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(54) A FILLING ARRANGEMENT, A CASSETTE, A SYSTEM AND A METHOD FOR FILLING FOOD PRODUCT INTO A NUMBER OF PACKAGES

(57) A filling arrangement (200) comprising a filling arrangement frame (202); a number of filling pipes (204) attached to the frame (202) and arranged to be moved into a number of packages (300), respectively, during a filling procedure; wherein the number of filling pipes () are arranged to feed a food product (FP) into the packages (300), respectively; one or more guiding rods (206) attached to the frame (202) and arranged to interact with one or more guiding holes (102) of a cassette (100) holding the number of packages (300) during the filling procedure such that the filling pipes (204) are aligned with the packages (300) before the filling pipes (204) are moved into the packages (300).

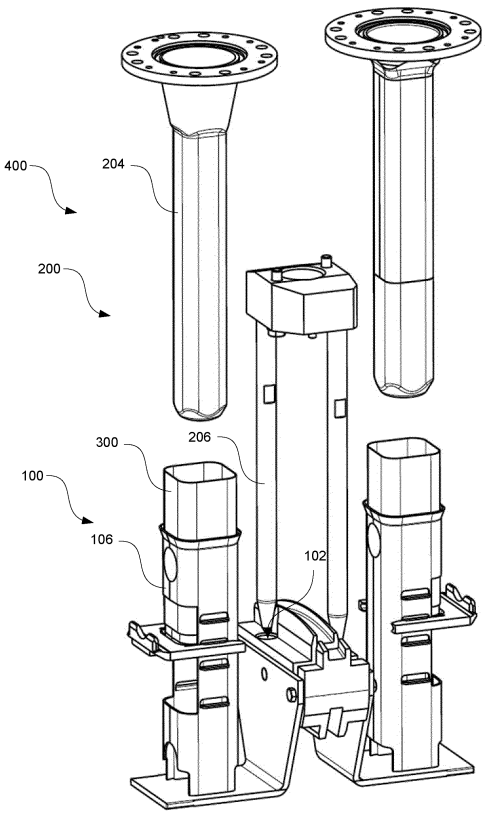

Fig. 5A

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Description

Technical Field

[0001] The invention relates to packaging technology. More particularly, it is related to a filling arrangement arranged to interact with a cassette holding a number packages, the cassette, a system comprising the filling arrangement and the cassette as well as a method for filling food product into the number of packages.

Background Art

[0002] Today, it is well known to use filling arrangements for filling food product into one or several packages. The filling arrangements may come in different forms. For instance in a tin can packaging line, the filling arrangement, sometimes referred to as a filling station or filler, may be a stand-alone piece of equipment. In this example, an electromagnet may be used to lift the tin can such that this held against a filling device during filling. By using this approach, a risk of having food product, or any other product, spilled outside the package during filling can be reduced.

[0003] As an alternative to having the package held close to the filling device by using the electromagnet as in the example above, it is known to have a filling nozzle fed down into the package and lift the filling nozzle upwards during the filling of the package to reduce spillage and foaming, and as a consequence reducing time needed for filling. This approach may be used on a package by package basis or it may be used, as is common in PET bottling lines, to have a filling carousel arranged to handle several packages at the same time.

[0004] Even though there are different types of filling arrangements used today that can provide for that the food product is filled efficiently and with no or limited spillage, there is a need to improve the filling arrangements such that even more reliably filling can be provided. This holds true in particular for filling machines, also sometimes referred to as packaging machines or systems, using individual cassettes for holding a number of packages. By using individual cassettes, that is devices comprising package holders that are not fixedly linked to preceding or subsequent devices in a queue of such devices in the filling machine, it is made possible to have a flexible system that can be easily adapted. For instance, by having such set-up, changing from one type of package to another can be made more easily than in case, for instance, a chain-based system with specific slots acting as package holders is being used.

[0005] An effect of using individual cassettes is however that during the filling procedure, the package, and thus also the package holder, is to be aligned with a filling pipe of the filling arrangement to assure that the filling pipe can be fed into the package without scratching or in any other way damaging the package. Today, this alignment can be achieved by having the cassettes arranged in a queue upstream the filling arrangement and having the cassettes provided with spacer elements such that a distance between two consecutive packages can be controlled. Even though this approach is working, there is a need to even further reduce the risks involved during the filling procedure.

Summary

[0006] It is an object of the invention to at least partly overcome one or more of the above-identified limitations of the prior art. In particular, it is an object to achieve improved filling by being able to more accurately align packages with filling pipes.

[0007] Generally, it has been realized that by having cassettes, arranged to hold the packages, provided with guiding holes and the filling arrangement provided with guiding rods, horizontal misalignments can be compensated for when the guiding rods are inserted into the guiding holes.

[0008] According to a first aspect it is provided a filling arrangement comprising a filling arrangement frame; a number of filling pipes attached to the frame and arranged to be moved into a number of packages, respectively, during a filling procedure; wherein the number of filling pipes are arranged to feed a food product into the packages, respectively; one or more guiding rods attached to the frame and arranged to interact with one or more guiding holes of a cassette holding the number of packages during the filling procedure such that the filling pipes are aligned with the packages before the filling pipes are moved into the packages.

[0009] By having the filling arrangement arranged in this manner, the guiding rods can provide for that the packages, held in an interrelated cassette, are adjusted horizontally before the filling pipes enter into the packages. An effect of having improved alignment is that tolerances can be lowered. For instance, the filling pipes can be arranged to cover a larger cross-sectional area of the packages than is possible in case there is less precise alignment between the cassette and the filling arrangement. An effect of this, in turn, is that more efficient filling can be achieved. Another advantage is that this approach is cost-efficient. By compensating for any misalignments that may arise, it is made possible to achieve precise alignment even though components being used in the system do not fully meet the highest requirements. In a similar way, by using the approach suggested herein, any misalignments caused due to wear of components may be compensated for. As an effect, the service need may be held lower compared to other systems in which no or less efficient misalignment adjustment is being made.

[0010] The number of filling pipes may be arranged to be moved into the number of packages along a vertical axis, wherein the number of filling pipes may be placed along a first horizontal axis, and wherein the one or more guiding rods comprise two guiding rods that are spaced apart along the first horizontal axis as well as along a

second horizontal axis, wherein the second horizontal axis is perpendicular to the first horizontal axis.

[0011] By having two guiding holes interacting with two guiding rods as specified above, it is made possible use guiding rods with circular cross-sections and guiding holes with circular cross-sections and compensating for any horizontal misalignments.

[0012] Lower ends of the one or more guiding rods may be tapered.

[0013] By having these tapered it is made possible to adjust the cassette horizontally as the guiding rods are inserted into the guiding holes. Put differently, by having each of the guiding rods provided with a width increasing as a function of a distance from a tip of the guiding rod, it is made possible to compensate for any horizontal misalignments as long as the tips of the guiding rods are placed within the guiding holes when the guiding rods are inserted into the guiding holes.

[0014] The one or more guiding rods may have at least in part circular cross-sections.

[0015] By having circular cross-sections, the rods can provide for that the cassette is rotationally adjusted after the guiding rods have been inserted into the guiding holes. For instance, by having both the guiding rods as well as the guiding holes provided with circular cross-sections, it is made possible to rotate the cassette with respect to the filling arrangement with the guiding rods inserted into the guiding holes. If using multiple guiding rods, these may have the same length or different length. In the latter case, a longer guiding rod will be inserted into a mating guiding hole before a shorter guiding rod is inserted into its mating guiding hole.

[0016] Having the guiding rods at least in part provided with circular cross-section should be understood to encompass both that a part of the rods in a longitudinal direction may be provided with circular cross-section, e.g. a lower part of the guiding rods may be provided with the circular cross-section. In addition, having the guiding rods at least in part provided with circular cross-section is also to be understood as that at least one segment along a circumference line has a circular cross-section. Put differently, the guiding rods can be embodied such that part of the circumference line, also referred to as a segment, is in contact with the guiding holes, while other parts along the circumference line of the guiding rods are not in contact with the guiding holes. As an effect of not being in contact, a space is provided between the guiding rods and the guiding holes. An advantage of having such space is that food product and/or cleaning solution may to a lesser degree hinder the guiding rods from being inserted into the guiding holes.

[0017] The one or more guiding rods may have at least in part polygonal cross-sections.

[0018] By having polygonal cross-sections, the guiding rods and the guiding holes can provide for that the cassette can be rotationally locked with respect to the filling arrangement. In this way, only one guiding rod and one guiding hole may be sufficient. It should be noted that the guiding rods may have both a circular cross-section as well as a polygonal cross-section. For instance, by having a lower portion of the guiding rod provided with a circular cross-section and an upper portion provided with a polygonal cross-section and having a continuous transition between the two portions, it is made possible to in a first phase allow for rotational movement and then in a second phase rotationally lock the cassette in position.

[0019] The number of filling pipes may have substantially rectangular cross-sections.

[0020] Since most carton-based package are folded, rectangular cross-sections are commonly used cross-sections for such packages. To achieve a controlled and efficient filling process, the filling pipes are made to meet the cross-sections of the packages. An effect of this more precise fit between the filling pipe and the package is that aligning the filling arrangement with the cassette becomes particular relevant to avoid that the packages are scraped or in any other way damaged due to spatial misalignment.

[0021] Each of the number of filling pipes may be provided with an opening in a lower end, and the filling arrangement may further comprise

- a number of stems, each provided with a disc-shaped member, wherein the number of stems may be placed inside the number of filling pipes, respectively,
- wherein each of the filling pipes may be arranged to be in a closed state in which the disc-shaped member is pushed downwards such that the food product is hindered from passing the opening, or in an opened state in which the disc-shaped member is placed at a distance from the opening such that the food product is allowed to pass the opening.

[0022] According to a second aspect it is provided a cassette comprising

- a cassette frame,
- a number of package holders attached to the cassette frame and arranged to hold a number of packages, respectively,
- wherein the cassette frame may be provided with one or more guiding holes arranged to interact with one or more guiding rods of a filling arrangement during a filling procedure such that the packages in the package holders are aligned with filling pipes of the filing arrangement before the filling pipes are moved into the packages.

[0023] Generally, the cassette described above has the same advantages as the filling arrangement of the first aspect since the two are interrelated and together can provide for that there is horizontal alignment between the filling arrangement and the cassette before the filling pipes are introduced into the packages. In line with the

advantages described above, this in turn provides for that the risk of scratching or in other ways damaging the packages with the filling pipes can be reduced. In addition, due to that the spatial control is improved, it is also possible to control the filling process on a more detail level. For instance, a cross-sectional area of the filling pipe can be made increased such that in turn a larger part of a cross-sectional area of the package is occupied by the filling pipe. Having less space between the filling pipe and the package may in turn reduce foaming, splashing etc.

[0024] An advantage with having the cassette frame and the number of package holders is that the cassette may easily be adapted to handle other package formats. For instance, by having the package holders attached by screws to the cassette frame, these package holders can easily be replaced by other package holders in case another type of package having a different cross-sectional area is to be produced.

[0025] The number of filling pipes may be arranged to be moved into the number of packages along a vertical axis, wherein the number of package holders may be placed along a first horizontal axis, and wherein the one or more guiding holes may comprise two guiding holes that are spaced apart along the first horizontal axis as well as along a second horizontal axis, wherein the second horizontal axis may be perpendicular to the first horizontal axis.

[0026] Having the guiding holes provided in this way provides for that horizontal misalignments can be compensated for efficiently. In addition, by having the guiding holes provided in this way, it is made possible to make the cassette frame more compact compared to having the guiding holes only spaced apart in the first horizontal axis. Having the guiding holes only spaced apart in the first horizontal axis may namely reduce a mechanical strength of the cassette frame unless this is compensated for by adding more material.

[0027] The one or more guiding holes may have at least in part circular cross-sections.

[0028] As described above with respect to the first aspect, having round holes may provide for that rotational adjustments is made possible.

[0029] As described above, by having the guiding holes provided with circular cross-sections and the guiding rods only partly provided with circular cross-sections, for each rod and hole pair, a longitudinal space may be provided between the guiding hole and the guiding rod. This has the benefit that food product, cleaning solution, etc that may hinder an insertion of the rod into the hole if a snug fit between the two is provided, can be pushed into this longitudinal space as the rod is inserted into the longitudinal space, and from this space out from the guiding hole.

[0030] To achieve the effect above, it is not necessary that the guiding rod is in part provided with the circular cross-section, but any form of the cross-section can do as long as a cross-sectional diameter at least along one horizontal line of the rod matches a cross-sectional diameter of the hole. For instance, an X-shaped cross-section of the rod may suffice.

[0031] The number of package holders may have at least in part rectangular cross-sections.

[0032] An advantage with having the package holders arranged in this way is that packages with rectangular cross-sections can be held efficiently in these holders. Using such packages comes with logistic benefit, e.g. a pallet can be loaded more efficiently if having packages with rectangular cross-sections compared to packages having circular cross-sections. Having the package holders adapted to keep such packages in place in combination with having the filling pipes arranged with rectangular cross-sections provides for that these packages can be filled more efficiently.

[0033] The number of package holders may be arranged to hold packages with plastic top sections, and wherein the packages are held with the plastic top sections placed downwards in the package holders and open bottom ends facing upwards.

[0034] According to a third aspect it is provided a system comprising a filling arrangement according to the first aspect and a plurality of cassettes according to the second aspect, said system further comprising

a conveyor arrangement arranged to transport the plurality of cassettes along a second horizontal axis, wherein the cassettes are resting upon the conveyor arrangement.

[0035] The system may further comprise

a lifting arrangement comprising a first and a second lifting member provided on either side of the conveyor arrangement, wherein the first and second lifting member comprise a first and second slit, respectively, facing the conveyor arrangement and extending along the second horizontal axis, such that the cassette can be slid into the first and second slit, wherein the lifting arrangement may be configured

to lift the cassette along the vertical axis once the cassette frame is slid into the first and second slit, and

to allow the cassette to move within the first and second slit once the one or more guiding rods of the lifting arrangement are inserted into the one or more guiding holes of the cassette such that misalignments in a first horizontal axis and the second horizontal axis can be corrected, wherein the first and second horizontal axes may be perpendicular.

[0036] An advantage with having the lifting arrangement arranged as described above is that the cassette is allowed to move in the horizontal plane but yet be held in place vertically.

[0037] According to a fifth aspect it is provided a method for filling food product into a number of packages, said method may comprise

placing the number of packages, with open ends facing upwards, into a number of package holders of a cassette,
transferring the cassette along a second horizontal axis by using a conveyor arrangement to a filling arrangement provided with a number of filling pipes for filling the food product into the number of packages,
lifting the cassette along a vertical axis towards the filling arrangement by using a lifting arrangement,
adjusting horizontal misalignments by having one or more guiding rods of the filling arrangement interacting with one or more guiding holes of the cassette,
introducing the number of filling pipes of the filling arrangement into the packages held by the package holders of the cassette, and
releasing the food product into the packages via the one or more filling pipes of the filling arrangement.

[0038] The same features and advantages as described above with respect to the first aspect also apply to this aspect.

[0039] Even though one rod and one hole may be used as well as that multiple rods and multiple holes may be used, an advantage with using two rods and two holes is that rotational displacement of the cassette with respect to the filling arrangement can be mitigated efficient. It is beneficial to have the two rods, and also the corresponding two holes, placed as far away from each other as possible to provide for that rotational misalignment can be compensated for efficiently. By way of example, the two holes may be provided in diagonal corner areas of the cassette.

[0040] 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

[0041] Embodiments of the invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1A illustrates an exploded view of a cassette arranged to hold two packages.
Fig. 1B illustrates a perspective view of the cassette as assembled.
Fig. 2A illustrates a filling arrangement and the cassette from a first view.
Fig. 2B illustrates the filling arrangement and the cassette from a second view.
Fig. 3 illustrates the filling arrangement and the cassette in combination with a conveyor arrangement and a lifting arrangement.
Fig. 4 illustrates the filling arrangement with its guiding rods inserted into guiding holes of the cassette.
Fig. 5A illustrates the filling arrangement and the cassette, wherein cleaning hoods of the filling arrangement are removed such that filling pipes are made visible.
Fig. 5B illustrates the filling arrangement and the cassette, wherein the guiding rods of the filling arrangement are inserted into the guiding holes of the cassette.
Fig. 6A is a cross-sectional side view of the filling pipe and the package, wherein the filling pipe is in a closed state.
Fig. 6B is cross-sectional perspective view of the filling pipe and the package, wherein the filling pipe is in the closed state.
Fig. 7A is a cross-sectional side view of the filling pipe and the package, wherein the filling pipe is in an open state.
Fig. 7B is cross-sectional perspective view of the filling pipe and the package, wherein the filling pipe is in the open state.
Fig. 8 is a flowchart illustrating a method for filling food product into a number of packages.
Fig. 9A-C illustrate three different cross-sectional views of examples of guiding rods that can be combined with a guiding hole with circular cross-section.

Detailed Description

[0042] Fig. 1A illustrates by way of example a cassette 100 arranged to hold two packages. As illustrated in this exploded view, the cassette 100 may comprise be a combination of several components. In this particular example a cassette frame 104 provided with guiding holes 102 is used as a mid-segment. On either side of this mid-segment a package holder 106 can be provided. By having a modular approach as suggested herein, it is made possible to easily adjust the cassette 100 from supporting one type of package to another type by replacing the package holders 106. Fig. 1B illustrates the cassette 100 as assembled.

[0043] Fig. 2A illustrates by way of example a system 400 comprising the cassette 100, illustrated in fig. 1A and 1B, and a filling arrangement 200. The filling arrangement 200 can comprise a filling arrangement frame 202 and guiding rods 206. The cassette 100 may be arranged such that this can be moved towards the filling arrangement along a vertical axis V-A. The two package holders 106 of the cassette 100 may be spaced apart along a first horizontal axis H-A-1 and the cassette 100 may be moved along a conveyor arrangement in a second horizontal axis H-A-2, wherein the first and second horizontal axes H-A-1, H-A-2 are perpendicular. As illustrated, the guiding rods 206 as well as the guiding holes 102 may be spaced apart both with respect to the first and second horizontal axes H-A-1, H-A-2.

[0044] As illustrated in fig. 2A, the guiding rods 206 may be tapered in their distal ends. An advantage with this is that in case the cassette 100 and the filling arrangement 200 are not perfectly aligned when the cassette 100 is lifted towards the filling arrangement 200 this

misalignment can be adjusted for in that the cassette 100 is horizontally adjusted as the guiding rods 206 enter into the guiding holes 104.

[0045] Even though the examples presented herein are based on that the cassette 100 is lifted towards the filling arrangement 200, the principle of using the guiding rods 206 in combination with the guiding holes 104 may also be applied for systems in which the filling arrangement 200 is moved and the cassette 100 is placed still. Still an option is to have both the filling arrangement 200 and the cassette 100 moving along the vertical axis V-A.

[0046] Further, as illustrated, the guiding rods 206 may have circular cross-sections. Another possibility is to have polygonal cross-sections, e.g. rectangular cross-sections. It is also a possibility to have different parts of the guiding rods 206, as well as the guiding holes 104, provided with different types of cross-sections. For instance, a lower end of the guiding rods 206 may have the circular cross-sections to allow rotation, which may be needed to have both the guiding rods 206 placed in the respective guiding holes 104. In a mid-section or upper section of the guiding rods 206, the cross-sections may be polygonal such that rotation is prevented. Put differently, the cassette 100 may be rotationally locked when having polygonal cross-sections. Further, a transition from one type of cross-section to another may be continuous such that, by way of example, the cassette 100 can rotationally aligned with respect to the filling arrangement 200.

[0047] Even though illustrated that two guiding holes 104 and two guiding rods 206 are being used, this is only an example. The alignment can be achieved by only having one guiding hole and one guiding rod, especially if having these provided with the polygonal cross-section such that there can be a rotational alignment between the cassette 100 and the filling arrangement 200.

[0048] Fig. 2B illustrates the system 400, as illustrated in fig. 2A, but from a different view. As illustrated in fig. 2B, the guiding rods 206 of the filling arrangement 200 are introduced into the guiding holes 104 of the cassette 100.

[0049] Fig. 3 illustrates the system 400 described above in combination with a conveyor arrangement 402 as well as a lifting arrangement 404. The conveyor arrangement 402 may be a belt or belt-like system arranged for transporting the cassettes 100 along the second horizontal axis H-A-2. As illustrated, the lifting arrangement 404 may comprise a first and a second lifting member 406, 408 placed on either side of the conveyor arrangement 402. The first lifting member 406 may comprise a first slit 410, and the second lifting member 408 may comprise a second slit 412. As illustrated, the first and second slit 410, 412 may extend along the second horizontal axis H-A-2. As illustrated, there may be room available in the first and/or second slit 410, 412 such that the cassette 100 can be moved not only along the second horizontal axis H-A-2, but also along the first horizontal axis H-A-1. In this way, when introducing the guiding rods 206 into the guiding holes 104, in case there is a misalignment, this can be compensated for due to that the cassette 100 is allowed to move in a horizontal plane defined by the first and second horizontal axis H-A-1, H-A-2.

[0050] Fig. 4 illustrates the system 400 with cleaning hoods of the filling arrangement 200 being removed such that filling pipes 204, in use covered by the cleaning hoods as illustrated in fig. 2A, 2B and 3, are made visible. As illustrated, the filling pipes 204, in this example two filling pipes, can be fed into packages 300. The packages 300 are held in placed by the package holders 106 of the cassette 100. As an effect of having the guiding holes 102 in the cassette 100 interacting with the guiding rods 204 of the filling arrangement 200, the packages 300 can be aligned with respect to the filling pipes 204 such that a risk of having the filling pipes 204 damaging the packages 300 can be avoided, or at least reduced. In addition to avoid that the packages 300 are being damaged, having an improved alignment between the packages 300 and the filling pipes 204 also provides for that the filling procedure can be made even more efficient. For instance, to increase filling control, that is, being able to control on a more detail level such that foaming, splashing etc can be reduced further, it is beneficial to have the filling pipe 204 arranged such that a large part of a horizontal cross-sectional area of the package 300 is occupied by the filling pipe 300. Put differently, it has found beneficial to reduce space available between the package 300 and the filling pipe 204 to achieve an improved control during filling. As an alternative, in case a control model is based on that there is space available between the package 300 and the filling pipe 204, an improved alignment between the two will result in that this space can estimated with improved accuracy and as an effect that improved filling control can be achieved even though space between the package 300 and the filling pipe 204 is not reduced to a minimum.

[0051] As illustrated, the packages 300 may have substantially rectangular cross-sections. An advantage with having such shape of the packages 300 is that improved logistics can be achieved. Put differently, having brick-shaped packages or other packages with rectangular cross-sections, such as Tetra Top™ marketed by Tetra Pak™ comes with the advantage that the amount of air on a pallet loaded with packages can be held at low levels compared to e.g. packages having circular cross-sections. Filling packages with rectangular cross-sections comes however with the challenge that the ninety-degree corners inside the package may affect the filling procedure negatively, e.g. the corners may give rise to turbulence that in turn may cause foaming and splashing. For this reason, having improved alignment between the cassette 100 and the filling arrangement 200 is more relevant for packages having non-circular cross sections compared to packages having circular cross-sections.

[0052] The packages 300 illustrated by example can be carton-based packages. Such package may be made from a laminate comprising several layers of cellulose-

based material and plastic material. When folding such laminate, wrinkles and other effects may arise. These effects may have an effect on the filling in that these give rise to turbulence that in turn may result in foaming and splashing. Thus, the improved alignment between the filling pipe 204 and the packages 300 achieved by using the guiding rods 206 and the guiding holes 102 is of more relevance for the packages 300 being made of the laminate described above compared to packages not being made of such laminate and hence that do not have any wrinkles or other laminate-associated effects in corner areas of the packages. By way of example, a blow-molded PET bottle with a rectangular cross-section does not have any wrinkles in the corner areas due to that this is produced in a different way.

[0053] Fig. 5A illustrates another perspective view of the system 400. As in fig. 4, the cleaning hoods as well as the filling arrangement frame 202 have been removed for illustrative purposes. As illustrated, the guiding rods 206 may be arranged such that these enter into the guiding holes 102 before the filling pipes 204 enter into the packages 300. Having the system 400 set up in this manner provides for that the alignment can be made by the guiding rods 206 in combination with the guiding holes 102 before the filling pipes 204 are introduced into the packages 300.

[0054] In fig. 5B, the system 400 is illustrated in accordance with fig. 5A. While fig. 5A illustrates a situation in which the guiding holes 102 are moving towards the guiding holes 206, and also the packages 300 moving towards the filling pipes 204, fig. 5B illustrates a situation in which the guiding rods 204 have been introduced into the guiding holes 102, but the filling pipes 204 are yet to be introduced into the packages 300. Put differently, the situation illustrated in fig. 5B occurs after the situation illustrated in fig. 5A.

[0055] During the filling procedure, the cassette 100 is aligned with the filling arrangement 200 such that the packages 300 held in the package holders 106 are aligned with the filling pipes 204 of the filling arrangement 200. Once being aligned, the filling pipes 204 are fed into the packages 300. As described, this can be achieved by having the cassette 100 lifted up towards the filling arrangement 200. Once being fed into a lower end position inside the packages 300, the filling pipes 204 may be switch from being in a closed state CLOSE to being in an open state OPEN. Being in the open state OPEN has the effect that food product FP held in the filling pipes 204 is released down into the packages 300. During releasing the food product, that is, while being in the open state OPEN, the packages 300 can be lowered such that efficient filling can be achieved, that is, foaming, splashing etc can be reduced. Before or shortly after the filling pipes 204 are lifted out from the packages 300, the filling pipes may enter the closed state CLOSE. Closing the filling pipes 204 in this way may be considered to be an end of the filling procedure. After closing the filling pipes 204, the filled packages 300 may be lowered down onto the conveyor arrangement such that these packages can be transported to a next station. After the filled packages 300 have been released onto the conveyor arrangement, unfilled packages can be fetched via the conveyor arrangement and the filling procedure can be repeated.

[0056] The opening and closing of the filling pipes 204 can be made in different ways. One way, as illustrated in fig. 6A and 6B and also fig. 7A and 7B, is to use, for each filling pipe 204, a stem 208 provided with a disc-shaped member 210 in a lower end. As illustrated the stem 208 can be provided inside the filling pipe 204. By having the disc-shaped member 210 pushed down towards a lower end of the filling pipe 204, an opening 212 in this lower end can be closed. Thus, when having the stem 208, and also the disc-shaped member 210, pushed down onto the lower end of the filling pipe 204, the filling pipe 204 is considered to be in the closed state CLOSE. On the other hand, as illustrated in fig. 7A and 7B, when having the disc-shaped member 210 placed at a distance D-OS from the opening 212 of the lower end of the filling pipe 204, the filling pipe is considered to be in the open state OPEN. Even though not illustrated, the stem 208 and the filling pipe 204 may be moved vertically by using electric motor arrangements or other similar devices capable of providing controlled vertical movement.

[0057] Fig. 8 is a flowchart illustrating a method 500 for filling food product FP into the number of packages 300. The method may comprise

placing 502 the number of packages 300, with open ends facing upwards, into the number of package holders 106 of the cassette 100,

transferring 504 the cassette 100 along a second horizontal axis H-A-2 by using the conveyor arrangement 402 to the filling arrangement 200 provided with the number of filling pipes 204 for filling the food product FP into the number of packages 300,

lifting 506 the cassette 100 along a vertical axis V-A towards the filling arrangement 200 by using the lifting arrangement 404,

adjusting 508 horizontal misalignments by having the one or more guiding rod 206 of the filling arrangement 200 interacting with the one or more guiding hole 102 of the cassette 100,

introducing 510 the number of filling pipes 204 of the filling arrangement 200 into the packages 300 held by the package holders 106 of the cassette 100, and releasing 512 the food product FP into the packages 300 via the one or more filling pipes 204 of the filling arrangement 200.

[0058] Fig. 9A illustrates a first example in which the guiding hole 102 is provided with the circular cross-section, thereby allowing the guiding rod 206 to provide for that the cassette is rotationally adjusted when the rod 206 is placed in the guiding hole 102. As illustrated, part of the circumference line of the cross-section of the guiding rod 206 is circular such that direct contact between the rod

and hole is obtained. In the non-circular parts of the circumference line of the rod, there is a distance provided between the rod and the hole, such that a first and a second longitudinal space 900a, 900b are formed. In these two longitudinal spaces 900a, 900b, food product, water, etc may be released, thereby reducing the risk that the interaction between the rod and the hole is negatively affected by such food product, water, etc, present in the hole 102.

[0059] Fig. 9B illustrates a second example. In this example, the cross-section of the guiding rod 206 is rectangular. The cross-section of the guiding rod 206 is chosen such that a distance between two diagonal positioned corners correspond to a diameter of the cross-section of the guiding hole 102. In this example, four longitudinal spaces 900a-d are formed.

[0060] Fig. 9C illustrates a third example. In this example, the guiding rod 206 is also rectangular-shaped, but with a more prominent length-to-width ratio, that is, compared to the guiding rod 206 of the second example, the rod is more I-shaped. Since the width is comparably small, there is virtually no space provided at the shorter ends, which results in that there is a first and second space 900a,900b on either side of the length sections of the rod 206. As illustrated, in this example, the length of the cross-section of the guiding rod 206 may be chosen such that this corresponds to the diameter of the guiding hole 102.

[0061] The three examples above serves the purpose of presenting that the cross-section of the guiding rod 206 may be chosen in various ways.

[0062] 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. A filling arrangement (200) comprising

a filling arrangement frame (202);
a number of filling pipes (204) attached to the frame (202) and arranged to be moved into a number of packages (300), respectively, during a filling procedure;
wherein the number of filling pipes (204) are arranged to feed a food product (FP) into the packages (300), respectively;
one or more guiding rods (206) attached to the frame (202) and arranged to interact with one or more guiding holes (102) of a cassette (100) holding the number of packages (300) during the filling procedure such that the filling pipes (204) are aligned with the packages (300) before the filling pipes (204) are moved into the packages (300).

2. The filling arrangement (200) according to claim 1, wherein the number of filling pipes (204) are arranged to be moved into the number of packages (300) along a vertical axis (V-A), wherein the number of filling pipes (204) are placed along a first horizontal axis (H-A-1), and wherein the one or more guiding rods (206) comprise two guiding rods (204) that are spaced apart along the first horizontal axis (H-A-1) as well as along a second horizontal axis (H-A-2), wherein the second horizontal axis (H-A-2) is perpendicular to the first horizontal axis (H-A-1).

3. The filing arrangement (200) according to any one of the preceding claims, wherein lower ends of the one or more guiding rods (206) are tapered.

4. The filling arrangement (200) according to any one of the preceding claims, wherein the one or more guiding rods (206) have at least in part circular cross-sections.

5. The filling arrangement (200) according to any one of the preceding claims, wherein the one or more guiding rods (206) have at least in part polygonal cross-sections.

6. The filling arrangement (200) according to any one of the preceding claims, wherein the number of filling pipes (204) have substantially rectangular cross-sections.

7. The filling arrangement (200) according to any one of the preceding claims, wherein each of the number of filling pipes (204) is provided with an opening (212) in a lower end, said filling arrangement (200) further comprising

a number of stems (208), each provided with a disc-shaped member (210), wherein the number of stems (208) are placed inside the number of filling pipes (204), respectively,
wherein each of the filling pipes (204) is arranged to be in a closed state (CLOSE) in which the disc-shaped member (210) is pushed downwards such that the food product (FP) is hindered from passing the opening (212), or in an opened state (OPEN) in which the disc-shaped member (210) is placed at a distance (D-OS) from the opening (212) such that the food product (FP) is allowed to pass the opening (212).

8. A cassette (100) comprising

a cassette frame (104),
a number of package holders (106) attached to the cassette frame (104) and arranged to hold a

number of packages (300), respectively,
wherein the cassette frame (104) is provided with one or more guiding holes (102) arranged to interact with one or more guiding rods (206) of a filling arrangement (200) during a filling procedure such that the packages (300) in the package holders (106) are aligned with filling pipes (204) of the filing arrangement (200) before the filling pipes (204) are moved into the packages (300).

9. The cassette (100) according to claim 8, wherein the number of filling pipes (204) are arranged to be moved into the number of packages (300) along a vertical axis (V-A), wherein the number of package holders (106) are placed along a first horizontal axis (H-A-1), and wherein the one or more guiding holes (102) comprise two guiding holes (102) that are spaced apart along the first horizontal axis (H-A-1) as well as along a second horizontal axis (H-A-2), wherein the second horizontal axis (H-A-2) is perpendicular to the first horizontal axis (H-A-1).

10. The cassette (100) according to claim 8 or 9, wherein the one or more guiding holes (102) have at least in part circular cross-sections.

11. The cassette (100) according to any one of the claims 8 to 10, wherein the number of package holders (106) have at least in part rectangular cross-sections.

12. The cassette (100) according to any one of the claims 8 to 11, wherein the number of package holders (106) are arranged to hold packages with plastic top sections, and wherein the packages are held with the plastic top sections placed downwards in the package holders and open bottom ends facing upwards.

13. A system (400) comprising a filling arrangement (200) according to any one of claims 1 to 7 and a plurality of cassettes (100) according to any one of claims 8 to 12, said system (400) further comprising a conveyor arrangement (402) arranged to transport the plurality of cassettes (100) along a second horizontal axis (H-A-2), wherein the cassettes (100) are resting upon the conveyor arrangement (402).

14. The system (400) according to claim 13, further comprising

a lifting arrangement (404) comprising a first and a second lifting member (406, 408) provided on either side of the conveyor arrangement (402), wherein the first and second lifting member (406, 408) comprise a first and second slit (410, 412), respectively, facing the conveyor arrangement (402) and extending along the second horizontal axis (H-A-2), such that the cassette frame (104) of one of the cassettes (100) can be slid into the first and second slit (410, 412), wherein the lifting arrangement (404) is configured
to lift the cassette (100) along the vertical axis (V-A) once the cassette frame (104) is slid into the first and second slit (410, 412), and
to allow the cassette (100) to move within the first and second slit (410, 412) once the one or more guiding rods (206) of the lifting arrangement (200) are inserted into the one or more guiding holes (102) of the cassette (100) such that misalignments in a first horizontal axis (H-A-1) and the second horizontal axis (H-A-2) can be corrected, wherein the first and second horizontal axes (H-A-1, H-A-2) are perpendicular.

15. A method (500) for filling food product (FP) into a number of packages (300), said method comprising

placing (502) the number of packages (300), with open ends facing upwards, into a number of package holders (106) of a cassette (100),
transferring (504) the cassette (100) along a second horizontal axis (H-A-2) by using a conveyor arrangement (402) to a filling arrangement (200) provided with a number of filling pipes (204) for filling the food product (FP) into the number of packages (300),
lifting (506) the cassette (100) along a vertical axis (V-A) towards the filling arrangement (200) by using a lifting arrangement (404),
adjusting (508) horizontal misalignments by having one or more guiding rods (206) of the filling arrangement (200) interacting with one or more guiding holes (102) of the cassette (100),
introducing (510) the number of filling pipes (204) of the filling arrangement (200) into the packages (300) held by the package holders (106) of the cassette (100), and
releasing (512) the food product (FP) into the packages (300) via the one or more filling pipes (204) of the filling arrangement (200).

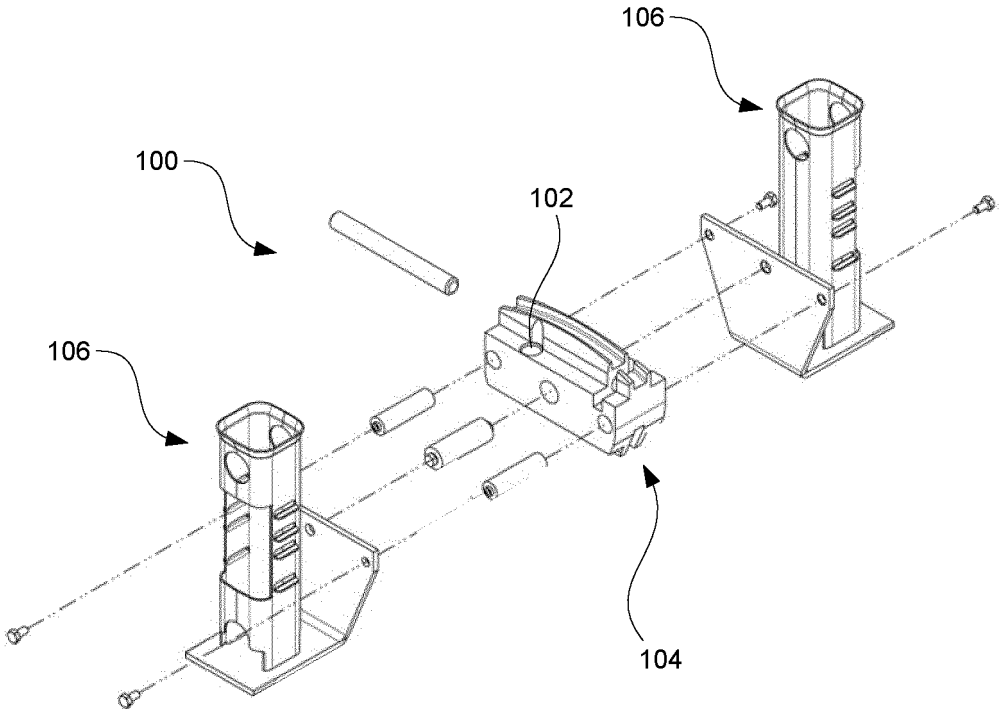

Fig. 1A

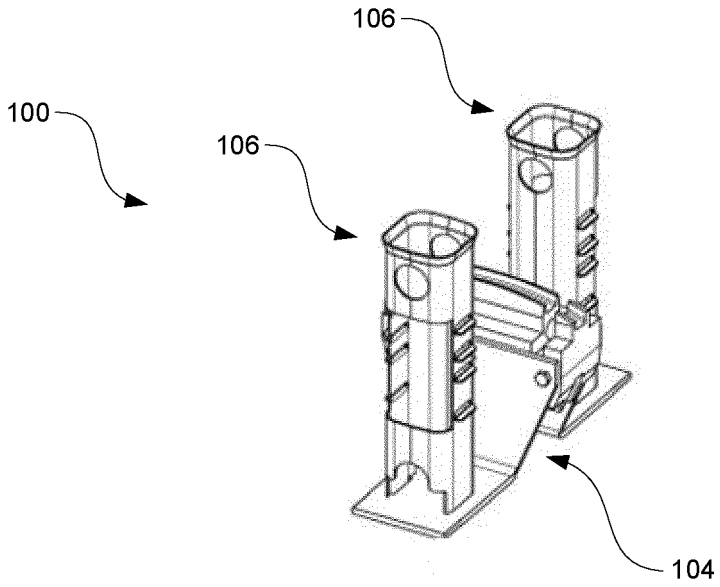

Fig. 1B

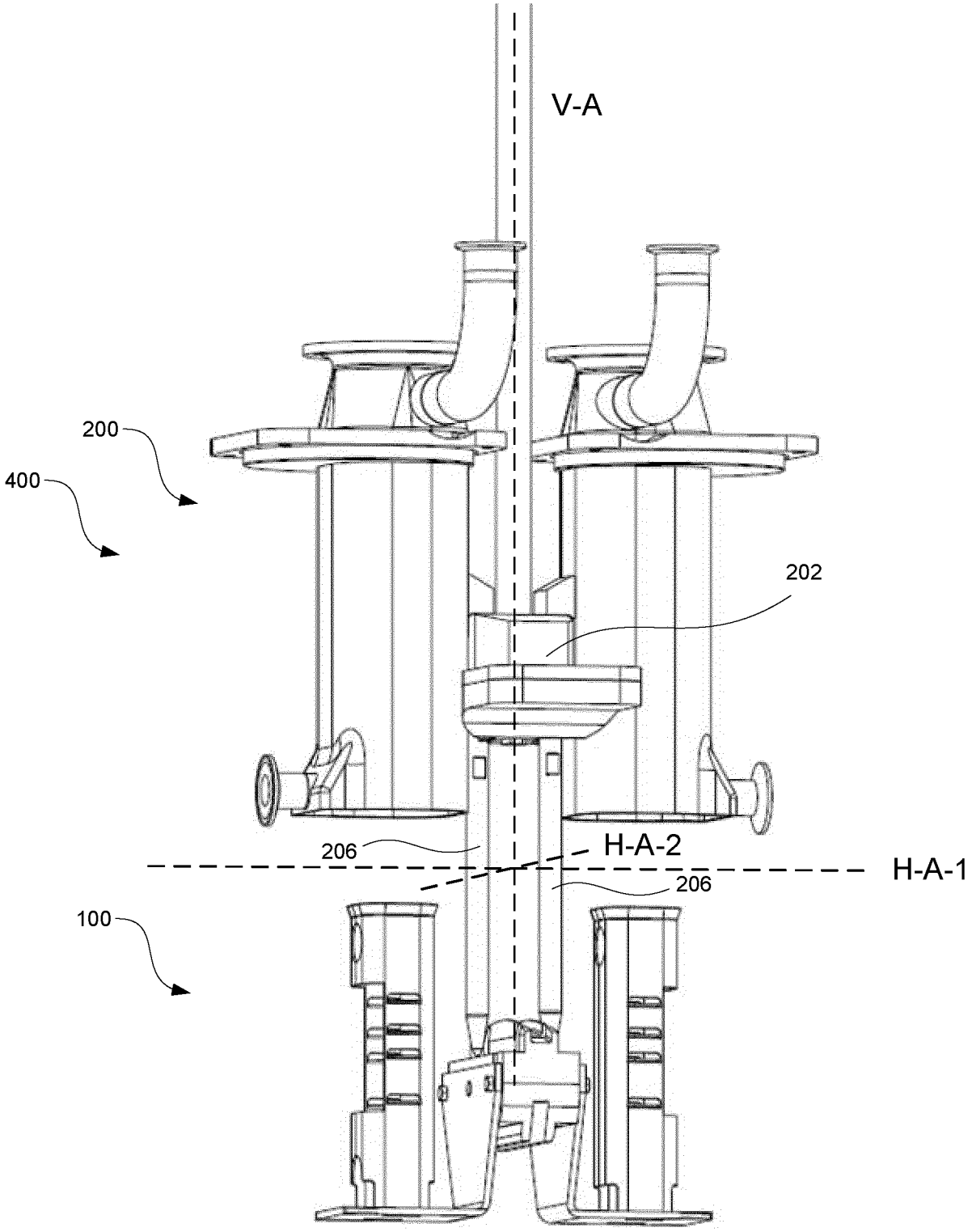

Fig. 2A

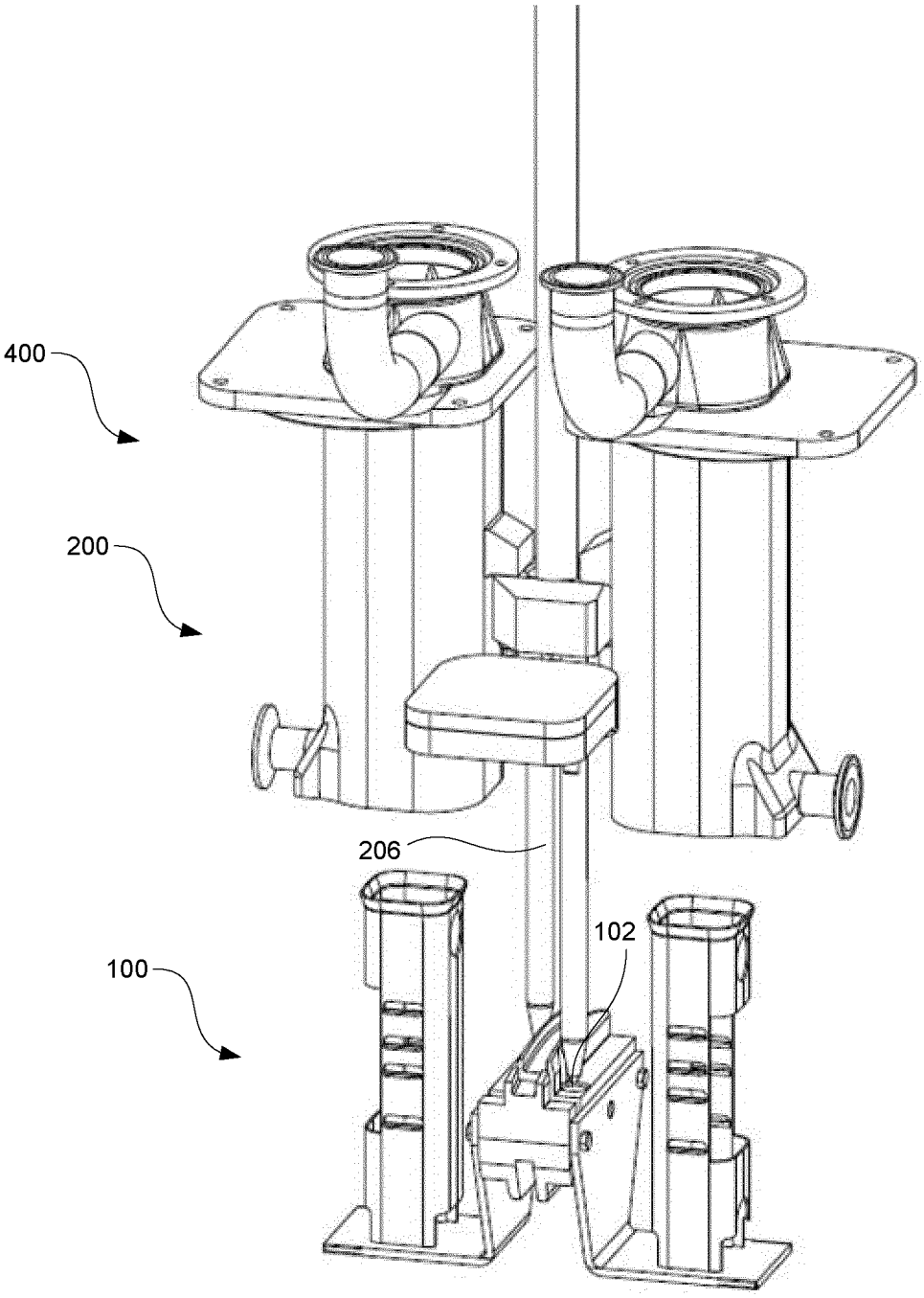

Fig. 2B

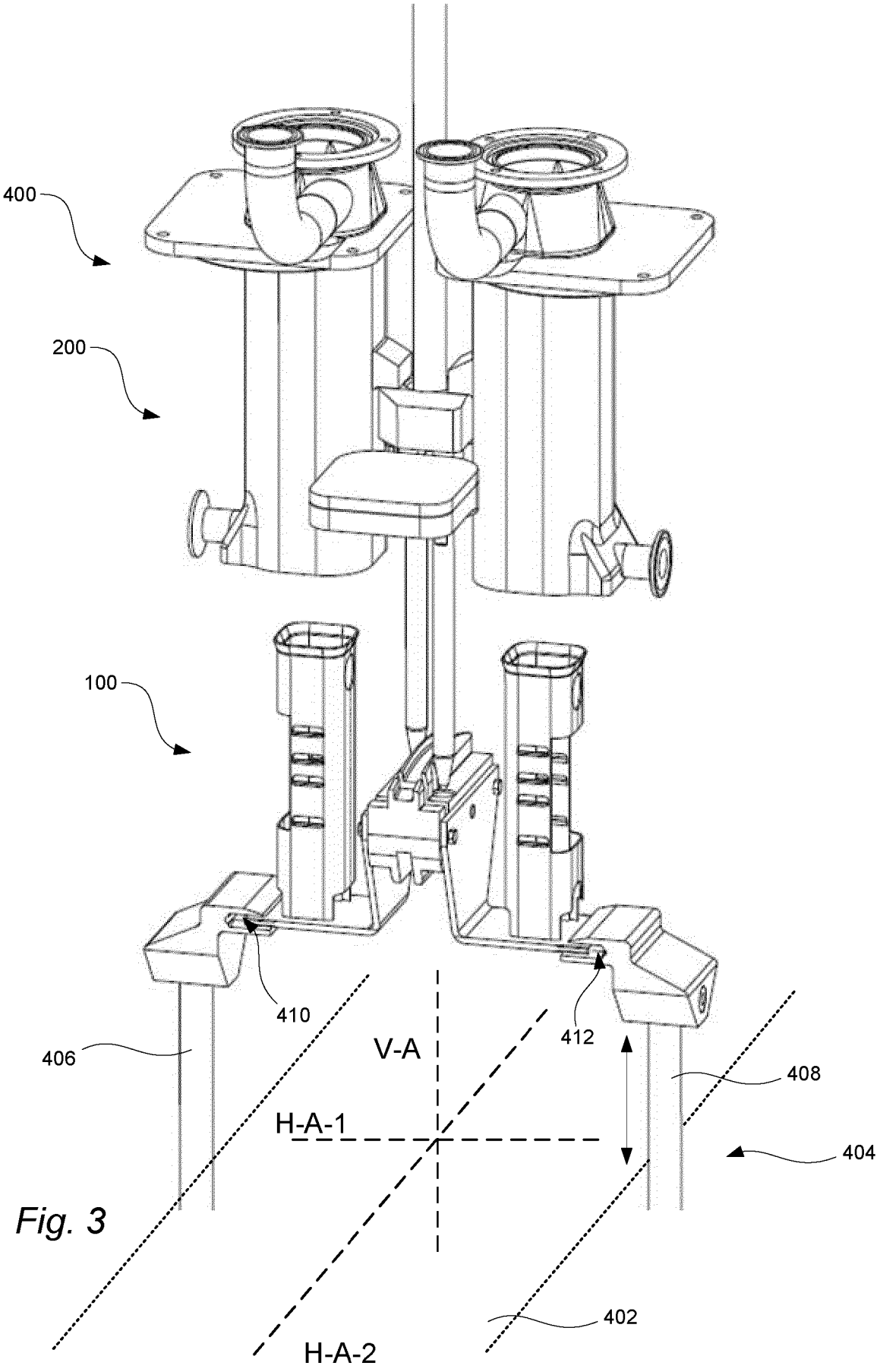

Fig. 3

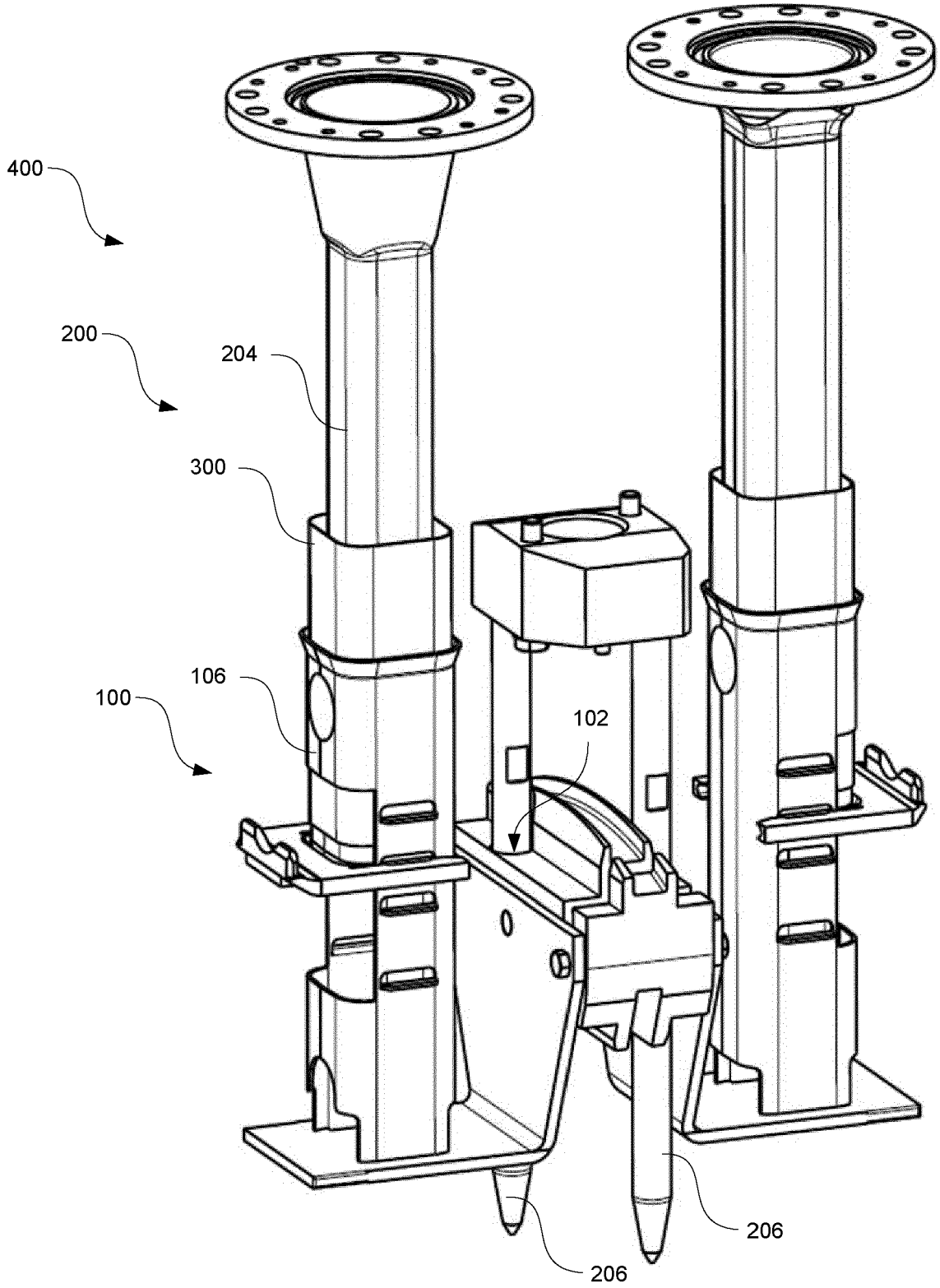

Fig. 4

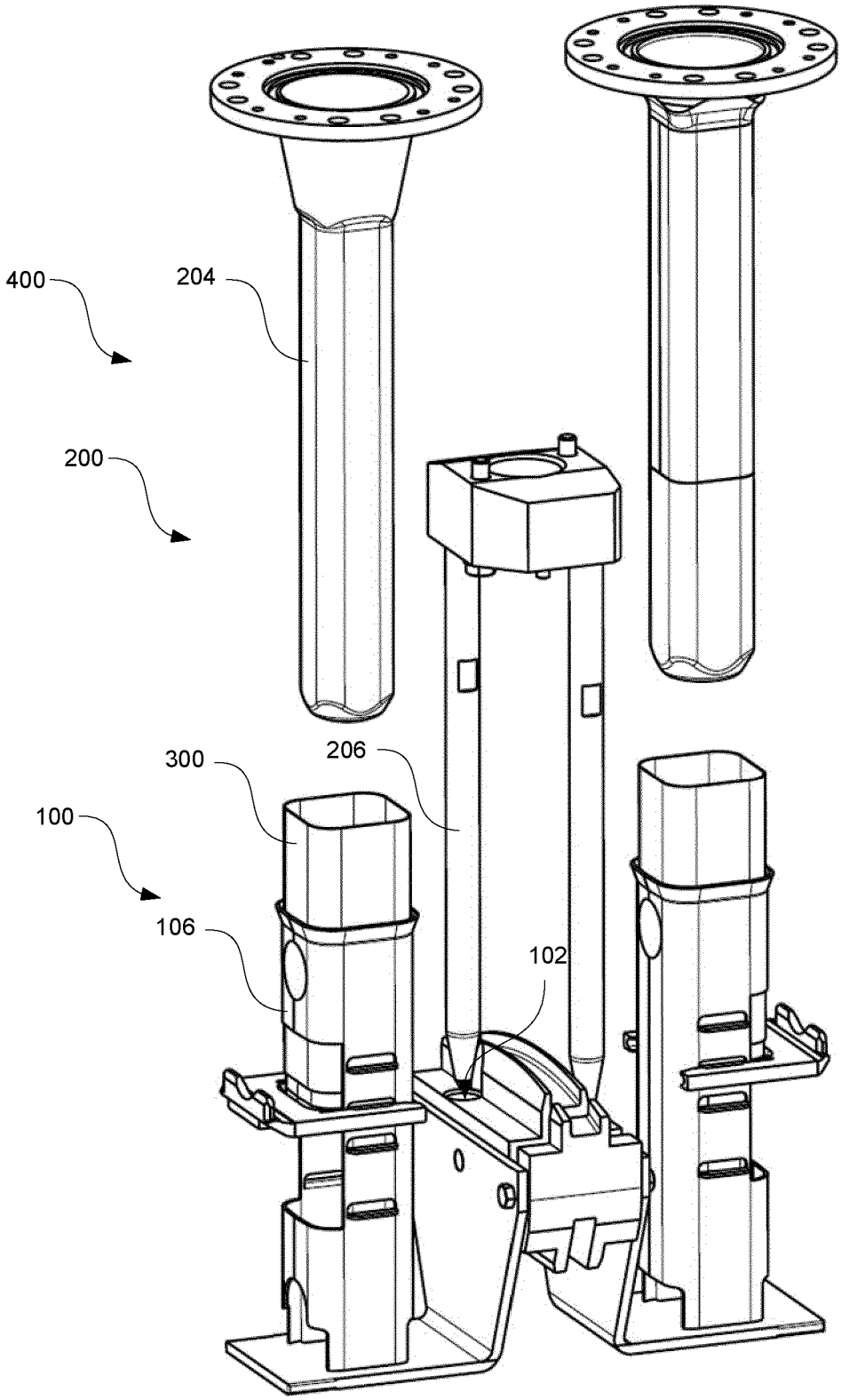

Fig. 5A

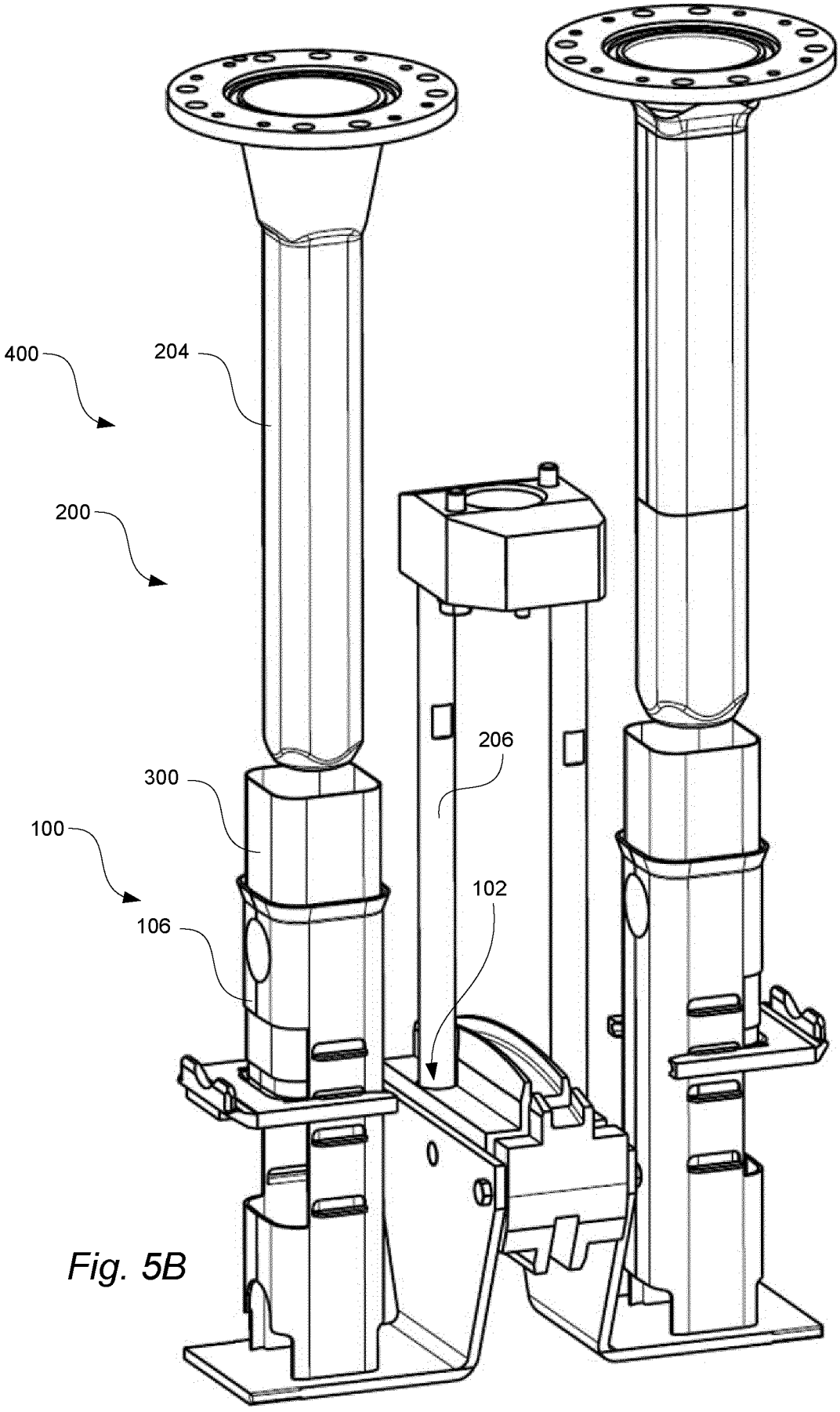

Fig. 5B

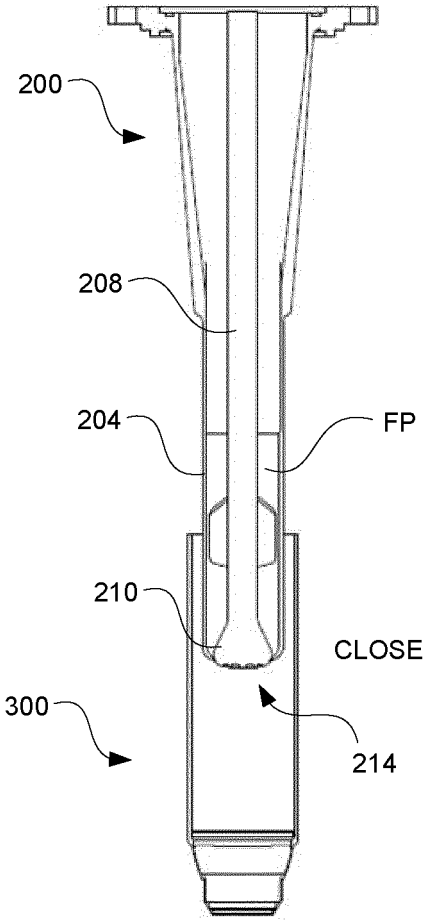

Fig. 6A

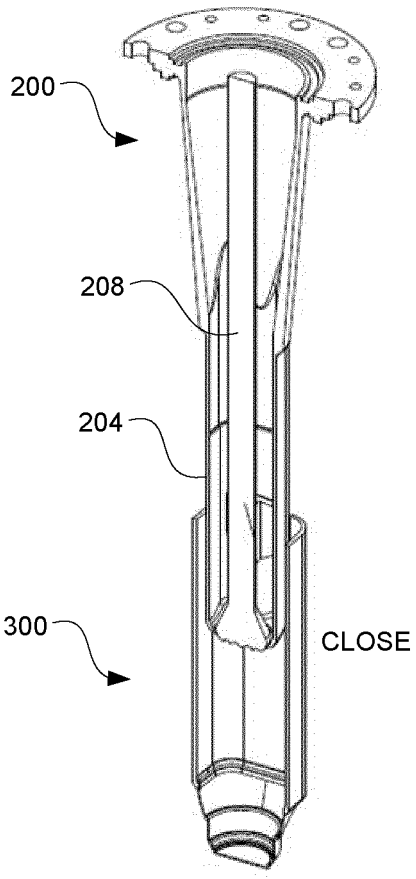

Fig. 6B

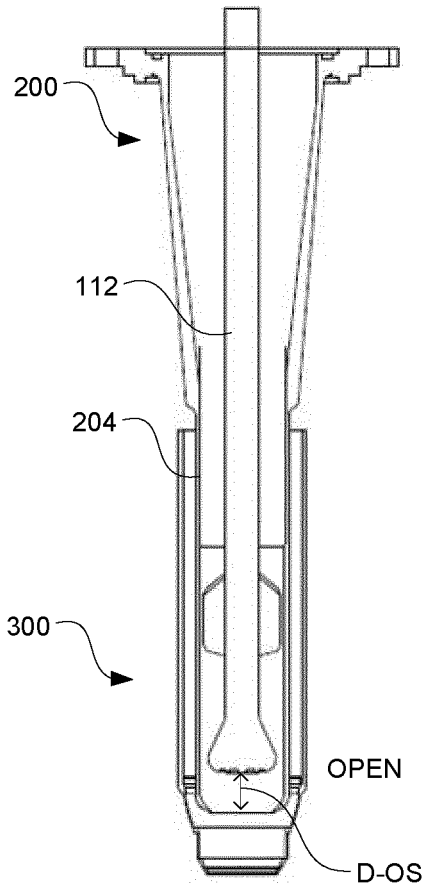

Fig. 7A

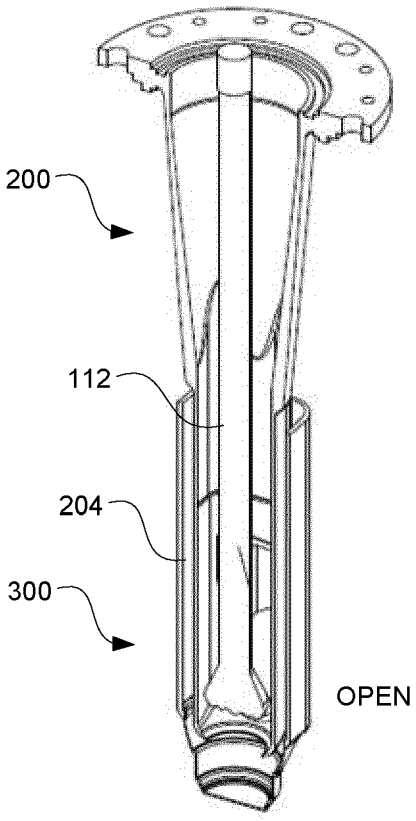

Fig. 7B

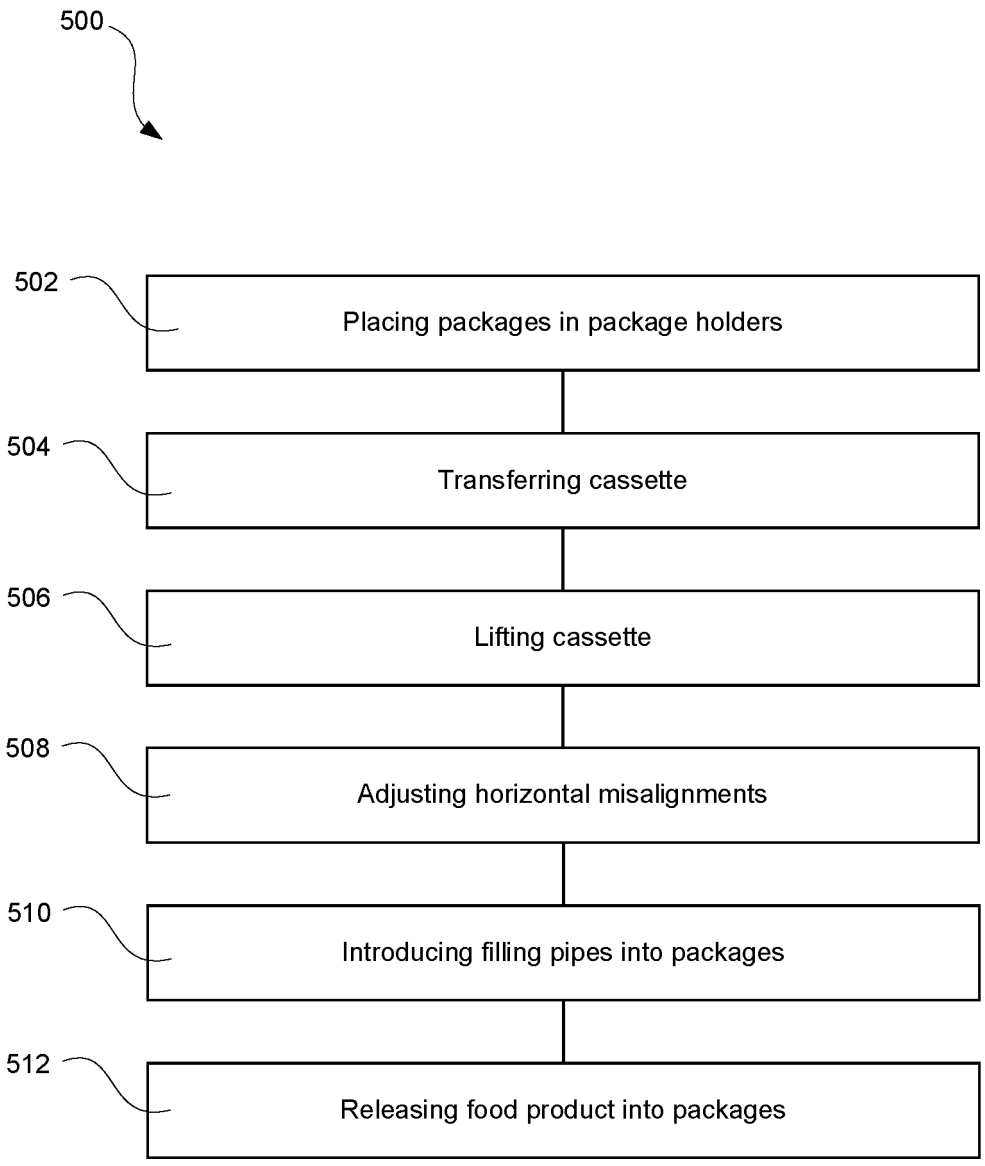
500
502
Placing packages in package holders
504
Transferring cassette
506
Lifting cassette
508
Adjusting horizontal misalignments
510
Introducing filling pipes into packages
512
Releasing food product into packages

Fig. 8

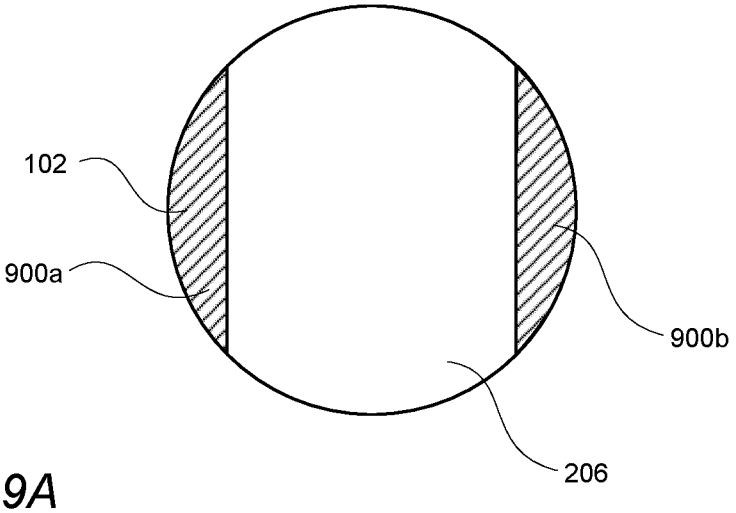

Fig. 9A

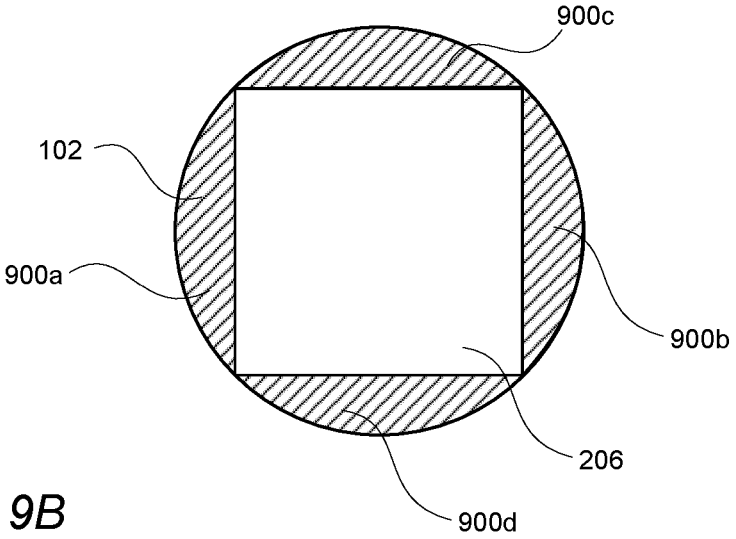

Fig. 9B

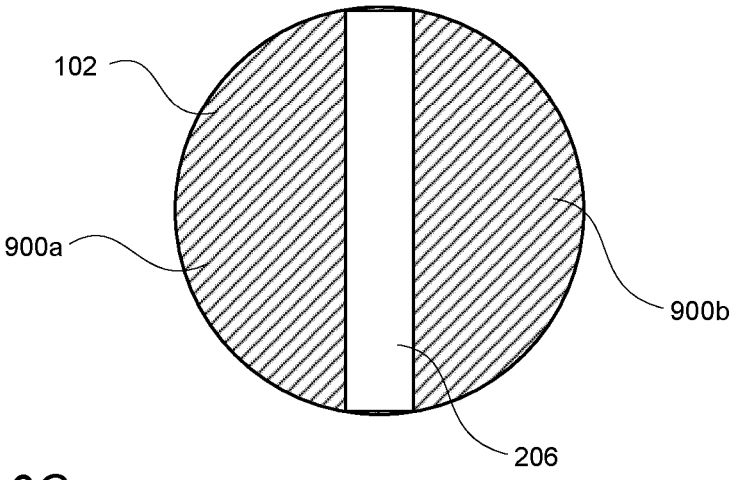

Fig. 9C

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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 2851

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 729 206 A (FRANCIS RONALD R [US] ET AL) 8 March 1988 (1988-03-08)	1,3-7	INV. B65B39/00
A	* figures 5,6 *	2,13-15	B65B59/00 B65B59/04

A	EP 0 850 838 A1 (RONCHI MARIO S R L [IT]) 1 July 1998 (1998-07-01) * figures 5,6 *	7	

X	US 6 073 422 A (MASSEY SAMUEL M [US] ET AL) 13 June 2000 (2000-06-13)	8-12	
A	* figure 5 *	13-15	

TECHNICAL FIELDS SEARCHED (IPC)
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 April 2025	Dick, Birgit

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30-04-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4729206 A	08-03-1988	NONE	
EP 0850838 A1	01-07-1998	DE 69728024 T2	16-09-2004
		EP 0850838 A1	01-07-1998
		ES 2213799 T3	01-09-2004
		IT MI962730 A1	23-06-1998
		US 5954086 A	21-09-1999
US 6073422 A	13-06-2000	NONE	

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