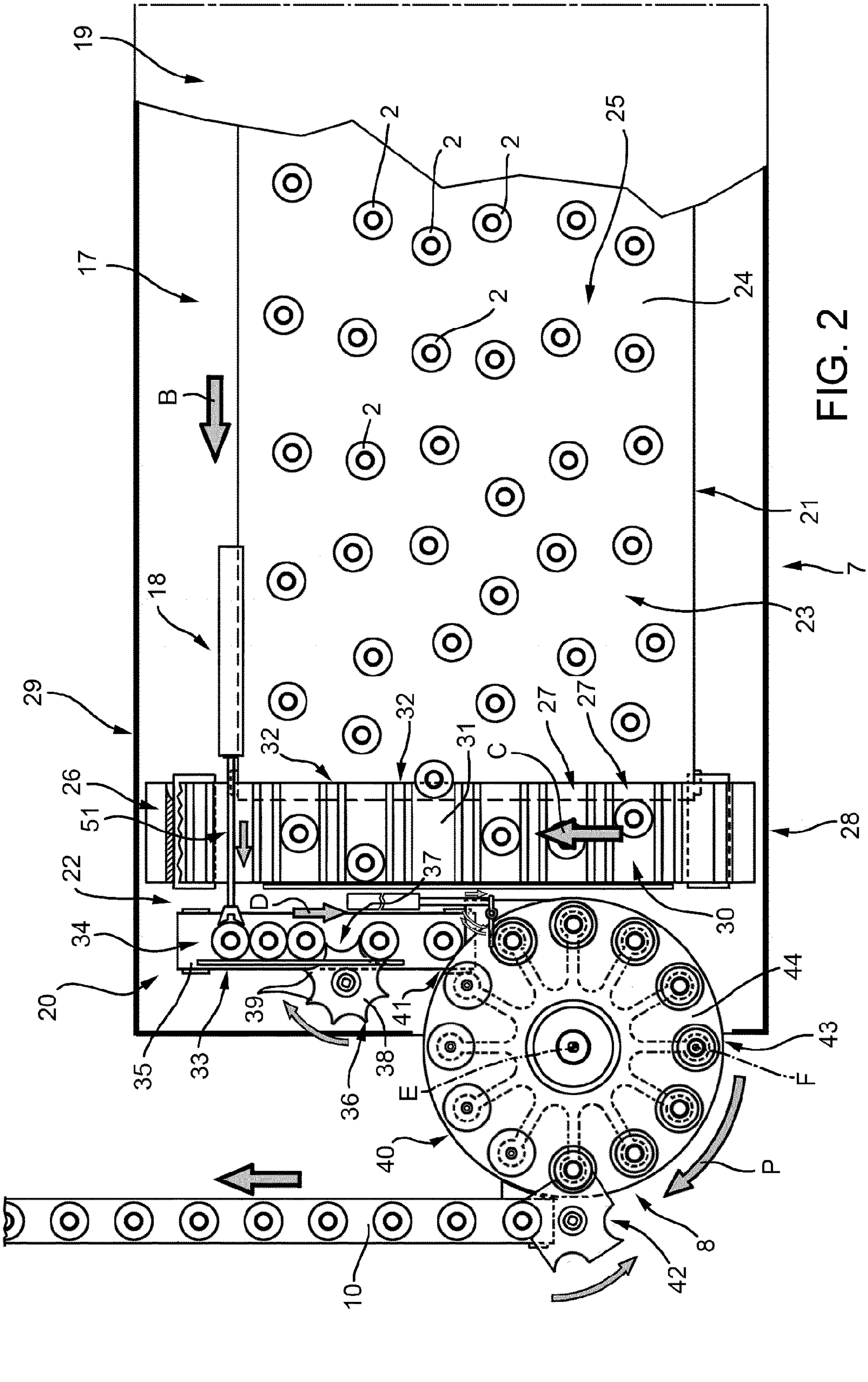

FIG. 2

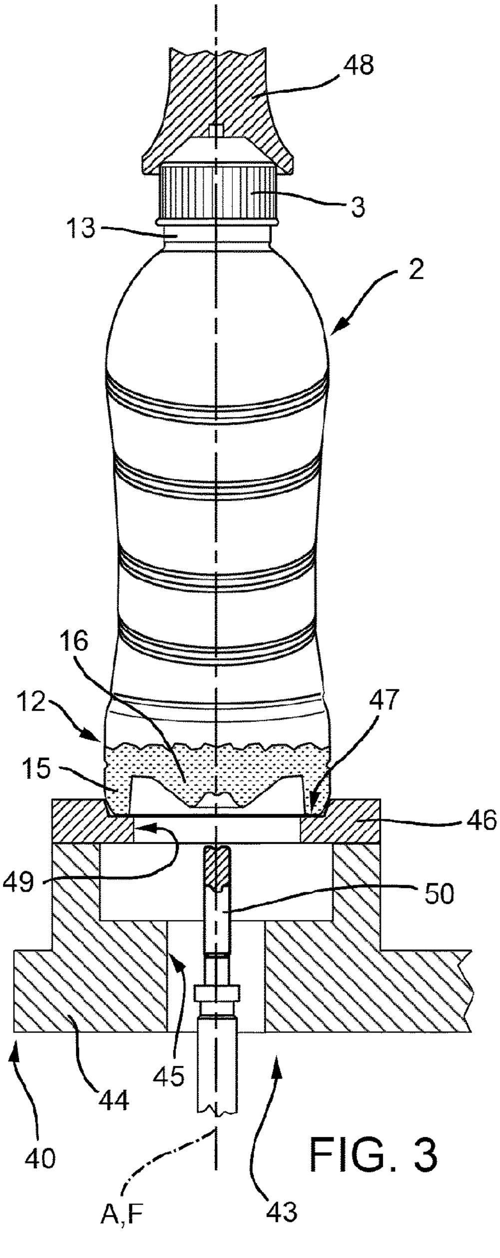
48
3
13
2
16
12
47
15
46
49
50
44
45
40
A,F
43

FIG. 3

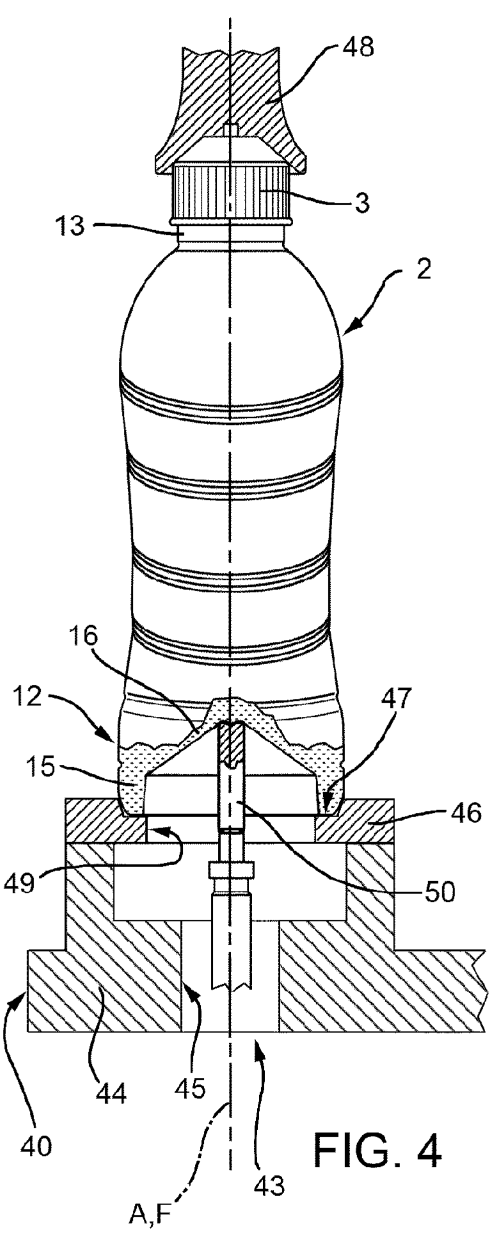
48
3
13
2
16
12
47
15
46
49
50
40
44
45
A,F
43

FIG. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 13 18 5244

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	WO 2005/012091 A2 (GRAHAM PACKAGING CO [US]; KELLEY PAUL [US]; GOSS KENT [US]; SHEETS PHI) 10 February 2005 (2005-02-10) * page 13, line 27 - page 15, line 22 * * page 16, line 18 - page 17, line 29; figures 4, 5, 12, 13 * -----	1-5,8-12 6,7	INV. B67C3/04 F25D25/04
Y A	EP 1 338 855 A2 (VOLPAK SA [ES]) 27 August 2003 (2003-08-27) * paragraphs [0013], [0014], [0019], [0020]; figures 1, 6-9 * -----	6,7 3,4	
X	FR 2 896 232 A1 (LOHR IND [FR]) 20 July 2007 (2007-07-20) * page 7, line 25 - page 9, line 1 * * page 11, line 5 - line 20 * * figures 1, 8 * -----	1,2,8-12	
A	US 2009/293436 A1 (MIYAZAKI SHUNZO [JP] ET AL) 3 December 2009 (2009-12-03) * paragraph [0071]; figures 3, 10 * -----	1,8-10	TECHNICAL FIELDS SEARCHED (IPC)
A	US 3 056 530 A (KRIER HERBERT E) 2 October 1962 (1962-10-02) * column 1, line 43 - line 56; figure 6 * -----	3-7	F25D B67C

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	20 February 2014	Luepke, Erik

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
&: member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 18 5244

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-02-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2005012091 A2	10-02-2005	AT 390383 T	15-04-2008
		AU 2004261654 A1	10-02-2005
		AU 2010246525 A1	23-12-2010
		CA 2534266 A1	10-02-2005
		CA 2707701 A1	10-02-2005
		CA 2707749 A1	10-02-2005
		DE 602004012753 T2	09-04-2009
		EP 1651554 A2	03-05-2006
		JP 4576382 B2	04-11-2010
		JP 5269742 B2	21-08-2013
		JP 2007500658 A	18-01-2007
		JP 2010047323 A	04-03-2010
		NZ 545528 A	28-11-2008
		NZ 569422 A	26-02-2010
		NZ 579937 A	28-01-2011
		US 2007051073 A1	08-03-2007
		US 2009120530 A1	14-05-2009
		US 2009126323 A1	21-05-2009
		US 2012152964 A1	21-06-2012
		WO 2005012091 A2	10-02-2005
EP 1338855 A2	27-08-2003	EP 1338855 A2	27-08-2003
		ES 2228204 A1	01-04-2005
		US 2003155032 A1	21-08-2003
FR 2896232 A1	20-07-2007	FR 2896232 A1	20-07-2007
		WO 2007080327 A2	19-07-2007
US 2009293436 A1	03-12-2009	BR PI0713972 A2	18-12-2012
		US 2009293436 A1	03-12-2009
		WO 2008004458 A1	10-01-2008
US 3056530 A	02-10-1962	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2006068511 A **[0008]**