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(54) **DEVICE FOR FILLING CONTAINERS**

(57) A device (1) for filling containers (100) with a preferably liquid filling product, or a product with two phases, installable on a filling machine (200), wherein each container (100) is positioned below the filling device (1), said device (1) comprising from the top down a doser (50), a tap (60) and a nozzle (10) located in the proximity of the container (100), wherein through the tap (60), a corresponding amount of filling product is introduced into the doser (50) and subsequently transferred to the nozzle (10), which comprises an outlet mouth (11) from which the product exits to be introduced into the container (100), characterized in that said nozzle (10) comprising an outer body (30) and an inner body (20) that is in fluid communication with the doser (50), said nozzle (10) is configured to allow/prevent the passage of the product to the container (100) by a relative lifting/lowering motion between the outer body (30) and the inner body (20), wherein said relative lifting/lowering motion occurs by a mechanical cam (40) having a profile adapted to define a specific law of motion during said relative lifting/lowering motion.

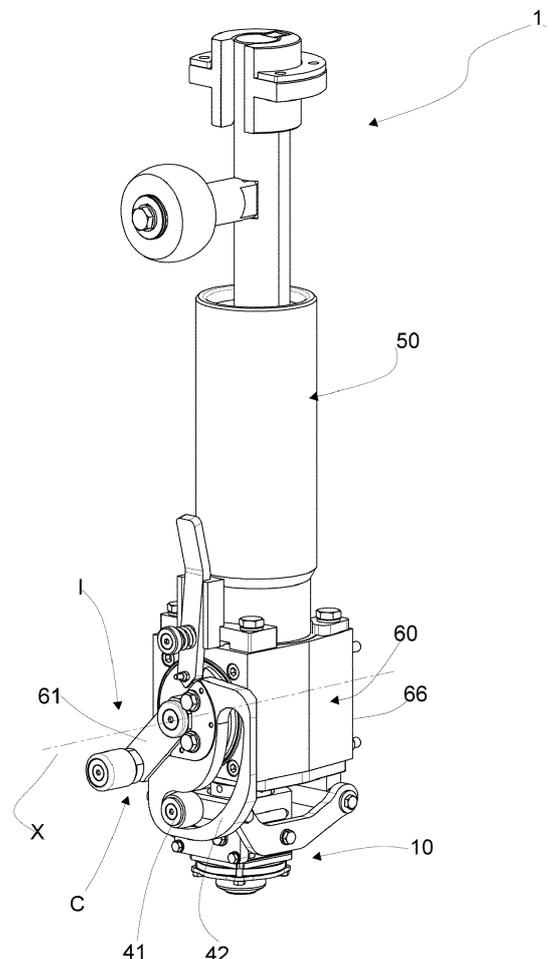


Fig. 2a

EP 4 321 473 A1

Description

FIELD OF APPLICATION OF THE INVENTION

[0001] The present invention pertains to the field of the devices for filling a container with a filling product in a filling plant. In particular, the filling device is installable onto a filling machine of both a rotary, and a linear type.

STATE OF THE ART

[0002] The use of filling devices in filling plants to insert the respective filling product, into containers to be filled, is known. Said devices are suitable for processing different types of products, for example, a liquid product like a beverage, or a viscous product like an oil, or a fibrous product like a pulp or juice, or a product with two phases, i.e., both liquid and solid, such as a minestrone or a soup, etc. The containers can be, for example, PET or glass containers, in particular bottles, cans, jars, etc.

[0003] For this purpose, the containers are arranged under the filling device, and in particular under a nozzle of said filling device. The filling device generally comprises a tap and a doser above said nozzle.

[0004] Through the opening of the tap towards product holding tanks, a corresponding amount of filling product is introduced into the doser, for example, by a suction system due to the movement of an internal plunger within a filling chamber of the doser.

[0005] Through the opening of the tap towards the nozzle, this amount of product is subsequently transferred to the nozzle, then to the container.

[0006] The tap is generally of a rotary type, and comprises a tap body that is movable relative to a tap seat.

[0007] The rotation of the tap body between a suctioning position and a filling position allows performing the suctioning phase and the filling phase of the device, respectively.

[0008] In particular during the suctioning phase the tap body is positioned so as to put in fluid communication the doser filling chamber with the tanks containing the product; the doser plunger lifts to create the suctioning effect resulting in the filling of the chamber with the product.

[0009] "In said position, which is referred to as the suctioning position, the tap body does not allow the passage of product from the doser filling chamber to the nozzle.

[0010] During the filling phase, on the other hand, the tap body is positioned so as to put in fluid communication the doser filling chamber with the nozzle; the doser plunger lowers to make the product exit from the filling chamber.

[0011] In said position, which is referred to as the filling position, the tap body closes the passage of the product between the doser filling chamber and the tanks containing the product.

[0012] The achievement of the two suctioning and filling positions of the tap is generally carried out by means

of a control lever integral with the tap body, which engages with a mechanical cam of the filling machine and rotates said tap body inside the tap seat.

[0013] The nozzle comprises an outlet mouth from which the product exits to enter the container to be filled.

[0014] The nozzle can also comprise a product delivery valve, which enables or prevents the passage of the filling product to the container to be filled.

[0015] The presence of the valve downstream from the tap allows for greater filling precision as it helps reduce any leaks originating from the tap. These leaks are more noticeable with very fluid and low-viscosity products, such as water, for example.

[0016] The valves can be of different types and generally comprise a valve body that is movable relative to a valve seat. For example, we describe two well-known types of product delivery valve: a first type, in which the valve performs the opening/closing by a rotational motion, and the second type, in which the valve performs the opening/closing by a translational motion.

[0017] To allow the filling product to flow out from the outlet mouth, the first type of valve requires the valve body to be rotated inside from the valve seat, so that the filling product that is located above it can flow within a dedicated passage that is present in the valve body and exits from the outlet mouth to enter the container to be filled.

[0018] To allow the filling product to flow out from the outlet mouth, the second type of valve provides for the valve body be raised or lowered from the valve seat, so that the filling product that is located above it can flow between said valve body and the valve seat and exits the outlet mouth to enter the container to be filled.

[0019] With both types of valve, an actuation is required for each filling device, by which the valve body is rotated inside the valve seat or alternatively raised/lowered relative to said seat.

[0020] In the first type, the opening/closing of the valve can be carried out by taking the motion from the tap control lever, for example, by an arm which is integral with the valve body and connected, for example, with a pantograph system, to the tap control lever.

[0021] This mechanical operation is simple and cost-effective, because it does not require the insertion of electric- or pneumatic-type actuation devices.

[0022] The disadvantage of this solution is due to the fact that the rotation involves a reduced sealing function due to the absence of gaskets and is solely dependent on the mechanical tolerances of the valve.

[0023] This operation may result in leaks, thereby adversely affecting the precision of the dispensed product amount. In particular, said solution does not allow to properly work with high-fluidity products such as water.

[0024] Furthermore, said operation makes so that the opening/closing of the valve occurs in a synchronized manner with the opening/closing of the tap, but does not allow for varying the law of motion of said opening/closing of the valve. Therefore, the valve is not suitable for work-

ing with all types of products.

[0025] In fact, the variation of the law of motion can offer significant advantages, as it allows for working with a variety of products, from the most fluid to the denser, viscous, and fibre-containing ones, thus optimizing the filling thereof.

[0026] In the second type, the opening/closing of the valve is carried out, for example, by a pneumatic or spring actuation that raises or lowers the valve body relative to the seat, or vice versa.

[0027] Said mechanical operation has fewer wearing issues, since the gaskets can remain always engaged on the working surface and be less stressed compared to a rotation, in which the gaskets are more subject to shearing

[0028] However, said solution has the disadvantage of requiring the additional use of pneumatic actuation devices, which are therefore more complex and costly to manage, or alternatively, spring devices that are not very reliable over time.

[0029] Furthermore, the above-mentioned devices provide an operation that does not allow for the synchronization of the motion of the valve body with the opening/closing of the tap.

[0030] In addition, even with said devices, it is not possible to vary the law of motion of the opening/closing of the valve.

[0031] Therefore, in this case as well, it is a solution that is not flexible for the use of products with a different fluidity.

DISCLOSURE AND ADVANTAGES OF THE INVENTION

[0032] The technical problem underlying the present invention is to provide a device for filling containers that is structurally and functionally designed to overcome one or more of the limitations set forth above with reference to the mentioned prior art.

[0033] Within the scope of the above-mentioned problem, a primary object of the invention is to perfect a device for filling containers with a nozzle capable of performing precise and reliable closure, which also allows for a reduction in the cycle time of the filling machine. Furthermore, said solution enables the handling of products with different textures.

[0034] In particular, said nozzle, by virtue of the mechanical cam, allows for a synchronized closure with the tap that controls the suction and filling of the product. In addition, it allows an adjustable closure according to a law of motion that is appropriate to the fluid being processed.

[0035] Moreover, the nozzle allows for a precise and instantaneous closure while eliminating the dripping and dripping times, by virtue of an internal chamber expansion system that creates a vacuum at the closure point. The nozzle also provides for a configuration capable of performing a cutting function of the fluid stream, which

allows for filling products with pieces or filaments as well.

[0036] In particular, it is the object of the invention a device for filling containers with a preferably liquid filling product, or a product with two phases, installable on a filling machine, in which each container is positioned below the filling device.

[0037] Preferably said device comprises from the top down a doser, a tap and a nozzle located in the proximity of the container, in which, through the tap, a corresponding amount of filling product is introduced into the doser and subsequently transferred to the nozzle.

[0038] Said nozzle preferably comprises an outlet mouth from which the product exits to be introduced into the container.

[0039] Said nozzle preferably comprises an outer body and an inner body that is in fluid communication with the doser.

[0040] Said nozzle is preferably configured to allow/prevent the passage of the product to the container by a relative lifting/lowering motion between the outer body and the inner body.

[0041] Said relative lifting/lowering motion preferably occurs by a mechanical cam having a profile adapted to define a specific law of motion during said relative lifting/lowering motion.

[0042] The outer body is preferably movable and operatively associated to the mechanical cam to translate in a vertical direction of moving away/approaching with respect to the container to be filled between a fully open position and a fully closed position so as to allow the passage of the product moving away from the container and to prevent the passage thereof when approaching to the container, or vice versa.

[0043] The tap preferably comprises a driving member that is rotatable according to a first rotational axis, orthogonal to the vertical direction, and preferably rotated by engaging/disengaging with an engaging profile of the filling machine.

[0044] Said driving member is preferably configured to bring the tap from a suctioning position, in which the doser is filled at a filling position where the doser empties and the container is filled.

[0045] Said driving member preferably being mechanically connected to the mechanical cam so that, when said driving member brings the tap from the suctioning position to the filling position, it simultaneously acts onto the mechanical cam to bring the nozzle from the fully closed position towards the fully open position.

[0046] Vice versa, when it brings the tap from the filling position to the suctioning position, it simultaneously acts onto the mechanical cam, to bring the nozzle from the fully open position towards the fully closed position.

[0047] Said nozzle preferably defines, between the outer body and the inner body, a volume adapted to receive the filling product, and comprising an upper chamber and a lower chamber that is closer to the container and comprising an outlet mouth of the nozzle.

[0048] Said chambers are preferably put into commu-

nication when the nozzle passes from the fully closed position towards the fully open position and vice versa, said communication stops when the fully closed position is reached.

[0049] Said communication preferably stops in an intermediate position that precedes the fully closed position.

[0050] Preferably, so that the lower chamber increases its volume before reaching the fully closed position, preferably in the passage between the intermediate position and the fully closed position.

[0051] The mechanical cam preferably comprises first engaging means configured to be moved by second engaging means, in which the first engaging means are preferably integral with the outer body.

[0052] The second engaging means are preferably moved by the driving member, which is preferably configured to rotate said second engaging means according to an axis that is parallel to, preferably coincident with, the first rotational axis.

[0053] Said driving member is preferably configured to make so that, when it brings the tap from the suctioning position to the filling position, it simultaneously rotates the second engaging means so that they act onto the first engaging means to bring the outer body from the fully closed position towards the fully open position.

[0054] Vice versa, when it brings the tap from the filling position to the suctioning position, it simultaneously rotates the second engaging means so that they act onto the first engaging means to bring the outer body from the fully open position towards the fully closed position.

[0055] The nozzle preferably comprises a second order leverage, in which a first end thereof is secured to a coupling member of the nozzle in a rotatable manner about a fulcrum.

[0056] Preferably, at a second end the first engaging means are installed, said leverage comprising, between the first and the second ends, a thrust member which is mechanically connected to the outer body, adapted to convert the rotational motion of the lever into a shift of the outer body according to the vertical direction.

[0057] The second engaging means preferably comprise a profile adapted to guide the first engaging means according to a law of motion which is preferably as a function of the type of the filling product, or vice versa, in which the first engaging means comprise a profile adapted to be guided by the second engaging means according to a law of motion which is preferably as a function of the type of the filling product.

[0058] The first engaging means preferably comprise a roller, and the second engaging means comprise a grooved or slotted plate into which said roller is inserted and is guided.

[0059] Object of the invention is also the nozzle for filling containers with a preferably liquid filling product, or a product with two phases, installable on a filling machine, in which each container is positioned below said nozzle.

[0060] Said nozzle preferably cooperates with a doser,

a tap, in which, through the tap, a corresponding amount of filling product is introduced into the doser, and subsequently transferred to the nozzle.

[0061] Said nozzle preferably comprises an outlet mouth from which the product exits to be introduced into the container.

[0062] Said nozzle preferably comprises an outer body and an inner body that is in fluid communication with the doser, said nozzle is configured to allow/prevent the passage of the product to the container by a relative lifting/lowering motion between the outer body and the inner body.

[0063] Said relative lifting/lowering motion preferably occurs by a mechanical cam having a profile adapted to define a specific law of motion during said relative lifting/lowering motion.

[0064] Such and other objects are achieved by the features of the invention set forth in the independent claim 1. The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

[0065] Said purposes and advantages are all achieved by the filling device, which is the subject matter of the present invention, which is characterized by what is provided for in the claims set forth herein below.

BRIEF DESCRIPTION OF THE FIGURES

[0066] These and other features will become more evident from the following description of some embodiments, illustrated by way of illustrative, non-limiting example only, in the attached drawing tables.

- Fig. 1a, 1b: shows in an axonometric view a rotary filling machine with a filling device according to the invention in the start of filling and end of filling phases;
- Fig. 2a, 2b: shows in an axonometric view the two outermost working positions of the filling device according to the invention;
- Fig. 3a, 3b: shows two different axonometric views of a nozzle according to the invention;
- Fig. 4a, 4b, 4c: shows a sectional view of a nozzle according to the invention, in a closed, intermediate, and open position;
- Fig. 4d: shows a sectional view of a detail of the nozzle according to the invention;
- Fig. 5a, 5b, 5c, 5d: shows a sectional view of a device according to the invention in the two working phases di suction and filling with and without fluid highlighted;
- Fig. 6a, 6b: shows an axonometric view of a rotary filling machine with a filling device according to the known art in the start of filling and end of filling phases;
- Fig. 7a, 7b: the two outermost working positions of a filling device according to the known art;
- Fig. 8a, 8b: shows in an axonometric view the two outermost working positions of a filling device ac-

ording to the known art.

DESCRIPTION OF THE INVENTION

[0067] With particular reference to Fig. 2a, 2b, a device 1 for filling containers 100 with a certain filling product is depicted.

[0068] Said preferably liquid product can be of a fluid, semi-dense, or dense type, such as sauces, honey, oil, creams, yoghurt, milk, water, or a fibrous product, such as a pulp or a juice, or a product with two phases, i.e., liquid and solid, such as a minestrone or a soup, etc.

[0069] Said device 1 is installable in a filling plant, in particular in a filling machine 200.

[0070] In Fig. 1a, 1b, a filling machine 200 of a rotary type, onto which a plurality of devices 1 is installed, is depicted.

[0071] The device 1 can be also installed on a filling machine of a linear type, not shown in the figure.

[0072] Said linear or rotary filling machines 200 can process containers 100 of different types, e.g., containers 100 made of glass, plastics, or cans in metal, with different capacities, and, for example, with capacities from 20 mL up to 5 or 10 litres.

[0073] The containers can be, for example, PET or glass containers, in particular bottles, cans, jars, etc.

[0074] The containers 100 to be filled are positioned below the filling device 1 and receive the product by gravity.

[0075] In particular, the container 100 is located beneath a nozzle 10 of said filling device 1.

[0076] In fact, the filling device 1 comprises, in sequence from the top down, a doser 50, a tap 60, and the nozzle 10.

[0077] Through opening the tap 60 towards product holding tanks, a corresponding amount of filling product is introduced into the doser 50 e.g., by a suctioning system due to the motion of a plunger 52 within a filling chamber 51 of the doser.

[0078] This working phase is referred to herein below as the suctioning phase.

[0079] The doser 50 is filled during the suctioning phase with a quantity of product corresponding to the one that has to be introduced into the container 100 to be filled.

[0080] Through the opening of the tap 60 towards the nozzle 10, said amount of product is subsequently transferred to the nozzle 10, and then to the container 100.

[0081] Therefore, said amount of product is transferred from the doser 50 to the nozzle 10. Said working phase is referred to herein below as the filling phase.

[0082] Said nozzle 10 comprises an outlet mouth 11 from which the product exits to be introduced into the container 100.

[0083] The outlet mouth 11 is arranged in the proximity of the container 100 above an inlet mouth 101 of the container 100, as highlighted in Fig. 5a and 5b.

[0084] The tap 60 is generally a three-way valve, pref-

erably of the rotary type, and comprises a tap body 65 that is movable and arranged within a seat 66 of the tap 60.

[0085] The rotation of the tap body 65 between a suctioning position I and a filling position II allows performing the suctioning phase and the filling phase of the doser 50, respectively.

[0086] In particular during the suctioning phase, the tap body 65 is positioned so as to put in fluid communication a filling chamber 51 of the doser 50 with the tanks containing the product; the plunger 52 of the doser lifts to create the suctioning effect resulting in the filling of the chamber 51 with the product.

[0087] In said position, which is referred to as the suctioning position I, the tap body 65 does not allow the passage of product from the filling chamber 51 of the doser 50, to the nozzle 10.

[0088] During the filling phase, on the other hand, the tap body 65 is positioned so as to put in fluid communication the filling chamber 51 of the doser 50 with the nozzle 10; the plunger 52 of the doser lowers to make the product exit from the filling chamber 51.

[0089] In said position, which is referred to as the filling position II, the tap body 65 prevents the passage of the product between the filling chamber 51 of the doser 50 and the tanks containing the product.

[0090] The tap 60 preferably comprises a driving member 61, which is rotatable according to a first rotational axis X orthogonal to a vertical direction Z.

[0091] The achievement of the two suctioning I and filling II positions of the tap 60 is generally carried out by said driving member 61, which preferably rotates integrally with the tap body 65.

[0092] Said driving member 61 is preferably rotated by engaging/disengaging with an engaging profile 62 of the filling machine 200.

[0093] Therefore, the rotation of the driving member 61 put in rotation said tap body 65 inside the seat 66 of the tap 60.

[0094] In particular, in the case of a rotary filling machine 200 said engaging profile 62 extends along a stretch of the circumference of the path along which said devices 1 move during the rotation of the filling machine 200.

[0095] The above-mentioned description is common to the prior art as well.

[0096] What is represented in the Figures 6 to 8 allows for a better understanding of the differences between the prior art and the invention, which will be explained below.

[0097] In fact, in Figs. 7a, 7b, 8a, 8b, a filling device 1' according to the prior art is depicted, in sectional and axonometric view, comprising, in sequence from the top down, a doser 50', a tap 60', and the nozzle 10'.

[0098] In particular, said device 1' is represented in the two outermost working positions relative to the suctioning and filling phases.

[0099] In the Figures 6a, 6b, a filling machine 200' is shown, in which a plurality of devices 1' is installed, in

the suctioning and filling phases, according to the prior art.

[0100] As clearly seen in Fig. 7a, 7b, the nozzle 10' is a simple outlet channel.

[0101] On the contrary, according to the invention, the nozzle 10 preferably comprises an outer body 30 and an inner body 20.

[0102] The outer body 30 is preferably cylindrical, or shaped like a parallelepiped.

[0103] However, it is understood that any form deemed suitable by a person skilled in the art in order to optimize the assembly and positioning of the devices 1 falls within the protection scope of the invention.

[0104] Said outer body 30 is preferably hollow, and adapted to hold the inner body 20.

[0105] Said inner body 20 is preferably in fluid communication with the doser 50, in particular when the tap 60 is in the filling position II.

[0106] Said nozzle 10 is preferably configured so as to allow/prevent the passage of the product to the container 100, in particular by a relative lifting/lowering motion between the outer body 30 and the inner body 20.

[0107] As shown in Fig. 4a, 4c, said relative lifting/lowering motion between the outer body 30 and the inner body 20 leads to the achievement of two positions:

a fully open position A and a fully closed one C.

in the fully open position A, the passage of the product from the nozzle 10 to the container 100 is allowed, while in the fully closed position C, the passage of the product from the nozzle 10 to the container 100 is prevented.

[0108] By virtue of this solution, a filling device 1 is made, which allows for a greater filling precision compared to a device in which only the tap 60 enables/prevents the passage of product.

[0109] In fact, the thus-configured nozzle 10 aids reducing possible leaks coming from the tap 60, Intercepting and blocking them when the nozzle 10 moves to a fully closed position C.

[0110] Said leaks are more evident with very fluid, not very viscous products, e.g., water.

[0111] According to a preferred embodiment, said nozzle 10 defines, between the outer body 30 and the inner body 20, a volume adapted to receive the filling product.

[0112] Said volume preferably comprising an upper chamber V1 and a lower chamber V2 that is closer to the container 100.

[0113] As shown in the figure, the upper chamber V1 is put in fluid communication with the doser 50 when the tap 60 is in the filling position II.

[0114] The lower chamber V2 is in a position below the upper chamber V1 and is superiorly in communication with said upper chamber V1.

[0115] In particular, the lower chamber V2 inferiorly comprises the outlet mouth 11 of the nozzle 10, for the product to exit towards the container 100.

[0116] In particular, said chambers V1, V2 are put into communication when the nozzle 10 moves from the fully closed position C towards the fully open position A, and vice versa, said communication stops when the fully closed position C is reached.

[0117] Moreover, said communication preferably stops in an intermediate position B that precedes the fully closed position C.

[0118] In particular in said intermediate position B, the lower chamber V2 is configured so that it increases its volume before reaching the fully closed position C preferably in the passage between the intermediate position B and the fully closed position C.

[0119] By virtue of this solution, the nozzle 10 allows for making a precise and instant closure with the elimination of dripping, and consequently, the dripping times

[0120] Thanks to the volume expansion of the lower chamber V2 before reaching the closure position C, a vacuum is created during the closing phase.

[0121] This results in the generation of a suction effect that assists in halting the product flow.

[0122] In order to increase the precision of the closure, the nozzle 10 may provide for the outlet mouth 11 to be so shaped as to create a shearing function of the liquid stream.

[0123] This allows for a precise and reliable filling, even with products containing pieces or filaments.

[0124] In fact, as shown in the Figs. 4a, 4b, the inner body 20 may comprise an upper portion 20a, preferably internally hollows and adapted to receive the product coming from the tap 60.

[0125] Said upper portion 20a comprises at least one opening 21, which allows the passage of said product to the upper chamber V1.

[0126] As shown in the figure, said opening 21 is located in an underlying part of the upper portion 20a, and preferably having a tapered section compared to the overlying part.

[0127] Said at least one opening 21 preferably puts the inner cavity in communication with the outer surface of the upper portion 20a, allowing the product to exit in the vertical direction Z from the inner cavity to the upper chamber V1.

[0128] Said upper portion 20a is preferably configured to allow a relative sliding, preferably in a guided manner, with an inner surface 30a of the outer body 30.

[0129] In particular, as shown in the Figure, gaskets and/or guide members can be present between the upper portion 20a and the inner surface 30a to allow the sliding and prevent the exit of the product contained in the upper chamber V1. Said gaskets, as known to those skilled in the art, can be mounted onto the movable part or the stationary part, or both, And all of said possible alternative solutions are considered to fall within the protection scope of the invention.

[0130] Said inner body 20 preferably further comprises a lower portion 20b substantially axisymmetric and arranged below the upper portion 20a.

[0131] In particular, said lower portion 20b comprises, at the end facing the outlet mouth 11, an extension 22 that widens, thus defining a substantially circular, preferably bell-like, shape.

[0132] Said extension 22 preferably comprises a knife-tapered perimeter 23.

[0133] Said perimeter 23 cooperates with an opening 31 of the substantially circular body 30.

[0134] In particular, said opening 31 matches the perimeter 23, i.e., the outer surface 23a of the perimeter 23 perfectly adheres to the inner surface 31a of said opening 31.

[0135] This occurs when the nozzle 10 is in the fully closed position C.

[0136] In order to further increase the precision of the closure, the body 30 can also provide for a gasket 32 cooperating with an intermediate portion 25 of the inner body 20.

[0137] In particular as shown in the figure, said intermediate portion 25 can cooperate with the gasket 32 to slid along its side surface. The opposite solution, in which the gasket is installed integral with the intermediate portion 25 configured to cooperate with the inner surface of the body 30 by sliding, is also considered to fall within the protection scope of the invention.

[0138] Alternatively, a constructional form not shown in the Figure may provide for said intermediate portion 25 to cooperate with the gasket 32 not by sliding, but by resting.

[0139] Said intermediate portion 25 could be cylindrical or conical in shape, etc.

[0140] Said intermediate portion 25 preferably inserts between the upper portion 20a and the lower portion 20b.

[0141] Said intermediate portion 25 of the inner body 20 substantially serves the purpose of separating the upper chamber V1 from the lower chamber V2 when it cooperates with the gasket 32 by moving to the fully closed position C.

[0142] Said separation preferably occurs already in the intermediate position B that precedes the fully closed position C, i.e., when the intermediate portion 25 contacts the gasket 32.

[0143] Thanks to this gasket 32, the isolation of the upper chamber V1 from the lower chamber V2 is ensured, further reducing any potential leakage between the two chambers V1 and V2.

[0144] In a preferred embodiment, the relative lifting/lowering motion between the outer body 30 and the inner body 20 occurs by a mechanical cam 40.

[0145] In particular, said cam 40 has a profile adapted to define a specific law of motion during said relative lifting/lowering motion, preferably in the passage from the fully open position A to the fully closed one C, and vice versa.

[0146] By virtue of this solution, the nozzle 10 allows for an adjustable closure according to a law of motion appropriate to the fluid to be processed. Therefore, the device 1 can be used with products of varying textures,

by simply changing the cam 40 AND using a profile that enables the optimal closure for a specific product.

[0147] According to an aspect of the invention, as shown in the figures, said outer body 30 is movable and operatively associated to the mechanical cam 40.

[0148] However, it is understood that an alternative solution, not shown in the figure, in which it is the inner body 20 that is movable and operatively associated with the mechanical cam 40, while the outer body 30 remains stationary, is also considered falling within the scope of the invention.

[0149] In particular, in the Figure, the cam 40, which translates the outer body 30 in the vertical direction Z, moving away/approaching it with respect to the container 100 to be filled, is depicted.

[0150] In particular, it moves said outer body 30 from the fully open position A to the fully closed position C.

[0151] Preferably, as shown in Fig. 4a, 4b, 4c, the passage of the product moving away from the container 100 is allowed, while the passage approaching to the container 100 is prevented.

[0152] In particular, the passage of the product when the outer body 30 lifts in the vertical direction Z moving away from the container 100 is allowed, while the passage when the outer body 30 lowers in the vertical direction Z approaching to the container 100 is prevented.

[0153] When in the fully open position A, the extension 22 of the lower portion 20b is preferably located in a position underlying the opening 31.

[0154] Also falling within the scope of the invention is the opposite operation, not shown in the figure, in which the passage of the product is prevented when moving away from the container 100, while the passage is allowed when approaching the container 100.

[0155] In such a case, the passage of the product is allowed when the outer body 30 lowers in the vertical direction Z, approaching the container 100, while the passage is prevented when the outer body 30 lifts in the vertical direction Z, moving away from the container 100.

[0156] Preferably, in the fully open position A, the extension 22 of the lower portion 20b is located in a position overlying the opening 31.

[0157] According to a preferred embodiment, the driving member 61 of the tap 60, is mechanically connected to the mechanical cam 40.

[0158] In particular, when said driving member 61 brings the tap 60 from the suctioning position I to the filling position II, it simultaneously acts onto the mechanical cam 40 to bring the nozzle 10 from the fully closed position C towards the fully open position A.

[0159] Vice versa, when said driving member 61 brings the tap 60 from the filling position II to the suctioning position I, it simultaneously acts onto the mechanical cam 40 to bring the nozzle 10 from the fully open position A towards the fully closed position C.

[0160] By virtue of this solution, it is possible to close the nozzle 10 without adding dedicated operations for its opening/closing.

[0161] Therefore, it allows for the creation of a simple and cost-effective solution that uses the already-existing actuating means, as they are already in use for the tap 60.

[0162] In addition, by virtue of this solution, the closure of nozzle 10 and tap 60 occurs in a perfectly synchronized manner.

[0163] According to an aspect of the invention, the mechanical cam 40 comprises first engaging means 41 configured to be moved by second engaging means 42.

[0164] The first engaging means 41 are preferably integral with the outer body 30.

[0165] Optionally, said second engaging means 42 comprise a profile adapted to guide the first engaging means 41 according to a law of motion.

[0166] Alternatively, said first engaging means 41 may comprise a profile adapted to be guided by the second engaging means 42 according to a law of motion which is defined by the profile itself.

[0167] Said law of motion is preferably as a function of the type of the filling product.

[0168] A preferred embodiment provides for the second engaging means 42 to be moved by the driving member 61.

[0169] Said driving member 61 is preferably configured to rotate said second engaging means 42 according to an axis parallel to the first rotational axis X.

[0170] In particular, as shown in the Figure, said second engaging means 42 rotate according to an axis coincident with the first rotational axis X, for the rotation of the tap 60.

[0171] This solution simplifies the mechanical construction of the control systems for both the tap 60 and the nozzle 10.

[0172] In detail, an embodiment represented in the Figure preferably provides for said driving member 61 to be configured so as to ensure that when it brings the tap 60 from the suctioning position I to the filling position II, it simultaneously rotates the second engaging means 42.

[0173] The second engaging means 42 thus act onto the first engaging means 41, in particular to bring the outer body 30 from the fully closed position C towards the fully open position A.

[0174] Vice versa, when said driving member 61 brings the tap 60 from the filling position II to the suctioning position I, it simultaneously rotates the second engaging means 42.

[0175] The second engaging means 42 thus act onto the first engaging means 41, in particular to bring the outer body 30 from the fully open position A towards the fully closed position C.

[0176] According to an aspect of the invention, the nozzle 10 comprises a leverage 43 preferably a second order leverage, in which a first end 431 thereof is secured to a coupling member 24 of the nozzle 10.

[0177] Said coupling member 24 is not movable and preferably mechanically integral with the inner body 20.

[0178] In particular, in the Figure, a possible implementation in which said coupling member 24 is a flange em-

bracing the upper portion 20a of the inner body 20 is shown.

[0179] The first end 431 of the leverage 43 is secured to the coupling member 24 in a rotatable manner about a fulcrum 44.

[0180] Said fulcrum 44 preferably allows for a rotation about a second rotational axis Y, orthogonal to the first rotational axis X and to the vertical direction Z.

[0181] In particular, at a second end 432 of the leverage 43, the first engaging means 41 are installed.

[0182] Said leverage 43 preferably comprises, between the first and the second ends 431, 432, a thrust member 45 that is mechanically connected to the outer body 30.

[0183] The thrust member 45 corresponds to the point where the resisting force of a second-order lever is exerted, at the first end 431 being the fulcrum of rotation 44 and at the second end 432 being the point of application of the driving force.

[0184] Said thrust member 45 is adapted to convert the rotational motion of the leverage 43 into a shift of the outer body 30 according to the vertical direction Z.

[0185] The first engaging means 41 preferably comprise a roller 410.

[0186] Said roller 410 is installed onto the second end 432 of the leverage 43.

[0187] The second engaging means 42 preferably comprise a plate 420 comprising a groove or slot 420a into which said roller 410 is inserted and is guided.

[0188] Said groove or slot 420a defines a long path along which the roller 410 moves.

[0189] In the Figure, a slot 420a is shown, which is, for example, a portion of a parabola, a circumference, or in any case a profile that corresponds to a specific law of motion.

[0190] The motion of the roller 410 along said path generates a rotation of the leverage 43 about the fulcrum 44, and consequently a translation in the vertical direction Z of the thrust member 45, which lifts the outer body 30.

[0191] In particular, the thrust member 45 can comprise a slider 451, which is free to slide even on a plane orthogonal to the vertical direction Z. In this way, the rotation of the lever 43 is decomposed into two translations, a vertical and a horizontal one."

[0192] A preferred embodiment provides for said roller 410 to be mounted onto the leverage 43 in a rotatable manner, to decrease the friction during the sliding thereof along the groove or slot 420a of the plate 420.

[0193] As shown in the Figure, the leverage 43 may comprise a pair of levers 43a arranged on two opposite sides of the nozzle 10, and preferably mechanically connected at the first end 431, e.g., by a pin 44a serving as a fulcrum 44 around which they rotate integrally.

[0194] Furthermore, said pair of levers 43a can be mechanically connected at the second end 432, e.g., by means of a plate or a plaque onto which the roller 410 is installed.

[0195] Said roller 410 is preferably in a substantially

central position between the two levers 43a. Alternatively, it can also be positioned off-center for certain types of filling machines.

[0196] Object of the invention is also a nozzle 10 having the characteristics described above.

[0197] In particular, said nozzle 10 is configured to fill containers 100 with a preferably liquid filling product, or a product with two phases.

[0198] Said nozzle is preferably installable on a filling machine 200, in which each container 100 to be filled is positioned below said nozzle 10.

[0199] Said nozzle 10 cooperates with a doser 50 and a tap 60, in which, by means of the tap 60, a corresponding amount of filling product is introduced into the doser 50 and subsequently transferred to the nozzle 10.

[0200] Said nozzle 10 comprises an outlet mouth 11 from which the product exits to be introduced into the container 100.

[0201] Said nozzle 10 comprises an outer body 30 and an inner body 20 that is in fluid communication with the doser 50.

[0202] Said nozzle 10 is preferably configured to allow/prevent the passage of the product to the container 100 by a relative lifting/lowering motion between the outer body 30 and the inner body 20.

[0203] Said lifting/lowering preferably occurs from a fully open position A to a fully closed one C.

[0204] In particular, said relative lifting/lowering motion occurs by a mechanical cam 40 having a profile adapted to define a specific law of motion during said relative lifting/lowering motion, preferably in the passage from the fully open position A, to the fully closed one C, and vice versa.

[0205] Therefore, it allows for an adjustable opening/closing according to a law of motion appropriate to the fluid to be processed.

[0206] In any case, it shall be understood that what has been described above has an exemplary, non-limiting value; therefore, any variations of detail that may be necessary for technical and/or functional reasons are considered hereafter to fall within the same protection scope defined by the claims set forth below.

Claims

1. A device (1) for filling containers (100) with a preferably liquid filling product or a product with two phases, installable on a filling machine (200), wherein each container (100) is positioned below the filling device (1), said device (1) comprising from the top down a doser (50), a tap (60) and a nozzle (10) located in the proximity of the container (100), wherein, through the tap (60), a corresponding amount of filling product is introduced into the doser (50) and subsequently transferred to the nozzle (10), which comprises an outlet mouth (11) from which the product exits to be introduced into the container (100), char-

acterized in that said nozzle (10) comprising an outer body (30) and an inner body (20) that is in fluid communication with the doser (50), said nozzle (10) is configured to allow/prevent the passage of the product to the container (100) by a relative lifting/lowering motion between the outer body (30) and the inner body (20), wherein said relative lifting/lowering motion occurs by a mechanical cam (40) having a profile adapted to define a specific law of motion during said relative lifting/lowering motion.

2. The device (1) according to claim 1, wherein said outer body (30) is movable and operatively associated to the mechanical cam (40) to translate in a vertical direction (Z) of moving away/approaching with respect to the container (100) to be filled between a fully open position (A) and a fully closed position (C) so as to allow the passage of the product moving away from the container (100) and to prevent the passage thereof when approaching to the container (100), or vice versa.

3. The device (1) according to the preceding claim, wherein the tap (60) comprises a driving member (61) rotatable according to a first rotational axis (X) orthogonal to the vertical direction (Z) and preferably rotated by engaging/disengaging with an engaging profile (62) of the filling machine (200), said driving member (61) being configured to bring the tap (60) from a suctioning position (I), in which the doser (50) is filled, to a filling position (II), in which the doser (50) empties and the container (100) is filled, and said driving member (61) being mechanically connected to the mechanical cam (40) so that, when said driving member (61) brings the tap (60) from the suctioning position (I) to the filling position (II), it simultaneously acts onto the mechanical cam (40) to bring the nozzle (10) from the fully closed position (C) towards the fully open position (A) and vice versa, when it brings the tap (60) from the filling position (II) to the suctioning position (I) it simultaneously acts onto the mechanical cam (40) to bring the nozzle (10) from the fully open position (A) towards the fully closed position (C).

4. The device (1) according to the preceding claim, wherein said nozzle (10) defines, between the outer body (30) and the inner body (20), a volume adapted to receive the filling product and comprising an upper chamber (V1) and a lower chamber (V2) that is closer to the container (100) and comprising an outlet mouth (11) of the nozzle (10), said chambers (V1, V2) are put into communication when the nozzle (10) passes from the fully closed position (C) towards the fully open position (A) and vice versa, said communication stops when the fully closed position (C) is reached.

5. The device (1) according to the preceding claim, wherein said communication stops in an intermediate position (B) that precedes the fully closed position (C) and so that the lower chamber (V2) increases its volume before reaching the fully closed position (C) preferably in the passage between the intermediate position (B) and the fully closed position (C).
6. The device (1) according to the preceding claim, wherein the mechanical cam (40) comprises first engaging means (41) configured to be moved by second engaging means (42), wherein preferably the first engaging means (41) are integral with the outer body (30).
7. The device (1) according to the preceding claim, wherein the second engaging means (42) are moved by the driving member (61), which is preferably configured to rotate said second engaging means (42) according to an axis that is parallel to, preferably coincident with, the first rotational axis (X).
8. The device (1) according to the preceding claim, wherein said driving member (61) is configured to make so that, when it brings the tap (60) from the suctioning position (I) to the filling position (II), it simultaneously rotates the second engaging means (42) so that they act onto the first engaging means (41) to bring the outer body (30) from the fully closed position (C) towards the fully open position (A) and vice versa, when it brings the tap (60) from the filling position (II) to the suctioning position (I), it simultaneously rotates the second engaging means (42) so that they act onto the first engaging means (41) to bring the outer body (30) from the fully open position (A) towards the fully closed position (C).
9. The device (1) according to the preceding claim, wherein the nozzle (10) comprises a second order leverage (43), wherein a first end (431) thereof is secured to a coupling member (24) of the nozzle (10) in a rotatable manner about a fulcrum (44) and wherein at a second end (432) the first engaging means (41) are installed, said leverage (43) comprising, between the first and the second ends (431, 432), a thrust member (45) mechanically connected to the outer body (30) adapted to convert the rotational motion of the lever (43) into a shift of the outer body (30) according to the vertical direction (Z).
10. The device (1) according to the preceding claim, wherein the second engaging means (42) comprise a profile adapted to guide the first engaging means (41) according to a law of motion which is preferably as a function of the type of the filling product, or vice versa wherein the first engaging means (41) comprise a profile adapted to be guided by the second engaging means (42) according to a law of motion which is preferably as a function of the type of the filling product.
11. The device (1) according to the preceding claim, wherein the first engaging means (41) comprise a roller (410) and the second engaging means (42) comprise a grooved or slotted plate (420) into which said roller (410) is inserted and is guided.
12. A nozzle (10) for filling containers (100) with a preferably liquid filling product, or a product with two phases, installable on a filling machine (200), wherein each container (100) is positioned below said nozzle (10), said nozzle (10) cooperating with a doser (50), a tap (60), wherein, through the tap (60), a corresponding amount of filling product is introduced into the doser (50) and subsequently transferred to the nozzle (10), which comprises an outlet mouth (11) from which the product exits to be introduced into the container (100), **characterized in that** said nozzle (10) comprising an outer body (30) and an inner body (20) that is in fluid communication with the doser (50), said nozzle (10) is configured to allow/prevent the passage of the product to the container (100) by a relative lifting/lowering motion between the outer body (30) and the inner body (20) wherein said relative lifting/lowering motion occurs by a mechanical cam (40) having a profile adapted to define a specific law of motion during said relative lifting/lowering motion.

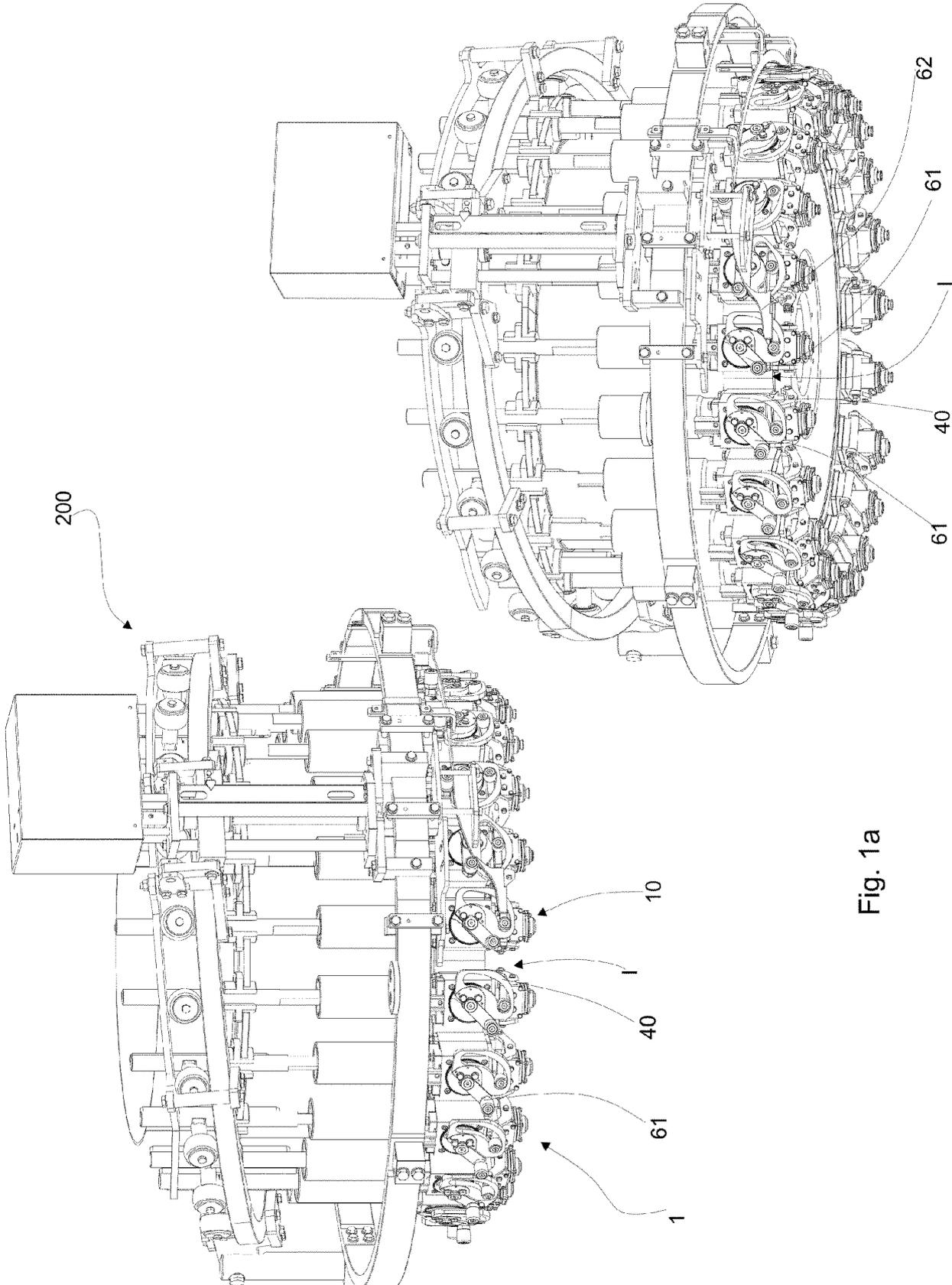


Fig. 1a

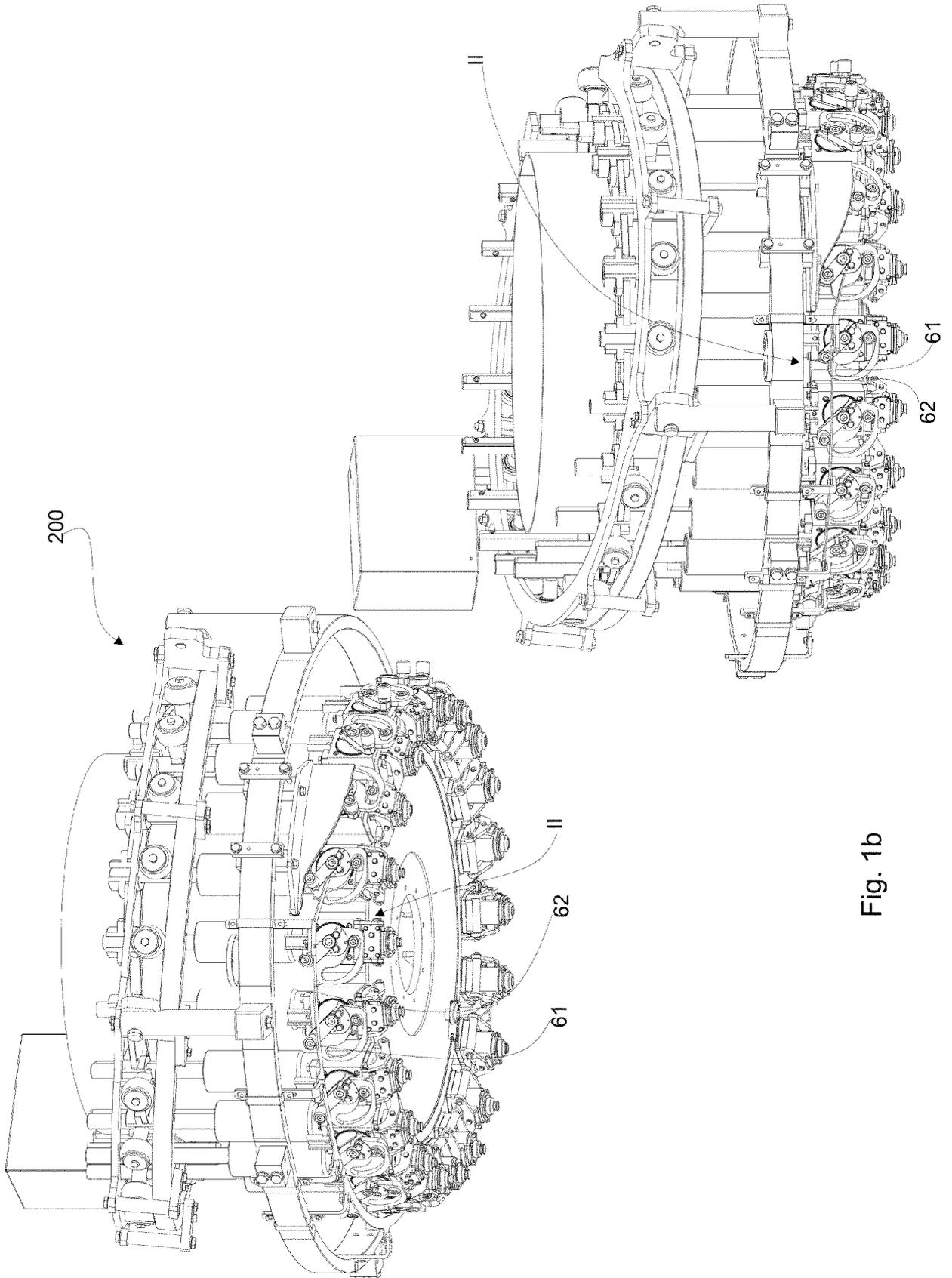


Fig. 1b

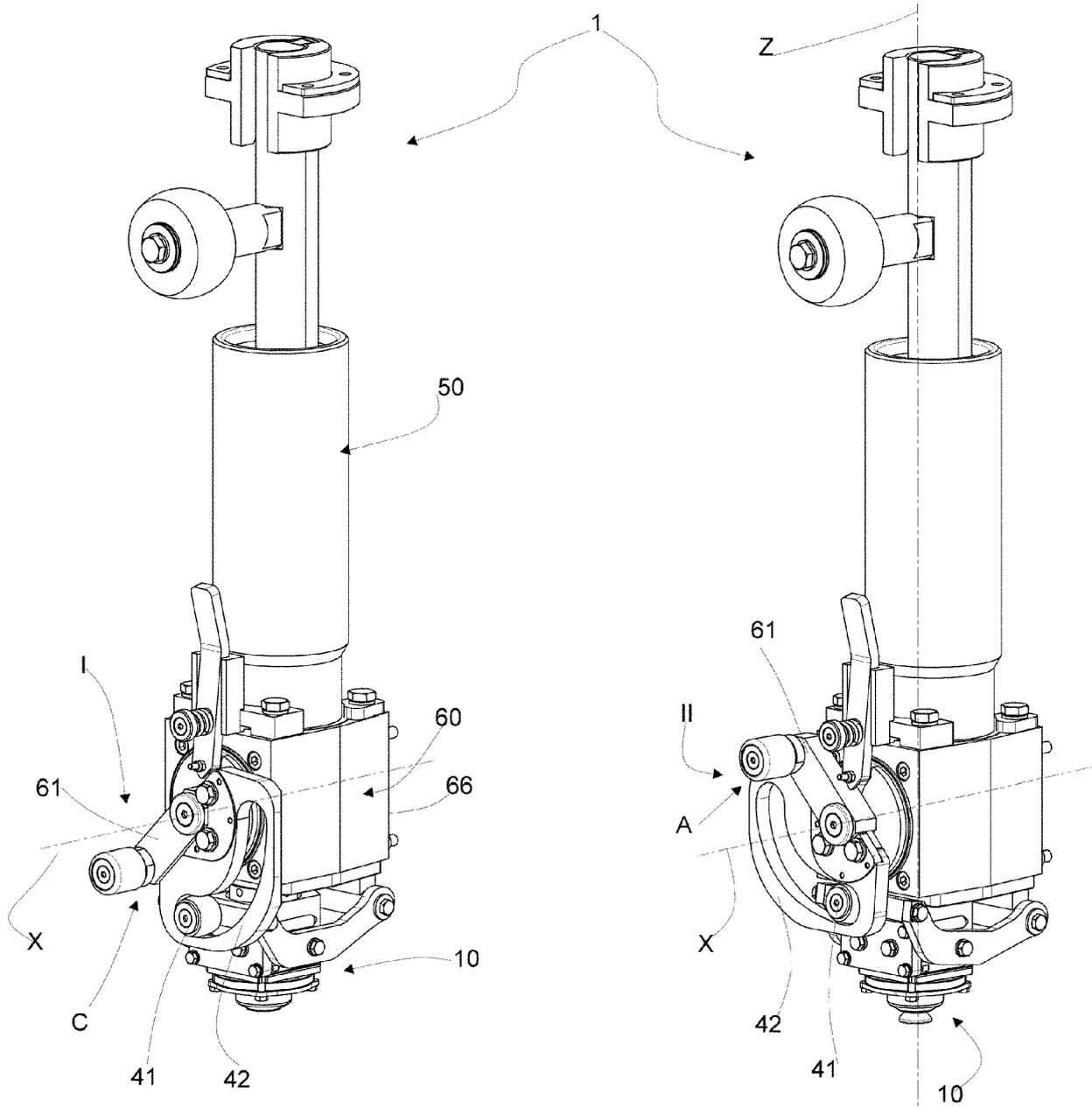


Fig. 2a

Fig. 2b

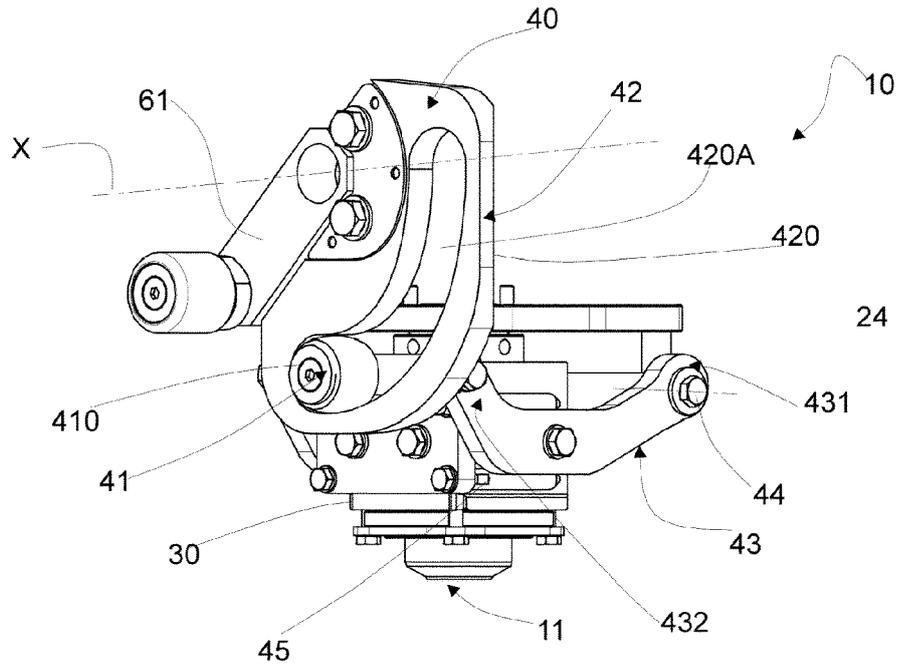


Fig. 3b

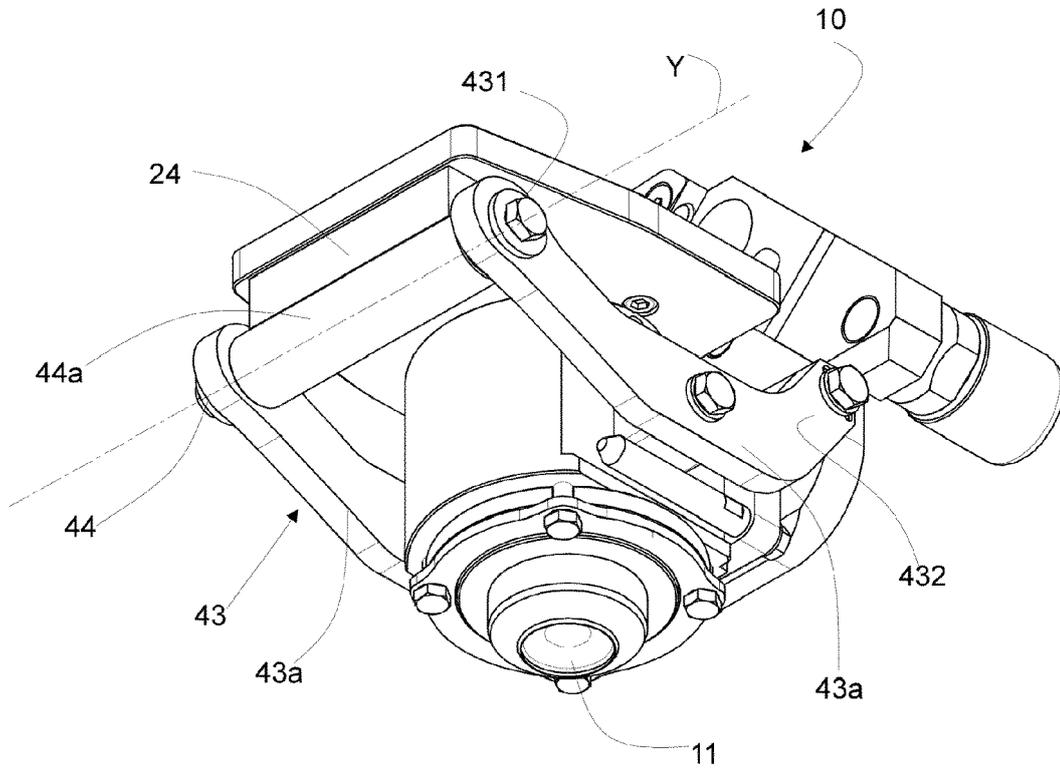


Fig. 3a

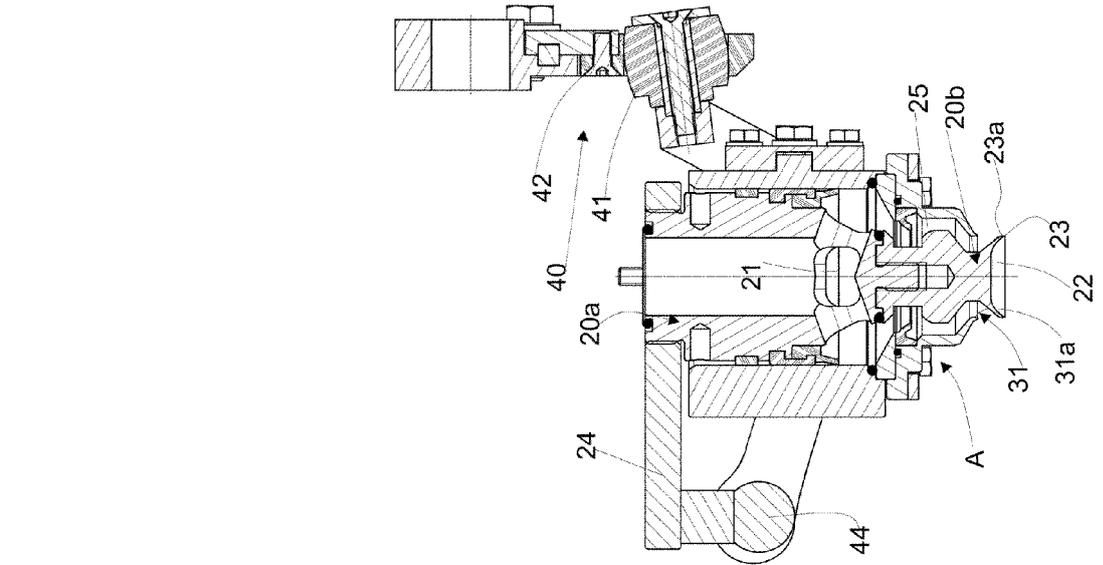


Fig. 4a

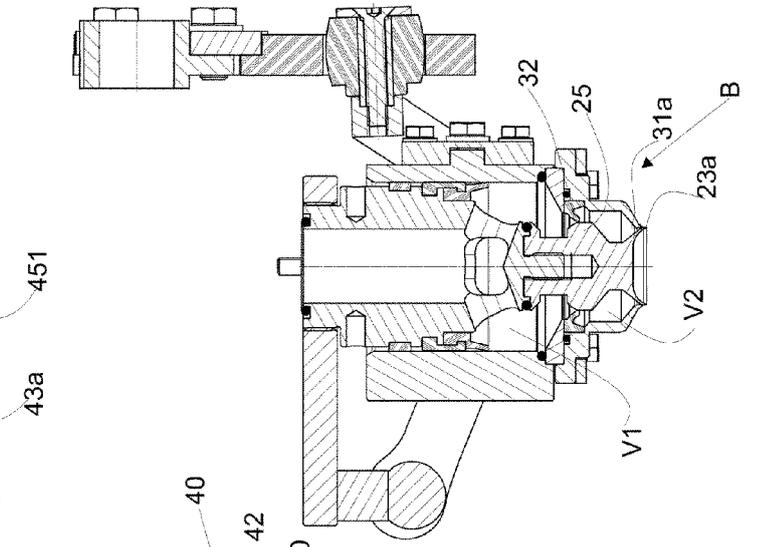


Fig. 4b

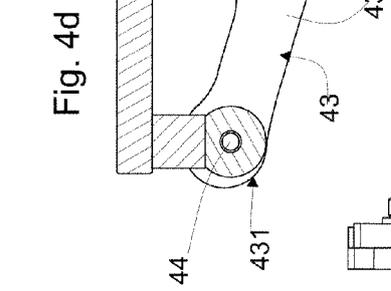


Fig. 4c

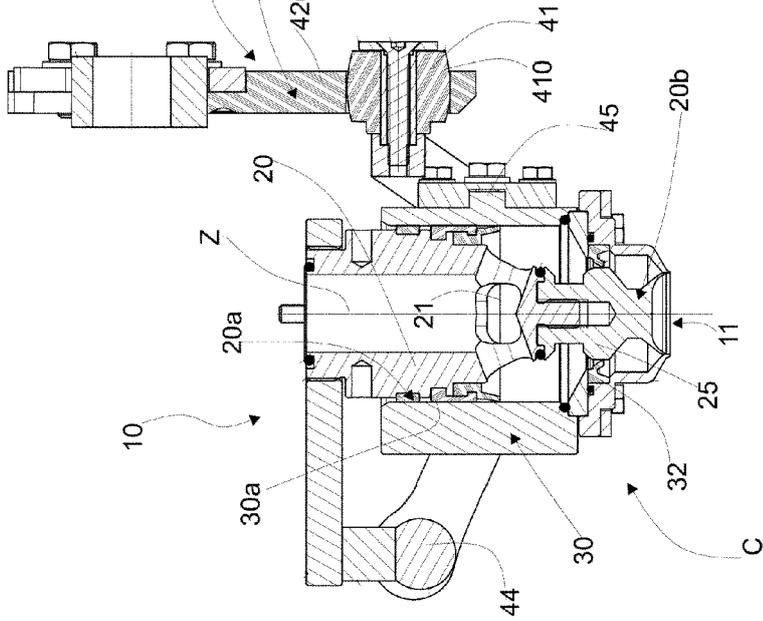


Fig. 4d

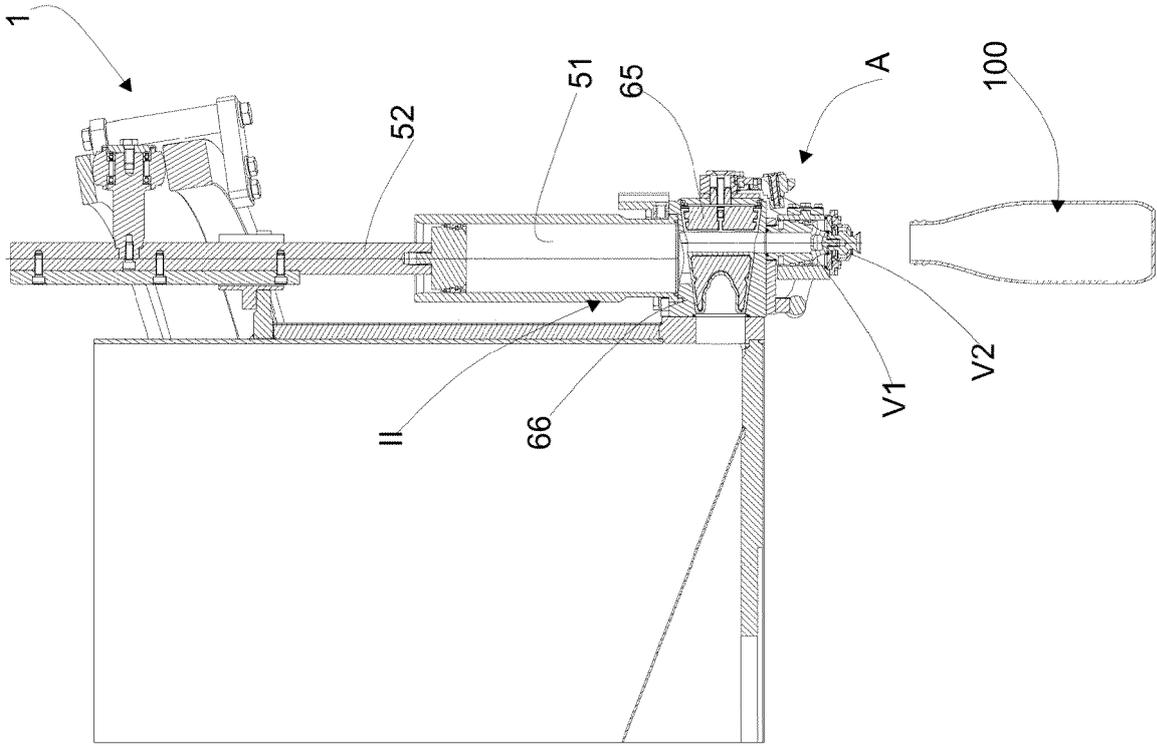


Fig. 5b

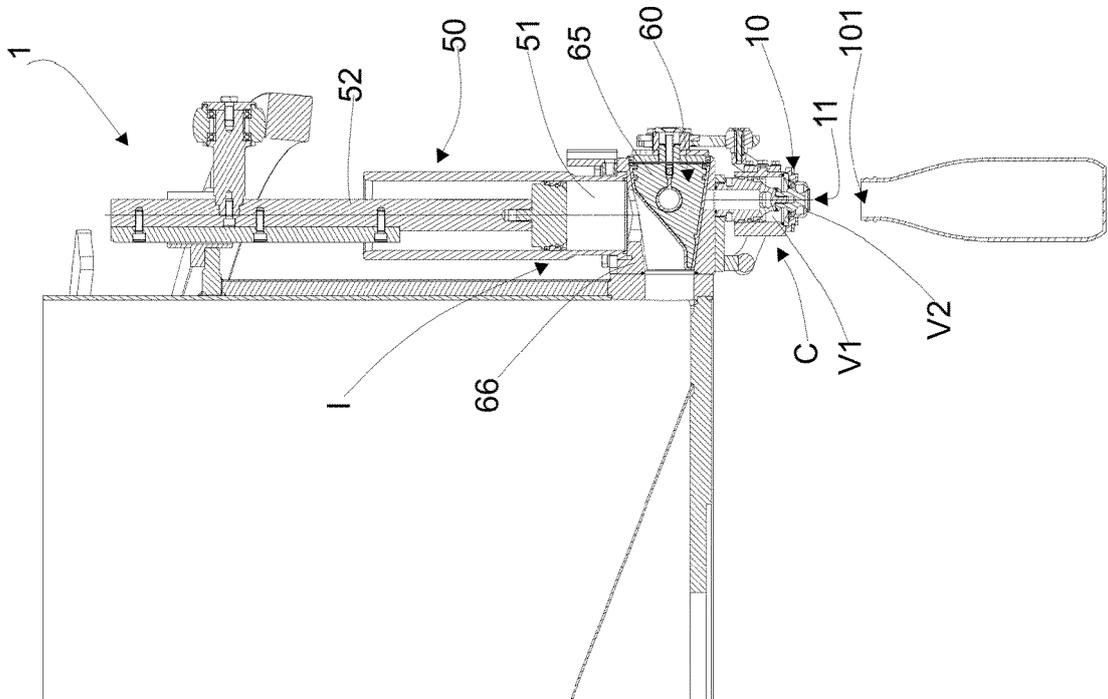


Fig. 5a

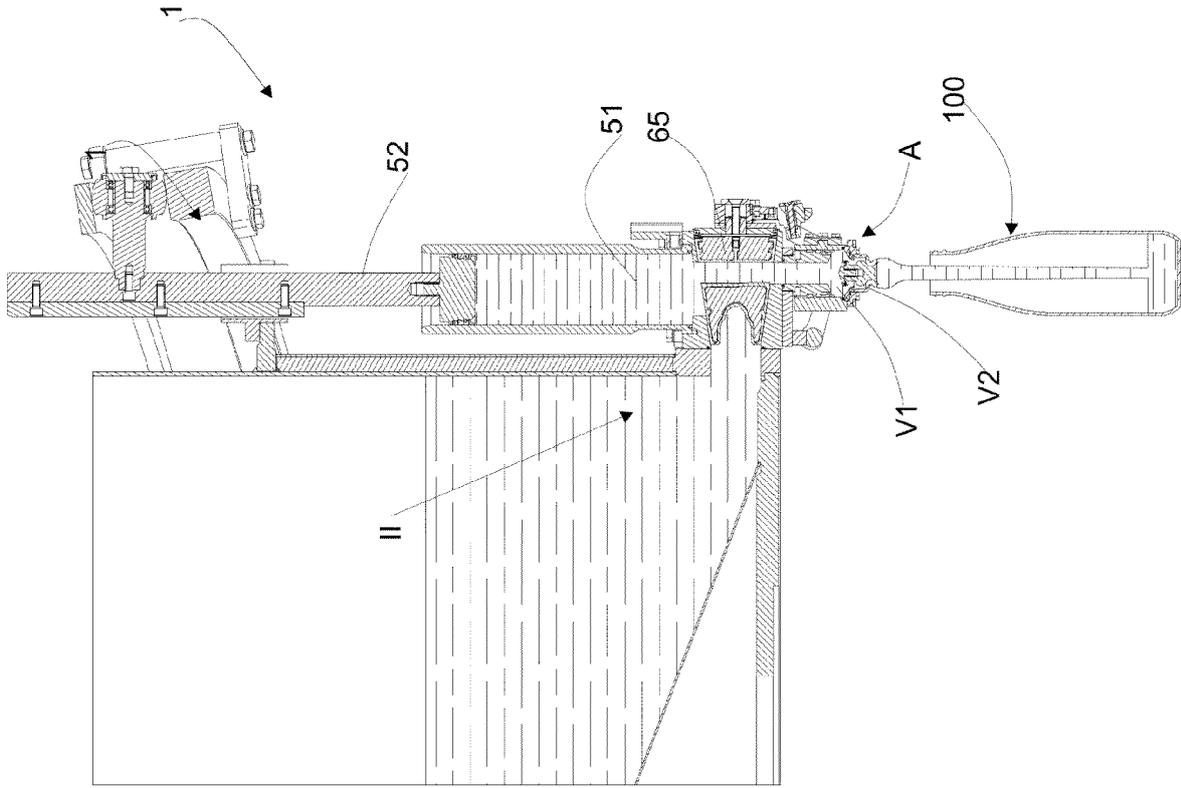


Fig. 5d

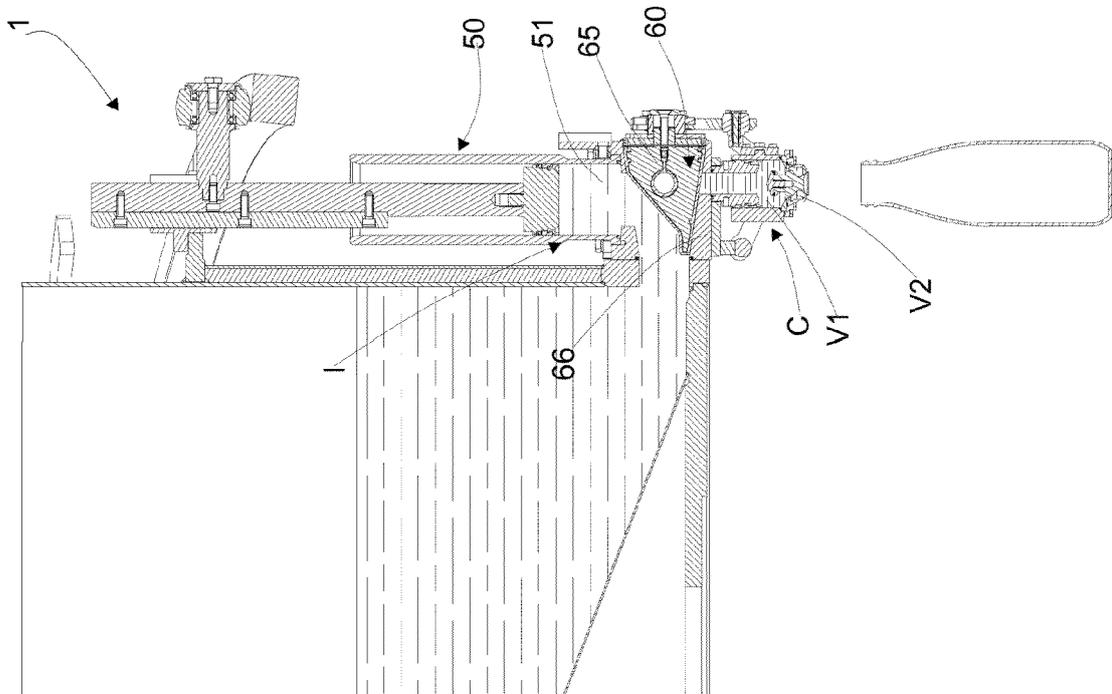


Fig. 5c

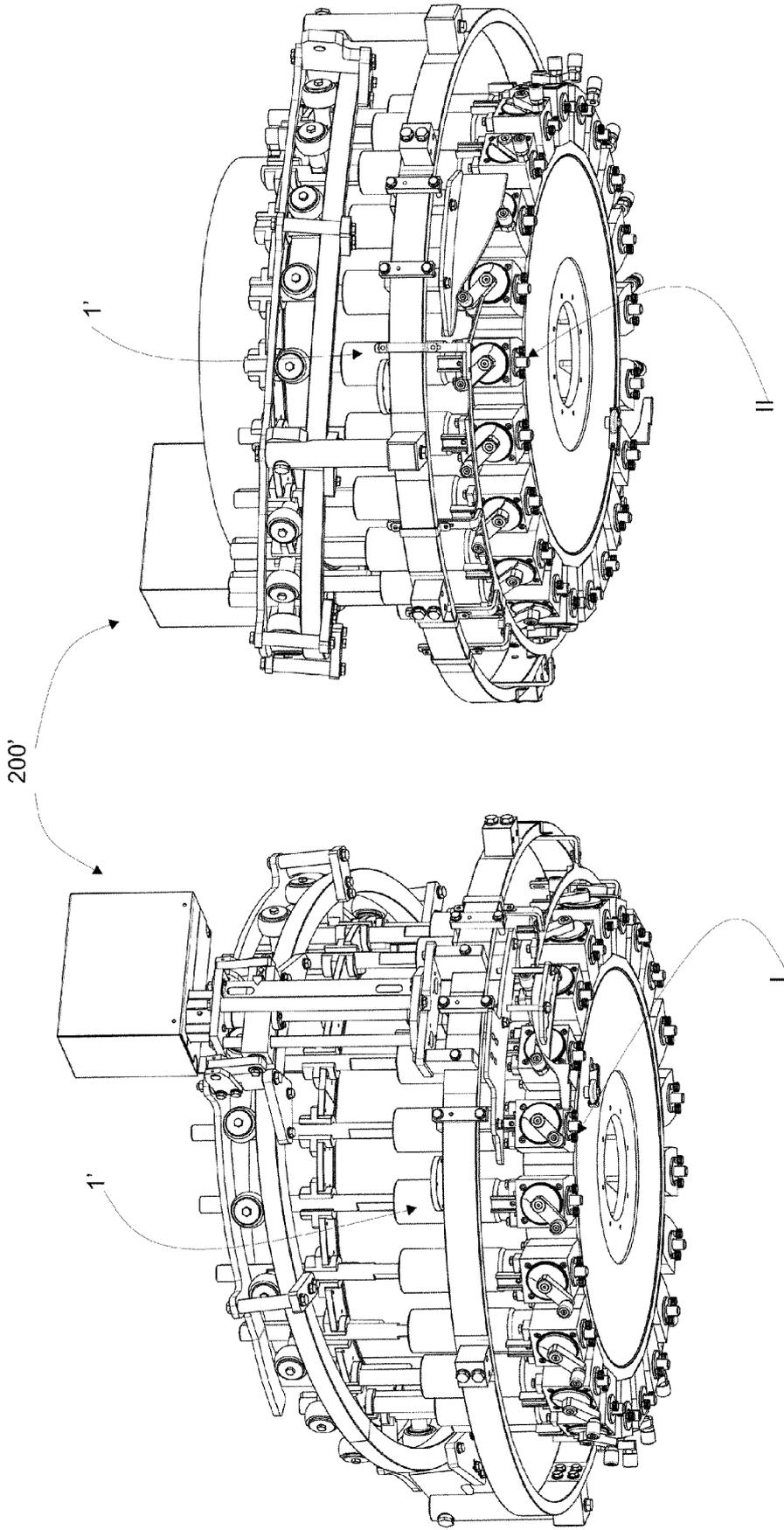


Fig. 6b

Fig. 6a

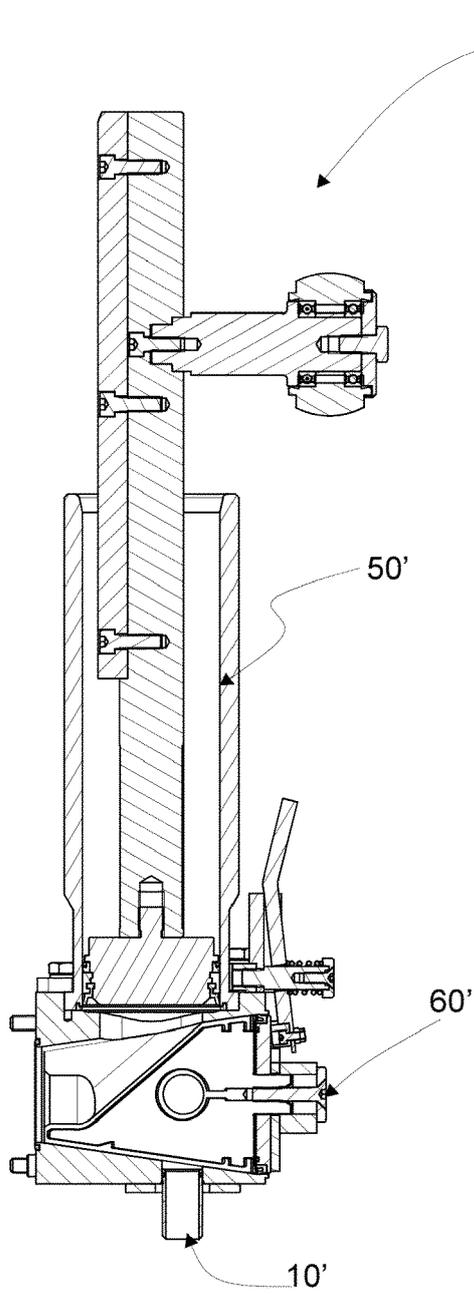


Fig. 7a

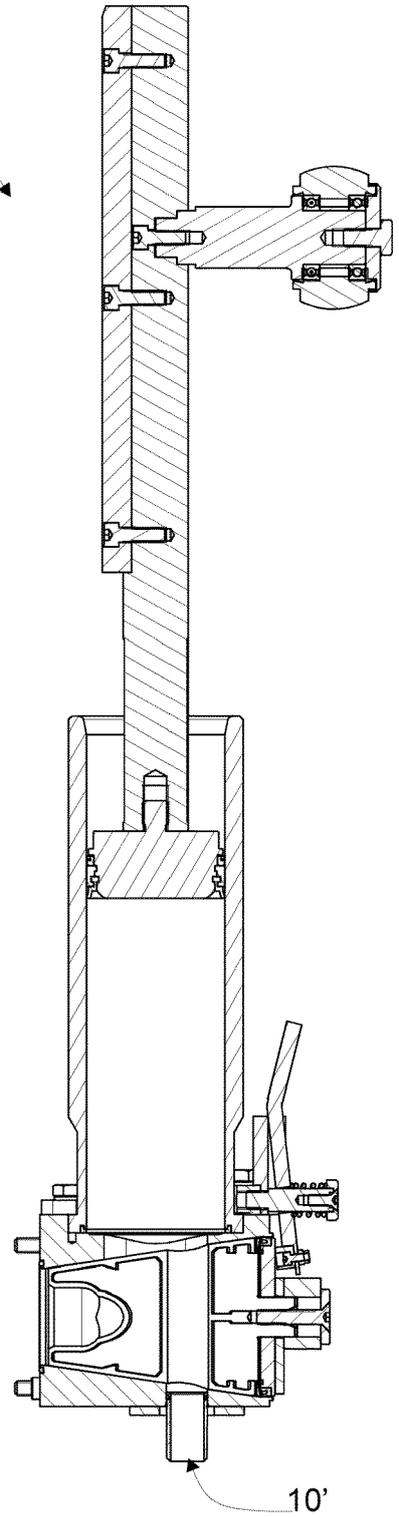


Fig. 7b

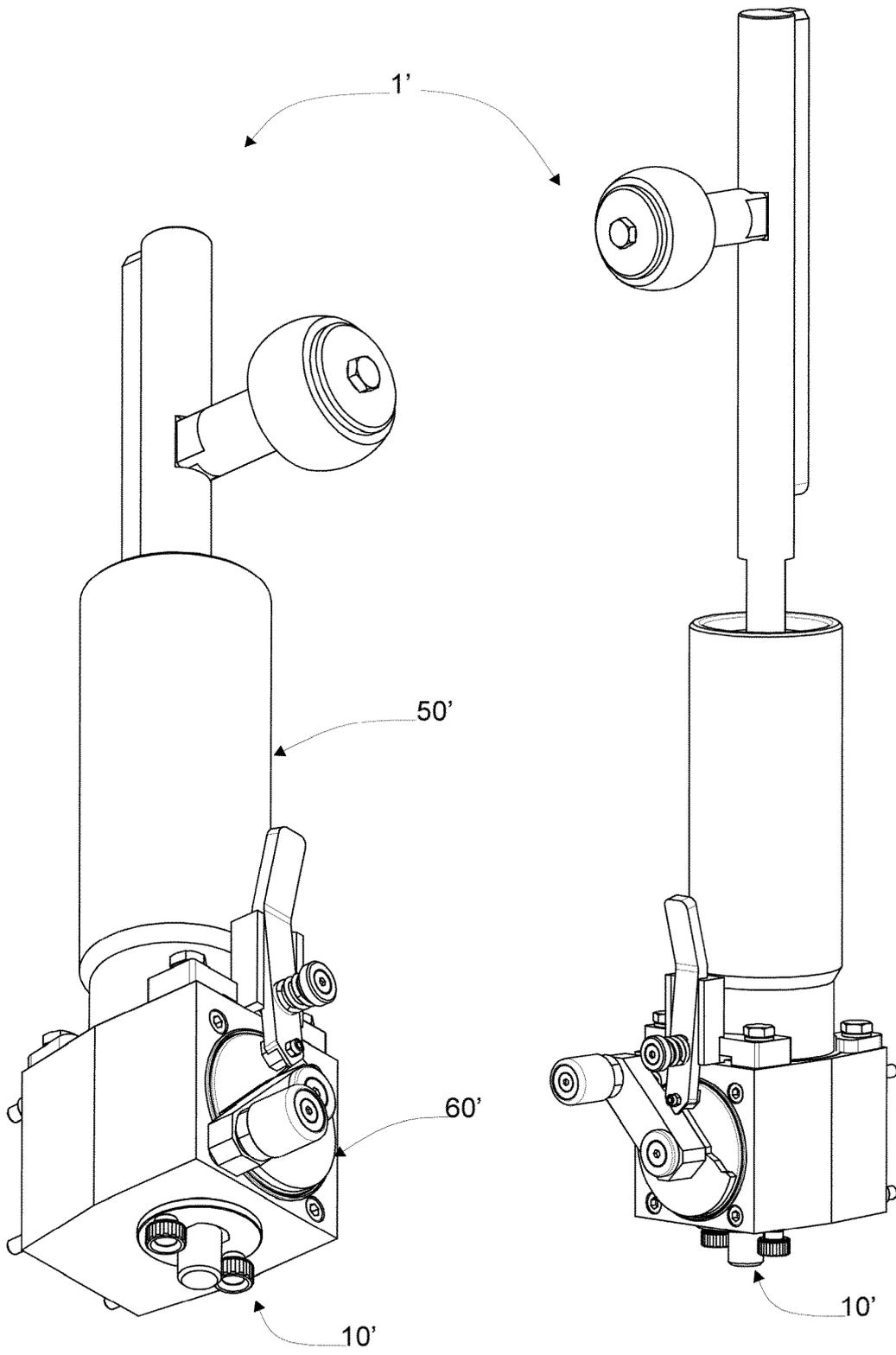


Fig. 8a

Fig. 8b



EUROPEAN SEARCH REPORT

Application Number

EP 23 18 9999

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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	<p>US 4 606 382 A (BILLER VICTOR [US] ET AL) 19 August 1986 (1986-08-19) * column 5, line 19 - column 6, line 51; figures 1-10 *</p> <p style="text-align: center;">-----</p>	1, 12	<p>INV. B67C3/20 B67C3/26</p>
A	<p>GB 2 214 612 A (OCME SPA [IT]) 6 September 1989 (1989-09-06) * abstract; figures 1-3 *</p> <p style="text-align: center;">-----</p>	1-12	<p>TECHNICAL FIELDS SEARCHED (IPC)</p> <p>B67C B65B</p>
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 December 2023	Examiner Wartenhorst, Frank
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>..... & : member of the same patent family, corresponding document</p>	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 23 18 9999

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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