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(54) **AN APPARATUS AND A FILLING MACHINE**

(57) An apparatus (100) for lifting a package (402) is disclosed. The apparatus comprising a housing (110) having an upper and a lower guide (221, 231) that support a rod (202) that is movable for lifting a package (402), a gap (204) formed between the rod and the housing and extending between the guides for holding lubricant that provides lubrication between the rod and the guides, a first scraper (222) for scraping the rod to remove lubricant that has passed by the upper guide, a second scraper (223) for scraping the rod to remove lubricant that has passed by the first scraper, first and second spaces (224, 225) for receiving lubricant that has been scraped by the first scraper respectively by the second scraper, and a common lubricant drain (126) to which each of the first space and the second space is fluidly connected. A filling machine (400) comprising the apparatus is also disclosed.

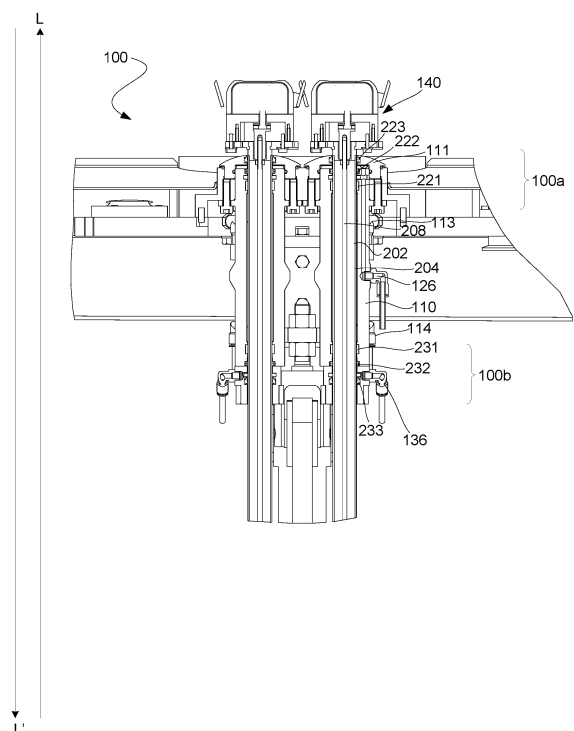


Fig. 2

Description

Technical Field

[0001] The disclosure generally relates to an apparatus for lifting a package. More particularly, it is related to an apparatus comprising a housing, a first scraper and a second scraper. The disclosure also relates to a filling machine for filling food product in a food package.

Background

[0002] It is commonly known to use different types of filling machines in the food processing industry for filling food product in food packages. Such filling machines typically comprise an apparatus for lifting the food package towards e.g. filling nozzles such that the filling of food product in the food package may be performed in an easy and safe way. Equipment used in the food processing industry have to be designed such that it fulfills hygienic requirements.

[0003] Even though food processing equipment and especially apparatuses for lifting food packages in filling machines have been used in the food processing industry for decades, there is room for improvements for obtaining better hygienic levels of the filling machine.

[0004] For these reasons, there is a demand for an improved apparatus for lifting a package that fulfills the requirements related to the food processing industry, e.g. hygienic design as well as food safety.

Summary

[0005] It is an object to at least partly overcome one or more of the above-identified limitations of the prior art. In particular, it is an object to provide an apparatus that is capable of lifting packages while still efficiently fulfilling hygienic requirements in the food processing industry.

[0006] Another object is to provide such an apparatus with improved durability.

[0007] Another object is to provide such an apparatus with an increased cost-efficiency.

[0008] According to a first aspect, it is provided an apparatus for lifting a package, the apparatus comprising: a housing having an upper guide and a lower guide that support a rod which extends through the housing and is arranged to move in a longitudinal direction for lifting the package, wherein a gap is formed between the rod and the housing, the gap extending from the upper guide to the lower guide for holding lubricant that provides lubrication between the rod and the upper and lower guides; a first scraper arranged above the upper guide and surrounding the rod for scraping an exterior surface of the rod to remove lubricant that has passed by the upper guide from the gap; a second scraper arranged above the first scraper and surrounding the rod for scraping the exterior surface of the rod to remove lubricant that has passed by the first scraper; a first space formed between

the upper guide and the first scraper and surrounding the rod for receiving lubricant that has been scraped by the first scraper; a second space formed between first scraper and the second scraper, and surrounding the rod for receiving lubricant that has been scraped by the second scraper; and a common lubricant drain to which each of the first space and the second space is fluidly connected.

[0009] The apparatus is preferably arranged to lift packages, preferably towards filling nozzles, such that the packages may be filled with food product. This is provided by that the rod of the apparatus is movable in the longitudinal direction. It should be noted that the rod of the apparatus may be movable in a direction opposite the longitudinal direction such that the package may be lowered after being lifted. Thus, the rod is preferably arranged to provide a vertical movement, either in the longitudinal direction or in the direction opposite the longitudinal direction. In other words, the rod is in practice typically arranged to provide a vertical movement in opposite longitudinal directions thereof.

[0010] The apparatus is advantageous as it allows for maintaining a good hygienic level of the apparatus since excessive oil, including lubricant leakages, such as oil leakages, above the second scraper may be avoided or at least significantly reduced compared to common solutions once the rod is moving in the longitudinal direction, i.e., once the rod is moving upwards for lifting a package. The upper and lower guides are preferably leak free gaskets such that there is provided a lubrication-free gasket solution in order to avoid, or at least reduce, lubrication leakages within the apparatus.

[0011] The rod is typically moved with a high speed in the longitudinal direction e.g., when lifting a package, such that the lubricant that provides lubrication between the rod and the upper and lower guides may follow the rod in the longitudinal direction because of the high-speed movement. In this context, high speed may be interpreted as a speed of at least 4 m/s. Operating the apparatus with the high speed may be disadvantageous as it provides for that the lubricant may follow the rod into hygienic zones of the apparatus. Therefore, the apparatus is especially advantageous when the rod moves with the high speed in the longitudinal direction, wherein the apparatus is arranged to remove the lubricant from the exterior surface of the rod in order to avoid, or at least reduce, the amount of lubricant that passes into the hygienic zones of the apparatus.

[0012] The gap should be understood as a geometrical void of a certain shape that defines its surrounding, i.e. it is a technical design parameter that gives the apparatus certain technical characteristics. The gap is therefore created to let its geometrical shape define the shape of the parts of the apparatus that surrounds the gap or the shape of the parts of the apparatus which being surrounded by the gap. The gap may have an extension in a transverse direction, i.e. between the rod and the housing, between e.g. 2-15 mm. This is advantageous as it allows for introducing an adequate amount of lubricant in the

gap such that the components within the apparatus may be lubricated in an efficient way.

[0013] The first space should be understood as a geometrical void of a certain shape that defines its surrounding, i.e. it is a technical design parameter that gives the apparatus certain technical characteristics. The first space is therefore created to let its geometrical shape define the shape of the parts of the apparatus that surrounds the first space or the shape of the parts of the apparatus which being surrounded by the first space.

[0014] The second space should be understood as a geometrical void of a certain shape that defines its surrounding, i.e. it is a technical design parameter that gives the apparatus certain technical characteristics. The second space is therefore created to let its geometrical shape define the shape of the parts of the apparatus that surrounds the second space or the shape of the parts of the apparatus which being surrounded by the second space.

[0015] In this context, the term "fluidly connected" should be interpreted as each of the first space and the second space is connected to the common lubricant drain such that lubricant is drainable from each of the first space and the second space to the common lubricant drain.

[0016] The upper and lower guides may be referred to as upper and lower wear rings. The upper and lower guides are typically lubricated by the lubricant present in the gap when the rod is moved in the vertical direction. This is advantageous as it allows for that wear and tear on the upper and lower guides is reduced which thereby provides for that improved durability of the apparatus is achieved.

[0017] The first scraper is preferably configured to circumscribe (surround) the rod, i.e. is arranged like a ring around the rod, and is configured to scrape the exterior surface of the rod. Thereby, the first scraper is configured to remove lubricant that is resident on the exterior surface of the rod and which has passed the upper guide from the gap. When the first scraper removes the lubricant resident on the exterior surface of the rod, the lubricant is preferably scraped off into the first space, wherein the first space is fluidly connected to the common lubricant drain such that the lubricant may be drained from the apparatus through the common lubricant drain.

[0018] The second scraper is preferably configured to circumscribe (surround) the rod, i.e. is arranged like a ring around the rod, and to scrape the exterior surface of the rod. Thereby, the second scraper is configured to remove lubricant that is resident on the exterior surface of the rod and that has passed the first scraper. Once the second scraper removes the lubricant that is resident on the exterior surface of the rod, the lubricant is scraped off into the second space such that the lubricant may be drained from the apparatus, wherein the second space is fluidly connected to the common lubricant drain. Thus, lubricant which is removed from the exterior of the rod by either the first scraper or the second scraper is directed to the common lubricant drain for draining the lubricant

from the apparatus. This is advantageous as it allows for that lubricant is avoided, or at least reduced, in the hygienic zones of the apparatus. This is further advantageous as it allows for improved controllability of where the lubricant is present within the apparatus such that the lubricant may not enter hygienic zones of the apparatus. This is advantageous as it allows for fulfilling hygienic requirements of the food processing industry.

[0019] The apparatus is further advantageous as it allows for the common lubricant drain to be connected to a single point of drainage. Hence, both the first space and the second spaced may be drained into one single drainage, which is advantageous in that a single drain is only required although two different spaces are drained from lubricant.

[0020] The second space may be fluidly connected to the first space via a fluid channel, such that lubricant is drainable from the second space, through the fluid channel, into the first space and further to the common lubricant drain. The second space is fluidly connected to the first space via the fluid channel. This is advantageous as it allows for the lubricant to be drainable into the common lubricant drain, from either the first space or the second space, in an easy and efficient way. It is further advantageous in that a single drainage is needed.

[0021] The first space may be defined by the housing, the upper guide, the rod and the first scraper. In other words, the first space may be defined by surface portions of the housing, the upper guide, the rod and the first scraper. These surface portions may consequently form the first space while defining its shape and physical extension. This is advantageous as it allows for the lubricant which has been removed from the exterior of the rod by the first scraper to be received by the first space before being drained from the first space to the common lubricant drain.

[0022] The housing may comprise an upper main portion and a top member that is arranged on the upper main portion, wherein the second scraper is positioned in a groove that is formed in the top member. This is advantageous as it allows for introducing the second scraper to the apparatus in an easy way with a reduced risk of damaging the second scraper. This is further advantageous as it allows for removing the second scraper from the apparatus in an easy way.

[0023] The second space may be defined by the top member, the upper main portion, the first scraper, the rod and the second scraper. In other words, the second space may be defined by surface portions of the top member, the upper main portion, the first scraper, the rod and the second scraper. These surface portions may consequently form the second space while defining its shape and physical extension. This is advantageous as it allows for the lubricant which has been removed from the exterior of the rod by the second scraper to be received by the second space before being drained from the second space to the common lubricant drain.

[0024] The housing may comprise a disk that is located

between the upper main portion and the top member, the disk may be connected to the upper main portion such that a groove is formed by the upper main portion and the disk, and the first scraper may be positioned in the groove formed by the upper main portion and the disk. This is advantageous as it allows for introducing the first scraper to the apparatus in an easy and efficient way with a reduced risk of damaging the first scraper. It is possible to introduce the first scraper by removing the top member and the disk, arrange the first scraper in the groove which is formed by the upper main portion and the disk, and thereafter arrange the disk and the top member on the upper main portion. This is further advantageous as it allows for keeping the first scraper in place by the disk. This is also advantageous as it allows for removing the first scraper in an easy and efficient way.

[0025] The first scraper may preferably be surrounded by one or more O-rings arranged to provide for an even pressure around the scraper.

[0026] The disk may comprise a through hole which forms part of the fluid channel that connects the second space to the first space. This is advantageous as the lubricant removed from the exterior of the rod by the second scraper may be drained from the second space to the first space in an easy way in which the fluid channel is formed to facilitate the drainage. This is further advantageous as it allows for the fluid channel to be designed as efficient as possible, without the need of introducing unnecessary pathways between the first and second spaces.

[0027] The first scraper may comprise an upper protrusion and a lower protrusion that are in contact with the rod and arranged at a distance from each other along a longitudinal extension of the rod, such that an intermediate space is formed between the protrusions, the lower protrusion being provided with a recess that forms a channel between the intermediate space and the first space. This is advantageous as it allows for the first scraper to scrape lubricant more efficiently from the rod by means of the upper protrusion and the lower protrusion. This is further advantageous in that lubricant which has been removed from the exterior of the rod and into the intermediate space may be drained to the first space via the recess in an easy and efficient way in order to avoid for lubricant to be introduced in hygienic zones of the apparatus. The recess may further counteract that lubricant is accumulated in the intermediate space and that a pressure is built up in the intermediate space which otherwise may lead to that lubricant is pushed into the hygienic zones of the apparatus.

[0028] The apparatus may comprise a third scraper arranged below the lower guide and surrounding the rod for scraping the exterior surface of the rod to remove lubricant that has passed by the lower guide from the gap, a fourth scraper arranged below the third scraper and surrounding the rod for scraping the exterior surface of the rod to remove lubricant that has passed by the third scraper, a third space formed between the third

scraper and the fourth scraper and surrounding the rod for receiving lubricant that has been scraped by the fourth scraper, and a further lubricant drain to which the third space may be fluidly connected.

[0029] This is advantageous as it allows for maintaining a good hygienic level of the apparatus since oil leakage below the fourth scraper may be avoided or at least reduced compared to conventional solutions. This is preferably advantageous when the rod is moved in the direction opposite the longitudinal direction, i.e., in a downwards direction when e.g., a food package is lowered.

[0030] The third scraper is preferably configured to circumscribe (surround) the rod, i.e. is arranged like a ring around the rod, and is configured to scrape the exterior surface of the rod. Thereby, the third scraper is configured to remove lubricant that has passed the lower guide from the gap. When the third scraper removes the lubricant that is resident on the exterior surface of the rod, the lubricant is preferably directed towards the gap. The fourth scraper is preferably configured to circumscribe (surround) the rod, i.e. is arranged like a ring around the rod, and is configured to scrape the exterior surface of the rod. Thereby, the fourth scraper is configured to remove lubricant that has passed the third scraper. When the fourth scraper removes the lubricant that is resident on the exterior surface of the rod, the lubricant is directed into the third space, wherein the third space is fluidly connected to the further lubricant drain.

[0031] The third space should be understood as a geometrical void of a certain shape that defines its surrounding, i.e. it is a technical design parameter that gives the apparatus certain technical characteristics. The third space is therefore created to let its geometrical shape define the shape of the parts of the apparatus that surrounds the third space or the shape of the parts of the apparatus which being surrounded by the third space.

[0032] The housing may comprise a lower main portion and a bottom member that is arranged on the lower main portion, wherein the fourth scraper may be positioned in a groove that is formed in the bottom member. This is advantageous as it allows for introducing the fourth scraper to the apparatus in an easy way with a reduced risk of damaging the fourth scraper. This is further advantageous as it allows for removing the fourth scraper from the apparatus in an easy way.

[0033] The third space may be defined by the third scraper, the bottom member, the fourth scraper and the rod. In other words, the third space may be defined by surface portions of the third scraper, the bottom member, the fourth scraper and the rod. These surface portions may consequently form the third space while defining its shape and physical extension. This is advantageous as it allows for the lubricant which has been removed from the exterior of the rod by the third scraper to be received by the gap instead of being directed into hygienic zones of the apparatus.

[0034] The bottom member may be connected to the lower main portion such that a groove is formed by the

lower main portion and the bottom member, and the third scraper is positioned in the groove formed by the lower main portion and bottom member.

[0035] This is advantageous as it allows for introducing the third scraper to the apparatus in an easy and efficient way with a reduced risk of damaging the third scraper. This is further advantageous as it allows for keeping the third scraper in place by the bottom member. This is also advantageous as it allows for removing the third scraper in an easy and efficient way. The third scraper may preferably be arranged in the groove surrounded by one or more O-rings arranged to provide for an even pressure around the scraper.

[0036] The rod may be configured to be moved in the longitudinal direction with a speed of at least 4 m/s. This is advantageous as it allows for the apparatus to lift the food package with a high speed such that a time-efficient, and also a cost-efficient, filling of the packages may be provided. The rod may be configured to be moved in the direction opposite the longitudinal direction with a speed equal to a speed of filling food product in the package.

[0037] According to a second aspect, it is provided a filling machine for filling food product in a package, the filling machine comprising an apparatus according to the first aspect.

[0038] Effects and features of the second aspect are largely analogue to those described above in connection with the first aspect.

[0039] Still other objectives, features, aspects, and advantages will appear from the following detailed description as well as from the drawings.

Drawings

[0040] Embodiments will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1 is a schematic view of a filling machine which comprises an apparatus for lifting packages.

Fig. 2 is a schematic view of an apparatus for lifting packages.

Fig. 3 is an exploded view of an upper portion of an apparatus for lifting packages.

Fig. 4 is an exploded view of a lower portion of an apparatus for lifting packages.

Description

[0041] With reference to Fig. 1, a filling machine 400 is illustrated by way of example. The filling machine 400 is depicted in a highly simplified manner in which only parts relevant for understanding how an apparatus 100 for lifting a package 402 is integrated in the filling machine 400. Hence, it is to be understood that the filling machine 400 typically includes further conventional parts that are commonly used for filling machines, even though these are not shown or described in the following disclosure.

The filling machine 400 is for filling food product in a package 402. The food product is preferably filled into the package 402 by means of filling nozzles 404. The filling machine 400 comprises an apparatus 100 for lifting the package 402. More specifically, the depicted filling machine 400 comprises two apparatuses 100 arranged side by side for lifting a respective package 402. The respective apparatuses 100 for lifting a package 402 depicted in Fig. 1 are identical and will in the following be described jointly while referring to one, the other or both apparatuses 100. The respective apparatuses 100 for lifting a package 402 may be identical or may not be identical. The filling nozzles 404 are arranged above the apparatuses 100 as seen in a longitudinal direction L thereof, which is typically the same as the vertical direction, such that the apparatuses 100 are able to lift a respective package 402 towards the filling nozzles 404 before filling the respective package 402 with food product. Each apparatus 100 comprises a housing 110 having a top member 111 and a bottom member 112. Each apparatus 100 further comprises a gripping arrangement 140 arranged above the top member 111 of the housing 110. The gripping arrangement 140 is arranged for gripping the package 402 prior to lifting the package 402. As further illustrated in Fig. 1, each apparatus 100 comprises a common lubricant drain 126 and a further lubricant drain 136 which will be discussed in more detail further below.

[0042] With reference also to Fig. 2, an apparatus 100 for lifting the package 402 as introduced in connection with Fig. 1 is illustrated in further detail by way of examples. In Fig. 2, like in Fig. 1., there are two similar apparatuses 100 illustrated next to each other, wherein each apparatus 100 is arranged for lifting a respective package 402. The two apparatuses 100 comprise similar features and are arranged in a similar way. In order to avoid repetition, only the apparatus 100 to the right will be discussed in connection with Fig. 2. It should however be noted that the below disclosure is equally valid for the apparatus to the left in Fig. 2 as for the apparatus to the right in Fig. 2.

[0043] As stated above, the apparatus 100 comprises a housing 110. The housing 110 has a rod 202, an inner rod 208, an upper guide 221 and a lower guide 231, wherein the rod 202 extends through the housing 110 between the upper and lower guides 221, 231. The rod 202 is movable in the longitudinal direction L, wherein the upper and lower guides 221, 231 are arranged to support the rod 202. The rod 202 is movable in the longitudinal direction L for lifting the package 402. Preferably, the rod 202 is movable in the longitudinal direction L with a speed of at least 4 m/s. Further, the rod 202 is also movable in a direction L' opposite to the longitudinal direction L for lowering the package 402. The rod 202 is configured to be moved in the direction L' opposite to the longitudinal direction L preferably with a speed which is smaller than the speed the rod 202 is moving in the longitudinal direction L. However, the rod 202 may be moved with the same speed in the longitudinal direction L and

in the direction L' opposite to the longitudinal direction L. The rod 202 may be moved with a higher speed in the direction L' opposite to the longitudinal direction L than in the longitudinal direction L. The inner rod 208 extends through the rod 202 and is arranged to actuate or move the gripping arrangement 140 as introduced in connection with Fig. 1 between different states, e.g. a gripping state for gripping the package 402 and a release state for releasing the package 402.

[0044] As illustrated in Fig. 2, a gap 204 is formed between the rod 202 and the housing 110 and extends between the upper and lower guides 221, 231. The gap 204 is arranged to hold any suitable lubricant that provides lubrication between the rod 202 and the upper and lower guides 221, 231. The housing 110 comprises an inlet 113 arranged to be fluidly connected to the gap 204 in order to provide lubricant to the gap 204. The inlet 113 may be referred to as an oil-inlet. The housing 110 may comprise an overflow drain 114 arranged to be fluidly connected to the gap 204. The overflow drain 114 is arranged to drain lubricant from the gap 204 when a level of the lubricant is above a level of the overflow drain 114, i.e. when the lubricant is above a maximum level of the gap 204. The overflow drain 114 may be referred to as a first oil-outlet arranged to drain lubricant from the apparatus 100. The lubricant is used for lubricating the rod 202, wherein, when the rod 202 is provided with lubricant at an exterior surface of the rod 202, and when the rod 202 is moving in the longitudinal direction L or the direction L' opposite the longitudinal direction L, the upper and lower guides 221, 231 are lubricated as well. This is advantageous as it allows for an improved lifetime of both the rod 202 and the upper and lower guides 221, 231 as well as that these components are lubricated in an easy and efficient way when the rod 202 is moving in the longitudinal direction L or in the direction L' opposite the longitudinal direction L.

[0045] Now also referring to Fig. 3 and Fig. 4., the apparatus 100 comprises an upper main portion 213 and a lower main portion 214. The apparatus 100 also comprises a disk 217. The top member 111 as introduced in connection with Fig. 1 is arranged on the upper main portion 213. The disk 217 is located between the upper main portion 213 and the top member 111. The disk 217 is preferably connected to the upper main portion 213 such that a groove 219 is formed by the upper main portion 213 and the disk 217. The disk 217 comprises a through hole 217a. The bottom member 112 as introduced in connection with Fig. 1 is arranged on the lower main portion 214. The bottom member 112 is connected to the lower main portion 214 such that a groove 218 is formed by the lower main portion 214 and the bottom member 112.

[0046] As best illustrated in Fig. 3, which illustrates an upper portion 100a of the apparatus 100, the apparatus 100 comprises a first scraper 222 and a second scraper 223. The first scraper 222 is arranged above the upper guide 221 and in the groove 219 formed by the upper

main portion 213 and the disk 217. The first scraper 222 is arranged in the groove 219 and surrounded by two O-rings 229 arranged to provide for an even pressure around the first scraper 222. Hence, the two O-rings 229 are backing the first scraper 222. The first scraper 222 surrounds the rod 202 for scraping the exterior surface of the rod 202. The first scraper 222 is arranged to scrape the exterior surface of the rod 202 when the rod is moving in the longitudinal direction L. Correspondingly, the first scraper 222 is arranged to scrape the exterior surface of the rod 202 when the rod is moving in the direction L' opposite to the longitudinal direction L. Preferably, the first scraper 222 rests against the exterior surface of the rod 202 such that the rod 202 is movable in the longitudinal direction L in a way such that the first scraper 222 scrapes the exterior surface of the rod 202. In other words, the first scraper 222 preferably exhibits a tight fit around the rod 202. The first scraper 222 is arranged to remove lubricant that is present on the exterior surface of the rod 202 and has passed by the upper guide 221 from the gap 204 when the rod 202 moves in the longitudinal direction L.

[0047] The first scraper 222 comprises an upper protrusion 222a and a lower protrusion 222b. The upper and lower protrusions 222a, 222b are in contact with the rod 202 and are arranged at a distance D from each other along a longitudinal extension of the rod 202. Thereby, an intermediate space 227 is formed between the upper and lower protrusions 222a, 222b. The lower protrusion 222b comprises a recess (not illustrated) that forms a channel (not illustrated) between the intermediate space and a first space 224, which is described in more detail below, such that lubricant which has been scraped by the first scraper 222 may pass to the first space 224 via the recess. The recess may be a cut out in the lower protrusion 222b.

[0048] The second scraper 223 is arranged above the first scraper 222. The second scraper 223 is arranged in a groove 215 comprised in the top member 111. The second scraper 223 preferably surrounds the rod 202 for scraping the exterior surface of the rod 202. The second scraper 223 is arranged to scrape the exterior surface of the rod 202 when the rod is moved in the longitudinal direction L. Correspondingly, the second scraper 223 is arranged to scrape the exterior surface of the rod 202 when the rod is moving in the direction L' opposite to the longitudinal direction L. Preferably, the second scraper 223 rests against the exterior surface of the rod 202 such that the rod 202 is movable in the longitudinal direction L in a way such that the second scraper 223 scrapes the exterior surface of the rod 202. In other words, the second scraper 223 preferably exhibits a tight fit around the rod 202. The second scraper 223 is arranged to remove lubricant that is present on the exterior surface of the rod 202 and has passed by the first scraper 222 when the rod 202 moves in the longitudinal direction L.

[0049] The apparatus 100 comprises the first space 224 and a second space 225. The first space 224 is

formed between the upper guide 221 and the first scraper 222 and surrounds the rod 202. The first space 224 is arranged to receive lubricant that has been scraped by the first scraper 222. The first space 224 is defined by the housing 110 the upper guide 221, the rod 202 and the first scraper 222. Thus, the first space 224 has a transversal extension between the housing 110 and the rod 202 and a longitudinal extension between the upper guide 221 and the first scraper 222.

[0050] The second space 225 is formed between the first scraper 222 and the second scraper 223 and surrounds the rod 202. The second space 225 is arranged to receive lubricant that has been scraped by the second scraper 223. The second space 225 is arranged to receive lubricant that has been scraped by the first scraper 222, when the rod 202 is moving downwards in the vertical direction. The second space 225 is defined by the top member 111 of the housing 110, the upper main portion 213 of the housing 110, the first scraper 222, the rod 202 and the second scraper 223. Thus, the second space 225 has a transversal extension between the top member 111 and the rod 202 and the upper main portion 213 and the rod 202, respectively, and a longitudinal extension between the first scraper 222 and the second scraper 223.

[0051] The apparatus 100 further comprises a common lubricant drain 126 to which each of the first space 224 and the second space 225 are fluidly connected. As the first and second spaces 224, 225 are fluidly connected to the common lubricant drain 126, the lubricant that has been received by the first and second spaces 224, 225 is drained by the common lubricant drain 126. The common lubricant drain 126 is arranged to drain the lubricant that has been scraped by the first or second scraper 222, 223 and received by the first or second space 224, 225. As further illustrated, the second space 225 is fluidly connected to the first space 224 via a fluid channel 228. Thereby, lubricant which has been received by the second space 225 is drainable from the second space 225, through the fluid channel 228, into the first space 224 and further to the common lubricant drain 126. The through hole 217a of the disk 217 as introduced above preferably forms part of the fluid channel 228 that connects the first and second spaces 224, 225.

[0052] The common lubricant drain 126 may be referred to as a second oil-outlet arranged to drain lubricant from the apparatus 100.

[0053] As best illustrated in figure 4, which illustrates a lower portion 100b of the apparatus 100, the apparatus 100 further comprises a third scraper 232 which is arranged below the lower guide 231 and surrounds the rod 202. The third scraper 232 is arranged for scraping the exterior surface of the rod 202 to remove lubricant that has passed by the lower guide 231 from the gap 204. The third scraper 232 may be designed in a similar way, and comprise similar features, as the first scraper 222 discussed above. The third scraper 232 is positioned in the groove 218 formed by the lower main portion 214 and

the bottom member 112 as introduced above.

[0054] The apparatus 100 further comprises a fourth scraper 233 which is arranged below the third scraper 232 and surrounds the rod 202. The fourth scraper 233 is for scraping the exterior surface of the rod 202 to remove lubricant that has passed by the third scraper 232. The fourth scraper 233 may be designed in a similar way, and comprise similar features, as the second scraper 223 discussed above. The fourth scraper 233 is positioned in a groove 216 which is formed in the bottom member 112 as introduced above.

[0055] The apparatus 100 also comprises a third space 235 which is formed between the third and fourth scrapers 232, 233 and surrounds the rod 202. The third space 235 is arranged for receiving lubricant that has been scraped by the fourth scraper 222. The third space 235 is defined by the third scraper 232, the bottom member 112, the fourth scraper 233 and the rod 202. Thus, the third space 235 has a transversal extension between the bottom member 112 and the rod 202 and a longitudinal extension between the third and fourth scrapers 232, 233.

[0056] The apparatus 100 also comprises a further lubricant drain 136 to which the third space 235 is fluidly connected. The further lubricant drain 136 may be referred to as a third oil-outlet arranged to drain lubricant from the apparatus 100.

[0057] Thus, the scrapers 222, 223 of the upper portion 100a of the apparatus 100 are mainly arranged to scrape the exterior surface of the rod 202 when the rod 202 is moved in the longitudinal direction L (typically upward in the vertical direction). The scrapers 232, 233 of the lower portion 110b of the apparatus 110 are mainly arranged to scrape the exterior surface of the rod 202 when the rod 202 is moved in the direction L' opposite the longitudinal direction L (typically downward in the vertical direction). It should however be noted that the scrapers 222, 223 of the upper portion 100a of the apparatus 100 may scrape the exterior surface of the rod 202 when the rod 202 is moved in the direction L' opposite the longitudinal direction L. It should however also be noted that the scrapers 232, 233 of the lower portion 100b of the apparatus 100 may scrape the exterior surface of the rod 202 when the rod 202 is moved in the longitudinal direction L. Also, the upper guide 221 and the lower guide 231 will scrape lubricant from the exterior surface of the rod 202 when the rod 202 is moved in the longitudinal direction L and when the rod 202 is moved in direction L' opposite to the longitudinal direction L.

[0058] In addition to scraping of lubricant, the scrapers are also useful for scraping of dust and other particles from the rod, which may get caught on sections of the rod that are outside of the apparatus during the movement of the rod.

[0059] 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 apparatus (100) for lifting a package (402), the apparatus (100) comprising

a housing (110) having an upper guide (221) and a lower guide (231) that support a rod (202) which extends through the housing (110) and is arranged to move in a longitudinal direction (L) for lifting a package (402), wherein a gap (204) is formed between the rod (202) and the housing (110), the gap (204) extending from the upper guide (221) to the lower guide (231) for holding lubricant that provides lubrication between the rod (202) and the upper and lower guides (221, 231),

a first scraper (222) arranged above the upper guide (221) and surrounding the rod (202) for scraping an exterior surface of the rod (202) to remove lubricant that has passed by the upper guide (221) from the gap (204),

a second scraper (223) arranged above the first scraper (222) and surrounding the rod (202) for scraping the exterior surface of the rod (202) to remove lubricant that has passed by the first scraper (222),

a first space (224) formed between the upper guide (221) and the first scraper (222) and surrounding the rod (202) for receiving lubricant that has been scraped by the first scraper (222),

a second space (225) formed between first scraper (222) and the second scraper (223), and surrounding the rod (222) for receiving lubricant that has been scraped by the second scraper (223), and

a common lubricant drain (126) to which each of the first space (224) and the second space (225) is fluidly connected.

2. The apparatus (100) according to claim 1, wherein the second space (225) is fluidly connected to the first space (224) via a fluid channel (228), such that lubricant is drainable from the second space (225), through the fluid channel (228), into the first space (224) and further to the common lubricant drain (126).
3. The apparatus (100) according to claim 1 or 2, wherein the first space (224) is defined by the housing (110), the upper guide (221), the rod (202) and the first scraper (222).
4. The apparatus (100) according to any one of the preceding claims, wherein the housing (110) comprises

an upper main portion (213) and a top member (111) that is arranged on the upper main portion (213), wherein the second scraper (225) is positioned in a groove (215) that is formed in the top member (111).

5. The apparatus (100) according to claim 4, wherein the second space (225) is defined by the top member (111), the upper main portion (213), the first scraper (222), the rod (202) and the second scraper (223).

6. The apparatus (100) according to claim 4 or 5, wherein

the housing (110) comprises a disk (217) that is located between the upper main portion (213) and the top member (111),

the disk (217) is connected to the upper main portion (213) such that a groove (219) is formed by the upper main portion (213) and the disk (217), and

the first scraper (222) is positioned in the groove (219) formed by the upper main portion (213) and the disk (217).

7. The apparatus (100) according to claim 2 and 6, wherein the disk (217) comprises a through hole (217a) which forms part of the fluid channel (228) that connects the second space (225) to the first space (224).

8. The apparatus (100) according to any one of the preceding claims, wherein the first scraper (222) comprises an upper protrusion (222a) and a lower protrusion (222b) that are in contact with the rod (202) and arranged at a distance (D) from each other along a longitudinal extension of the rod (202), such that an intermediate space (227) is formed between the protrusions (222a, 222b), the lower protrusion (222b) being provided with a recess that forms a channel between the intermediate space (227) and the first space (224).

9. The apparatus (100) according to any one of the preceding claims, comprising

a third scraper (232) arranged below the lower guide (231) and surrounding the rod (202) for scraping the exterior surface of the rod (202) to remove lubricant that has passed by the lower guide (231) from the gap (204),

a fourth scraper (233) arranged below the third scraper (232) and surrounding the rod (202) for scraping the exterior surface of the rod (202) to remove lubricant that has passed by the third scraper (232),

a third space (235) formed between the third scraper (232) and the fourth scraper (233) and surrounding the rod (222) for receiving lubricant

that has been scraped by the fourth scraper (222), and
a further lubricant drain (136) to which the third space (235) is fluidly connected.

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10. The apparatus (100) according to claim 9, wherein the housing (110) comprises a lower main portion (214) and a bottom member (112) that is arranged on the lower main portion (214), wherein the fourth scraper (233) is positioned in a groove (216) that is formed in the bottom member (112). 10
11. The apparatus (100) according to claim 10, wherein the third space (235) is defined by the third scraper (232), the bottom member (112), the fourth scraper (233) and the rod (202). 15
12. The apparatus (100) according to claim 10 or 11, wherein 20
- the bottom member (112) is connected to the lower main portion (214) such that a groove (218) is formed by the lower main portion (214) and the bottom member (112), and 25
- the third scraper (232) is positioned in the groove (218) formed by the lower main portion (214) and bottom member (112).
13. The apparatus (100) according to any one of the preceding claims, wherein the rod (202) is configured to be moved in the longitudinal direction (L) with a speed of at least 4 m/s. 30
14. A filling machine (400) for filling food product in a package (402), the filling machine (400) comprising an apparatus (100) according to any one of claims 1 to 12. 35

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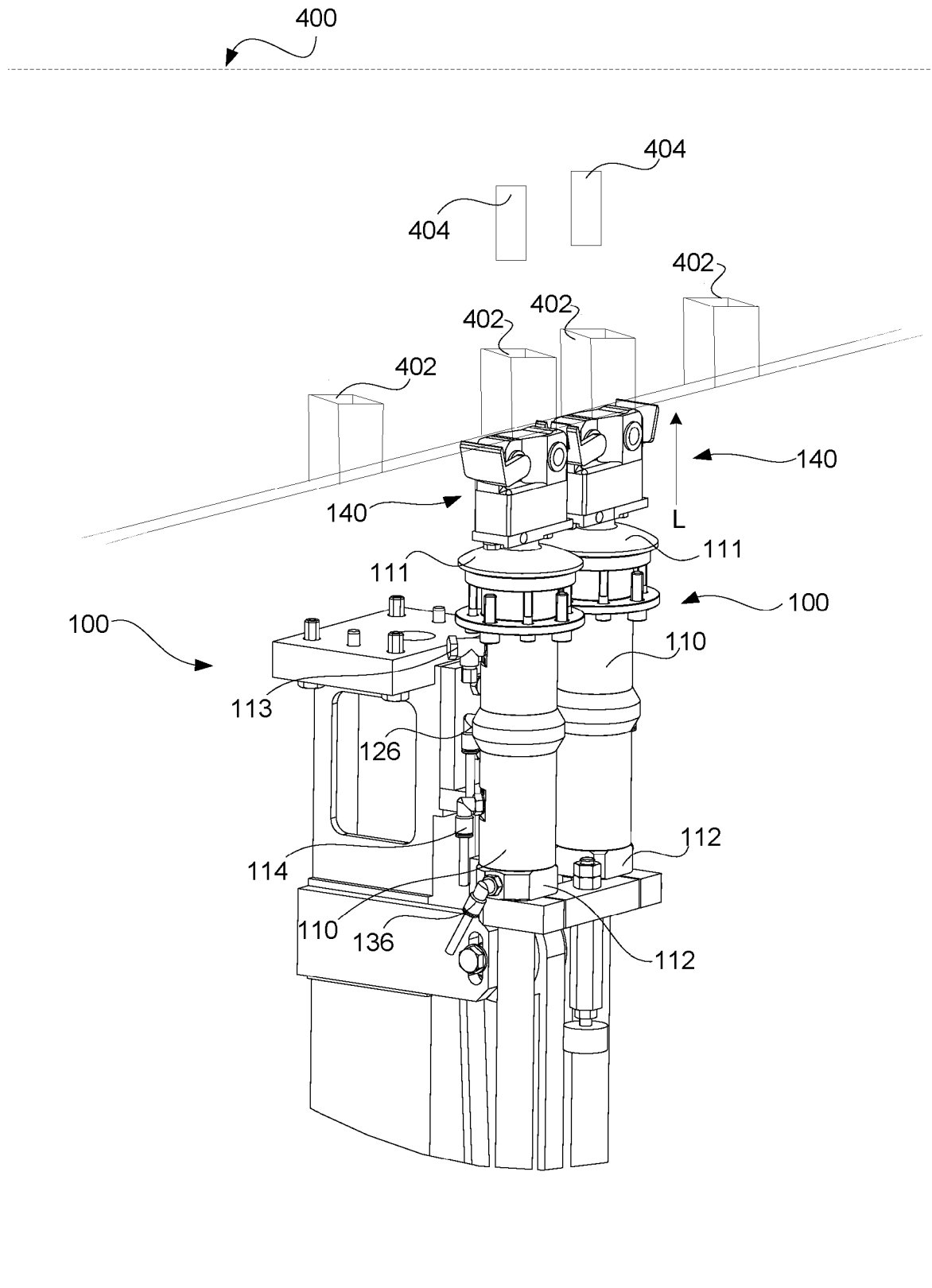


Fig. 1

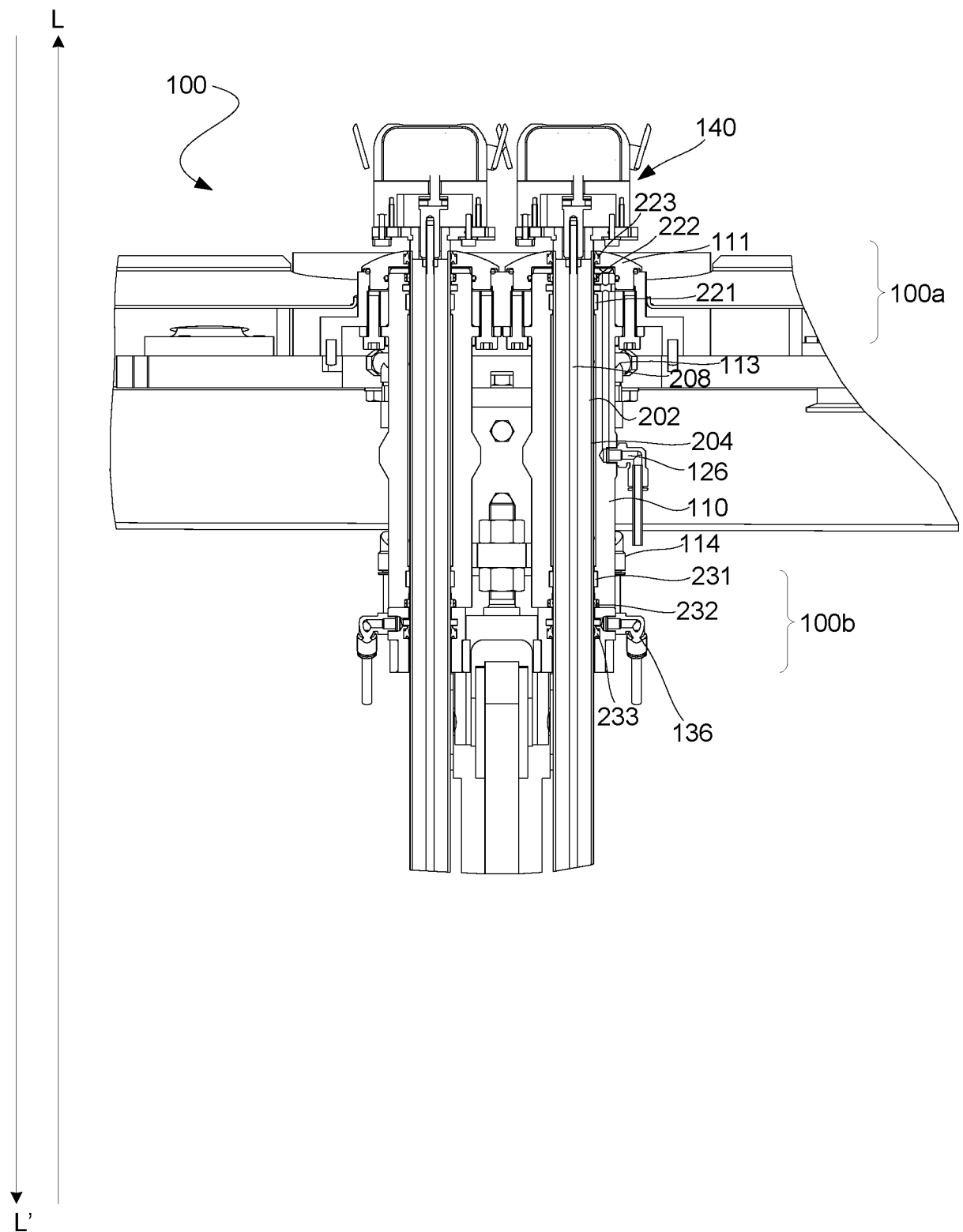


Fig. 2

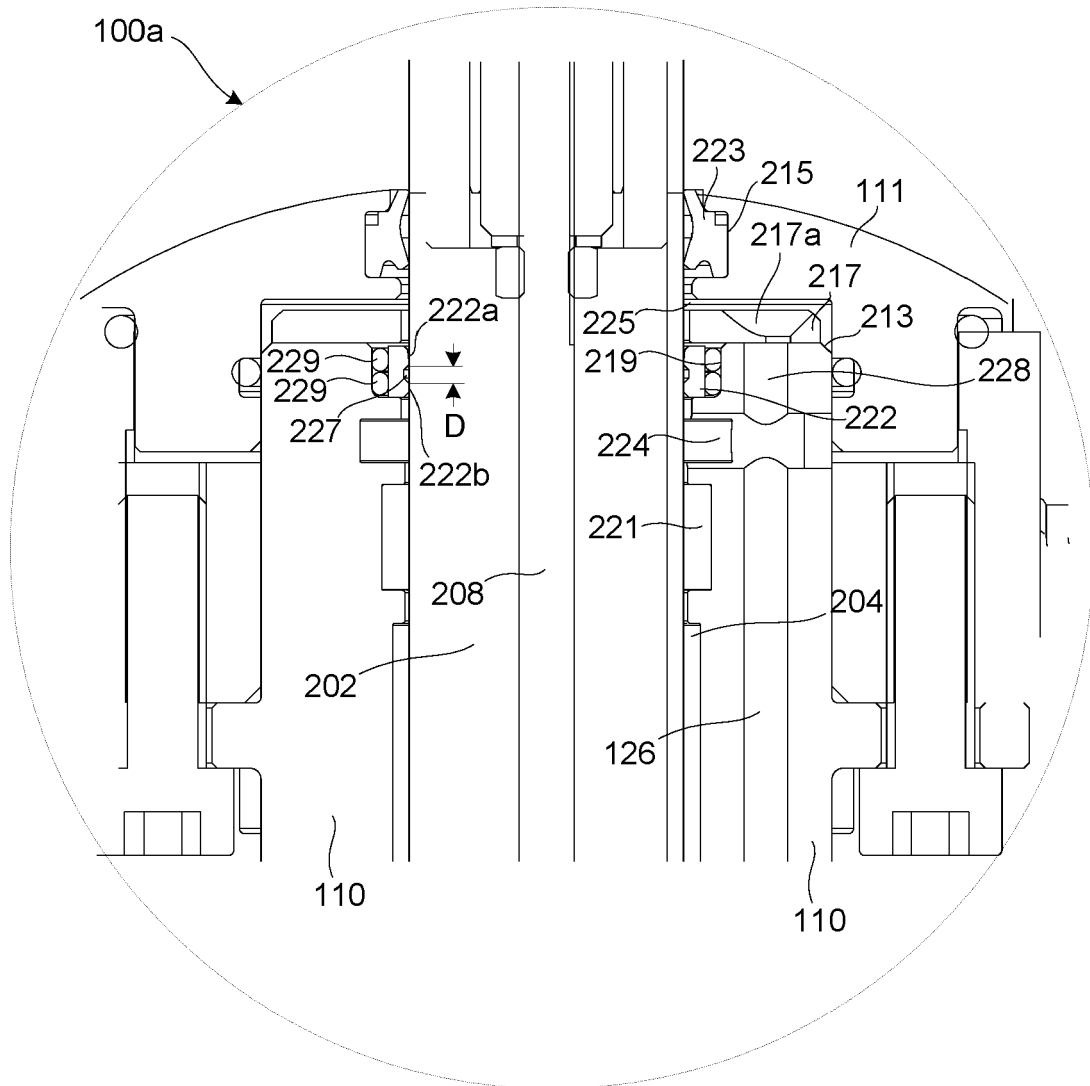


Fig. 3

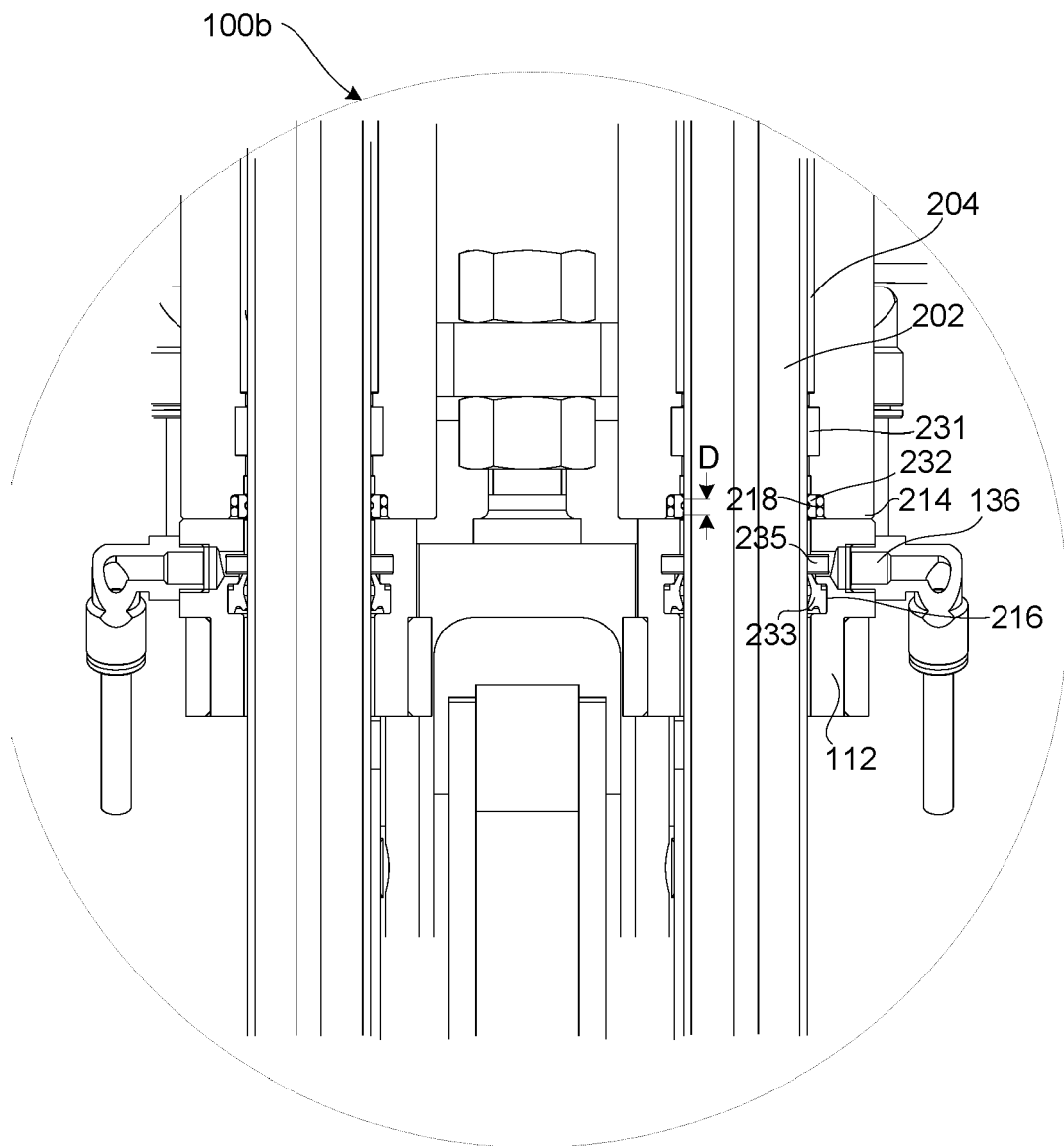


Fig. 4



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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 December 2023	Examiner Ungureanu, Mirela
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