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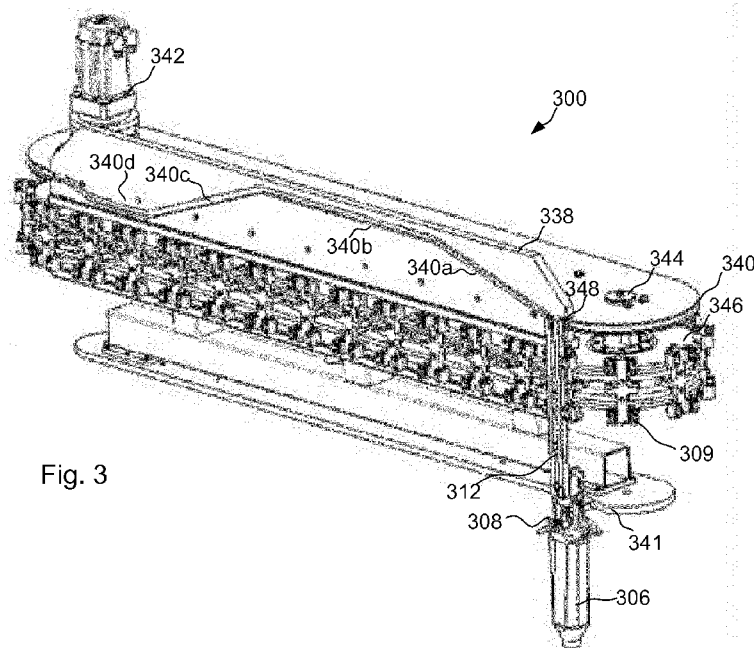


Fig. 3

(57) Abstract: A transfer arrangement (100)  
for transfer of packaging containers (106)  
from a first conveyor arrangement to a second  
conveyor arrangement, wherein the transfer ar-  
rangement comprises at least one gripper  
(108) arranged to engage the packaging con-  
tainers frictionally.

## TRANSFER ARRANGEMENT

5    Technical Field

          The present invention relates to a transfer arrangement configured to transfer packaging containers, and in particular to a transfer arrangement configured to transfer packaging containers from a first conveyor arrangement to a second conveyor arrangement. The present invention also relates to particular components of such transfer arrangement.

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Technical Background

          Within the field of packaging of foodstuff in individual packaging containers there is a need for conveyor arrangements for conveying the packaging containers through e.g. the process of filling the packaging containers. In such a process there is a need for transfer arrangements when e.g. a packaging container is transferred from a filling station to subsequent processing.

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          The technical area of product transfer is obviously relevant for various technical fields, and with the purpose of limiting the disclosure to a definable field the present disclosure will be limited to examples of applications within food processing, in particular processing pourable foodstuff.

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Summary

          On a high-level the present disclosure relates to a transfer between a first conveyor arrangement and a second arrangement by means of a separate transfer arrangement. On a more detailed level the disclosure relates to details of grippers of the transfer arrangement and control of said grippers as well as to actions performed by the grippers. Furthermore the packages transported by the first conveyor arrangement may be subjected to a first atmosphere while the packages transported by the second conveyor arrangement may be subjected to a second atmosphere. Further details are defined in the appended claims and in the detailed description of embodiments. It may be important to note that the embodiments are given as examples only, and that features present in an embodiment may be removed or combined to form a non-disclosed embodiment, within the constraints given by the scope as defined by the claims.

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          According to a first aspect the present disclosure relates to a transfer arrangement for transfer of packaging containers from a first conveyor arrangement to a second conveyor arrangement, wherein the transfer arrangement comprises at least one gripper configured to engage the packaging containers frictionally.

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The engagement may in any embodiment comprise lifting the packaging container from the first conveyer arrangement, suggestively but not limited to gripping the packaging container at one end thereof. This one end may be the end of the packaging container facing upwards in a transfer situation.

5           The frictional engagement may in one or more embodiments be performed by means of a gripper having gripper jaws arranged to clamp the packaging container.

          In one or several embodiments the gripper comprises gripper elements configured to interact with a constructional detail of the packaging container so as to secure the packaging container. This interaction may be categorized as a frictional engagement  
10           within a broad sense, yet due to a locking function provided by the interaction there may be no need for a clamping force. Furthermore, the clamping providing a frictional engagement and the effect of an interaction with a constructional detail may be combined, such that the packaging container is secured by two means.

          The gripper may in one or more embodiments may comprise two portions at least  
15           one of which being pivotally arranged, forming a gripper jaw.

          The gripper is arranged on an endless conveyor, and there is at least one gripper, though in a foreseeable application several grippers are distributed equidistantly around the circumference of the endless conveyor.

          Each gripper may be operationally connected to at least one cam curve such that  
20           the cam curve may control at least a vertical position of the gripper. In one or more embodiments the gripper is connected to the cam curve via a guide shaft, and wherein the guide shaft is slidably arranged in a carrier attached to the endless conveyor, thus allowing for a vertical motion.

          The grippers may be configured to turn the packaging containers a set angle  
25           during transfer from the first conveyor arrangement to the second conveyor arrangement. This may be effected in many ways, which will be described in the detailed description.

          The grippers may furthermore be arranged to apply a compressing force on the packaging container, in a longitudinal direction thereof, during handover to the second transport arrangement, which may simplify the downstream processing of the packaging  
30           containers.

          The grippers may be arranged to open and release by the operation of a cam follower following a cam curve on the transfer arrangement.

          In an even more elaborate embodiment the grippers are arranged to pick up packaging containers from the first conveyer arrangement at a first pitch and to release  
35           the packaging containers to the second conveyer arrangement at a second pitch, wherein the first pitch is greater than the second pitch.

### Brief Description of the Drawings

Fig. 1 is a rudimentary plan view of a transfer arrangement for transfer of packaging container from a first conveyor arrangement to a second conveyor arrangement.

Figs. 2i-v is a sequence showing the forming of packaging containers of a carton bottle type, also showing a schematic gripper.

Fig. 3 is a perspective view of a transfer arrangement.

Fig. 4a is a partial perspective view of a gripper in a gripping position.

Fig. 4b is a partial perspective view of a gripper in a releasing position.

### Detailed Description

In the drawings same or similar components have been given the same reference numeral preceded by the drawing number, i.e. the packaging container is given reference numeral 106 in Fig. 1, 206 in Fig. 2 etc.

In the plan view of Fig. 1 a number of packaging containers 106 are shown as they are transported through a series of events. The packaging containers 106 may for example be leaving a filling machine 102 in which they have been sterilized, filled and sealed. The packaging containers 106 are shown in the form of carton bottles, i.e. packaging containers comprising a carton sleeve and a plastic top, such as the packaging container Tetra Top®. It should be noted however, that for the general purposes of the present disclosure the packaging containers 106 could as well be cans, glass bottles, plastic bottles, PET bottles, container made from packaging laminate etc. In some embodiments however use may be made of the particular properties posed by carton bottles, while corresponding or alternative properties may be, or may be made, available on other packaging containers. The purpose of Fig. 1 is to assist in describing some general features rather than to disclose an embodiment of the present invention, and therefore the level of detail is very low. The conveyor arrangements 102, 104 as well as the transfer arrangement 100 comprise grippers 108, which have been given the same reference numeral in Fig. 1. When the grippers 108 are described in more detail it will be the grippers of the transfer arrangement 100 which are the relevant ones, and the first and second conveyor arrangement 102 and 104 respectively may be provided with carriers holding the packaging containers rather than actual grippers 108, which is a less important detail. In any case, though not illustrated the grippers 108 of the transfer arrangement are distributed evenly and in register with the carriers or grippers of both the first conveyor arrangement 102 and the second conveyor arrangement 104 in an operational setup.

In the illustrated view the first conveyor arrangement 102 forwards the packaging containers through the various stations of a packaging machine (or filling machine) in a continuous manner. In other embodiments the conveyor arrangement 102 may use intermittent motion, i.e. that the packaging containers 106 are indexed forward stepwise rather than being in continuous movement. Existing filling machines are generally based on one of these two concepts. The actual concept chosen may affect the design of the stations of the filling machine, typically including a sterilization station, a venting station, a filling station, and a sealing station. In the area following the sterilization station to the sealing station there is, in the case of filling of perishable products such as foodstuff, an aseptic atmosphere. All potentially hazardous germs and spores are incapacitated in the sterilization step and by ensuring that there is no reinfection before the packaging container is sealed the asepticity of the product is ensured. "Asepticity" may in other situations be replaced by an "adequate level of sterility ensuring that the projected shelflife is assured". The phrases are not interchangeable in a literal change, but for the purposes of the present disclosure it may be relevant to be aware of that there are different levels of sterility and/or asepticity, and though specific features in relation to the present invention may be directed towards maintaining e.g. asepticity the disclosure on the whole should not be limited in this aspect.

The present disclosure does not discriminate the type of transport arrangement used for the first conveyor arrangement 102 yet in for the embodiment showed in Fig. 1 each packaging container is carried by a separate carrier, and each carrier is attached to a moving belt, chain or wire, or several belts/chains/wires (not shown in Fig. 1). The same first conveyor arrangement may be used to transport the packaging container through the entire filling machine, from an inlet end to an outlet end where the packaging container are handed over from the first conveyor arrangement to the transfer arrangement. In other options there are package handovers inside the filling machine, either temporal – e.g. the packaging containers leave the first conveyor arrangement for a while during its travel through the filling machine and is then returned to the first transport arrangement – or "permanent" handovers from an auxiliary conveyor arrangement to the first conveyor arrangement 102 at some point inside the packaging machine. These two alternatives may of course be combined.

In a handover section the packages are released, if at all necessary, from the carriers or gripper of the first conveyor arrangement 102 and secured by the grippers 108 of the transfer arrangement 100.

Without yet addressing details of the transfer arrangement 100 its purpose is to transfer the packaging containers 106 from the first conveyor arrangement 102 to the second conveyor arrangement 104. This may be performed while accomplishing or maintaining certain operational conditions. One condition could be that the protected

atmosphere of the filling machine should not be affected. The transport arrangement of the second conveyor arrangement may or may not be of similar design as for the first conveyor arrangement, yet it by definition forms part of a downstream processing equipment, such as a folding device, a labelling machine, etc. If the packaging container 106 has been sealed there may be no strict requirement in terms of asepticity or sterility, though as a general rule any part of a machine handling packaging containers for commercial use may benefit of having a high hygienic standard. In the illustrated embodiment the second transport arrangement is related to a final folder, a device where the sealed end of each packaging containers is folded such as to form a bottom of the resulting packaging container.

Before describing some more details of a particular embodiment of the present invention reference is made to Fig. 2 where a typical packaging container 206 of a carton-bottle type is shown as a sequence during the forming thereof. To the left 2i the rudimentary shape is shown, illustrating the condition of the carton bottle 206 ready for filling. The carton bottle 206 has a top 220 formed from plastic or another mouldable material. In other embodiments the plastic top 220 may be replaced by a folded packaging laminate top formed in one piece with the second constructional detail; the sleeve 222. The sleeve 222 is formed as a hollow cylinder formed by a packaging laminate. The cross section of the sleeve 222 conforms to the cross section of the top 220 in the area where the two are fused together. A closure arrangement 224 extends from the top 222 and may be formed in one piece therewith. The end of the sleeve 222 remote to the top 224, i.e. the bottom end, is open to begin with, and the packaging container 206 will be filled from the bottom end. After being filled the open end of the sleeve 222 is sealed. The seal may be effected by clamping the open end between two sealing jaws (not shown) and providing energy such that interacting surfaces of the packaging laminate fuse together. The sealing process will shape the packaging container as shown in 2ii. In a sideview (not shown) the front the sleeve will taper off towards the sealed end, where a seal fin 226 is formed. In this sealed state the packaging container may leave a filling machine without compromising the hygienic level of the product contained in the packaging container, still a commercial packaging container is not necessarily formed yet. The folding of a packaging container such as the one shown in Fig. 2 is described in other documents, e.g. WO2004054790, yet for the sake of completeness the fin formed in the sealing step will be pressed down and two primary flaps will be formed, as shown in Fig. 2iii. These primary flaps may then be folded further and finally attached to form the bottom of the packaging container, as indicated in Figs. 2iv and 2v.

Fig. 2iii also indicates a first embodiment of a gripper 208 that could be used within the scope of the present invention. The gripper comprises a clamping portion 230 engaging with a portion of the fin 226, and two gripper elements 232 engaging with

packaging container below the primary flaps 228. The gripper 208 takes advantage of the structural rigidity of the packaging laminate and how the primary flaps 228 will ensure a secure hold. In some embodiments it will may sufficient that the clamping portion 230 merely localises the fin 226, without applying any clamping force. Still, the application  
5 of a clamping force may be preferred in some applications.

Returning to Fig. 1 packaging containers 106 of the type illustrated in Fig. 2 may be gripped at one end thereof, using the grippers 208 described above or below. In the illustrated embodiment the packaging containers 106/206 are sealed when they are gripped, i.e. before they are gripped, and in the first portion of the transfer process the  
10 packaging containers leave what is the aseptic region, or if not aseptic at least a region having controlled atmosphere. The transfer arrangement 100 comprises a number of grippers 108/208 arranged on an endless belt 110 (a chain, a wire, a belt, or similar), and each gripper 108/208 is configured to grip and secure one or more packages 106/206. In one or more embodiment the gripper secures the packaging container by means of a  
15 frictional force, e.g. the gripper clamps the packaging container at the one end. In the present embodiment, however, the grip is secured (or complemented) by gripper elements engaging with a structural element of the packaging container. In the case of a bottle made from plastic or glass the structural element may be a portion of a closure, a neck ring or any other suitable structural element which may be used for grip-enhancing  
20 purposes. For the carton bottles of the present example it is preferred to use a portion of the sealed carton bottle, namely the fin portion or one or more flaps formed therefrom.

In Fig. 3 a more detailed perspective view of a transfer arrangement 300 is disclosed. In the illustrated embodiment the design is very simplistic and function are clearly separated. There is an inherent benefit in making a simplistic mechanical solution  
25 in a machine being operated at the projected rates of 20-30 000 packages per hour. Still, the present disclosure does not rule out more elaborate solutions, such as servo motors, independent cart technology etc. Starting to the upper left in Fig. 3 there is shown an electric drive motor 342 providing the drive for the transfer arrangement. The drive motor 342 is arranged at one end of a support plate, and a rotational shaft 344 with a  
30 guide wheel 346 is arranged at the other end. The transfer arrangement or rather the carriers 309 thereof is/are arranged to follow a race-track shaped path defined by the guide wheel 346 and a corresponding drive wheel connected to the drive motor 342 via a drive shaft (not shown). On the view shown the carriers 309 will travel from right to left. Only one gripper 310 is shown, yet in practice there is one gripper 310 for each carrier  
35 309, and the carrier secures the gripper 308, or a guide shaft 312 thereof slidably. A first cam curve 340 is arranged in a cam plate 338 extending in a vertical orientation. From the shape of the cam curve it is possible to see that a cam follower 348 arranged in one end of the shaft 312 of the gripper 310 will guide the gripper 310 to enter at a first level,

after which it will be raised (segment 340a) (when having gripped the packaging containers). Following the raise the gripper may remain at a constant level (segment 340b) before being lowered (340c) to release the packaging containers 306, the grip and release function will be described. It is also noticeable that for the present embodiment the gripper will be lowered a bit further, relatively speaking, such as to compress the bottom of the packaging container 306 and to initiate a process of final folding of the bottom end of the packaging container. Actually the entire packaging container will experience a compressing force, yet since the bottom end of the packaging container comprises the crease lines, i.e. the bottom folding pattern it is the bottom end that will be affected most. Allowing for the carrier and gripper to perform this operation results in one less operation that have to be incorporated in a final folder arrangement. The operation as such is readily achieved by merely reducing the distance between the gripper holding the packaging container and the carrier arranged to receive the packaging container during handover.

As the packaging containers arrive at the second transport arrangement the grippers open and release the packaging containers. Again this could be realized by cam followers of the gripper jaws entering a cam curve (segment 340c), essentially a solution being a mirror image of the pickup. In another embodiment the grippers are arranged to perform further operations vis-à-vis the packaging containers prior to being disengaged. An immediate example is that the grippers may be arranged to be lowered a bit further in relation to a first end of the packaging container (segment 340d), as mentioned above. This will cause a deformation of the packaging containers, at one end thereof, which is a desired step in a final folding of the packaging container. In this way the gripper may be arranged to perform the function of a prefolding plunge, such as the one disclosed in WO2011138252 by the present applicant. This embodiment of the feature, the prefolding, is limited to packaging containers of the carton bottle type, or rather packaging containers having a deformable portion. In the case of plastic bottles or glass bottles this further operation could instead consist in a rotative action, a turning action etc.

A gripper 408 is shown in some detail in the views of Fig. 4a and Fig. 4b. It comprises two opposing jaws 430a and 430b, at least one jaw 430a being pivotally arranged. By controlling the opposing jaws it will be possible to open or close the jaws in a suitable way. Again, in a simplistic approach the engagement of the jaws may be accomplished by a cam/cam curve interaction, i.e. that a cam follower on one or both of the jaws will follow a cam curve in an overhead structure such that opening and closing is performed at a suitable time. An example is illustrated by a cam follower having a shaft 435 with a linkage 437 connecting it to one of the jaws. In the view of Fig. 4 the jaws are closed and in Fig. 5 the jaws are opened, and the function of the cam follower



434 is readily understood. The jaws 430a and 430b are biased towards a closing direction, yet in other embodiments they may be biased towards an opening direction or not being biased at all. More elaborate means for controlling the grippers should not be excluded, yet for a high-performance machine this mechanical approach has proven to be a reliable solution. The actual gripper has first gripper area which is configured to grip the packaging container by the fin area, referred to as the jaws above, adapted to engage the fin area in a frictional hold. Furthermore the gripper has two gripper elements 432 extending from at least one of the jaws. In the present embodiment the gripper elements comprise two rods or shafts 432 extending at a right angle from each of the sealing jaw.

These elements 432 are configured to be located below the extending fin portions 428 of the closed end of the packaging container 406. The structural stability provided by the fin 426 and how it may be positionally locked by the gripper area will maintain the shape of the end of the packaging container end 406, and consequently the weight of the packaging container will be carried by the gripper elements 432 in their engagement with the fin portion. Part of the weight may be distributed to the first gripper area, at least in some embodiments. In other embodiments the first gripper area may merely provide a support so as to prevent the sealed fin from collapsing, which would suffice in order to allow for the gripper elements to carry the weight of the packaging container. An effect of the latter embodiment is that the holding of the packaging container, which is filled at the time of transfer, may be very gentle. The shape of the gripper elements may be such that the load is distributed over a larger area of the packaging container while the first gripper area basically does not engage the packaging container at all, or at least only to a minimum degree. The gripper of Fig. 4a and 4b may also comprise a third cam follower 436 arranged to effect a rotation of the gripper, more specifically a rotation of at least a portion comprising the jaws 90 degrees. Any other angle of rotation may be realized. In an embodiment where the packaging containers of Fig. 2 are transported a rotation of 90 degrees would enable a reduction of the distance between adjacent containers, due to the slightly elongate cross sectional shape. A shorter distance (a lower pitch) between packaging containers may result in slower machine speeds for the same output, which may be beneficial from a cost/performance perspective. For this reason the present disclosure also relates to a transfer arrangement configured to collect packaging containers at a first pitch, and releases the packaging containers at a second pitch, and that preferably the second pitch is smaller than the first pitch, i.e. the distance between adjacent packaging containers is reduced.

In the disclosed embodiment of Fig. 3 each gripper is configured to lift the packaging container after a grip has been secured. The lift may be effected to dislocate the packaging container from its carrier, or for any other reason. Again, there may be

more or less elaborate ways of accomplishing the lift, some of which are described in the present specification.

The carrier as shown in Fig. 3 and 4a and 4b comprises a vertical shaft 312, 412 connecting the gripper with the first cam curve 340, and since the vertical shaft 312, 412 is slidably arranged in the carrier 309 the cam curve may be effectively used to control the vertical position of the gripper.

Concerning the grip and release function and again referring to Fig. 3 there is a second cam curve 341 arranged in a horizontal plane. The cam curve interacts with a second cam follower and relative motion between the two will control the grip and release function in a direct way.

For convenience during manufacture of the illustrated packaging container there is also a third cam curve (not shown) and cam follower coupled to the gripper. The purpose of this particular setup is to rotate the packaging container 90 degrees (around a longitudinal axis thereof) so as to obtain an optimal positioning as it is released into the second transport arrangement for further processing. For this purpose a portion of the gripper, said portion comprising the jaws, is configured to rotate in relation to the remainder of the gripper (or relative to the carrier as such). Actually, this third cam curve may be reduced to a short block forcing the gripper to rotate in one direction or the other. For other packaging containers other or further manoeuvres may be realized.

The control system for the grippers may be very complex, using servos, independently controllable carriers, etc, yet still the present solution offers a simplicity which is sought for in an application with high demands on durability and performance. The present solution for the gripper may be completely mechanical, basically only being controlled by cam curves. Furthermore the grippers utilises constructional properties of the packaging container to ensure a secure and gentle grip. Furthermore, the versatility of the gripper solution may be used to perform further operations on the packaging container, a few of which have been mentioned.

## CLAIMS

1. A transfer arrangement for transfer of packaging containers from a first  
5 conveyor arrangement to a second conveyor arrangement, wherein the transfer  
arrangement comprises at least one gripper configured to engage the packaging  
containers frictionally and wherein the gripper comprises gripper elements configured to  
interact with a constructional detail of the packaging container so as to secure the  
packaging container .  
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2. The transfer arrangement of claim 1, wherein the gripper comprises gripper  
jaws arranged to clamp a portion of the packaging container by engaging it frictionally.
3. The transfer arrangement of any preceding claim, wherein the gripper  
15 comprises two portions at least one of which being pivotally arranged, forming a gripper  
jaw.
4. The transfer arrangement of any preceding claim, wherein the at least one  
gripper is arranged on an endless conveyor.  
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5. The transfer arrangement of any preceding claim, wherein the gripper is  
operationally connected to at least one cam curve such that the cam curve may control at  
least a vertical position of the gripper.
- 25 6. The transfer arrangement of claim 5 and 6, wherein the gripper is connected to  
the cam curve via a guide shaft, and wherein the guide shaft is slidably arranged in a  
carrier attached to the endless conveyor.
7. The transfer arrangement of any preceding claim, wherein grippers are  
30 configured turn the packaging containers a set angle during transfer from the first  
conveyor arrangement to the second conveyor arrangement.
8. The transfer arrangement of any preceding claim, wherein the grippers are  
arranged to apply a compressing force on the packaging container, in a longitudinal  
35 direction thereof, during handover to the second transport arrangement.

9. The transfer arrangement of any preceding claim, wherein the gripper is arranged to open and release by the operation of a cam follower following a cam curve on the transfer arrangement.

- 5            10. The transfer arrangement of any preceding claim, wherein the grippers are arranged to pick up packaging containers from the first conveyer arrangement at a first pitch and to release the packaging containers to the second conveyer arrangement at a second pitch, wherein the first pitch is greater than the second pitch.

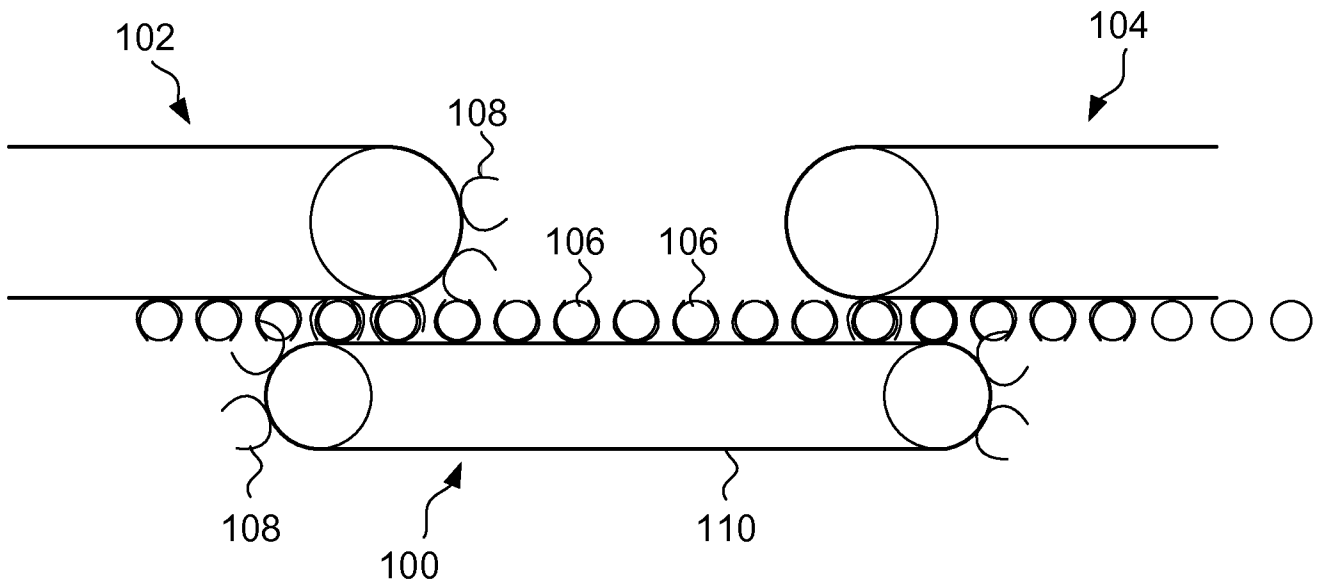


Fig. 1

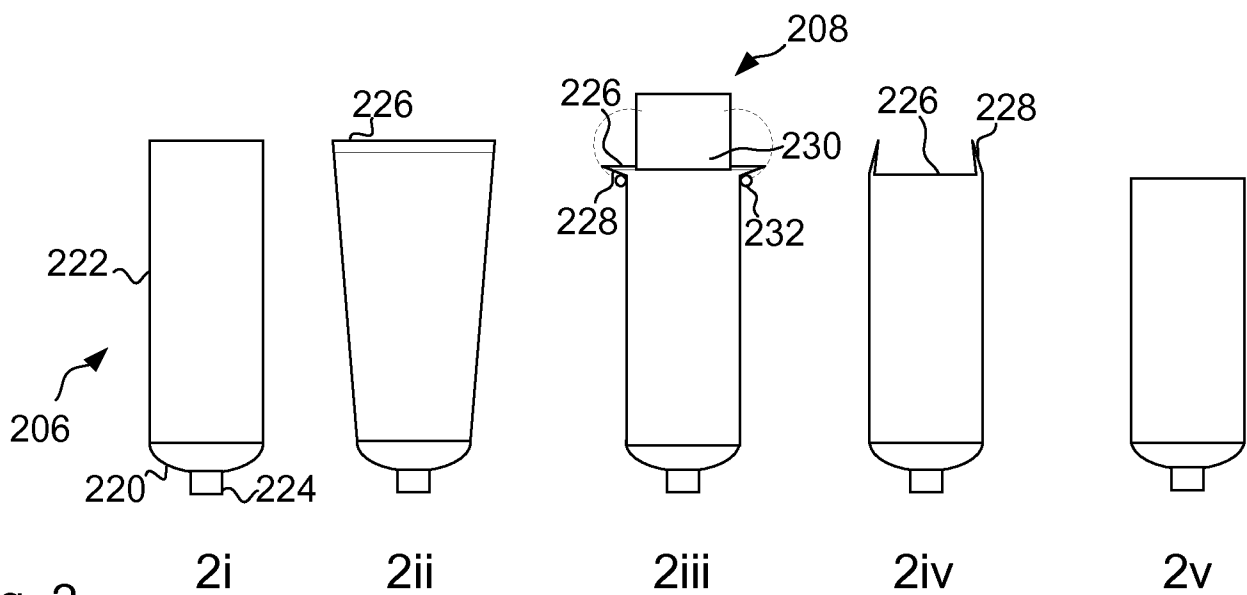


Fig. 2

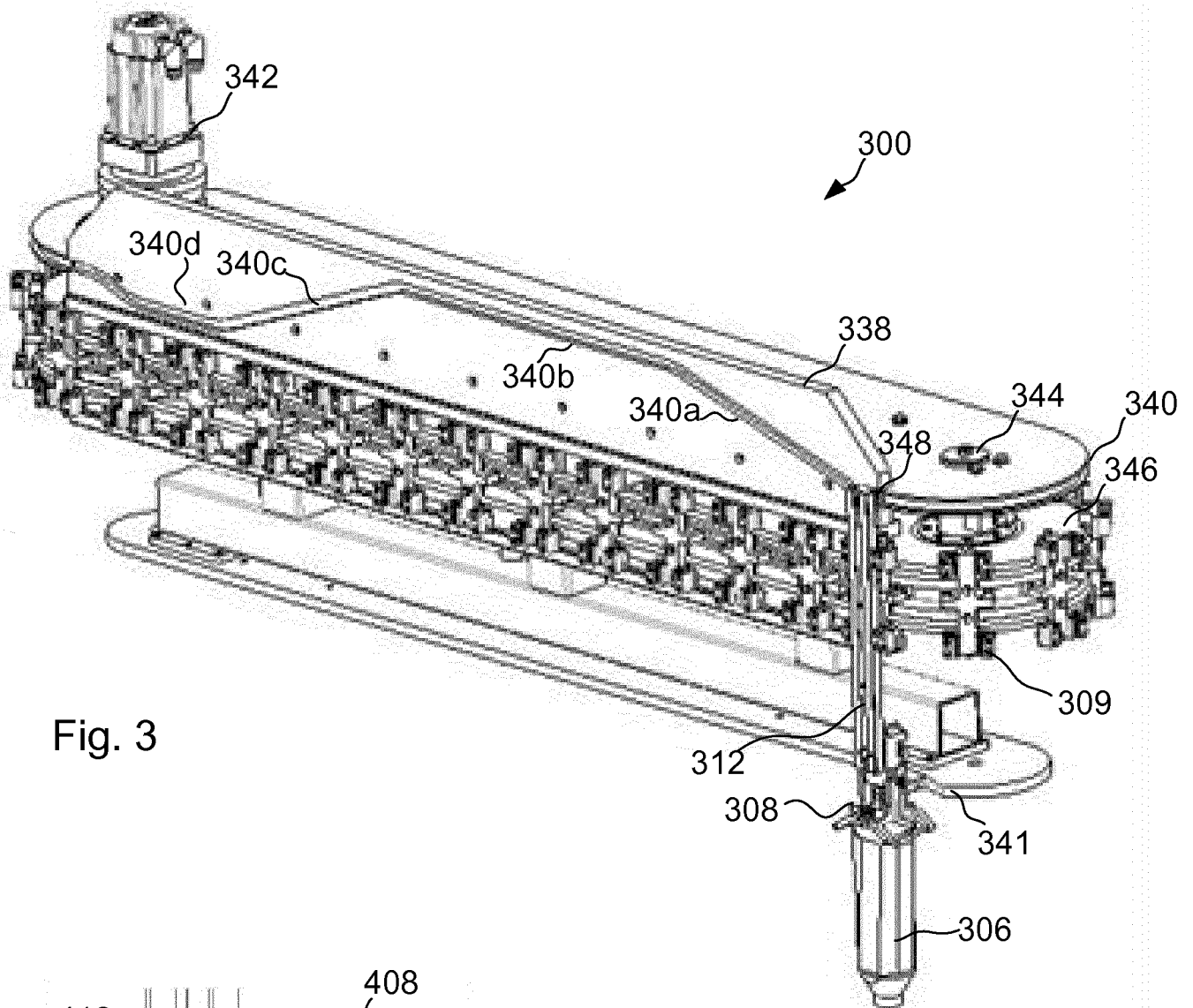


Fig. 3

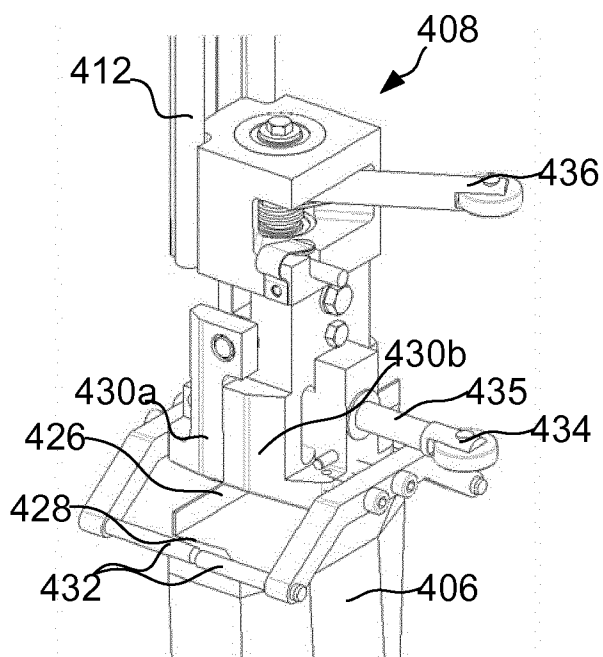


Fig. 4a

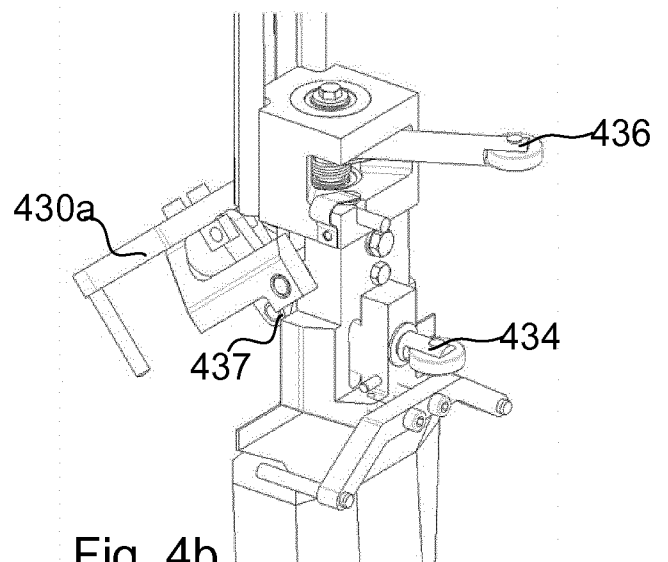


Fig. 4b

## INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER  
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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/142719 A1 (FERAG AG [CH]; MAEDER CARL CONRAD [CH]) 26 October 2012 (2012-10-26)	1-4,8,9
Y	the whole document	10
X	US 2014/008927 A1 (ROUSSEAU NICOLAS [FR] ET AL) 9 January 2014 (2014-01-09) the whole document	1-4,8,9
A	EP 2 386 512 A1 (FERAG AG [CH]) 16 November 2011 (2011-11-16) figures 1-3	9
X	DE 20 2012 004015 U1 (ARCOR GMBH [DE]) 13 August 2012 (2012-08-13) the whole document	1,4-8
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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## INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 261 520 A (DUKE B MICHAEL [US]) 16 November 1993 (1993-11-16) abstract; figure 1 -----	10



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/062953

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