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(54) AN INFEED DEVICE AND A METHOD FOR FEEDING A BLANK OF A PACKAGING MATERIAL

(57) An infeed device (100) is provided. The infeed device (100) comprises an inlet station (110) configured to provide a series of consecutive blanks (30), an infeed carousel (120) arranged vertically below the inlet station (110) and having a plurality of receiving devices (130) distributed along the circumference of the infeed carousel (120). Each receiving device (130) is configured to receive a blank (30) from the inlet station (110) and to transform the blank (30) to an erected body (40), wherein the infeed device (100) further comprises a conveyor (140) having a plurality of carriers (150) configured to receive a respective erected body (40) from an associated receiving device (130), and wherein the conveyor (140) is arranged vertically above the infeed carousel (120).

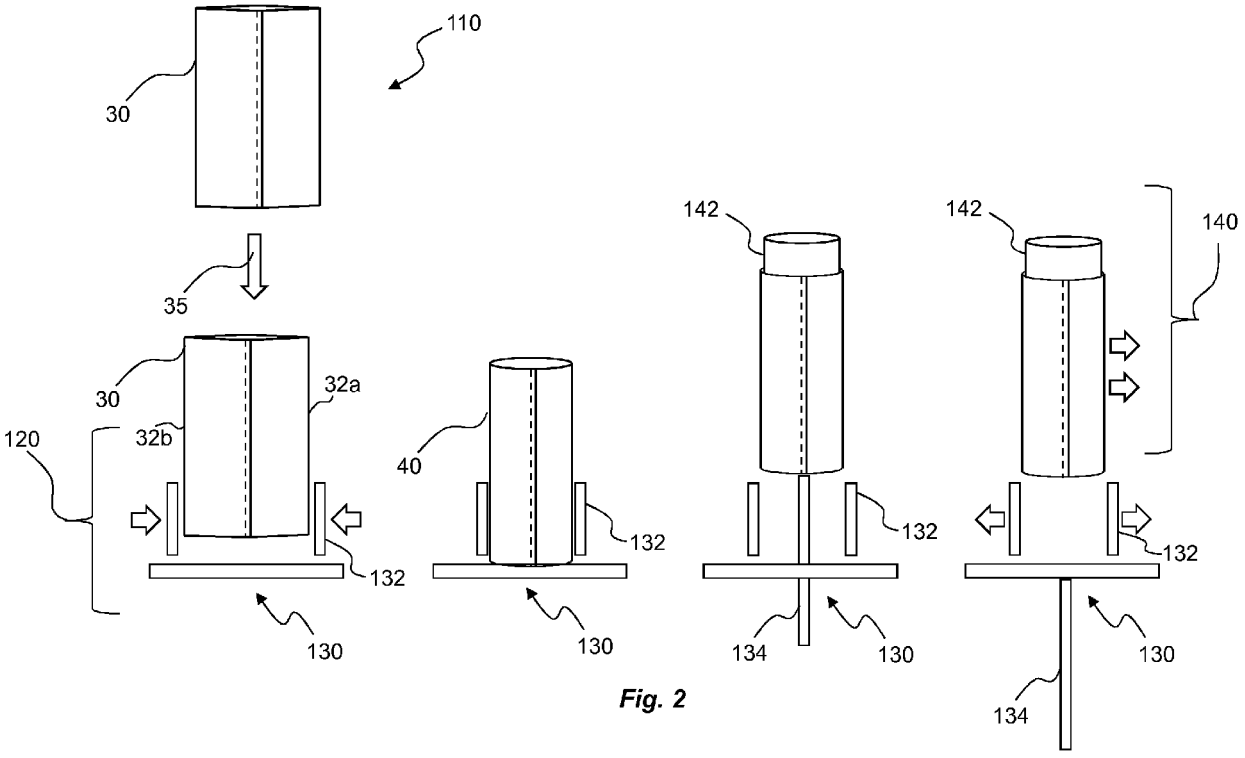

Fig. 2

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Description

Technical Field

[0001] The invention relates to an infeed device configured to transform flattened packaging material to an erected sleeve, as well as a method for performing such transformation.

Background Art

[0002] Infeed devices are provided in various types of manufacturing, such as in the packaging industry. Here it is well known to use the infeed device as a tool in which carton-based blanks (i.e. flattened packaging material) are transformed to sleeves ready to receive plastic tops forming the spout of the final package.

[0003] Instead of providing the blanks in a magazine from which the infeed device receives a series of consecutive blanks, it has been suggested to feed a flattened tube to the infeed device and to cut a blank from the continuous tube immediately before the cut blank enters the infeed device. One problem with such solution is that while the tube is running vertically, the infeed device is transporting the erected sleeves in a horizontal plane. Hence a motion conversion is required, increasing the complexity and bulkiness of the infeed device.

[0004] In view of this it would be advantageous to provide a less complex and less bulky infeed device which is still capable of receiving a vertically moving flattened blank, to erect them to sleeves, and to transport the sleeves in a horizontal plane.

Summary

[0005] It is an object of the present solution to at least partly overcome one or more of the above-identified limitations of the prior art. In particular, it is an object to reduce the required height of the infeed device.

To solve these objects an infeed device is provided. The infeed device comprises an inlet station configured to provide a series of consecutive blanks, an infeed carousel arranged vertically below the inlet station and having a plurality of receiving devices distributed along the circumference of the infeed carousel. Each receiving device is configured to receive a blank from the inlet station and to transform the blank to an erected body. The infeed device further comprises a conveyor having a plurality of carriers configured to receive a respective erected body from an associated receiving device, and wherein the conveyor is arranged vertically above the infeed carousel.

[0006] According to another aspect of the present solution, a method for feeding a blank of a packaging material is provided, where the method comprises

- moving the blank in a vertical direction to a receiving device arranged on a rotating infeed carousel,
- erecting the blank to a tubular body while the blank is transported by the motion of the receiving device, and
- delivering the erected body to a carrier of a conveyor arranged vertically above the receiving device.

[0007] Still other objectives, features, aspects and advantages of the invention will appear from the following detailed description as well as from the drawings.

Brief Description of the Drawings

[0008] Embodiments of the invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1 is a schematic view of how a blank in the form of a flattened tube is transformed to a final package;
Fig. 2 is a schematic view of the transformation steps performed by an infeed device according to an embodiment;
Fig. 3 is an isometric view of an infeed device according to an embodiment; and
Fig. 4 is a schematic view of a method according to an embodiment.

Detailed Description

[0009] With reference to Fig. 1 the process of transforming a flattened tube 10 of packaging material is illustrated. The tube 10 is initially having a cylindrical shape, indicated by the uppermost portion 12 of the tube 10. The flattened shape is e.g. achieved by clamping two opposite sides of the tube 10 against each other. Such clamping may be performed using two jaws 20a-b arranged such that a gap is formed therebetween. The tube 10 may be continuously fed through the gap and as the jaws 20a-b are moved towards each other, as is indicated by the block arrows in Fig. 1, the cylindrical portion 12 will be flattened. Downstream the gap a cutting device (not shown) may be arranged to cut a sequence of flattened tube portions 30 from the continuous tube 10. Each tube portion 30 forms a blank which is intended to form a longitudinal main body of a package. In order to produce the final package a series of steps is performed.

[0010] Firstly, the blank 30 is handled by an infeed device which will later be described with reference to Figs. 2 and 3. The purpose of the infeed device is to transform the flat blank 30 to an erected body 40, here in the form of a tubular body having two opposite open ends. Once the tubular shape is formed the erected body 40 is transported to an injection molding station. In this station one end of the erected body 40 is provided with a plastic top 50, thus closing that end of the body 40. Thereafter, a threaded cap 55 is applied onto a corresponding thread on the neck portion (not shown) of the plastic top 50.

[0011] Once the plastic top 50 is in place, the semi-finished package 40, 50 is ready for sterilization. This

may e.g. be performed by inserting a sterilization device 60, such as an electron beam sterilization device, in the open-ended body 40. Other means of sterilization could also be used, such as introducing hydrogen peroxide (H2O2) or hot water vapour through the sterilization device 60 into the open-ended bod 40. Following sterilization, a filling nozzle 70 is controlled to fill the open-ended package 40, 50 with the desired content. As a final step for manufacturing, the still open end of the semi-finished package 40,50 is folded and sealed forming a closed end 82. This results in a finished package 80.

[0012] The operating principle of the infeed device 100 is further shown in Fig. 2, although being only schematically illustrated. The infeed device 100 comprises, except for an inlet station 110, an infeed carousel 120, and a conveyor 140. Comparing with the manufacturing principle described with reference to Fig. 1, the inlet station 110 is configured to provide the blanks 30, while the infeed carousel 120 as well as the conveyor 140 are configured to receive the blanks 30 and to deliver the erected bodies 40 to the injection molding station where the plastic top 50 is added to the erected body 40.

[0013] As can be seen in Fig. 2 the blanks 30 are provided at the inlet station 110 at the left of the drawing. Each blank 30 is fed vertically downwards, i.e. in the direction of the arrow 35, to the infeed carousel 120. The infeed carousel 120, in Fig. 2 represented by a linear projection, has a number of receiving devices 130. A receiving device 130 is positioned to receive a blank 30 approaching the infeed carousel 120, and to transport the blank 30 as the infeed carousel 120 rotates. During this transportation a gate 132 of the receiving device 130 is configured to engage with the blank 30 and to erect the tubular body 40. Erection may e.g. be accomplished by means of the gate 132 urging the lateral ends 32a-b of the blank 30 to move towards each other, thus opening the blank 30 to form an erected body 40. The gate 132 may be constructed in various ways, e.g. as two opposing gripping members 132 being moveable towards each other for erecting the blank 30 or as a claw-like member contracting to force the blank 30 to erect. The gate 130 may preferably be programmed to engage with the blank 30 during the vertical movement, and to continuously reduce the vertical speed of the blank 30 during engagement with the gate 130 so that a smooth, and almost instant transition between a vertical and a horizontal movement is accomplished.

[0014] When the erected body 40 has obtained its desired tubular shape it is moved vertically upwards, i.e. opposite the direction of the arrow 35. Each receiving device 130 is for this purpose provided with a plunger 134, or other suitable means being configured to push the erected body 40 to a position where the erected body 40 engages with a carrier 142 of the conveyor 140 (shown in Fig. 3). The carrier 142 moves along the conveyor 140 at a vertical level above the receiving devices 130 of the infeed carousel 120. During some time the horizontal movement of the carrier 142 is synchronized with the horizontal movement of the receiving device 130, which means that the gate 132 will have time to release the erected body 40 while the erected body 40 is also carried by the carrier 142 of the conveyor 140. The carrier 142 may e.g. be a sleeve-like member of which the diameter is adjustable. For example, the diameter of the sleeve-like member may have a first value dimensioned to allow the erected body 40 to be arranged onto the sleeve-like member, and a second value being larger than the first value and being dimensioned to apply a radially outwardly directed force on the inside of the erected body 40, such that the erected body 40 remains onto the carrier 142 during transport by means of the conveyor 140.

[0015] Accordingly, the infeed carousel 120 acts as an intermediate transport means for converting a vertical movement of a blank 30 to a horizontal movement of an erected body 40.

[0016] Now turning to Fig. 3 an example of an infeed device 100 is shown in more detail. As can be seen, the conveyor 140 is arranged to move in a horizontal plane. It may be formed as a belt conveyor. The conveyor 140 passes a number of wheels 150, 152, of which at least one may be a driven wheel not only configured to drive the conveyor 140, but also to control the speed of the conveyor 140 as well as the position of the carriers 142 relative the infeed carousel 120. The driven wheel (not shown) may e.g. be the injection molding station.

[0017] The carriers 142 are attached to holders 144 which are clamped to the converyor 140 and which themselves are evenly distributed along the conveyor 140, such that the distance between two adjacent holders 144remains constant as the conveyor 140 is running. In contrast, the carriers 142 attached to the holders 144 are offset in relation to each other, such that on outer curves, such as the outer curve OC above the infeed carousel 120, the distance between two adjacent carriers 142 measured as the arc length between their two centers is larger than the distance between two adjacent holders 144. On inner curves, such as the inner curve IC carousel 160, the distance between adjacent carriers 142 is reduced to roughly half of the distance on the outer curve. The larger distance on the outer curve ensures that the sleeves pass the conveyor wheel and "hit" the receving devices 130. The larger distance also makes it easier to access the conveyor 140 and its elements by tools for the purpose of readjustment and service. Also, the distance between two adjacent carriers 142 is somewhere between the distance of the adjacent carriers 142 on the outer curve OC and the inner curve IC. To give some example distances for one embodiment of the present solution, the distance between two adjacent holders 144 on the straight part of the conveyor 140 may be selected to be 190 mm, while the distances between two carriers 142 on the outer curve may HM be 258 mm and 135 mm on the inner curve IC. During a part of the horizontal movement of the conveyor 140, i.e. a part of the horizontal transportation path of the conveyor 140, said part being the outer curve OC, a carrier 142 will be synchronized

and aligned with one of the receiving devices 130 of the infeed carousel 120.

[0018] The infeed carousel 120 is a rotary device having a plurality of receiving devices 130 arranged at its periphery. The infeed carousel 120 is preferably configured to rotate at a constant speed and the operation of the gates 132 as well as the plungers 134 may be controlled by cam structures 136a, 136b or other suitable means for controlling periodic movement patterns of these parts 132, 134. The receiving devices 130 are also arranged at an equal distance between them; preferably the distance between two adjacent receiving devices 130 is the same as the distance between two adjacent carriers 142 of the conveyor 140 which means that the vertical alignment between a carrier 142 and a receiving device 130 can be maintained for as long as the conveyor 140 follows the rotary motion of the infeed carousel 120.

[0019] The inlet station 110 is arranged at a position behind the transportation path of the conveyor 140, such that the tube 10 or the separated blanks 30 (not shown in Fig. 3) do not interfere with the carriers 142 distributed along the conveyor 140 but may pass immediately to a receiving device 130 arranged vertically below. The inlet station 110 is for this purpose provided with a cutting device 112, as well as drive device 114 configured to accelerate a blank 30, once cut from the tube 10, vertically downwards to the receiving device 130 of the infeed carousel 120. The drive device 114 may e.g. operate by friction.

[0020] Now turning to Fig. 4, a method 200 for converting a vertical movement of a flattened tube 10 of packaging material to a horizontal movement of an erected body 40 will be described. The method 200 is thus configured to feed a blank 30 to downstream equipment such as an injection molding station or similar.

[0021] In a first step 202 a blank 30 is provided by cutting a flattened tube 10 of packaging material. This step 202 is preferably repeated continuously such that a series of consecutive blanks 30 are provided. The method 200 then continues by moving, in step 204, the blank 30 in a vertical direction downwards to a receiving device 130 arranged on a rotating infeed carousel 120.

[0022] In a following step 206 the blank 30 is erected to a tubular body 40 while the blank 30 is transported by the motion of the receiving device 30, and in step 208 the erected body 40 is delivered to a carrier 142 of a conveyor 140 arranged vertically above the receiving device 130. From the carrier 142, the erected body 40 is ready to be transported to the downstream equipment.

[0023] While the initial movement of the blank 30 is purely vertical, the infeed carousel 120 converts this vertical motion to a horizontal motion before the blank 30 is transferred to the horizontal conveyor 140 arranged vertically above the infeed carousel 120.

[0024] For smooth transfer of the erected body 40 between the infeed carousel 120 and the conveyor 140 the speed of the conveyor 140 is preferably synchronized with the speed of the infeed carousel 120, and more precisely the angular speed of the receiving devices 130 of the infeed carousel 120.

[0025] From the description above follows that, although various embodiments of the invention have been described and shown, the invention is not restricted thereto, but may also be embodied in other ways within the scope of the subject-matter defined in the following claims.

Claims

1. An infeed device (100), comprising an inlet station (110) configured to provide a series of consecutive blanks (30), an infeed carousel (120) arranged vertically below the inlet station (110) and having a plurality of receiving devices (130) distributed along the circumference of the infeed carousel (120), each receiving device (130) being configured to receive a blank (30) from the inlet station (110) and to transform the blank (30) to an erected body (40), wherein the infeed device (100) further comprises a conveyor (140) having a plurality of carriers (150) configured to receive a respective erected body (40) from an associated receiving device (130), and wherein the conveyor (140) is arranged vertically above the infeed carousel (120), wherein the inlet station (110) is configured to cut the blanks (30) from a flattened tube (10) of packaging material.

2. The infeed device (100) according to claim 1, wherein the inlet station (110) is arranged remote from the conveyor (140).

3. The infeed device (100) according to any one of the preceding claims, wherein at least a part of the transportation path (HM) of the conveyor (140) is aligned with the rotary transportation path of the infeed carousel (120).

4. The infeed device (100) according to any one of the preceding claims, wherein each receiving device (130) is provided with a gate (132) configured to grip the blank (30).

5. The infeed device (100) according to claim 4, wherein the gate (132) is movable and further configured to urge the blank 30 to transform into an erected body (40).

6. The infeed device (100) according to claim 5, wherein the infeed carousel (120) is provided with a cam structure (136b) for controlling the position of the gate (132) during rotation of the infeed carousel (120).

7. The infeed device (100) according to any one of the preceding claims, wherein each receiving device

(130) is provided with a plunger (134) configured to move the erected body (40) of a receiving device (130) upwards to a carrier (142) of the conveyor (140).

8. The infeed device (100) according to claim 7, wherein the infeed carousel (120) is provided with a cam structure (136a) for controlling the position of the plunger (134) during rotation of the infeed carousel (120).

9. A method for feeding a blank (30) of a packaging material, the method comprising:

moving the blank (30) in a vertical direction to a receiving device (130) arranged on a rotating infeed carousel (120),
erecting the blank (30) to a tubular body (40) while the blank (30) is transported by the motion of the receiving device (130), and
delivering the erected body (40) to a carrier (142) of a conveyor (140) arranged vertically above the receiving device (130), the method further comprising providing a blank (30) by cutting a flattened tube (10) of packaging material.

10. The method according to claim 9, wherein the receiving device (130) is configured to move in a horizontal plane.

11. The method according to claim 10, wherein the conveyor (140) is configured to move in a horizontal plane.

12. The method according to any one of claim 10-11, wherein the speed of the conveyor (140) is synchronized with the speed of the receiving device (130).

13. The method according to any one of claims 10-13, further comprising providing a blank (30) by cutting a flattened tube (10) of packaging material.

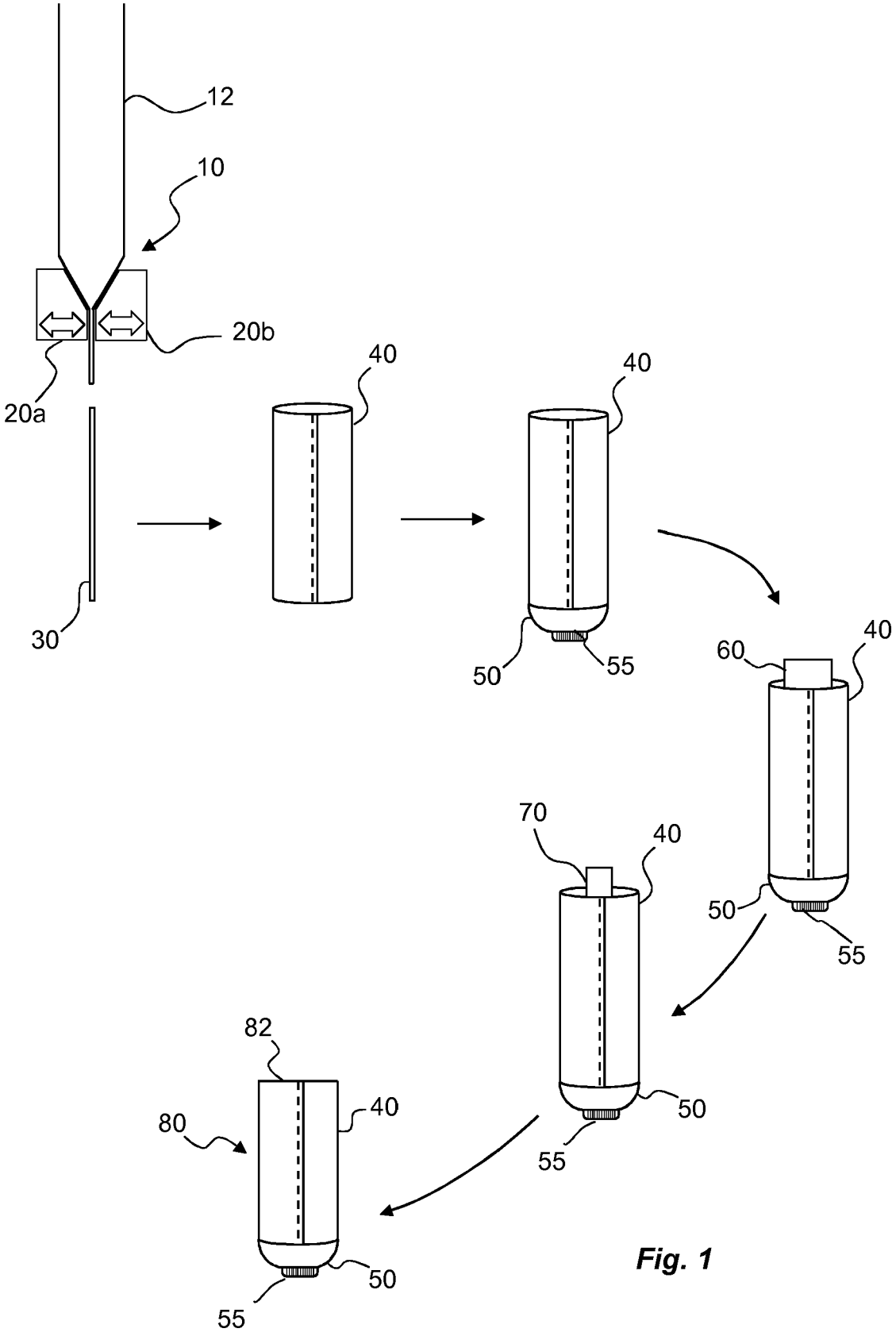

Fig. 1

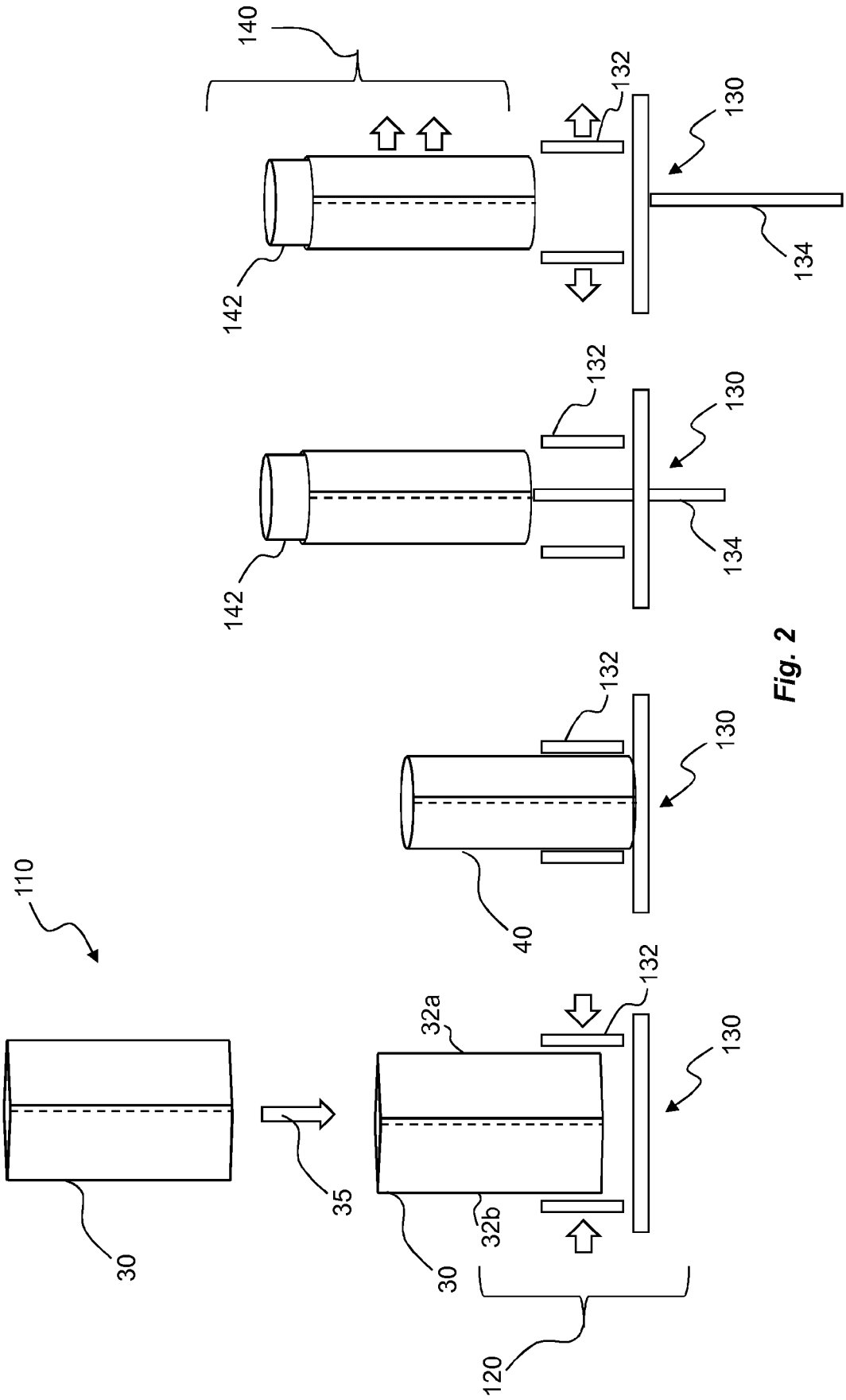
110
30
35
32a
32b
30
120
132
130
40
132
130
134
142
132
130
134
142
140

Fig. 2

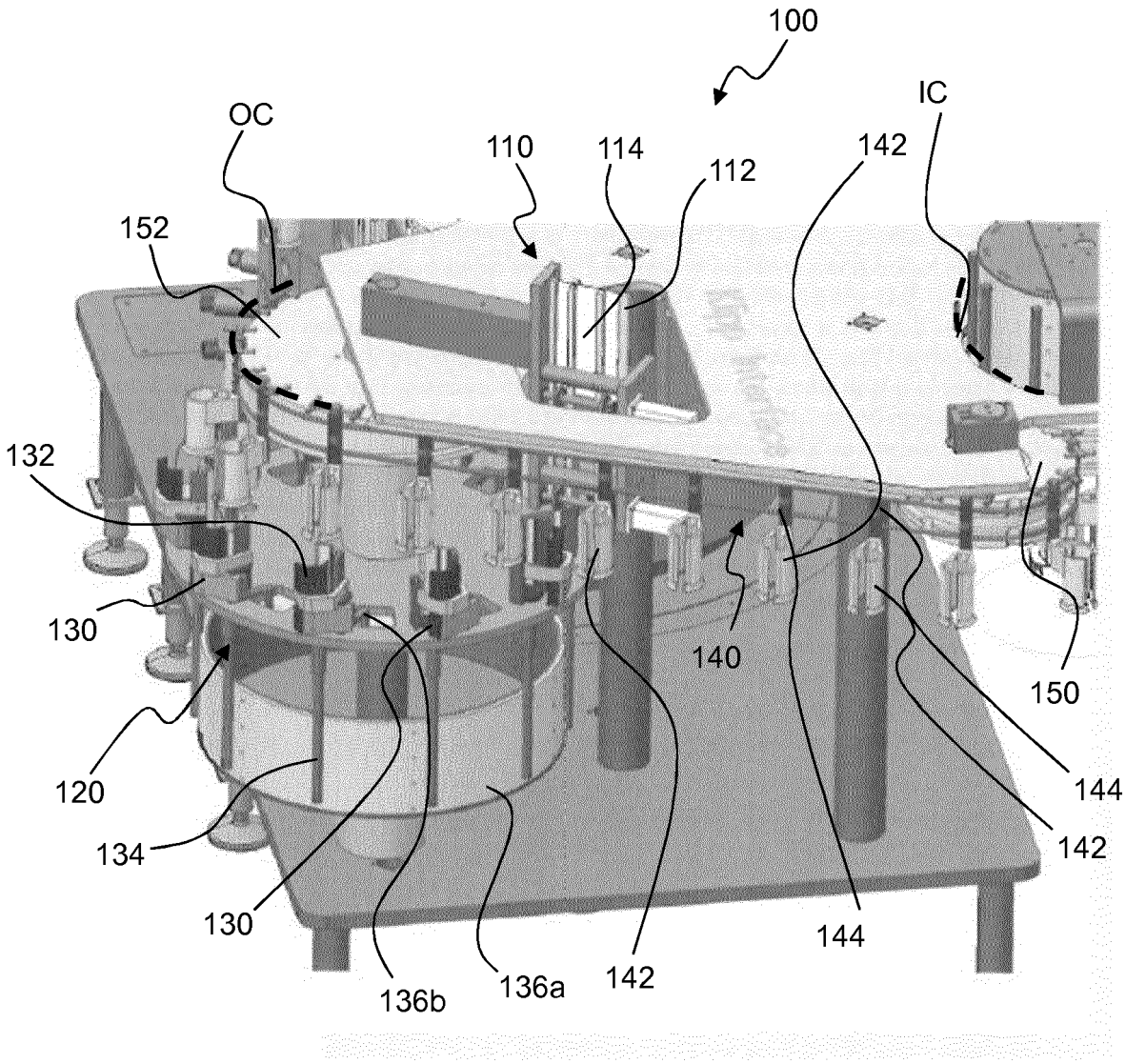
100
OC
IC
110
114
112
142
152
132
130
140
150
120
144
134
142
130
144
136b
136a
142

Fig. 3

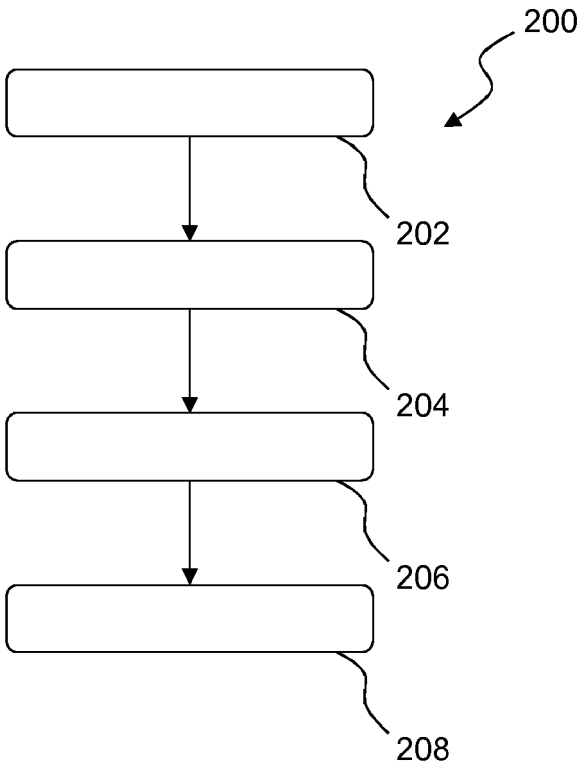

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 January 2019	Johne, Olaf

CATEGORY OF CITED DOCUMENTS

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