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(54) **A CAPPING PLANT FOR CAPPING CONTAINERS USING A TRANSFER STAR-WHEEL AND METHOD FOR CONVEYING CONTAINERS**

ANLAGE ZUM VERSCHLIESSEN VON BEHÄLTERN MIT EINEM TRANSFERSTERNRAD UND VERFAHREN ZUM FÖRDERN VON BEHÄLTERN

INSTALLATION DE BOUCHAGE POUR BOUCHER DES CONTENEURS EN UTILISANT UNE ÉTOILE DE TRANSFERT ET PROCÉDÉ DE TRANSPORT DE CONTENEURS

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Description

[0001] The present invention relates to a capping plant for capping containers using a transfer star-wheel and a method for conveying containers.

[0002] The reference sector for the present invention is the bottling of so-called "sensitive" food products, i.e. products that are particularly sensitive to bacteriological contamination and oxidation, such as, for example, isotonic drinks, juices, nectars, soft drinks, tea, milk-based beverages, coffee-based beverages, etc., for which avoiding possible microbiological contamination throughout all packaging steps is of fundamental importance.

[0003] The present invention relates in particular to bottling lines with aseptic technology where maintaining sterility is of fundamental importance. However, the present invention can also be used in non-aseptic filling and capping systems.

[0004] Usually, containers made of thermoplastic material leaving a capping unit are moved on a transfer star-wheel by means of a support for the neck, regardless of the format. At the end of their path on the transfer star-wheel, the containers are delivered to a conveyor belt, which supports the bottoms thereof. Such a capping plant is known from WO 2020/070026 A1. Disadvantageously, movement by supporting the neck ensures that the neck is always at the same height, whereas the bottom is always at a different height according to the format of the container.

[0005] A first solution of the known type adopted to overcome this drawback envisages the use of a tilting belt at the output of the transfer star-wheel. In other words, the conveyor belt comprises a portion that is movable in height to adapt to the format of the containers.

[0006] A second solution of the known type envisages equipping the transfer star-wheel with a helical slide that places it in communication with the conveyor belt. Disadvantageously, it is necessary to provide a slide for every container format: an operator must manually intervene in the event of a format change for replacing the slide, with the possible loss of sterility on aseptic machines. This therefore leads to long waiting times necessary for restoring sterility, with the consequent reduction of the overall efficiency of the machine.

[0007] On non-aseptic machines, after the manual intervention for replacing the slide, the sterility does not need to be restored but the manual operation itself determines a loss of efficiency.

[0008] Document DE 10 2017 120558 A1 describes a treatment apparatus that can be a closure apparatus in the form of a carousel. Containers are raised or lowered within the carousel by lifting devices.

[0009] Document CN 110499380 A discloses a transfer star wheel in which containers are raised using movement means comprising grippers and a cam. In this context, the technical task underpinning the present invention is that of proposing a a capping plant for capping containers using a transfer star-wheel and a method for conveying containers, which obviate the drawbacks of the prior art cited above.

[0010] In particular, the object of the present invention is to propose a capping plant for capping containers and a conveying method, which enable the transport of any container format, i.e. which enable format changes to be performed more quickly and, for aseptic machines, without any loss of sterility.

[0011] The defined technical task and the specified objects are substantially achieved by a capping plant according to claim 1 and a conveying method according to claim 5. Such plant comprises among other a star-wheel for containers of thermoplastic material, comprising:

- a rotating carousel having a plurality of support stations for the containers, each support station comprising a gripping member for gripping one of the containers by the neck thereof at an outer circumference of the rotating carousel;
- a movement means operationally active on each gripping member to move the gripping member along a sliding direction substantially orthogonal to the rotating carousel between a lower limit position and an upper limit position.

[0012] The movement means is movable along a direction that is substantially parallel to the sliding direction so as to be able to vary the lower and/or upper limit position.

[0013] The movement means comprises a cam so shaped as to define for each revolution of the rotating carousel a movement of the gripping member along the sliding direction between the lower limit position and the upper limit position.

[0014] According to an embodiment, the movement means comprises a roller connected to the gripping member and placed in contact with the cam.

[0015] In particular, the movement means comprises a jack that is operationally active on the roller to keep it in contact with the cam.

[0016] According to a further embodiment, the movement means comprises for each gripping member a linear electric motor or a stepper motor associated with a recirculation guide.

[0017] According to an aspect, the containers are provided with a concave closure, for example a cap or capsule.

[0018] Each support station comprises an abutment element located above the corresponding gripping member. The abutment element can be configured in an operating position in which it is in contact with the concave closure of the container supported by the corresponding gripping member, and a neutral position in which it is distanced from the concave closure.

[0019] The capping plant further comprises:

- a capping unit comprising a plurality of capping sta-

tions for applying closures to the containers.

[0020] The star-wheel is located downstream of the capping unit to receive the capped containers, i.e. containers to which the concave closures have been applied.

[0021] An output belt is located downstream of the transfer star-wheel.

[0022] The method for conveying containers made of thermoplastic material, comprises among other steps of:

- supporting each container along a conveying path from a pickup point to a delivery point of the transfer star-wheel;
- during the step of supporting each container, moving each container in height by a set amount, chosen so as to have each container at the delivery point with a bottom at a set height.

[0023] According to an aspect of the invention, the method comprises a step of unloading each container at the point of delivery onto a support surface located at said set height.

[0024] According to an embodiment, the conveying path is defined by an outer circumference of the rotating carousel.

[0025] According to an embodiment, the step of sustaining each container takes place by gripping members that sustain each container by its neck. Further characteristics and advantages of the present invention will more fully emerge from the indicative, and therefore non-limiting, description of a preferred but not exclusive embodiment of a transfer star-wheel for containers, a capping plant for capping containers and a method for conveying containers, as illustrated in the accompanying drawings, in which:

- figure 1 illustrates a transfer star-wheel for containers, according to the present invention, in a sectioned side view;
- figure 2 illustrates the transfer star-wheel of figure 1, with the gripping member at a different height for adapting to a different container format;
- figures 3a and 3b illustrate two different types of concave closure, respectively a flat cap and a sport cap, in a perspective view;
- figures 4a and 4b illustrate a support station of the transfer star-wheel of figure 1, in a sectioned side view, in two different configurations of the abutment element;
- figure 5 illustrates a capping plant, according to the present invention, in a plan view;
- figure 6 partially illustrates a container, in a lateral view.

[0026] With reference to the figures, the number 1 indicates a transfer star-wheel for containers made of thermoplastic material.

[0027] The transfer star-wheel 1 comprises a rotary carousel 2 having a plurality of support stations 3 for supporting the containers 100. Each support station 3 comprises a gripping member 4 for gripping (that is grasping) one of the containers 100 by its neck 100b. The gripping member 4 is arranged at the outer circumference of the rotating carousel 2.

[0028] Preferably, the gripping members 4 are equally spaced along the outer circumference of the rotating carousel 2.

[0029] In the embodiment described and illustrated herein, the gripping member 4 is a gripper solidly fixed to the rotating carousel 2.

[0030] The transfer star-wheel 1 comprises a movement means 5 operationally active on each gripping member 4 to move it along a sliding direction substantially orthogonal to the rotating carousel 2. The sliding direction is a direction for which the height of the gripping member 4 varies with respect to a base of the transfer star-wheel 1. Moving the gripping member 4 along the sliding direction also causes the height of the neck 100a and of the bottom 100b of the supported container 100 to change.

[0031] In the embodiment described and illustrated herein, the movement means 5 comprises a cam 8 having a profile such as to move each gripping member 4 along the sliding direction.

[0032] In particular, the cam 8 is shaped such as to define for each revolution of the rotating carousel 2 an upward/downward path of the gripping member 4 along the sliding direction between a lower limit position and/or an upper limit position.

[0033] Preferably, the movement means 5 comprises a roller kept in contact with the cam 8 which transfers motion to the gripping member 4.

[0034] Preferably, the movement means 5 comprises a jack 7 that is operationally active on the roller to keep it in contact with the cam 8. The jack 7 may be, for example, air operated (working like an air spring), or mechanical, i.e. provided with helical springs.

[0035] Advantageously, the cam 8 can be moved along a direction substantially parallel to the sliding direction. In other words, the cam 8 is adjustable in height. In this way, it is possible to vary the lower limit position and possibly the upper limit position of the gripping member 4 according to the format of the container 100.

[0036] In the embodiment described and illustrated herein, the upper limit position of the gripping member 4 is assumed to receive a container from the station or transfer star-wheel located upstream. In this case, the upper limit position is the same for all container formats. The lower limit position is instead varied according to the format.

[0037] The movement of the cam 8 can take place according to systems of the known type. For example, it is possible to use a mechanical system or a stepper motor or a linear electric motor.

[0038] In the embodiment described and illustrated herein, the cam 8 is fixed to a support 9 fixed to sliding bushings onto one or more threaded bars 10 for lifting

the cam 8. The cam 8 is therefore adjustable in height by varying the position of the bushing along the threaded bar 10.

[0039] According to an embodiment not illustrated, the movement means 5 comprises a linear electric motor for each gripping member 4.

[0040] According to a further embodiment, the movement means 5 comprises, for each gripping member 4, a stepper motor associated with a recirculating ball guide.

[0041] Preferably, the containers 100 are made of thermoplastic material, e.g. PET, provided with a concave closure 200.

[0042] Every container 100 has a tubular body 100a and a threaded neck 100b, as shown in figure 6.

[0043] In this context, the term concave closure means a cap or a capsule. The concave closure is preferably made of polymeric material.

[0044] The flat cap concave closure 200 has a discoid base 201, and a substantially cylindrical lateral surface 202 which extends from the discoid base 201 and defines a cavity 203 therewith. On the opposite side to the discoid base 201, the cavity 203 is open so as to accommodate the mouth of the container 100. This closure is illustrated in figure 3a.

[0045] The sport cap concave closure 200 has a projecting spout 204 instead of the discoid base. This figure is illustrated in figure 3b.

[0046] Preferably, each support station 3 comprises an abutment element 11 located above the corresponding gripping member 4.

[0047] The abutment element 11 can have two configurations:

- an operating position in which it is in contact with the concave closure 200 of the container 100 supported by the corresponding gripping member 4 (see figure 4a), and
- a neutral position in which it is distanced, i.e. raised, from the concave closure 200 (see figure 4b).

[0048] The means for moving the abutment element 11 between the two positions is of the known type and shall not be described further. According to the embodiment described and illustrated herein, each abutment element 11 is shaped like a concave shell (or bell) configured to be applied to the concave closure 200 so as to partially surround it. In particular, the abutment element 11 partially surrounds the concave closure 200 when it is in the operating position. In this case, thanks to the partial surrounding of the closure, it is sufficient for the abutment element 11 to rest (without pressing) on the underlying closure.

[0049] According to an aspect, the concave shell 11 is configured to be applied to the spout 204 of the sport cap 200 so as to surround it. The concave shell 11 can also be applied to a flat cap 200. In that case, the concave shell 11 surrounds the upper part of the discoid base 201 and the first section of the lateral surface 202 of the flat cap 200.

[0050] The abutment element 11 is made of metal, for example steel, or plastic.

[0051] According to a variant embodiment, not shown, each abutment element 11 is a full body having a substantially flat surface which contacts the concave closure 200 and presses thereon.

[0052] According to an embodiment, there is also a guide means 12 configured to contact the neck 100b of each container 100 on the opposite side with respect to the rotating carousel 2.

[0053] Preferably, the guide means 12 is arranged so as to contact, at the bottom, the part of bead 100c exposed towards the outside of the gripping member 4, i.e. the part of bead 100c which does not rest on the rotating carousel 2 or on the gripper 4.

[0054] According to a preferred embodiment, such guide means 12 consists of a profile which extends at least partially outside the rotating carousel 2 following the circumferential extension, as can be seen in figure 5.

[0055] In particular, the profile 12 consists of a slab having a partially annular shape which is arranged below the part of bead 100c of the containers 100 facing towards the outside of the gripping member 4.

[0056] For example, the guide means 12 is present when heavy containers 100 are moved, with a capacity of 1.75-2 litres, or when the transfer star-wheel 1 transports more than 40000 bottles/hour, or for sport cap applications (fig. 3b) in which the abutment element 11 contacts the cap without pressing on it.

[0057] Number 20 indicates a capping plant for containers made of thermoplastic material.

[0058] The capping plant 20 comprises a capping unit 21 comprising a plurality of capping stations 111 for applying closures 200 to the containers 100.

[0059] A transfer star-wheel 1 according to the above description is located downstream of the capping unit 21 to receive the capped containers 100, i.e. containers to which the closures 200 have been applied.

[0060] The capping plant 20 comprises an output belt 22 located downstream of the star-wheel 1. The gripping member 4 is moved along the sliding direction so that the bottom of the container 100 is at the output belt 22.

[0061] In particular, the cam profile 8 is made so that the uphill/downhill path imparted to the gripping member 4 enables the bottom of the container 100 to be brought to the output belt 22.

[0062] A method for conveying containers 100 is described below. The method is advantageously implemented by a transfer star-wheel 1 as described above.

[0063] The method comprises the step of supporting each container 100 along a conveying path from a pickup point A to a delivery point B.

[0064] During the step of supporting each container 100, while it is brought from the pickup point A to the delivery point B, each container 100 is moved in height by a set amount. Preferably, the set amount is selected so as to have each container 100 at the delivery point B

having the bottom at a set height. Preferably, the method comprises a step of unloading each container 100 at the point of delivery B onto a support surface located at the set height.

[0065] Preferably, the conveying path is defined by an outer circumference of a rotating carousel 2.

[0066] Preferably, the step of supporting each container 100 occurs through the action of grippers 4 that support each container 100 by the neck 100b thereof.

[0067] The combination of the movement of the gripping member between the two limit positions by the jack and the height adjustment of the cam enable any type of container format to be conveyed. In fact, it is possible to quickly perform a format change on the plant by adjusting the height of the cam, causing two new lower and upper limit positions of the stroke of the gripping member.

Claims

1. A capping plant (20) for capping containers (100) made of thermoplastic material, comprising:

   a capping unit (21) comprising a plurality of capping stations (111) for applying closures (200) to the containers (100);
   a transfer star-wheel (1) situated downstream of said capping unit (21) to receive the capped containers (200), i.e. to which the closures (200) have been applied;
   an output belt (22) situated downstream of said transfer star-wheel (1),
   said transfer star-wheel (1) comprising:

   a rotating carousel (2) having a plurality of support stations (3) for the containers (100), each support station (3) comprising a gripping member (4) for gripping one of the containers (100) by the neck (100b) thereof at an outer circumference of the rotating carousel (2);
   movement means (5) operationally active on each gripping member (4) to move the gripping member (4) along a sliding direction substantially orthogonal to the rotating carousel (2) between a lower limit position and an upper limit position so that the bottom of the container (100) is brougth at the output belt (22), said movement means (5) comprising a cam (8) so shaped as to define for each revolution of the rotating carousel (2) a movement of the gripping member (4) along the sliding direction between the lower limit position and the upper limit position, said movement means (5) being movable along a direction that is substantially parallel to the sliding direction so as to be able to vary said lower and/or upper limit position.

2. The capping plant (20) according to claim 1, wherein said movement means (5) comprises a roller connected to the gripping member (4) and placed in contact with the cam (8), said movement means (5) comprising a jack (7) that is operationally active on the roller to keep the roller in contact with the cam (8).

3. The capping plant (20) according to claim 1, wherein said movement means (5) comprises for each gripping member (4) a linear electric motor or a stepper motor associated with a recirculation guide.

4. The capping plant (20) according to any one of the preceding claims, wherein said containers (100) are provided with a concave closure (200), each support station (3) comprising an abutting element (11) situated above the corresponding gripping member (4), said abutting element (11) being configurable in an operating position in which it is in contact with the concave closure (200) of the container (100) supported by the corresponding gripping member (4), and a neutral position in which it is spaced apart from said concave closure (200).

5. A method for conveying containers (100) by a transfer star-wheel (1) of a capping plant (20) according to any one of claims 1 to 4, comprising the steps of:

   supporting each container (100) along a conveying path from a pickup point (A) to a delivery point (B) of said transfer star-wheel (1);
   during the step of supporting each container (100), moving each container (100) in height by a set quantity, said set quantity being chosen so as to have each container (100) at the delivery point (B) with a bottom at a set height.

6. The method according to claim 5, comprising a step of unloading each container (100) at the point of delivery (B) onto a support surface located at said set height.

7. The method according to claim 5 or 6, wherein the conveying path is defined by an outer circumference of a rotating carousel (2).

8. The method according to any one of claims 5 to 7, wherein the step of supporting each container (100) occurs through the action of gripping members (4) that support each container (100) by the neck (100b) thereof.

Patentansprüche

1. Verschließanlage (20) zum Verschließen von Behältern (100) aus thermoplastischem Material, umfassend:

eine Verschließeinheit (21), umfassend eine Vielzahl von Verschließstationen (111) zum Anbringen von Verschlüssen (200) an den Behältern (100);
ein Transfersternrad (1), das stromabwärts der Verschließeinheit (21) befindlich ist, um die verschlossenen Behälter (200), d. h., an denen die Verschlüsse (200) angebracht wurden, aufzunehmen;
ein Austransportband (22), das stromabwärts des Transfersternrads (1) befindlich ist,
wobei das Transfersternrad (1) Folgendes umfasst:

ein Drehkarussell (2), aufweisend eine Vielzahl von Tragestationen (3) für die Behälter (100), wobei eine jede Tragestation (3) ein Greifelement (4) zum Greifen von einem der Behälter (100) mittels dessen Halses (100b) an einem äußeren Umfang des Drehkarussells (2) umfasst;
Bewegungsmittel (5), die betriebswirksam auf ein jedes Greifelement (4) einwirken, um das Greifelement (4) entlang einer Verschieberichtung, die im Wesentlichen rechtwinkelig zum Drehkarussell (2) verläuft, zwischen einer unteren Grenzposition und einer oberen Grenzposition zu bewegen, sodass die Unterseite des Behälters (100) an das Austransportband (22) gebracht wird, wobei die Bewegungsmittel (5) einen Nocken (8) umfassen, der so ausgeformt ist, dass für eine jede Umdrehung des Drehkarussells (2) eine Bewegung des Greifelements (4) entlang der Verschieberichtung zwischen der unteren Grenzposition und der oberen Grenzposition definiert wird,
wobei die Bewegungsmittel (5) entlang einer Richtung bewegbar sind, die im Wesentlichen parallel zur Verschieberichtung verläuft, sodass die untere und/oder die obere Grenzposition variiert werden kann.

2. Verschließanlage (20) nach Anspruch 1, wobei die Bewegungsmittel (5) eine Walze umfassen, die mit dem Greifelement (4) verbunden und in Kontakt mit dem Nocken (8) platziert ist, wobei die Bewegungsmittel (5) einen Hebebock (7) umfassen, der betriebswirksam auf die Walze einwirkt, um die Walze in Kontakt mit dem Nocken (8) zu halten.

3. Verschließanlage (20) nach Anspruch 1, wobei die Bewegungsmittel (5) für ein jedes Greifelement (4) einen linearen Elektromotor oder einen Schrittmotor, assoziiert mit einer Umlaufführung, umfassen.

4. Verschließanlage (20) nach einem der vorhergehenden Ansprüche, wobei die Behälter (100) mit einem konkaven Verschluss (200) versehen sind, eine jede Tragestation (3) ein Anschlagselement (11) umfasst, das oberhalb des entsprechenden Greifelements (4) befindlich ist, wobei das Anschlagselement (11) in einer Betriebsposition, in der es mit dem konkaven Verschluss (200) des vom entsprechenden Greifelement (4) getragenen Behälters (100) in Kontakt ist, und einer neutralen Position, in der es vom konkaven Verschluss (200) beabstandet angeordnet ist, auslegbar ist.

5. Verfahren zum Fördern von Behältern (100) mittels eines Transfersternrads (1) einer Verschließanlage (20) nach einem der Ansprüche 1 bis 4, umfassend die folgenden Schritte:

Tragen eines jeden Behälters (100) entlang eines Förderwegs von einem Aufnahmepunkt (A) zu einem Übergabepunkt (B) des Transfersternrads (1);
während des Schritts zum Tragen eines jeden Behälters (100) Bewegen eines jeden Behälters (100) in der Höhe um eine vorgegebene Menge, wobei die vorgegebene Menge so ausgewählt wird, dass ein jeder Behälter (100) am Übergabepunkt (B) mit einer Unterseite auf einer vorgegebenen Höhe angeordnet ist.

6. Verfahren nach Anspruch 5, zudem umfassend einen Schritt zum Abladen eines jeden Behälters (100) am Übergabepunkt (B) auf eine Trageoberfläche, die sich auf der vorgegebenen Höhe befindet.

7. Verfahren nach Anspruch 5 oder 6, wobei der Förderweg durch einen äußeren Umfang eines Drehkarussells (2) definiert ist.

8. Verfahren nach einem der Ansprüche 5 bis 7, wobei der Schritt zum Tragen eines jeden Behälters (100) durch die Wirkung von Greifelementen (4) stattfindet, die einen jeden Behälter (100) mittels dessen Halses (100b) tragen.

Revendications

1. Installation de bouchage (20) pour boucher des conteneurs (100) en matière thermoplastique, comprenant :

une unité de bouchage (21) comprenant une pluralité de postes de bouchage (111) servant à appliquer des fermetures (200) aux conteneurs (100) ;
une étoile de transfert (1) située en aval de ladite unité de bouchage (21) pour recevoir les conteneurs bouchés (200), c'est-à-dire sur lesquels

les fermetures (200) ont été appliquées ;
une bande de sortie (22) située en aval de ladite étoile de transfert (1), ladite étoile de transfert (1) comprenant :

un carrousel rotatif (2) comportant plusieurs postes de support (3) pour les conteneurs (100), chaque poste de support (3) comprenant un organe de préhension (4) pour saisir l'un des conteneurs (100) par le col (100b) de celui-ci en correspondance d'une circonférence extérieure du carrousel rotatif (2) ;
des moyens de déplacement (5) fonctionnellement actifs sur chaque organe de préhension (4) pour déplacer l'organe de préhension (4) le long d'une direction de coulissement sensiblement orthogonale au carrousel rotatif (2) entre une position de limite inférieure et une position de limite supérieure de manière à ce que le fond du conteneur (100) soit amené en correspondance de la bande de sortie (22), lesdits moyens de déplacement (5) comprenant une came (8) conformée de manière à définir pour chaque tour du carrousel rotatif (2) un déplacement de l'organe de préhension (4) le long de la direction de coulissement entre la position de limite inférieure et la position de limite supérieure,
lesdits moyens de déplacement (5) étant mobiles le long d'une direction qui est sensiblement parallèle à la direction de coulissement de manière à pouvoir faire varier ladite position de limite inférieure et/ou supérieure.

2. Installation de bouchage (20) selon la revendication 1, dans laquelle lesdits moyens de déplacement (5) comprennent un rouleau relié à l'organe de préhension (4) et placé en contact avec la came (8), lesdits moyens de déplacement (5) comprenant un vérin (7) qui est fonctionnellement actif sur le rouleau pour maintenir le rouleau en contact avec la came (8).

3. Installation de bouchage (20) selon la revendication 1, dans laquelle lesdits moyens de déplacement (5) comprennent pour chaque organe de préhension (4) un moteur électrique linéaire ou un moteur pas à pas associé à un guide de recirculation.

4. Installation de bouchage (20) selon l'une quelconque des revendications précédentes, dans laquelle lesdits conteneurs (100) sont pourvus d'une fermeture concave (200), chaque poste de support (3) comprenant un élément de butée (11) situé au-dessus de l'organe de préhension (4) correspondant, ledit élément de butée (11) étant configurable dans une position de fonctionnement dans laquelle il est en contact avec la fermeture concave (200) du conteneur (100) supporté par l'organe de préhension (4) correspondant, et dans une position neutre dans laquelle il est écarté de ladite fermeture concave (200).

5. Procédé de transport de conteneurs (100) par une étoile de transfert (1) d'une installation de bouchage (20) selon l'une quelconque des revendications 1 à 4, comprenant les étapes de :

supporter chaque conteneur (100) le long d'un parcours de transport allant d'un point de prélèvement (A) à un point de délivrance (B) de ladite étoile de transfert (1) ;
pendant l'étape de support de chaque conteneur (100), déplacer chaque conteneur (100) en hauteur d'une ampleur déterminée, ladite ampleur déterminée étant choisie de manière à ce que chaque conteneur (100) se trouve au point de délivrance (B) avec un fond à une hauteur déterminée.

6. Procédé selon la revendication 5, comprenant une étape de déchargement de chaque conteneur (100) au point de délivrance (B) sur une surface de support située à ladite hauteur déterminée.

7. Procédé selon la revendication 5 ou 6, dans lequel le parcours de transport est défini par une circonférence extérieure d'un carrousel rotatif (2).

8. Procédé selon l'une quelconque des revendications 5 à 7, dans lequel l'étape de support de chaque conteneur (100) se produit par l'action d'organes de préhension (4) qui supportent chaque conteneur (100) par le col (100b) de celui-ci.

FIG. 1

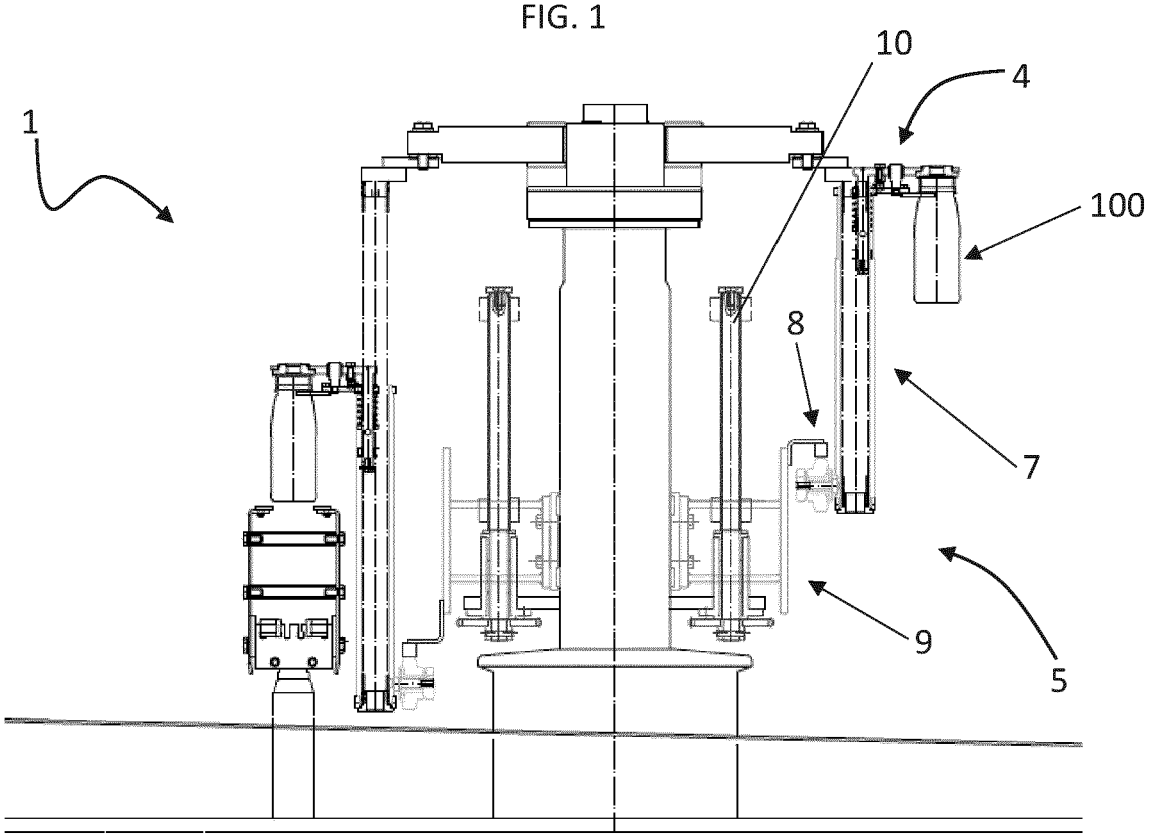


FIG. 2

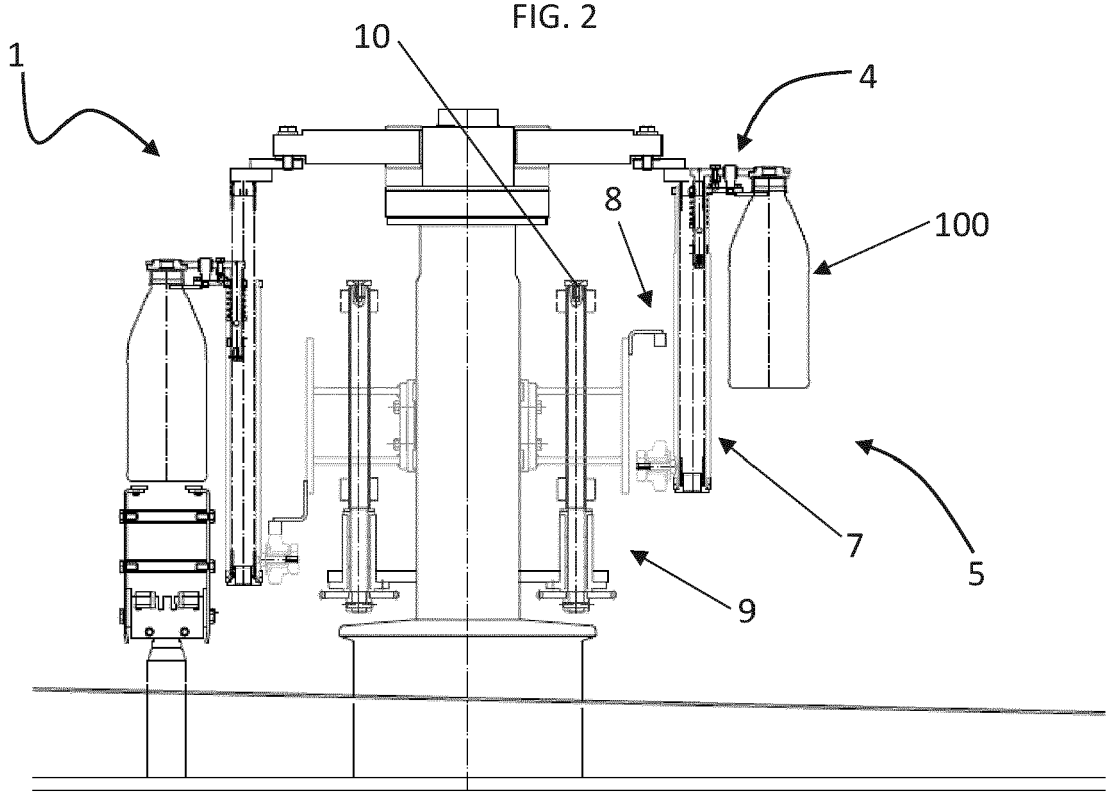


FIG. 3a

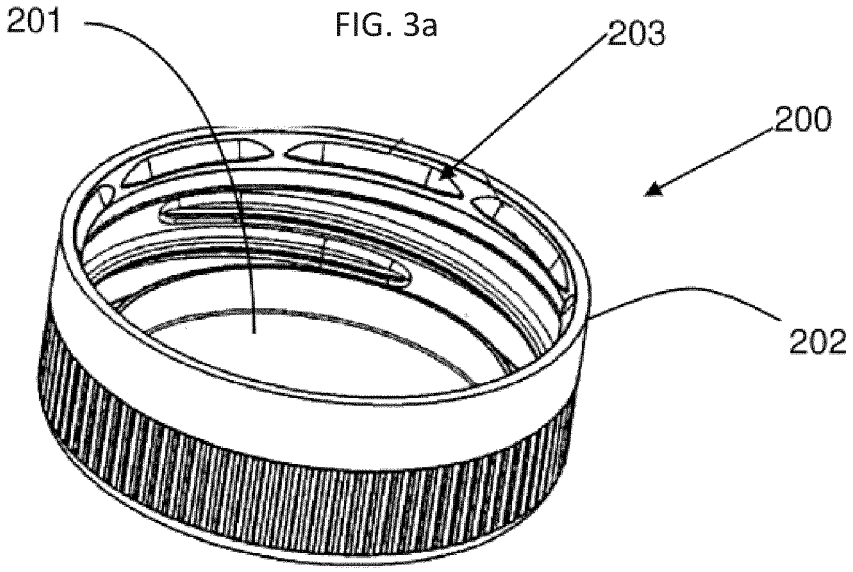


FIG. 3b

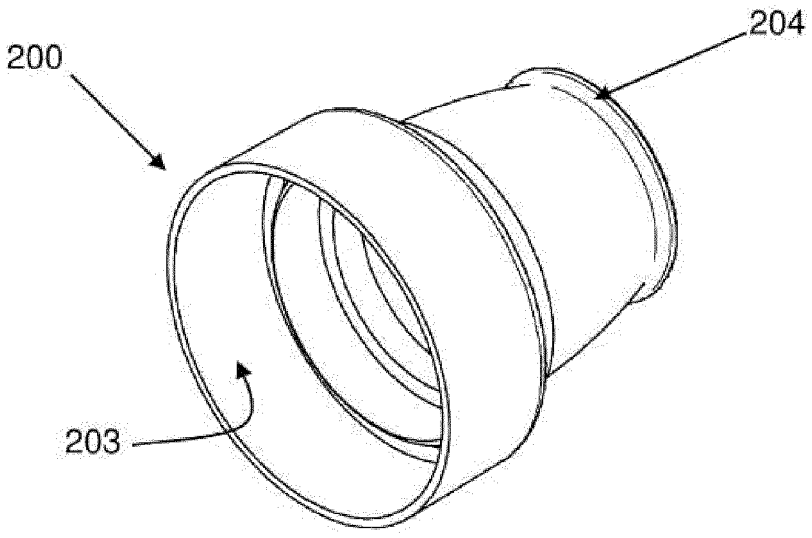


FIG. 4a

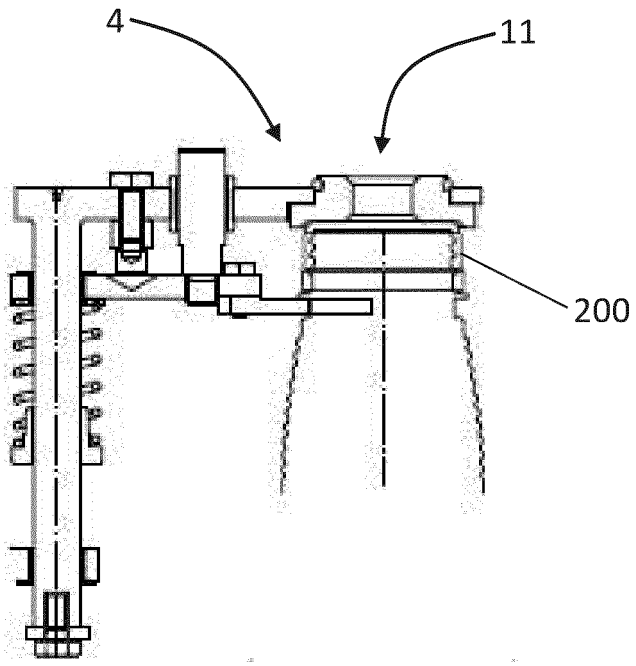


FIG. 4b

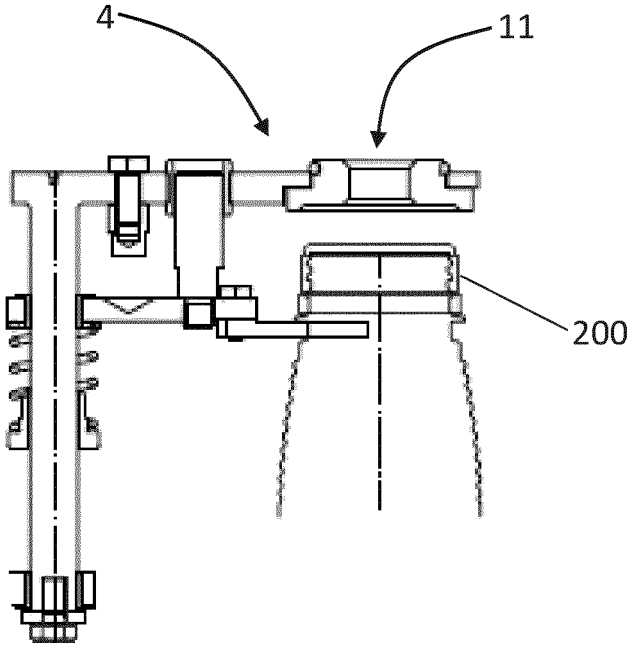


FIG. 5

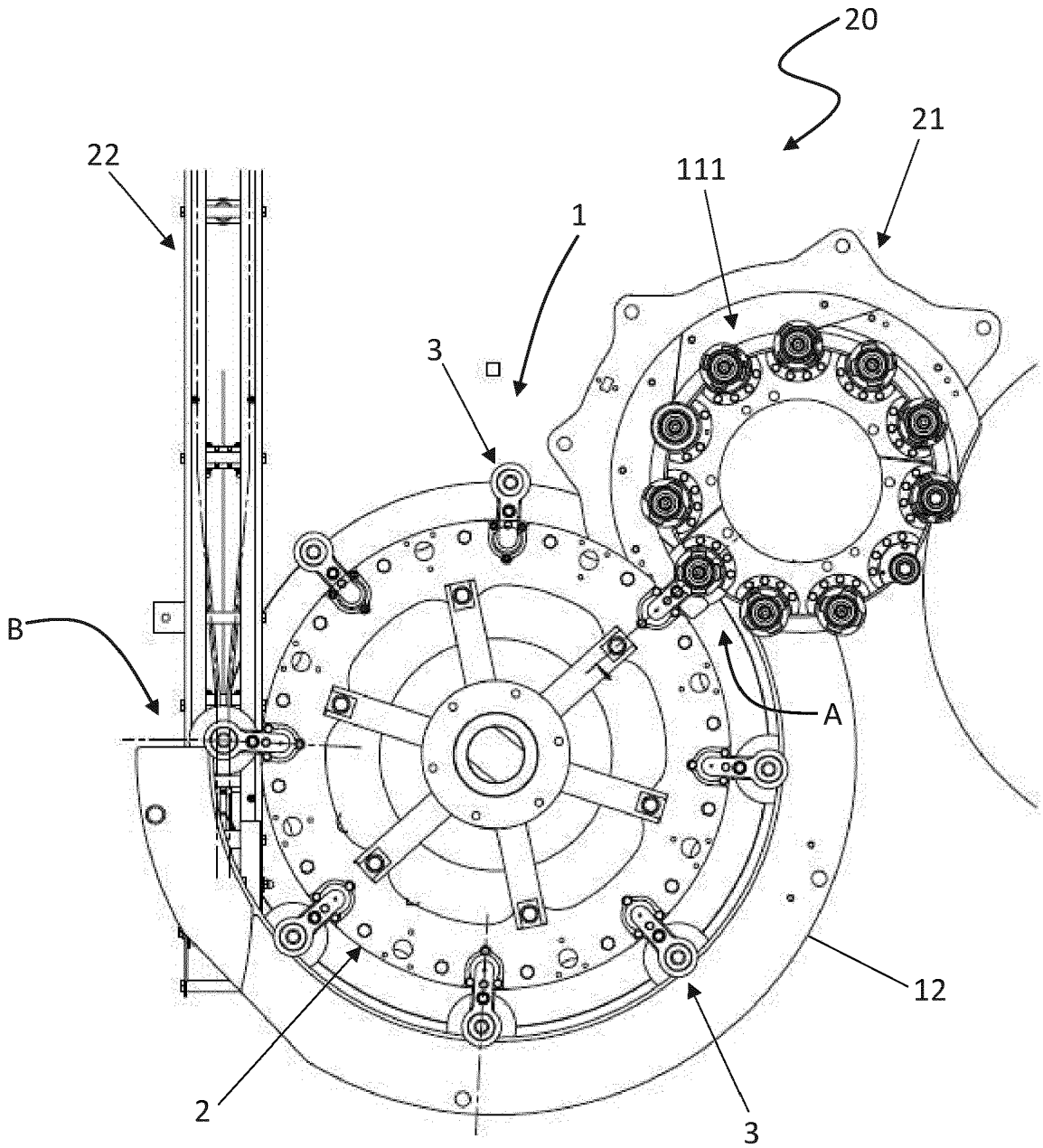
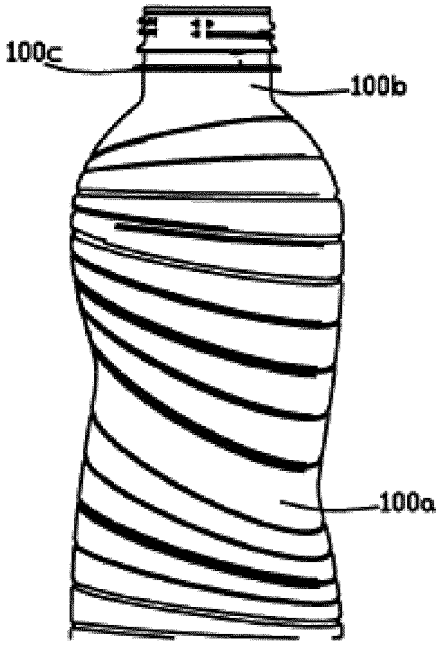


FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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