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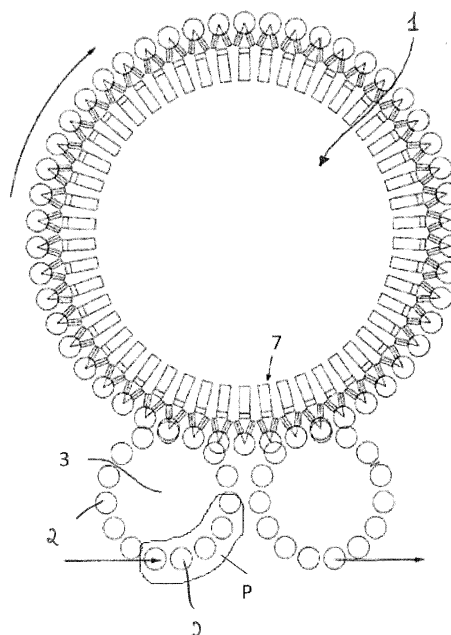
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(54) **PROCESS AND APPARATUS FOR CLOSING AND PRINTING/LABELLING A CONTAINER**

(57) Apparatus for closing and printing/labelling (1) containers (2) comprises an application unit (3) of closures (10) configured for applying, in particular resting and pressing, a concave closure (10) on the mouth (2a) of each container (2) and a plurality of locking devices (4) of the closures (10), each device being configured so

as to screw a concave closure (10) on the neck (2b) of the corresponding container (2). The apparatus for closing and printing/labelling (1) further comprises a plurality of printing/labelling stations (7) in which the closures (10) are also screwed by means of corresponding locking devices (4) of the closures.

FIG. 1



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Description

[0001] The present invention relates to a process and an apparatus for closing and printing/labelling containers.

[0002] The most relevant reference sector is the bottling of products, in particular food.

[0003] The term "labelling" is understood to mean the application of a label, preferably using an adhesive. The term "printing" is understood to mean printing, preferably ink-jet printing, carried out directly on the walls of the container.

[0004] Known bottling lines include specific and distinct apparatus respectively predisposed for closure of the container and for printing/labelling the container.

[0005] An example of a printing process and apparatus of containers is described in WO2012/022746, which discloses a carousel provided with a plurality of printing stations suitable for receiving the already-closed container. Internally of each printing station, the container is mobile vertically in order to be positioned at printing heads or preparation or finishing devices of the printing.

[0006] A solution described in document EP52045 is known providing, at the carousel, both the labelling devices and the closure devices. These devices however remain distinct both structurally and functionally and operate sequentially on the recipients.

[0007] As a consequence, both the known bottling lines and the solution described in EP52045 have large volumes and redundant structures or steps.

[0008] Further, in the known solutions, the use of the capper also for containers made of HDPE creates significant structural complications.

[0009] In particular, an object of the present invention is to provide an apparatus for closing and printing/labelling containers which requires smaller resources and lower additional costs than the known solutions, in particular having a smaller volume and a simplified structure with respect to the known solutions.

[0010] A further object of the present invention is to provide a method for closing and printing/labelling containers in which the working times are reduced and in which the labelling/closing operations are overall simplified.

[0011] A further object of the present invention is to provide an apparatus and a process for closing and printing/labelling containers which enables a broad versatility of use, in particular being applicable for both PET and HDPE. According to a first aspect, the specified technical task and the set objects are substantially attained by an apparatus for closing and printing/labelling containers, comprising:

- an application unit of concave closures configured for applying, preferably resting and pressing, a concave closure on a mouth of each container;
- a plurality of locking devices of the concave closures, each locking device being configured so as to screw

a concave closure on the neck of the corresponding container;

- a plurality of printing/labelling stations, each printing/labelling station being configured for applying a label to the body of the container or for printing the body of the container, in which each printing/labelling station comprises a locking device of the concave closures.

[0012] Each printing/labelling station preferably comprises a rest plate and a hood configured as anti-rotation devices.

[0013] Each locking device preferably comprises means for blocking the container between the rest plate and the hood and a device for applying a torque to the rest plate of the container.

[0014] The rest plate is preferably configured so as to shift towards or away from at least a printing/labelling position.

[0015] The rest plate is preferably configured so as to shift substantially along the longitudinal axis of the container.

[0016] The application unit is preferably external to the printing/labelling stations.

[0017] Alternatively an application unit is provided internally of each printing/labelling station.

[0018] According to a second aspect, the stated technical task and specified objects are substantially attained by a process for closing and printing/labelling a container comprising:

- applying a concave closure onto the mouth of the container;
- screwing the concave closure on the neck of the container;
- applying a label to the body of the container or printing the body of the container arranged in a corresponding printing/labelling station.

[0019] At least the step of screwing the concave closure on the neck of the container is carried out while the container is subjected to application of the label or to printing. The step of screwing the concave closure on the neck of the container is carried out internally of the same printing/labelling station.

[0020] The step of applying a concave closure onto the mouth of the container preferably comprises steps of:

- resting a concave closure on the mouth of the container;
- pressing the concave closure onto the mouth of the container.

[0021] The step of applying a concave closure onto the mouth of the container is preferably carried out externally of the corresponding printing/labelling station. Alternatively, the step of applying a concave closure onto the mouth of the container is carried out internally of the cor-

responding printing/labelling station.

[0022] The container is preferably predisposed in the corresponding printing/labelling station, aligning the container between a rest plate and a hood.

[0023] In particular, when the step of applying a concave closure onto the mouth of the container is carried out externally of the corresponding printing/labelling station, the container is predisposed in the printing/labelling station already with the closure resting on the mouth thereof.

[0024] The rest plate and the hood are preferably to be blocked on the container provided with a closure resting on the mouth thereof. The rest plate and hood are configured as anti-rotation devices.

[0025] The step of screwing the concave closure on the neck of the corresponding container is carried out by applying a torque to the rest plate when the container is blocked between the rest plate and the hood. The torque is preferably at least 1.5 Nm.

[0026] Alternatively, the step of screwing the concave closure on the neck of the corresponding container is carried out by applying a torque to the hood when the container is blocked between the rest plate and the hood.

[0027] The step of applying a label to the body of the container or printing the body of the container is preferably carried out while the container is aligned and not blocked between the rest plate and the hood.

[0028] The step of shifting the container arranged in the corresponding printing/labelling station is preferably included for bringing the container into or distancing it from at least a printing/labelling position. The step of screwing the concave closure on the neck of the corresponding container is carried out while the container shifts forward to and/or away from said at least a printing/labelling position.

[0029] The container is preferably shifted substantially along the longitudinal axis of the container.

[0030] The step of screwing the concave closure on the neck of the corresponding container preferably comprises a sub-step of preliminary screwing and a sub-step of completion. The step of applying a label to the body of the container or printing the body of the container is preferably carried out between the sub-step of preliminary screwing and the sub-step of completion.

[0031] The sub-step of preliminary screwing is preferably carried out by controlling the number of revolutions, and the sub-step of completion is carried out by controlling the torque applied.

[0032] Further characteristics and advantages of the present invention will more fully emerge from the indicative, and thus non-limiting description of a preferred but not exclusive embodiment of a process and an apparatus for closing and printing/labelling containers.

[0033] This description will be explained below with reference to the attached drawings, provided solely for indicative and therefore non-limiting purposes, in which:

- figure 1 illustrates an apparatus for closing and print-

ing/labelling containers, according to the present invention, in a schematic plan view;

- figure 2 illustrates a step of application of a concave closure by resting and pressing on a container in the apparatus of figure 1;
- figures 3A-3F illustrate a possible sequence of steps of closing and printing/labelling containers in the apparatus of figure 1;
- figure 4 illustrates a concave closure to be applied to a container.

[0034] With reference to the figures, number 1 indicates an apparatus for closing and printing/labelling containers 2, in the following indicated as apparatus 1.

[0035] In particular the containers 2 are made of a thermoplastic material, preferably PET or HDPE.

[0036] In this context, by concave closure 10 is meant a capsule or a cap comprising a base 10a and a lateral surface 10b which extends from the base 10a and defines therewith a cavity (see figure 4). On the opposite side of the base 10a, the closure 10 has an opening destined to accommodate the mouth 2a of a container 2.

[0037] The apparatus 1 is preferably of the rotating carousel type, as illustrated in figure 1. Alternatively, the closing apparatus 1 is of a linear type.

[0038] The apparatus 1 comprises an application unit 3 of closures configured for applying, in particular resting and pressing, a concave closure 10 on the mouth 2a of each container 2 and a plurality of locking devices 4.

[0039] In the application unit 3 each closure 10 is preferably rested on the mouth 2a of the corresponding container 2 and is then pressed on such mouth 2a.

[0040] In a possible embodiment, the closure 10 can be dropped from above onto the mouth 2a of the container 2 by means of guides. In the bottling sector, this is referred-to as "a la volée" gripping. The pressing of the closure 10 on the mouth 2a is done by means of an inclined plane P encountered by the container 2 during movement thereof. The "a la volée" gripping concept is already known and will therefore not be further detailed herein. For example, the inclined plane P is the lower plane of a circular sector located above the mouths 2a of the containers 2, as illustrated in figure 1. According to a possible embodiment, the application unit 3 of the closures 10 can comprise an isolator 5 (figure 2) adapted to define a controlled-contamination environment 6 containing at least the neck 2b of the containers 2. The controlled-contamination environment 6 preferably has a volume that extends into a restricted zone about the neck 2b of the containers 2.

[0041] In particular, the controlled-contamination environment 6 extends up to containing at least the bague 2c of the containers 2 while the body 2d of the containers is external to the environment 6, as illustrated in figure 2a. In an embodiment, the controlled-contamination environment 6 extends up to containing also a zone just below the bague 2c, so that the majority of the body 2d of the containers 2 is external to such environment 6. In

this context, the technical term "bague" relates to a circumferential protuberance of the neck 2b of the container 2, located below the threaded zone of the neck 2b.

[0042] The application of the concave closure 10 in the above-described way, in combination with the spacing of the containers provided by a transfer star, enables a temporary physical separation between the outside environment and the product, thus ensuring the microbiological integrity of the product even in the presence of an incomplete locking between the closure 10 and the movement of the container 2 out of a sterile environment.

[0043] In order to ensure the vacuum sealing and tamper-proof status of the packaging obtained thus, the locking of the closure 10, at the predetermined torque values provided by the supplier, takes place in the following step of labelling through the apparatus 1, as will be described in the following.

[0044] The application of a controlled contamination environment of smaller dimensions with respect to known solutions enables simplification of the microbiological isolator, reducing the sterile volumes, reducing the COP-SOP times, reducing capex and, in the scope of the present invention, facilitating the possibility of using a capper external to the sterile zone or integrating the closure function directly during labelling, as will be described in the following.

[0045] In particular, the application of the closures 10 on the mouth 2a of the containers 2 in such controlled-contamination environment 6 enables preserving the internal sterility, so that the containers 2 can be blocked by screwing the closures 10 externally of such zone (i.e. in a non-sterile zone), in the example in a traditional capper (not aseptic). This leads to a reduction in sterile volumes and, consequently, sterilisation times, as well as a reduction in the number of critical components (capping heads, roto-translating elements, heat barriers or chemical barriers, bellows, etc.) and a general reduction in costs.

[0046] The containers 2 are transferred from the application unit 3 to the plurality of locking devices 4 as described in the foregoing.

[0047] Each locking device 4 is configured so as to screw the concave closure 10 on the neck 2b of the corresponding container 2.

[0048] In particular the apparatus 1 comprises a plurality of printing/labelling stations 7, each of which is configured to apply a label to the body 2d of the container 2 or to print the body 2d of the container 2. Each printing/labelling station 7 originally comprises a locking device 4 of the closures.

[0049] Each printing/labelling station 7 preferably comprises a rest plate 8 and a hood 9 configured as anti-rotation devices.

[0050] In particular, the rest plate 8 is configured for coupling with the bottom 2e of the container 2 so that the container 2 is drawn in rotation about a longitudinal axis L of extension thereof, following a rotation imparted on the plate 8. For example the rest plate 8 comprises radial

ribbings or recesses counter-shaped with respect to the bottom 2e of the container 2. Alternatively, the plate 8 comprises gripping devices of the walls of the container 2 configured for making the plate 8 and the container 2 solidly constrained in rotation.

[0051] Further, the hood 9 has an internal surface that is complementarily shaped with respect to the external surface of the closure 10, for example knurled. Each locking device 4 comprises means for axially blocking the container 2 between the rest plate 8 and the hood 9. For example the rest plate 8 and/or the hood 9 are mounted with respect to the support structure of the corresponding printing/labelling station 7 so as to be able to shift relatively, forward to and/or away from the container 2. The hood 9 is alternatively gripper-configured for locking on the closure 10.

[0052] Each locking device 4 preferably further comprises an application device of a torque to the rest plate 8 of the container 2, for example an actuator device, not illustrated.

[0053] Alternatively, each locking device 4 comprises an application device of a torque to the hood 9.

[0054] The rest plate 8, and with it the hood 9, is preferably configured so as to shift, preferably parallel to the longitudinal axis L of the container 2, forward to or away from at least a printing/labelling position denoted by A)-E) in figure 3F.

[0055] The locking device 4 is therefore configured for screwing the closure 10 on the neck 2b of the corresponding container 2 in such a way as to seal it and make the seal definitive. For this purpose, the lateral surface 10b of the closure 10 is internally threaded so as to be screwed on the external thread of the neck 2b of the container 2.

[0056] A movement system of the containers 2 is preferably included between the application unit 3 and the printing/labelling stations 7, to prevent reciprocal contact between the containers. For example, this movement system comprises at least a transfer star bearing a plurality of pliers operatively active on the neck 2b of the containers 2.

[0057] The movement without reciprocal contact has the aim of ensuring the microbiological integrity of the product, in particular preventing the crushing of the containers 2 which might cause the raising of the closures 10.

[0058] Alternatively to the illustrated apparatus, in which the application unit 3 of closures is external to the printing/labelling stations 7, the apparatus can comprise an application unit 3 for each printing/labelling station 7, arranged internally of the printing/labelling station 7.

[0059] The process for closing and printing/labelling containers 2 according to the invention is described in the following.

[0060] The concave closure 10 is applied on the mouth 2a of the corresponding container 2. In particular, in a first step, illustrated in figure 2, the concave closure 10 is rested on the mouth 2a of the corresponding container 2 for example gripped "a la volée". The first step can take

place in the controlled-contamination environment 6. In a second step, again illustrated in figure 2, the concave closure 10 is pressed on the mouth 2a of the corresponding container 2. For example, this pressure is exerted by the inclined plane P. This second step can also take place in the controlled-contamination environment 6.

[0061] The concave closure 10 is then screwed on the neck 2b of the corresponding container 2 so as to seal it.

[0062] In a subsequent step a label is applied to the body 2d of each container 2 or printing the body 2d of the container 2 arranged in a corresponding printing/labelling station 7. During the step of applying the label or printing the body 2d of the container 2 at least the step of screwing the concave closure 10 on the neck 2b of the same container 2 is originally carried out. The step of screwing the concave closure 10 on the neck 2b is carried out in the corresponding printing/labelling station 7 of the container 2.

[0063] The step of applying a concave closure 10 on the mouth 2a of each container 2 is preferably carried out externally of the corresponding printing/labelling station 7. In this case each container 2 is predisposed in the corresponding printing/labelling station 7, with the concave closure thereof 10 already applied on the mouth 2a thereof.

[0064] Alternatively, the step of applying a concave closure 10 on the mouth 2a of each container 2 is also carried out internally of the corresponding printing/labelling station 7, i.e. while the container 2 is arranged in the corresponding printing/labelling station 7.

[0065] According to a possible embodiment, the step of predisposing each container 2 in a corresponding printing/labelling station 7 is attained by aligning the container 2 between the rest plate 8 and the hood 9 of the corresponding printing/labelling station 7. Further, the rest plate 8 and the hood 9 are locked on the container 2 provided with a closure 10.

[0066] The hood 9 is preferably lowered on the container 2 up to coupling with the closure 10 so as to axially block the container 2 between the rest plate 8 and the hood 9. Alternatively, the hood 9 shaped as gripper is locked on the closure 10.

[0067] The step of screwing each concave closure 10 on the neck 2b of the corresponding container (2) is preferably carried out by applying a torque to the rest plate 8 while the container 2 is blocked between the rest plate 8 and the hood 9. The torque is preferably at least 1.5 Nm. Owing to the shape of the plate 8, the rotation of the plate 8 draws the container 2 in rotation with respect to the closure 10, constrained by the hood 9. Alternatively, torque is applied to the hood 9 when the container 2 is blocked between the rest plate 8 and the hood 9.

[0068] With reference to figures 3A-3F, the container 2 is shifted preferably along the longitudinal axis L thereof, so as to bring it into or distance it from at least a printing/labelling position A-E. In this case, the step of screwing each concave closure 10 can be carried out while the container 2 is translating forward to or away from at least

a printing/labelling position. The step of screwing each concave closure 10 on the neck 2b of the corresponding container 2 preferably comprises:

- 5 - a sub-step of preliminary screwing, preferably carried out by controlling the number of revolutions (figure 3B),
- a sub-step of completion, preferably carried out by controlling the torque applied (figure 3F).

[0069] In particular, the step of applying a label to the body 2d of each container 2 or printing the body 2d of each container 2 is carried out between the sub-step of preliminary screwing and the sub-step of completion. The step of applying a label to the body 2d of each container 2 or printing the body 2d of each container 2 is preferably carried out while the container 2 is aligned and not blocked between the rest plate 8 and the hood 9.

[0070] With reference to figures 3A-3F and a printing process, the sequence of steps is the following.

[0071] Each container 2 provided with a closure 10 applied on the mouth 2a thereof is predisposed in a corresponding printing/labelling station 7, aligned between the rest plate 8 and the hood 9 (figure 3A). Alternatively, the closure 10 is applied in the corresponding printing/labelling station 7. The hood 9 is lowered or locked so as to axially block the container 2 between the rest plate 8 and the hood 9.

[0072] The plate 8 is shifted with the container 2 so as to bring it into the configuration shown in figure 3B, corresponding to a preliminary step of the printing suitable for modifying the surface tension of the walls of the container 2 and making them suitable for printing, for example a plasma or UV treatment.

[0073] The preliminary screwing is carried out during the step of transfer towards such position and/or during the preliminary step of the printing, while controlling the number of revolutions completed by the plate 8 with respect to the hood 9.

[0074] Subsequently the container 2 is shifted in the configurations illustrated in figures 3C-3D-3E for printing in which the container 2 is aligned and not blocked between the rest plate 8 and the hood 9. In other words, the hood 9 is slightly raised or opened (in the case of cone pliers) with respect to the closure 10 for preventing vibrations which would negatively influence the printing. In other words, during the step of printing, the step of screwing each concave closure 10 on the mouth 2b of the corresponding container 2 is interrupted. In this way, as well as avoiding damaging vibrations, the need to compensate for the height variations of the container-cap group (co-penetrating elements) by obliging the linear motor of the hood 9 to perform a shifting is eliminated. Lastly the container 2 is shifted in the configuration of figure 3F in which the polymerisation of the ink takes place. In the passage between the configuration of figure 3E and the configuration of figure 3F and/or during the polymerisation, the hood 9 is newly lowered or locked on

the closure 10 so as to block the container 2 and carry out the sub-step of completion of the screwing, controlling the torque applied to the plate 8.

[0075] In all the steps in which the plate 8 is set in rotation in order to screw the closure 10, the hood 9 is kept still and with it the closure 10, while the plate 8 draws the container 2 in rotation with it.

[0076] The characteristics of the process and closing apparatus of containers according to the present invention emerge clearly from the above description, as do the advantages.

[0077] The printing/labelling step and in particular the preliminary or final steps of the printing/labelling are used for completing the screwing of the closures so as to reduce the number of components of the line and the passage times in the line. The solution is particularly suitable in the case of sterile containers in which the step of application of the closure is carried out in an aseptic environment.

[0078] In this way the capper as it is known today, constituting a separate machine, can be eliminated, and the capping function can be integrated without extra resources and additional costs into the labelling machine, with great flexibility. In particular, the same solution can be used for containers made of PET and HDPE.

Claims

1. Closing and printing/labelling process of a container (2), comprising the steps of:

applying a concave closure (10) on the mouth (2a) of said container (2);
 screwing the concave closure (10) on the neck (2b) of said container (2);
 applying a label to the body (2d) of the container (2) or printing the body (2d) of the container (2) arranged in a corresponding printing/labelling station (7),
characterised in that during the step of applying the label or printing the body (2d) of the container (2) at least the step of screwing the concave closure (10) on the neck (2b) of the same container (2) is carried out, said step of screwing the concave closure (10) on the neck (2b) being carried out in the corresponding printing/labelling station (7) of said container (2).

2. Closing and printing/labelling process of a container (2) according to claim 1, wherein the step of applying a concave closure (10) on the mouth (2a) of the container (2) comprises:

resting the concave closure (10) on the mouth (2a) of said container (2);
 pressing the concave closure (10) on the mouth (2a) of the said container (2).

3. Closing and printing/labelling process of a container (2) according to any of the preceding claims, comprising the steps of:

in the printing/labelling station (7), predisposing the container (2) provided with the concave closure (10) applied on its mouth (2a), by aligning said container (2) between a rest plate (8) and a hood (9);
 blocking the rest plate (8) and the hood (9) on the container (2), said rest plate (8) and said hood (9) being configured as anti-rotation devices.

4. Closing and printing/labelling process of a container (2) according to claim 3, wherein said step of screwing the concave closure (10) to the neck (2b) of the corresponding container (2) is carried out by applying a torque to the rest plate (8) when the container (2) is blocked between the rest plate (8) and the hood (9).

5. Closing and printing/labelling process of a container (2) according to claim 3 or 4, wherein the step of applying a label to the body (2d) of the container (2) or printing the body (2d) of the container (2) is carried out while the container (2) is aligned and not blocked between the rest plate (8) and the hood (9).

6. Closing and printing/labelling process of a container (2) according to one or more of claims 3 to 5, wherein the step of applying a concave closure (10) on the mouth (2a) of the container (2) is carried out externally of the corresponding printing/labelling station (7).

7. Closing and printing/labelling process of a container (2) according to one or more of the preceding claims, comprising a step of shifting the container (2) arranged in the corresponding printing/labelling station (7) so as to bring it into, or distance it from, at least a printing/labelling position (A-F), and wherein said step of screwing the concave closure (10) to the neck (2b) of the corresponding container (2) is carried out while the container (2) shifts forward to and/or away from said at least a printing/labelling position (A-F).

8. Closing and printing/labelling process of a container (2) according to claim 7, wherein the step of shifting the container (2) occurs substantially along the longitudinal axis (L) of the container (2).

9. Closing and printing/labelling process of a container (2) according to one or more of the preceding claims, wherein the step of screwing the concave closure (10) to the neck (2b) of the container (2) comprises a sub-step of preliminary screwing and a sub-step of completion, and wherein the step of applying a

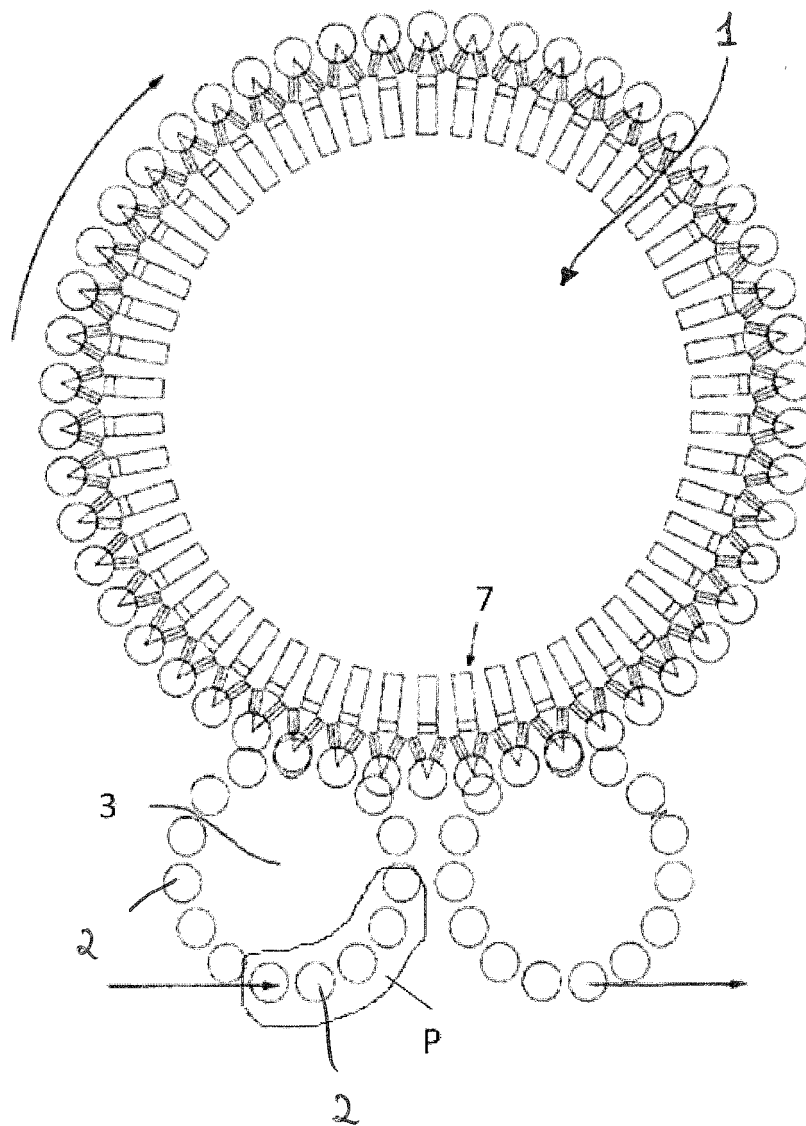
label to the body (2d) of the container (2) or printing the body (2d) of the container (2) is carried out between the sub-step of preliminary screwing and the sub-step of completion.

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10. Closing and printing/labelling process of a container (2) according to claim 9, wherein the sub-step of preliminary screwing is carried out by controlling the number of revolutions, and wherein the sub-step of completion is carried out by controlling the torque applied. 10
11. Apparatus for closing and printing/labelling (1) containers (2), comprising: 15
 - an application unit (3) of concave closures (10) configured so as to apply a concave closure (10) on the mouth (2a) of each container (2);
 - a plurality of locking devices (4) of the concave closures (10), each locking device (4) being configured so as to screw a concave closure (10) on the neck (2b) of the corresponding container (2); 20
 - a plurality of printing/labelling stations (7), each printing/labelling station (7) being configured to apply a label to the body (2d) of the container (2) or to print the body (2d) of the container (2), wherein each printing/labelling station (7) comprises a locking device (4) of the concave closures (10). 25 30
12. Apparatus for closing and printing/labelling (1) containers (2) according to claim 11, wherein said application unit (3) is configured so as to rest and press a concave closure (10) on the mouth (2a) of each container (2). 35
13. Apparatus for closing and printing/labelling (1) containers (2) according to claim 11 or 12, wherein each printing/labelling station (7) comprises a rest plate (8) and a hood (9) configured as anti-rotation devices. 40
14. Apparatus for closing and printing/labelling (1) containers (2) according to claim 11 to 13, wherein each locking device (4) comprises means for blocking the container (2) between the rest plate (8) and the hood (9) and a device for applying a torque to the rest plate (8) of the container (2). 45 50
15. Apparatus for closing and printing/labelling (1) containers (2) according to one or more of claims 11 to 14, wherein said rest plate (8) is configured so as to shift forward to or away from at least a printing/labelling position (A-F). 55
16. Apparatus for closing and printing/labelling (1) containers (2) according to claim 15, wherein said rest

plate (8) is configured so as to shift substantially along the longitudinal axis (L) of the container (2).

FIG. 1



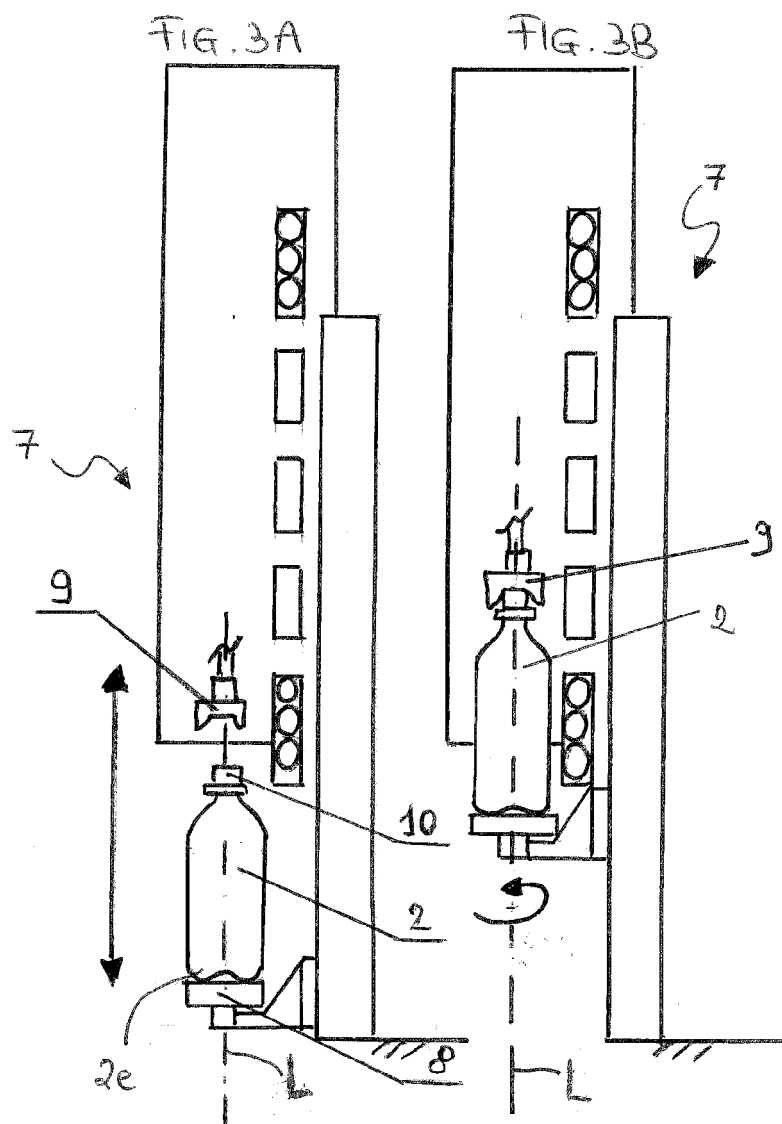
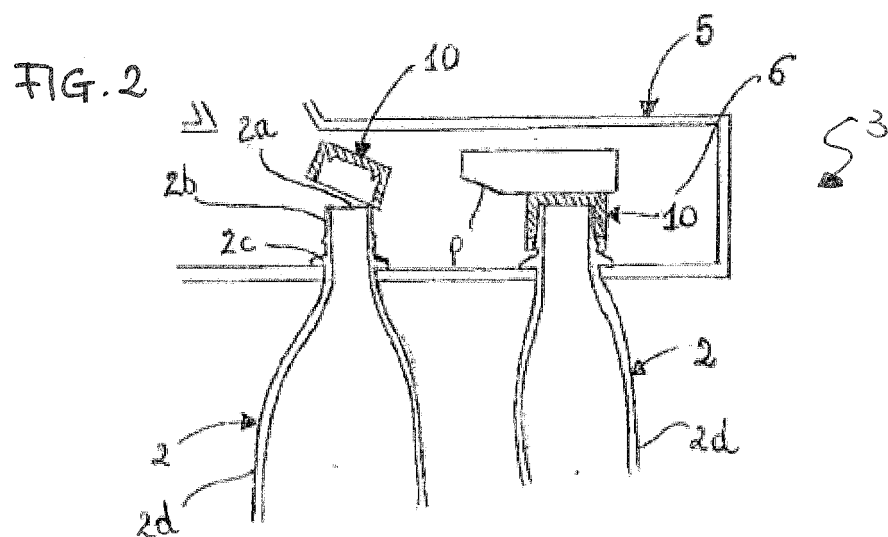


FIG. 3C

FIG. 3D

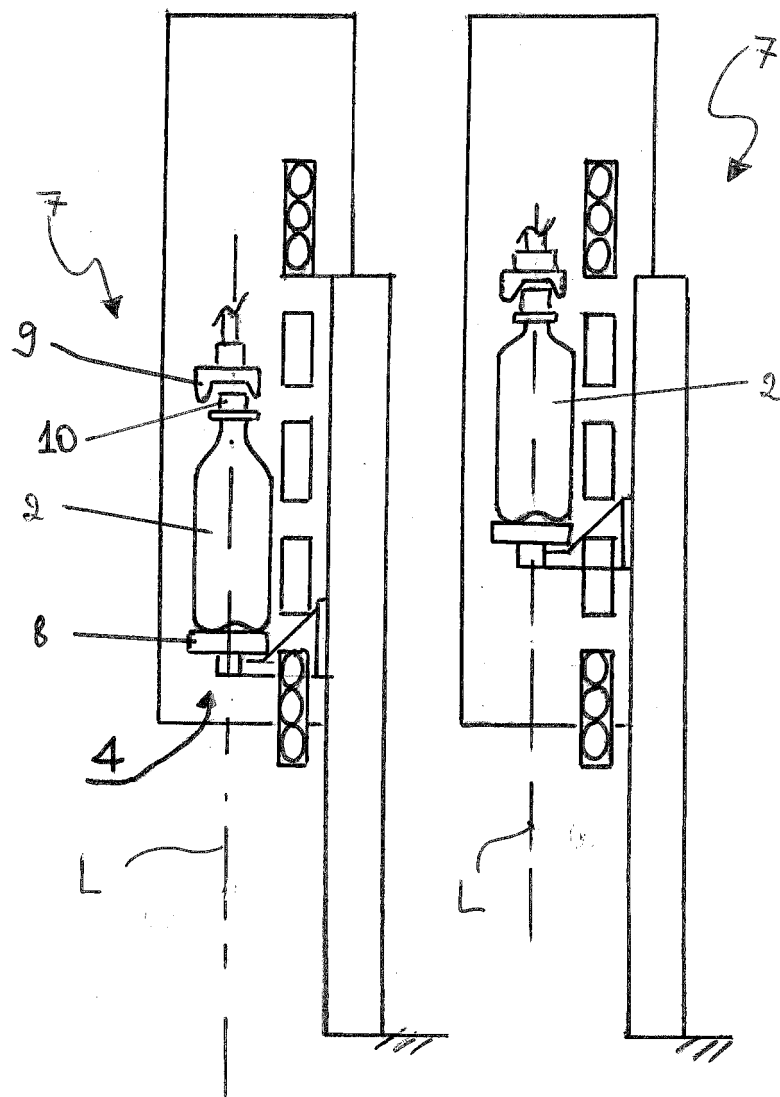


FIG. 3E

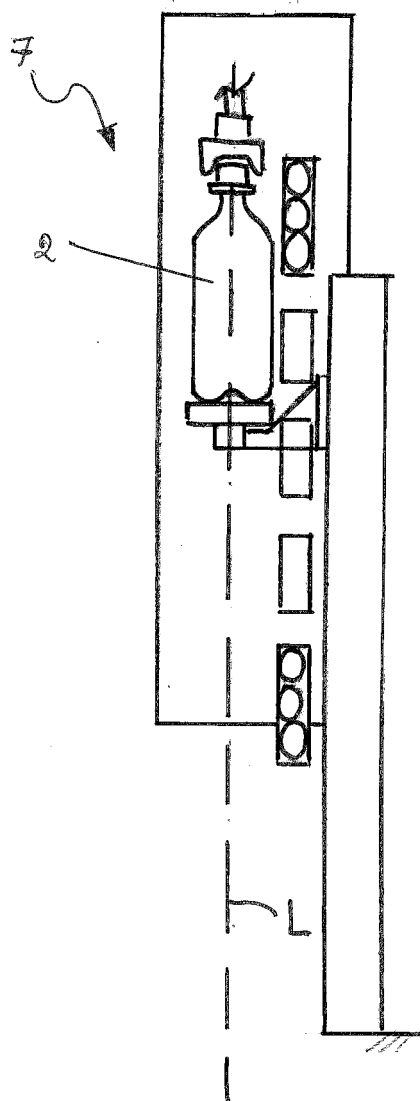


FIG. 3F

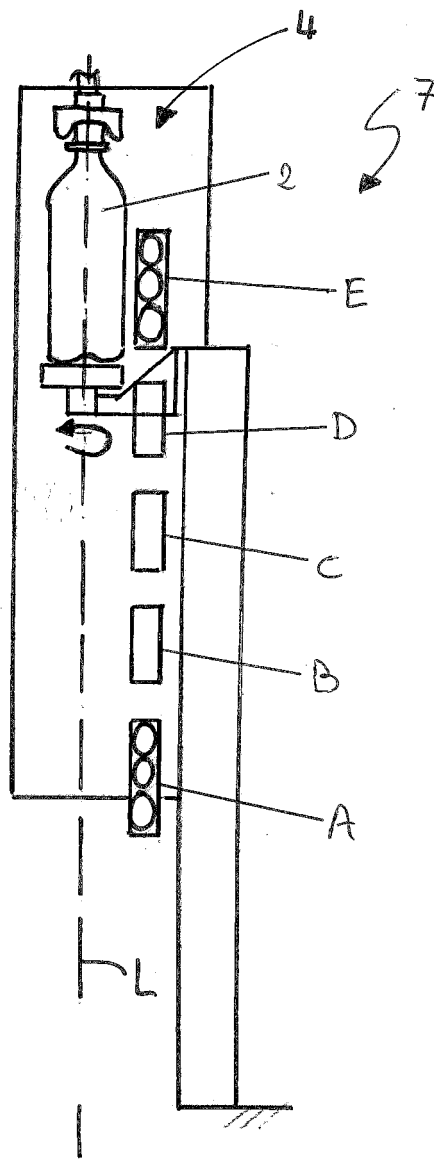
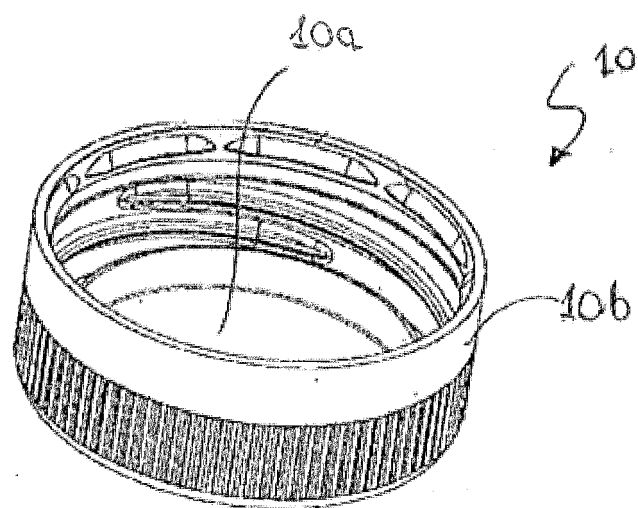


FIG. 4





EUROPEAN SEARCH REPORT

 Application Number
 EP 16 17 3671

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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