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(54) **Rotary machine for filling containers with liquids**

(57) Rotary machine for filling containers with liquids (1) provided with a plurality of valve assemblies (5) hydraulically connected to a tank (4) and mounted peripherally on a rotary carousel (3). Each valve assembly (5) comprises a tap (44) with interception means (8) for adjusting the outflow of liquid into the container. The machine is also provided with a plurality of chutes (100), each of which is mounted by means of a hinge (101) on the rotary carousel (3) at a valve assembly (5); and a tray

(104) mounted fixed with respect to the rotary carousel (3) and extending for at least one arc around the rotary carousel (3). First shifting means (109) are suitable to move each chute (100) around the hinge (101) between a withdrawn position (110), wherein the chute (100) is substantially aligned with the valve assembly (5), and a projecting position (111), wherein the chute (100) projects externally from the valve assembly (5) towards the tray (104) for draining - into the latter - the liquid released by the valve assembly (5).

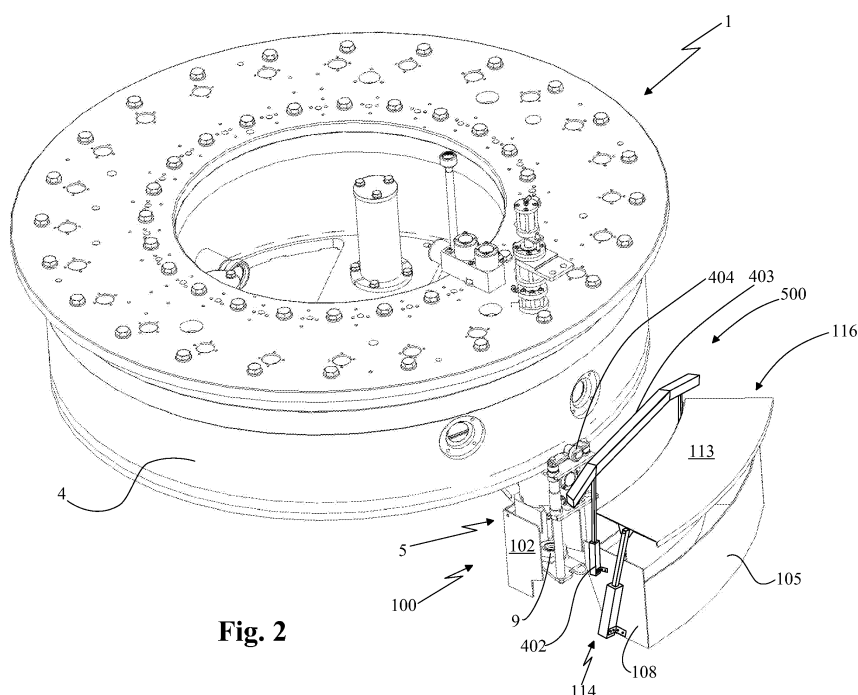


Fig. 2

Description

Field of application

[0001] The present invention refers to a rotary machine for filling containers with liquids.

[0002] The machine in question is intended to be used in the bottling industry for filling containers, in particular bottles, with liquids mostly for human consumption, such as for example beverages, wine, mineral water, beer etcetera.

[0003] The abovementioned rotary filling machine may be used in bottling lines comprising, typically a rinsing machine, a capping/capsuling machine or even, a labelling machine and a packaging machine.

[0004] Advantageously, the rotary filling machine according to the invention allows completely emptying the filling liquid and performing sanitization in an entirely automatic manner and without dirtying in any manner whatsoever.

State of the art

[0005] Rotary filling machines are conventionally provided with a rotary carousel (turret) bearing - peripherally mounted - a plurality of valve assemblies suitable to convey the liquid contained in a cylindrical tank into the containers to be filled. The latter, raised by suitable support plates, are associated to the single valve assemblies to be filled up to the desired level during the operational travel thereof around the rotary carousel.

[0006] Each valve assembly is provided with a shutter which controls the outflow of the liquid into the container.

[0007] The shutter is mounted inside a tubular pipe which places the tank in communication with the container. Also arranged coaxially inside the tubular pipe is a tube for the return of air, through which gas or air is discharged from the container.

[0008] The filling machines are usually classified, according to the method used for performing the filling operations, mainly in gravity machines, low vacuum machines and isobaric machines.

[0009] Gravity or low vacuum filling machines provide for that the passage of liquid to the underlying containers is provided for due to gravity or with the tank for containing the liquid under slight vacuum.

[0010] Alternatively, the so-called isobaric filling machines are mainly intended for filling containers with fizzy liquids, i.e. containing carbon dioxide such as fizzy wines, sparkling wines, etc and they operate under pressures higher than atmospheric pressure.

[0011] In such machines, each valve assembly is suitably fixed beneath the cylindrical tank and the tube for returning air coaxially mounted in the pipe serves as a compensation pipe between the tank and the container, through which gases or air present in the container are evacuated.

[0012] Operatively, the opening and closure of the

shutters for the outflow of liquid into the containers may be controlled electronically, by activating actuators (for example pneumatic actuators controlled by solenoids), or mechanically for example by automatically raising the actuator upon reaching pressure equilibrium between the tank and the containers in the isobaric machines, or by using cam followers mounted on valve assemblies and engaged on fixed raising cams with respect to the rotary carousel, for example in low vacuum machines.

[0013] In the rotary filling machines technical industry particularly arises the need of entirely emptying the filling liquids contained in the tank and in the plurality of valve assemblies to change the product to be bottled (or even solely for stopping the machine) or for performing sanitization operations.

[0014] As known, when changing the product to be bottled one is required to clean the machine so as to avoid contamination between different liquids.

[0015] In addition, the rotary filling machines of the type described above require periodic cleaning of all the parts, in particular the valve assemblies, subjected to come into contact with the food liquid to be bottled with the aim of maintaining the degree of concentration of microbes and bacteria in the bottled product within the levels allowed by the law.

[0016] In particular, such sanitization need arises upon completion of a production cycle before starting a new one. Interruption may, for example, also be provided for to perform machine maintenance operations or due to suspension of operations.

[0017] Sanitization operations require flowing a sanitizing fluid (mainly containing liquid and/or vapour chemical fluids) through all pipes traversed by the liquid and air or inert gases.

[0018] Currently, the most commonly used method for sanitization in the filling machines, in particular the isobaric ones, provides for the use of rinsing containers, technically known in the field by the term "false bottles", which allow the opening of single valve assemblies (in particular all valve assemblies simultaneously) and providing a closed circuit in which the sanitizing fluid is circulated. Such rinsing containers are purposely mounted beneath each valve assembly with the aim of opening the shutters and allowing the recirculation of the sanitizing fluid from the tank simultaneously in all tubular pipes and in all compensation tubes of the valve assemblies.

[0019] This sanitizing method, of the known type, requires long manual operations for mounting the rinsing containers beneath each valve assembly and does not allow automatic programming of the sanitization treatment operations.

[0020] Furthermore, the false bottles do not allow easy collection of the liquid of the valve assemblies so as to change the liquid to be bottled.

[0021] In order to overcome such drawbacks, filling machines capable of automatically inserting the rinsing containers beneath the valve assemblies have been developed more recently.

[0022] For example, patent US 5,533,552 describes an isobaric filling machine provided, at the valve assemblies, with bearing carriages each bearing a rinsing container, and slidably movable, through an opening provided in a casing, between an operative position, acquired thereby during the sanitization treatments and in which they are positioned with the container rinsing container aligned beneath a corresponding valve assembly and sealingly thereon, and an inoperative position, acquired thereby during normal operations for filling the machine and in which they are positioned behind the casing.

[0023] The sanitizing liquid is introduced into the tank and conveyed into the valve assemblies until it reaches the underlying rinsing containers, from which it then returns into the tank through the compensation tube.

[0024] This filling machine has the drawback of allowing sanitizing only the inner parts of the valve assemblies whose outer surface, which is even subjected to dirt, is not reached. Another drawback lies in the high cost of using carriages, actuators and rinsing containers for each and every valve assembly.

[0025] Patent application IT PD2009A000116 also discloses a filling machine provided with a plurality of rinsing containers, each of which is operatively and mechanically associable to one of the valve assemblies during sanitization operations provided for. First actuator means are capable of moving each of the rinsing containers between an inoperative position, wherein the rinsing container is beyond the operative dimensions of the valve assemblies, and an operative position, wherein the rinsing container is vertically aligned beneath one of the valve assemblies. Each valve assembly is provided with a centring cone comprising an external body having an upper portion suitable to be sealingly coupled with the tap, and a lower position suitable to be sealingly coupled with the rinsing container. The centring cone also comprises an internal body, which is slidably mounted in the outer body and it is provided with a top wall suitable to be sealingly coupled with the lower wall of the tap, and with a lower concavity suitable to be sealingly coupled with the mouth of the container to be filled.

[0026] Though it allows improving clearing operations with respect to the prior art machines, such filling machine is however expensive for the use of rinsing containers and centring cones in several parts for each valve assembly.

Disclosure of the invention

[0027] In this situation, the main object of the present invention is therefore that of overcoming the drawbacks of the art known hitherto by providing a rotary filling machine for filling containers with liquids capable of discharging the liquid product, for the various reasons, in an entirely automatic manner and at a low cost.

[0028] Another object of the present invention is that of providing a filling machine capable of performing sanitization operations that may allow also cleaning the outer

surface of the valve assemblies. Another object of the present invention is that of providing a filling machine capable of discharging the product or performing the sanitization operations without interfering with the protections provided for in isobaric machines.

[0029] Another object of the present invention is that of providing a filling machine entirely operatively reliable and having low production costs.

[0030] Another object of the present invention is that of providing a filling machine capable of completely discharging the product contained in the valve assemblies.

Brief description of the drawings

[0031] The technical characteristics of the finding, according to the abovementioned objects, are clearly observable from the contents of the claims indicated below and advantages thereof shall be clearer in the detailed description that follows, provided referring to the attached drawings, which represents an embodiment which is provided purely by way of non-limiting example, wherein:

- figure 1 shows a general perspective view of the filling machine subject of the present invention;
- figure 2 shows a general perspective view of some parts of the filling machine subject of the present invention referring to a rotary carousel bearing a tank, a valve assembly and a tray;
- figure 3 shows a sectional and partial perspective view of the filling machine subject of the present invention with the centring cone and air return tube provided thereof lowered, the draining chute provided thereof in withdrawn position and the tray in closed position;
- figure 4 shows the filling machine illustrated in figure 3 in a sectional side view;
- figure 5 shows a partial, lateral and sectional view of the filling machine subject of the present invention with the collection tray in open position;
- figure 6 shows a sectional and partial perspective view of the filling machine subject of the present invention with the centring cone and the air return tube raised, the drainage chute in projecting position and the tray open with the cover raised;
- figure 7 shows the filling machine illustrated in figure 6 in a sectional side view;
- figure 8 shows the centring cone of a valve assembly of the filling machine subject of the present invention slightly raised by a drainage chute by means of a first roller;
- figure 9 shows a perspective view of a different embodiment of the filling machine subject of the present invention, with some parts removed for clearer observation of the others and with the drainage chute in withdrawn position and the rotary carousel in lowered position;
- figure 10 shows the embodiment of the filling machine of figure 9 with the drainage chute in projecting

position and the rotary carousel raised to an operative level.

Detailed description of a preferred embodiment

[0032] Referring to the attached drawings an embodiment of the filling machine subject of the present invention has been described in its entirety with 1.

[0033] A preferred embodiment of the present invention referring to a filling machine of the isobaric type shall be described hereinafter, but it shall be understood that the technical solutions subject of the present invention are advantageously applicable even to other types of filling machines, such as for example low vacuum machines, gravity machines, etcetera.

[0034] An isobaric rotary filling machine, intended for bottling containers through gaseous fluids, generally used in the food industry, such as for example beverages added with carbon dioxide, sparkling wine, beer, mineral water, etcetera shall be described hereinafter.

[0035] The filling machine 1 is conventionally fitted in a bottling plant downstream of a rinsing machine and upstream of a capping machine. The containers to be filled are transferred from one machine to the other by means of transport lines, such as for example conveyor belts, starwheel, feed screws, etc.

[0036] Referring to figure 1, the filling machine 1 comprises - entirely conventionally and as well known to a man skilled in the art - a support structure 2, lying against the ground, rotatably mounted on which is a rotary carousel 3 bearing a tank 4 advantageously toroidal-shaped. The rotary carousel 3 is provided with a vertical central rotation shaft 45 which bears a horizontal support disc 38. Fixed on the latter are columns 37 which support the tank 4 containing the liquid to be bottled at an ideal pressure suitable to prevent the gas dissolved in the liquid from being dispersed.

[0037] A plurality of valve assemblies 5 are mounted on the rotary carousel 3 peripherally beneath the tank 4 and they are hydraulically connected to the latter to transfer the liquid to the underlying containers to be filled, generally represented by bottles made of glass or PET.

[0038] The latter are transported around the filling machine 1, in a per se conventional manner, by support means represented, for example, by a plurality of plates 10 which rotate synchronously with the valve assemblies 5 they are suitable to transfer the containers from an entry starwheel 39 to an exit starwheel 40.

[0039] More in detail, each valve assembly 5 comprises a metal body or tap 44 obtained in which is a tubular pipe 6, which places the tank 4 in hydraulic communication with the underlying container to be filled (not illustrated).

[0040] The outflow of the liquid through the tubular pipe 6 is controlled by interception means 8 for example represented by a shutter 12, which is coaxially mounted in the same tubular pipe 6 and it can be moved between an open position, in which it is spaced from the inner wall

of the tubular pipe 6 allowing the passage of the liquid towards the container, and a closed position, in which it is at contact with the inner wall del tubular pipe 6 obstructing the passage of the liquid. The shutter 12 is controlled in closure by means of, for example, a pneumatic actuator, and it is controlled in opening by means of, for example, a preloaded return spring to push it to the open position thereof when the container reaches the same pressure as the tank 4.

10 **[0041]** The interception means 8, therefore, control the outflow of the liquid from the tank 4 to each container which rotates synchronously with the corresponding valve assembly 5.

15 **[0042]** The tubular pipe 6 ends with one or more supply openings obtained on a lower wall 16 of the tap 44, which is suitable to be sealingly coupled with a centring cone 9 aligned with the same tubular pipe 6. Such centring cone 9 is connected to the valve assembly 5 by means of a support bracket 42 horizontally fixed to a pair of vertical bars 43 slidably mounted on the same valve assembly 5 to allow the centring cone 9 to move between a lower position, in which it is spaced from the tap 44, and an upper position, in which it is sealingly coupled with the tap 44.

25 **[0043]** Each valve assembly 5 is also provided with a compensation tube 68 for the return of air, mounted concentric with respect to the tubular pipe 6 and intercepted by a mechanical valve, preferably also associated to a pneumatic valve, for controlling the pressure equilibrium between the container and the tank 4. Such compensation tube 68, during the operation of the filling machine 1, is suitable to pass through the centring cone 9 so as to be introduced into the underlying container.

30 **[0044]** Each valve assembly 5 is conventionally provided with control valves for controlling the specific steps of the process of filling the containers, such as for example, in the described exemplified case of an isobaric machine: the step of pre-evacuation, pressurization, self-levelling and of degassing. More in detail, each valve assembly 1 of the isobaric filling machine 3 comprises, in a manner per se known to a man skilled in the art and hence not illustrated in detail, a first valve 200 for intercepting a vacuum circuit 200' intended to suction all the air from container 4 as soon as the latter is delivered by a support plate with the centring cone 14 sealingly coupled to the spout 13 of the delivery pipe 11; a second valve 201 for intercepting an isobaric circuit intended to move the container to the pressure of the tank 4 by flowing air into the tank 4 itself or an inert gas during the step of pressurizing the container, a third valve 202 for intercepting a self-levelling circuit 202' intended to insufflate inert gas into the container during the step of self-levelling the liquid in the container. Such interception valves 200, 201, 202 place the respect fluid circuits in communication with the container, usually through a further consent valve commonly mounted for the various circuits on the tap 44. The fluid supply circuits usually comprise ring pipes pre-arranged coaxially with respect to the axis of the machine

and connected to the valve of the various groups to distribute the required fluid thereto.

[0045] One or more degassing valves 84 connected to a degassing circuit 84' for evacuating air or gas in overpressure in the container once the latter has been filled with the liquid to be bottled are also provided for.

[0046] The filling machine 1 subject of the present invention also comprises a plurality of chutes 100, each of which is mounted on the rotary carousel 3 at at least one corresponding valve assembly 5. According to the preferred embodiment illustrated in the attached figures, each chute 100 is mounted on the rotary carousel 3 at a respective valve assembly 5 or simultaneously at several valve assemblies so as to be movable between two positions as described hereinafter.

[0047] According to a preferred embodiment of the present invention, the chutes 100 are advantageously obtained using a C-shaped steel metal sheet, and mounted beneath each valve assembly 5 winding the container during the normal filling operations.

[0048] According to such embodiment of an isobaric machine 1 illustrated on the attached figures, the chutes 100 provide the protection casing for the bursting of bottles.

[0049] Advantageously, they therefore wind the containers with two side walls 102 arranged to separate the containers with respect to the two contiguous containers and with an inner wall 103 facing towards the rotation shaft 45 of the rotary carousel 3 and arranged as a continuation of the two side walls 102.

[0050] The three walls 102, 103 may form a continuous arc or they may form three separate walls delimited and joined by corners. According to the example represented in the attached figures, the side walls 102 are obtained through orthogonal foldings starting from the inner wall 103. Alternatively, the chutes may extend for an arc of the rotary carousel 3, simultaneously involving several valve assemblies 5.

[0051] The machine 1 also comprises a tray 104 mounted fixed on the support structure 2 of the rotary carousel 3 and extending for at least one arc around the rotary carousel 3.

[0052] La tray 104 develops externally and around the rotary carousel 3 with a toroidal shape which extends preferably for an arc interfacing - at the front - with one or more valve assemblies 5.

[0053] The tray 104 is made of steel sheets through roller levelling, with an arc-shaped parallel outer wall 105 and inner wall 106, radially spaced from each other and closed - at the lower part - by a horizontal bottom wall 107 and laterally by two radial walls 108.

[0054] The bottom of the tray 104 is connected to a discharge pipe 300 intended to be connected to a tank for collecting the liquid or to a sanitization circuit for cleaning the machine 1.

[0055] According to the invention, also provided for are first shifting means 109 for shifting each chute 100 between a withdrawn position 110, wherein the chute 100

is spaced from the tray 104, and a projecting position 111, wherein the chute 100 projects externally from the valve assembly up to above the tray 104 with at least one free edge thereof 112, for draining - into the latter - the liquid released by the valve assembly 5.

[0056] Advantageously, according to the preferred embodiment of the present invention illustrated in the attached figures 1 - 8, the chutes 100 are mounted on the rotary carousel by means of hinges 101, in particular provided at brackets fixed to the body of the tap 44.

[0057] Each chute 100 is thus moved by the first shifting means 109 around its hinges 101 to vary the position thereof between the withdrawn one 110, in which the chute 100 is substantially aligned to the respective valve assembly 5, and the projecting position 111, in which the chute 100 is inclined so that the free edge thereof 112 projects above the tray 104.

[0058] According to such embodiment, each chute 100 is thus hinged at the upper end thereof to a bracket fixed to the body of the tap 44 beneath the lower wall 16 of the respective valve assembly 5 and terminates at the lower end thereof with the previously mentioned free edge 112. The chute 100 preferably develops vertically when it is in the withdrawn position 110, while it develops obliquely when in the projecting position 111.

[0059] Alternatively, the chutes 100 may be actuated by the first shifting means 109 to translate between the abovementioned two positions, guided by the guide means provided for or directly supported by the shifting means as indicated in the example of figures 9 and 10.

[0060] More in detail, according to the embodiment of figures 9 and 10, the first shifting means 109 are obtained with a fourth linear actuator 109^{iv}, which moves the chutes 100 between the two abovementioned positions withdrawn and projecting 110, 111, by means of a simple translation movement. Advantageously, the chutes are supported and guided in the movement thereof by the same fourth linear actuator 109^{iv}, responsible for the movement thereof.

[0061] The chutes may extend in circumferential direction for only one valve assembly or, alternatively, for several valve assemblies. Advantageously, the machine may be arranged with the valve assemblies in raised position so as to allow the chutes 100 to be easily inserted beneath the same assemblies as indicated in figure 10.

[0062] According to a different embodiment not illustrated in detail in the attached figures in that known by a man skilled in the art according to this same description, the chutes 100, in withdrawn position, may even lie not in proximity to the valve assemblies 3, as required by the presence of hinges 101. The chutes 100 may actually alternatively be positioned more internally towards the rotation shaft 45 of the machine 1, at a more lateral position with respect to the trajectory of the valve assemblies 3 and preferably already at an inclined position so that abovementioned shifting means 109 have the sole task of translating them from such withdrawn position to the projecting position or beneath valve assemblies 3

and above the tray 104 (according for example to the embodiment illustrated in figures 9 and 10).

[0063] Operatively, the chute 100, when in the projecting position 111, drains all the liquid that is transferred thereto by the tap 44 making it drop from the free edge 112 thereof into the tray 104. Such liquid may be represented solely by the liquid for filling the containers for example in case of change of product or stop of the machine 1 (for example for maintenance), i.e. it may be represented by the sanitizing liquid of the cleaning cycle of the machine 1. During the cleaning cycle of the machine 1 it is connected to a sanitizing fluid circuit (of the per se known type and thus not described in detail hereinafter) which is conveyed to the tank 4 and to all annular pipes of the circuit of the process fluid (inert gas circuit, pre-evacuation circuit, degassing circuit, vacuum circuit etc.). In the latter case, the chute 100 conveys - into the tray 104 - the sanitizing fluid which exits from the tap 44 not only passing through the shutter 12 of the tap 44 but also passing through the various valves (200, 201, 202, 84) of the abovementioned operative fluids circuits.

[0064] In the withdrawn position, the chute 100 does not functionally cooperate with the tray 104 given that it is mechanically separated by it and their projections do not intersect on a horizontal plane.

[0065] Both for drainage and sanitization the rotary carousel 3 is preferably arranged with its valve assemblies 5 and its tank 4, to an operative level which is controlled by means of raising means of per se entirely traditional type and commonly mounted on the rotary machine to take into account the height of the containers.

[0066] Such operative level of the rotary carousel 3 is such to preferably position the valve assemblies 5 at a level higher than that of the tray 104, in particular, to allow easy insertion of the chutes 100 beneath the valve assemblies 5 as represented in the example of figure 9.

[0067] Such raising means are preferably obtained with a linear actuator of mechanical type mounted in the central rotation shaft 45 of the rotary carousel 3.

[0068] The tray 104 is provided with a cover 113, movable by second shifting means 114 between a closed position 115, wherein it is sealingly coupled above the tray 104 so as to prevent the entry of contaminating elements, and an open position 116, in which it allows the chute 100 to drain the liquid from the tap 44 to the tray 104.

[0069] In the isobaric machines 1, during the step of filling gaseous liquids it often occurs that some containers, usually glass bottles, burst throwing pieces of glass in all directions. The chute 100 arranged winding the contiguous containers prevents the glasses thrown with force by the bursting from breaking other containers 10 or ruin the adjacent valves 5. However, the glasses may easily find their way into the tray 104 if the latter is not provided with a cover 113 which is suitably closed during the steps of filling the containers.

[0070] Also, in the absence of a cover 113 the tray 104 may be dirtied by dust, oil, insects or other contaminating elements, thus making the liquid recovery operation more

risky in case of change of product.

[0071] According to a preferred embodiment of the present invention, the cover 113 is provided with a projecting wall 117, in particular directed vertically and arranged in proximity to the external wall 105 of the tray 104. Such projecting wall 117 extends into the tray 104 so as to remain partly inserted therein even when the same tray 104 is in an open position 116.

[0072] The projecting wall 117 allows intercepting at least partly the flow of the liquid drained from the chute 100 towards the tray 104. In particular, such projecting wall 117 closes the gap that is created between the cover 113 and the upper edge 138 of the tray 104 when the cover 113 is in an open position 116 and prevents, even the sprays of liquid alone, from exiting from the tray 104. According to the embodiment illustrated in the attached figures referring to an isobaric machine 1, each valve assembly 5 is provided, as indicated previously, with a centring cone 9 which is raised by the head of the container during the raising thereof by means of the support plate, until it is sealingly coupled on the supply spout of the tap 44 arranged beneath the lower wall 16.

[0073] In this case, in order to move the chute 100 from the withdrawn position 110 to the projecting position 111, according to the mechanical arrangement illustrated in the attached figures, it is necessary to previously raise the centring cone 9. Provided for such purpose are third shifting means 118 suitable to move the centring cone 9 between a lowered position 119, wherein correspondingly the chute 100 is in withdrawn position 110, and a raised position 120, wherein the chute 100 is suitable to acquire the projecting position 111.

[0074] More in detail, according to a possible embodiment illustrated in figures 1 - 8, the first shifting means 109 are obtained with a plurality of arms 109', projecting at the back from the chutes 100, each engaged with a fork, in a horizontal bar 109" actuated to be moved with a vertical component by a first actuator 109".

[0075] It is possible to provide for the use of a single annular shaft 109" around the rotary carousel 3 which is raised by several first actuators 109"', preferably pneumatic and movable between two stop positions and uniformly distributed around the machine 1.

[0076] Alternatively, provided for may be several bars 109", each of which developing for an arc of circumference involving one or more taps 44 and raised by one or more first actuators 109".

[0077] Still alternatively, as indicated previously and as represented in figures 9 and 10 the first shifting means 109 may be obtained with fourth linear actuators 109^{iv} mounted on the rotary carousel 3 for example above the support disc 38 which supports, through the columns 37, the tank 4.

[0078] In turn, the second shifting means 114 preferably comprise a pair of second pneumatic actuators mounted inclined with the base nearest to the rotary carousel 4, on the two radial walls 108 of the tray 104 and operating on sui two corresponding side edges of the

cover 113 to move the latter as indicated in the arrow in figure or simultaneously raising and externally.

[0079] The third shifting means 118 may advantageously be obtained simply with at least one first roller 400 mounted idle on the support bracket 42 of the centring cone 9 and suitable to interfere with the front edge 401 (see figure 8) of a side wall 102 of the chute 100 when the latter passes from the withdrawn position 110 to the projecting position 111.

[0080] Advantageously according to the embodiment exemplified in figure 9, optionally provided for may be means 500 for shaking the centring cone 9 to allow complete cleaning of the latter during the sanitizing steps.

[0081] More in detail, such means 500 provide for third actuators 402, in particular of the pneumatic type, mounted on the walls, for example radial 108, of the tray 104 and suitable to move a cam 403 between an upper position, wherein the latter interferes with a second following roller 404 mounted externally projecting from the guide bars 43 of the centring cones 9 thus determining one or more vertical movements in succession, and a lower position, wherein the cam 403 does not interfere with the abovementioned second roller 403 and thus does not determine any movement of the centring cone 9.

[0082] Advantageously, preferably provided for are fourth shifting means 220, suitable to raise the air return tube 68 before moving the chute 100 so as to prevent, according to the dimensions provided for in the solution represented in the attached figures, the interference of the air return tube 68 with the chute 100.

[0083] The air return tube 68 allows - during the step of filling the container - evacuating the air contained in the latter so as to prevent the formation of counter-pressure which counters the descent of the liquid, as well as evacuating the excess liquid during the subsequent step of defining the level of liquid 5 in the container.

[0084] Functionally, during the cycle for filling the machine 1, the abovementioned air return tube 68 is may be slidably cyclically moved in the tubular pipe 6 between a raised position, wherein it allows the correct realization of the degassing step, and a lowered position in which it is inserted for at least one lower section into the container 4 with the open lower end 29 prearranged at a predetermined height for defining the level of the liquid therein.

[0085] The fourth shifting means 220 thus also allow levelling the liquid in the containers to a predetermined level.

[0086] Such fourth shifting means 220 are for example obtained, as described in the patent application IT PD2009A000075, from page 12 line 3 to page 15 line 24, with a fourth pneumatic actuator, which is integrally fixed to a support base and operates on the air return tube 68 between the abovementioned raised position to allow correct degassing, and lowered position to establish the predetermined level of liquid in the container 4.

[0087] More in detail, when the air return tube 68 is in lowered position, there occurs the levelling of the liquid to such level (compensation step) by means of insufflat-

ing inert gas into the container through the third valve 202 of the self-levelling circuit 202', and the ensuing passage of the liquid through the air return tube 68 until it returns into the tank 4.

[0088] The air return tube 68 is usually in raised position and it is moved downwards, in the lowered position, for the abovementioned compensation step aimed at defining the predetermined level of liquid in the bottle.

[0089] During the operation of draining the air return tube 68 is in raised position (preferably likewise during degassing in case of gaseous liquids).

[0090] In the example indicated in the attached figures described above with reference also in patent application IT PD2009A000075, the position of the air return tube 68 is electronically controlled by operating on the fourth shifting means 220.

[0091] Alternatively, the air return tube 68 may be simply dismounted in the last end part thereof so as to allow the movement of the chute 100 from the withdrawn position 110 to the projecting position 111. In most isobaric machines of the known type not controller electronically, the lower end part of the air return tube 68 is removably separable from the remaining part of the same tube 68 to allow adaptation to various types of containers also varying the filling level intended to be obtained. For such purpose, the abovementioned lower part of the tube 68 is removably connectable to the remaining part through coupling means, preferably of the quick coupling type, already known to the man skilled in the art and thus not described in detail.

[0092] According to a further characteristic of the machine 1 in question, a plurality of nozzles 121 connected to a sanitization circuit is mounted on the tray 104 for injecting sanitization liquid against the valve assembly 5 and/or against the tray 104.

[0093] More in detail advantageously, the abovementioned plurality of nozzles comprises a first series of nozzles 121' mounted on the cover 113 and directed towards the valve assembly 5 and a second series of nozzles 121'' mounted in the tray 104 in particular for cleaning the tray 104 and/or the cover 113.

[0094] The first series of nozzles 121' is mounted at least partly on the projecting wall 117 of the cover 113.

[0095] Operatively, in order to completely discharge the liquid from the machine 1 even with the aim of recovering it, for example upon completing a filling process before starting with a new product to be bottled or for stopping the machine 1 to allow ordinary maintenance operations or a break, it is possible to proceed as described hereinafter.

[0096] The draining indicated hereinafter entirely allows discharging all the liquid of the machine 1 that cannot be discharged with the delivery pipe connected to the tank 4, in that the latter is positioned at the level of the bottom of the tank 4 and thus it does not allow recovering the liquid from the valve assemblies 5 below the level of the tank 4.

[0097] It is initially possible to provide for an optional

cleaning of the tray to clean off possible contaminating elements. Such cleaning may conveniently be performed by circulating cleaning water or fluid in the tray 104 or by conveying it to the nozzles 121 and taking it from the discharge pipe of the tray 104.

[0098] Subsequently provided for is the raising of the cover 113 in the opening position 116 and thus the positioning of the rotary carousel 3 with the valve assemblies at a level higher than that of the tray 104.

[0099] The raising of the rotary carousel 3, in particular to the operative level, is obtained in a per se entirely traditional manner.

[0100] At this point, the centring cones 9 are raised (all simultaneously or only those at the tray 104) and the air return tube 68 is raised up to a level suitable to allow the subsequent rotation of the chute 100 in the projecting position 111.

[0101] The raising of the centring cones 9 may be alternatively obtained by means of the same raising of the rotary carousel 3 to the operative level.

[0102] Before rotating the chute 100 it is possible to wash it by means of sprays of liquids from the nozzles of the tray 104, with discharge of liquid directly on the plates and suitable dripping.

[0103] Lastly, after rotating the chute 100 in projecting position 111, the shutter 12 of each tap 44 may be opened when the valve assemblies 5 pass at the tray 104, allowing complete drainage of the liquid contained therein through the chute 100 in the tray 104 and complete recovery thereof through the discharge pipe 300 of the tray 104. After recovering the fluid, there may follow the release of the centring cones 9, the lowering of the chute to the withdrawn position 110 and the movement of the cover 113 to closure position 115 on the tray 104.

[0104] Operatively, in order to subject the machine 1 to the sanitization steps, one shall preferably proceed according to the operative steps indicated hereinafter.

[0105] Initially, the cover 113 shall be moved to the opening position 116 and the rotary carousel 3 shall be positioned with the valve assemblies at a level higher than that of the tray 104. Then the centring cones 9 (all simultaneously or only those at the tray 104) and air return tube 68 shall be raised up to a level suitable to allow the subsequent rotation of the chute 100 in the projecting position 111. After rotating the chute the clearing step may be started by flowing the sanitizing liquid in all the circuits of the operative fluids (or in particular conveying it to the tank and to all the valve assemblies as well as to various annular pipes of the various operative cycles such as pre-evacuation, self-levelling, pressurization, degassing) and opening the respective valves when in the rotation of the carousel 3 the groups 5 are at the tray 104 so as to drain the sanitizing fluid into the tray 104 through the chute 100.

[0106] The cleaning of the outer part of the centring cones 9 (which may have excursions in height for better cleaning) and of the lower part of the tap may be performed through the sprays emitted by the nozzles 121

given that the internal parts of the tap are cleaned by the fluid which passes from the valves of the various process circuits indicated above. Optionally provided for at the end of the clearing step may be a step of flowing air top dry all the pipes. After a period of dripping, all the valves shall be conveniently closed and there may follow the releasing of the centring cones 9, the lowering of the chute 100 in withdrawn position 110 and the movement of the cover 113 to closure position 115 on the tray 104.

[0107] Optionally, it is possible - with the chute 100 at the collection position 110 - to clean the centring cones 9 arranged at lowered position for at least one rotation of the rotary carousel 3 so as to suitably clean them even at the upper part.

[0108] Therefore, the invention thus conceived attains the preset objects.

[0109] Obviously, it may acquire, in the practical implementation thereof, shapes and configurations even different from that illustrated above without departing from the present scope of protection. In addition, all details may be replaced by technically equivalent elements and the dimensions, shapes, and materials used may vary depending on the requirements.

Claims

1. Rotary machine for filling containers with liquids (1) comprising:

- a support structure (2);
- a rotary carousel (3) rotatably mounted on said support structure (2);
- a tank (4) for containing a liquid to be bottled supported by said rotary carousel (3);
- a plurality of valve assemblies (5) hydraulically connected to said tank (4) and mounted peripherally with respect to said rotary carousel (3); each valve assembly (5) comprising:
 - a tap (44) provided with a tubular pipe (6), for the outflow of said liquid from said tank (4) to said containers to be bottled, and interception means (8) associated to said tubular pipe (6) and suitable to adjust the outflow of said liquid into said container;

characterised in that it comprises:

- a plurality of chutes (100), each of which is mechanically mounted on said rotary carousel (3) at at least one corresponding valve assembly (5);
- a tray (104) mounted fixed with respect to said rotary carousel (3) and extending for at least one arc around said rotary carousel (3);
- first shifting means (109) suitable to move each of said chute (100) between a withdrawn position (110), wherein said chute

- (100) is spaced from said tray (104), and a projecting position (111), wherein said chute (100) projects externally from said valve assembly (5) up to above said tray (104) with at least one free edge (112) thereof, for draining - into the latter - the liquid released by said valve assembly (5).
2. Filling machine according to claim 1, **characterised in that** each of said chute is mounted on said rotary carousel (3) through a hinge and **in that** said first shifting means (109) are suitable for moving each of the chutes (100) around said hinge (101) between said withdrawn position (110), wherein said chute (100) is substantially aligned with said valve assembly (5), and said projecting position (111), wherein said chute (100) is inclined with said free edge (112) placed above said tray (104).
 3. Filling machine according to claim 1, **characterised in that** said tray is provided with a cover (113), able to be moved through second shifting means (114) between a closed position above said tray (104) and an open position (116), in which it allows said chute (100) to drain the liquid into said tray (104).
 4. Filling machine according to claim 3, **characterised in that** said cover (113) is provided with a wall (117) projecting into said tray (104) suitable to for staying partially inserted into said tray (104) with the latter at open position (116) to at least partly intercept the liquid or the sprays of liquid drained from said valve assembly (5) into said tray (104) through said chute (100).
 5. Filling machine according to claim 1, **characterised in that** each valve assembly (5) carries a centring cone (9) aligned with said tubular pipe (6) that can move vertically on vertical guides (43); and **characterised in that** it comprises third shifting means (118) that can move said centring cone (9) between a lowered position, in which said chute (100) is correspondingly in withdrawn position (110) and a raised position, in which said chute (100) is able to take up said projecting position (111).
 6. Filling machine according to claim 1, **characterised in that** said chute (100) in said withdrawn position (110) goes between at least one container and the one associated with the adjacent valve assembly (5).
 7. Filling machine according to claim 6, **characterised in that** said chute (100) has a substantially C-shaped cross section and **characterised in that** in said withdrawn position (110) it winds around said container with two side walls (102) arranged to separate said container from the two contiguous containers of the
- two laterally adjacent valve assemblies (5), and with an inner wall (103) facing towards the central rotation shaft (45) of said rotary carousel (4) arranged as a continuation of said side walls (102).
8. Filling machine according to claim 1, **characterised in that** said first shifting means (109) comprise a plurality of arms (109') projecting at the back from said chutes (100), each engaged in at least one shaft (109'') actuated to move with a vertical component by a first actuator (109''').
 9. Filling machine according to claim 1, **characterised in that** said tray (104) extends toroidally around said rotary carousel (3) for an arc interfacing with one or more valve assemblies (5).
 10. Filling machine according to claim 3, **characterised in that** said second shifting means (114) comprise at least one second actuator mounted on a radial wall of said tray (104) and acting upon said cover (113).
 11. Filling machine according to claim 1, **characterised in that** it comprises at least a plurality of nozzles (121) connected to a sanitization circuit, mounted on said tray for injecting sanitization liquid against said valve assembly (5) and/or against said tray itself (104).
 12. Filling machine according to claim 11, **characterised in that** said plurality of nozzles (121) comprises a first series of nozzles (121') mounted on said cover (113) and directed towards said valve assembly (5), and in particular at least partly mounted on said projecting wall (117) of said cover (113).
 13. Filling machine according to claim 11, **characterised in that** said plurality of nozzles (121) comprises a second series of nozzles (121'') mounted in said tray (104) in particular for cleaning said tray (104) and/or said cover (113).
 14. Filling machine according to claim 1, **characterised in that** said first shifting means (109) comprise at least one fourth linear actuator (109^{iv}) for each said chute (100), mounted on said rotary carousel and operating on said chute (100) for moving it, and in particular also support it, between said withdrawn position (110), wherein said chute (100) is substantially arranged more internally with respect to said valve assembly (5), and said projecting position (111), wherein said chute (100) is arranged below said valve assembly (5) and said tray (104) with said free edge (112) positioned above said tray (104) to convey the fluid from said valve assembly (5) to said tray (104).

15. Filling machine according to any one of the preceding claims, **characterised in that** said rotary carousel (3) is moved by raising means to an operative level, in particular with said valve assemblies (5) arranged above the level of said tray (104), to allow easy insertion of said chute (100) beneath said valve assemblies (5).

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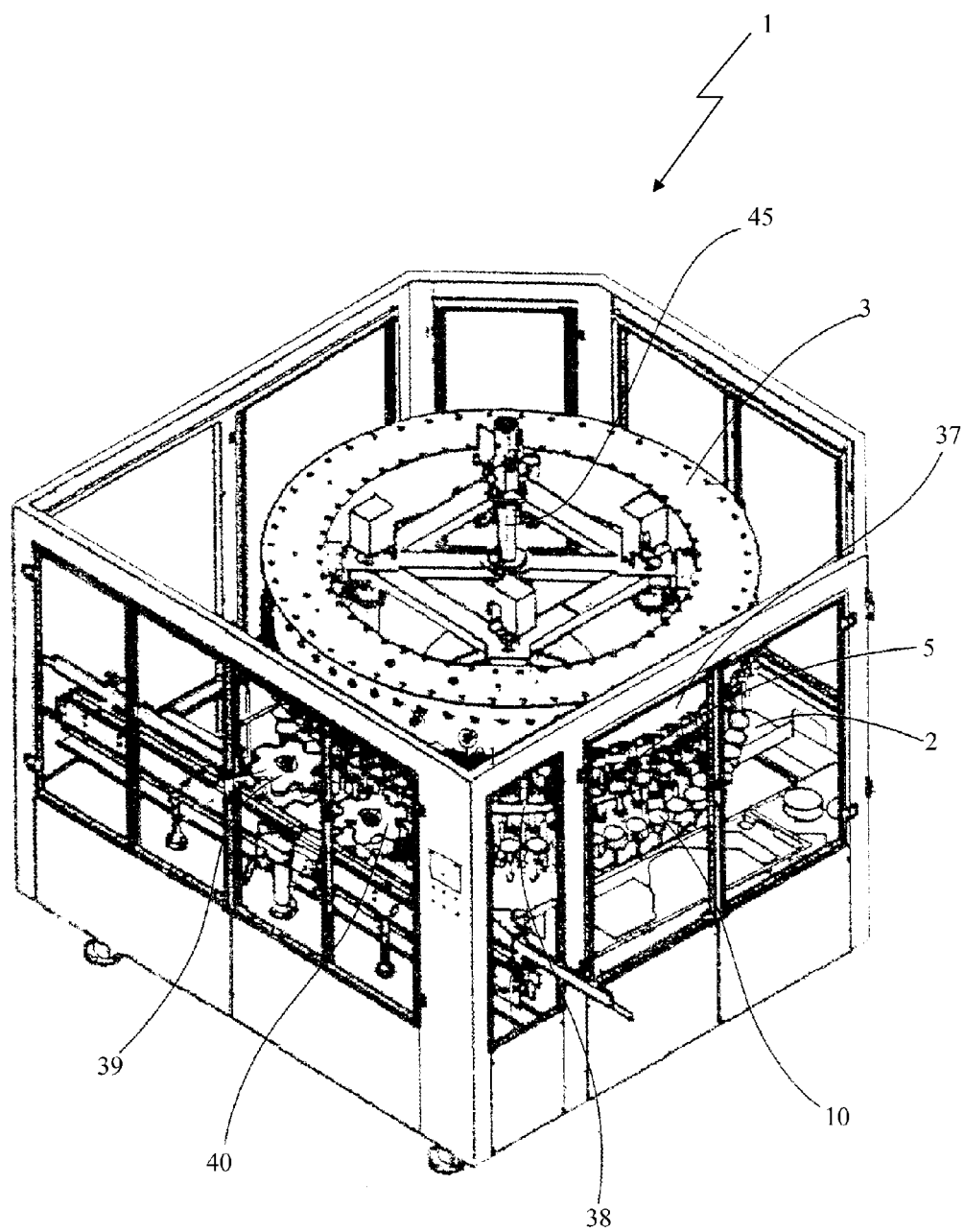


Fig. 1

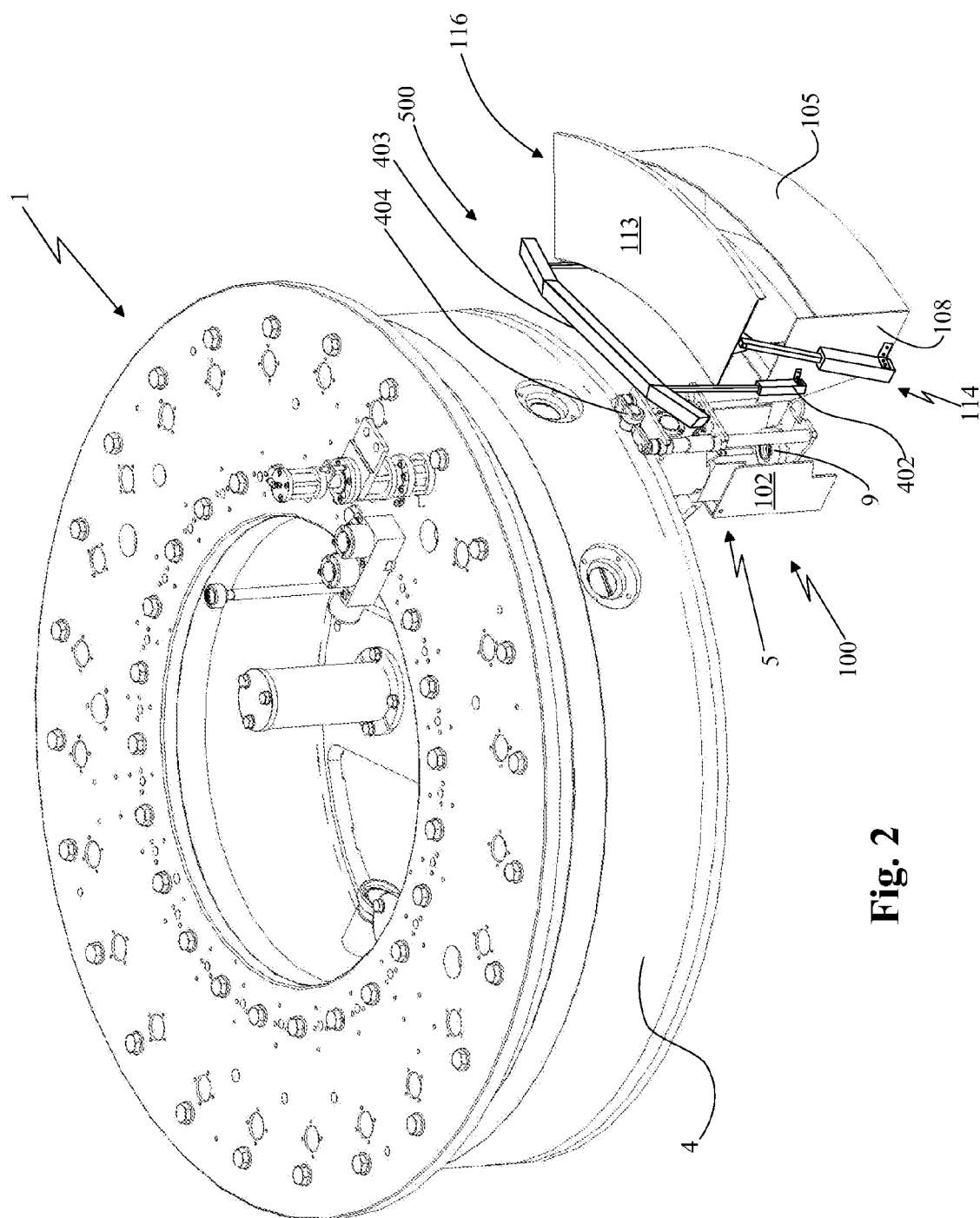


Fig. 2

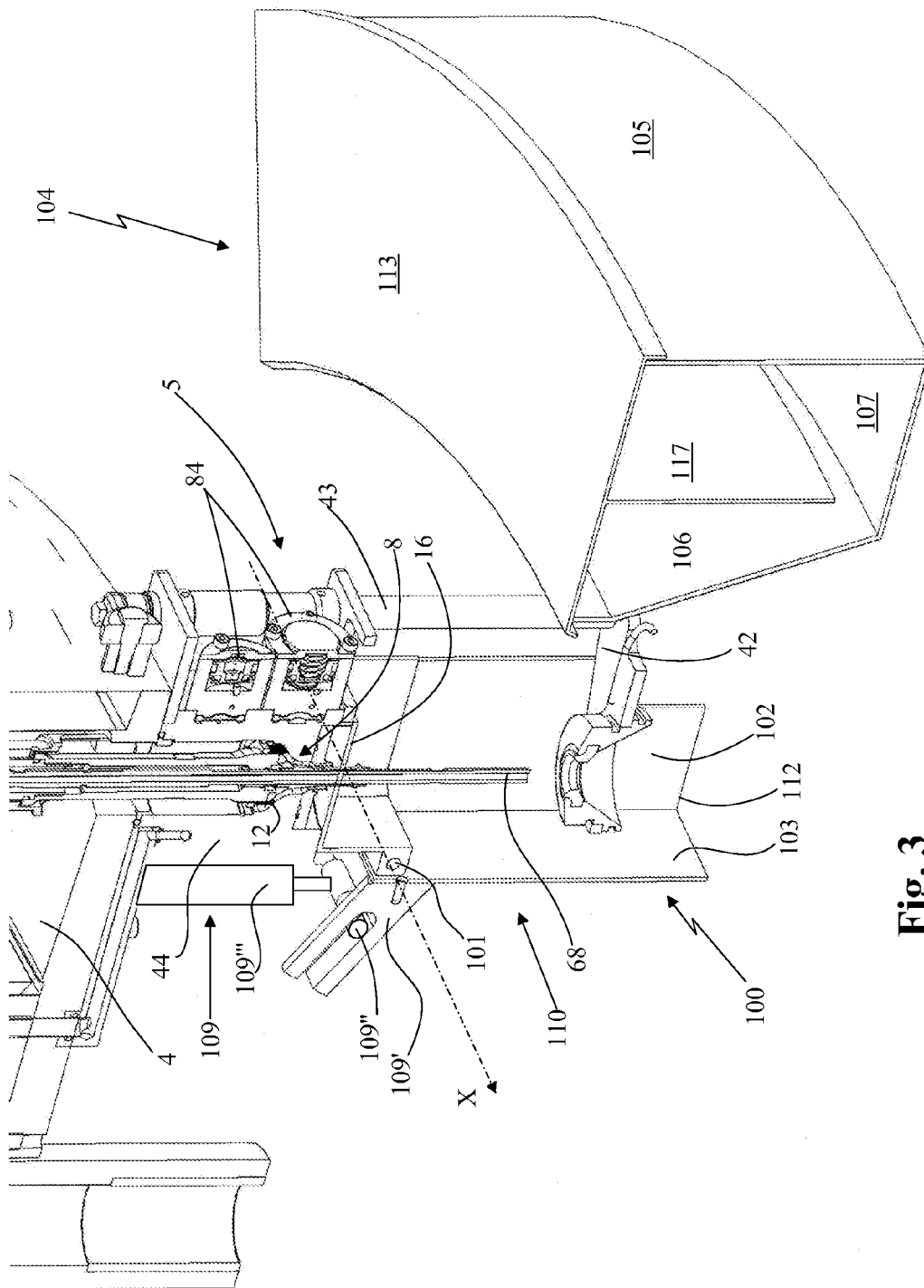


Fig. 3

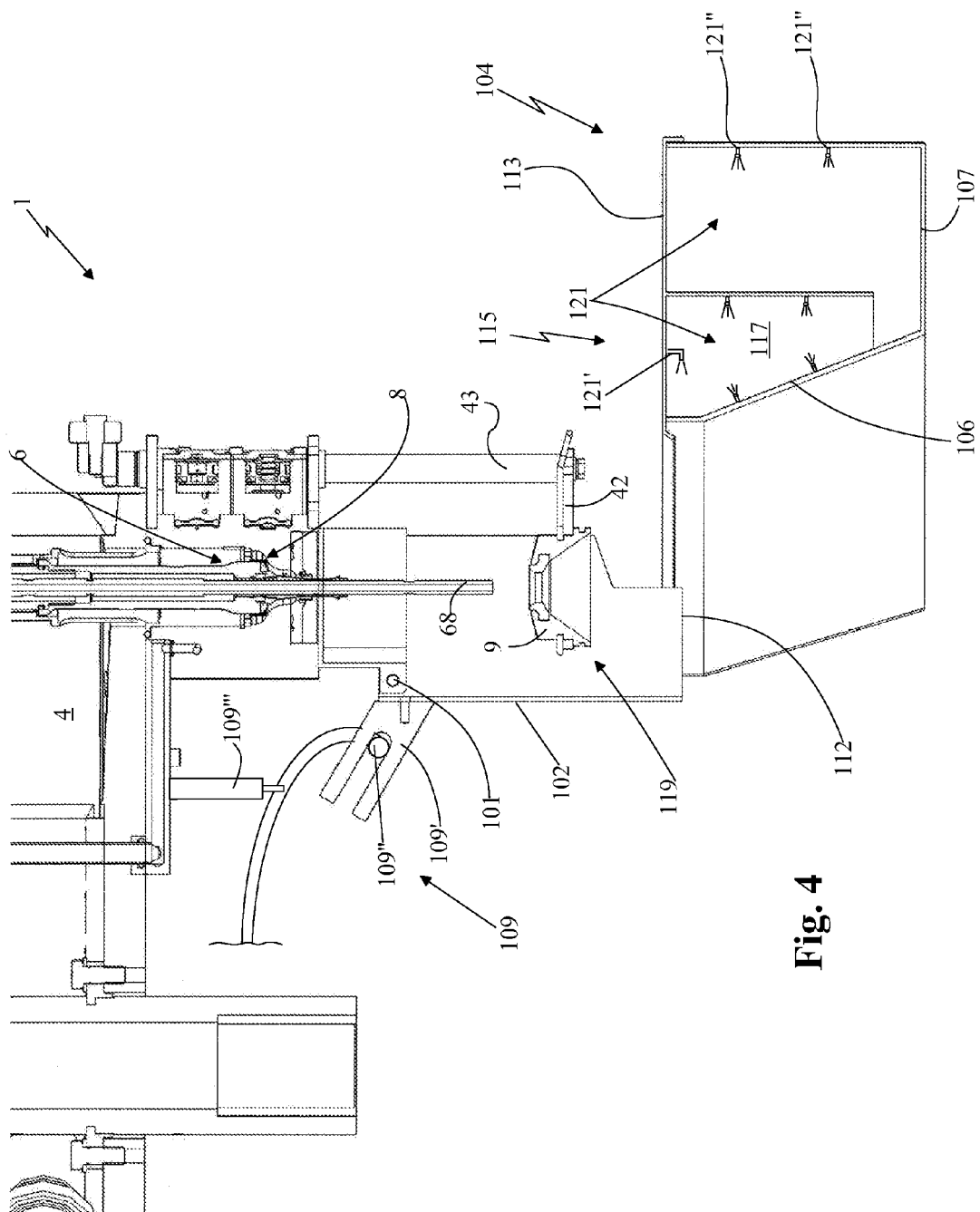


Fig. 4

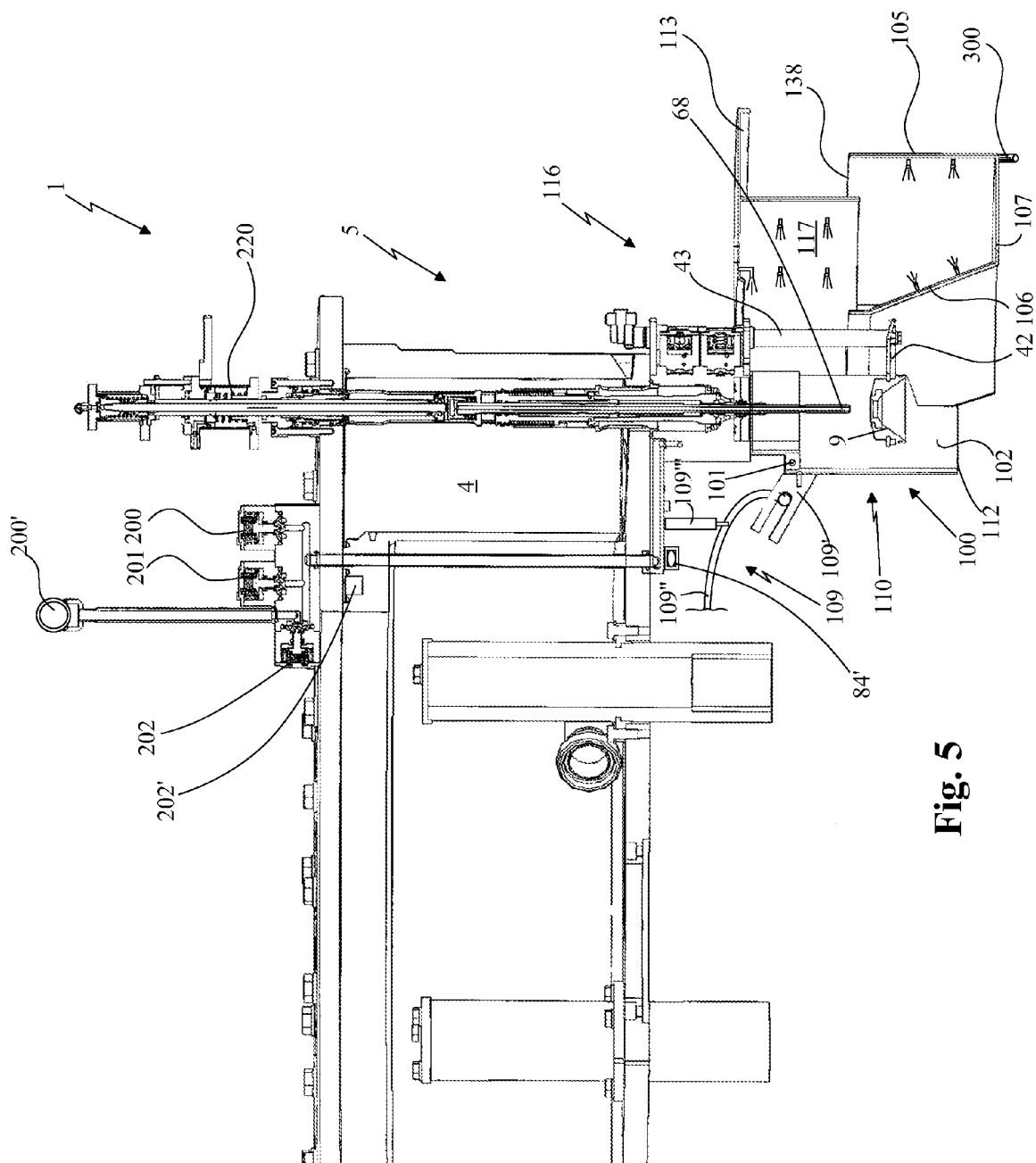


Fig. 5

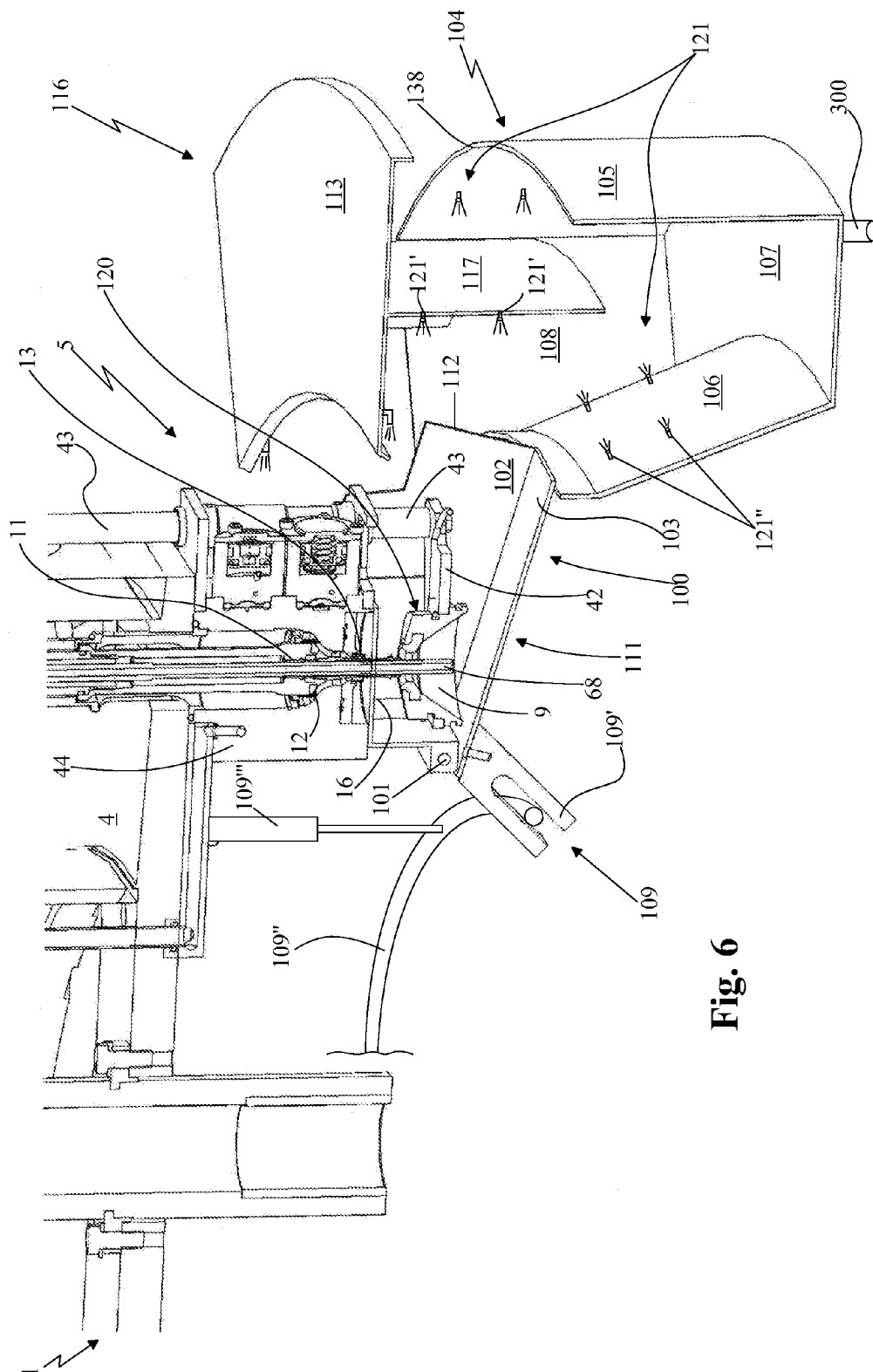


Fig. 6

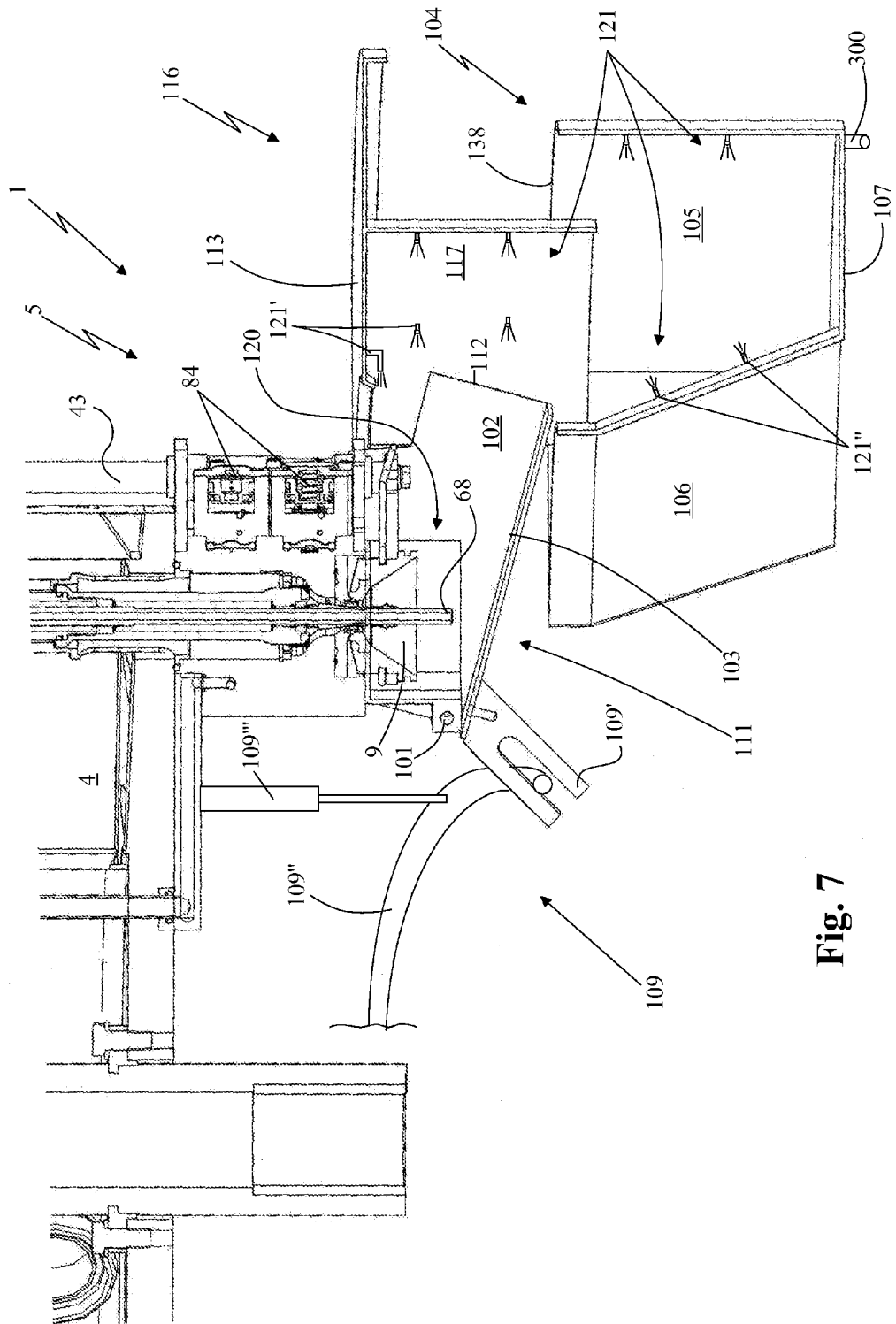


Fig. 7

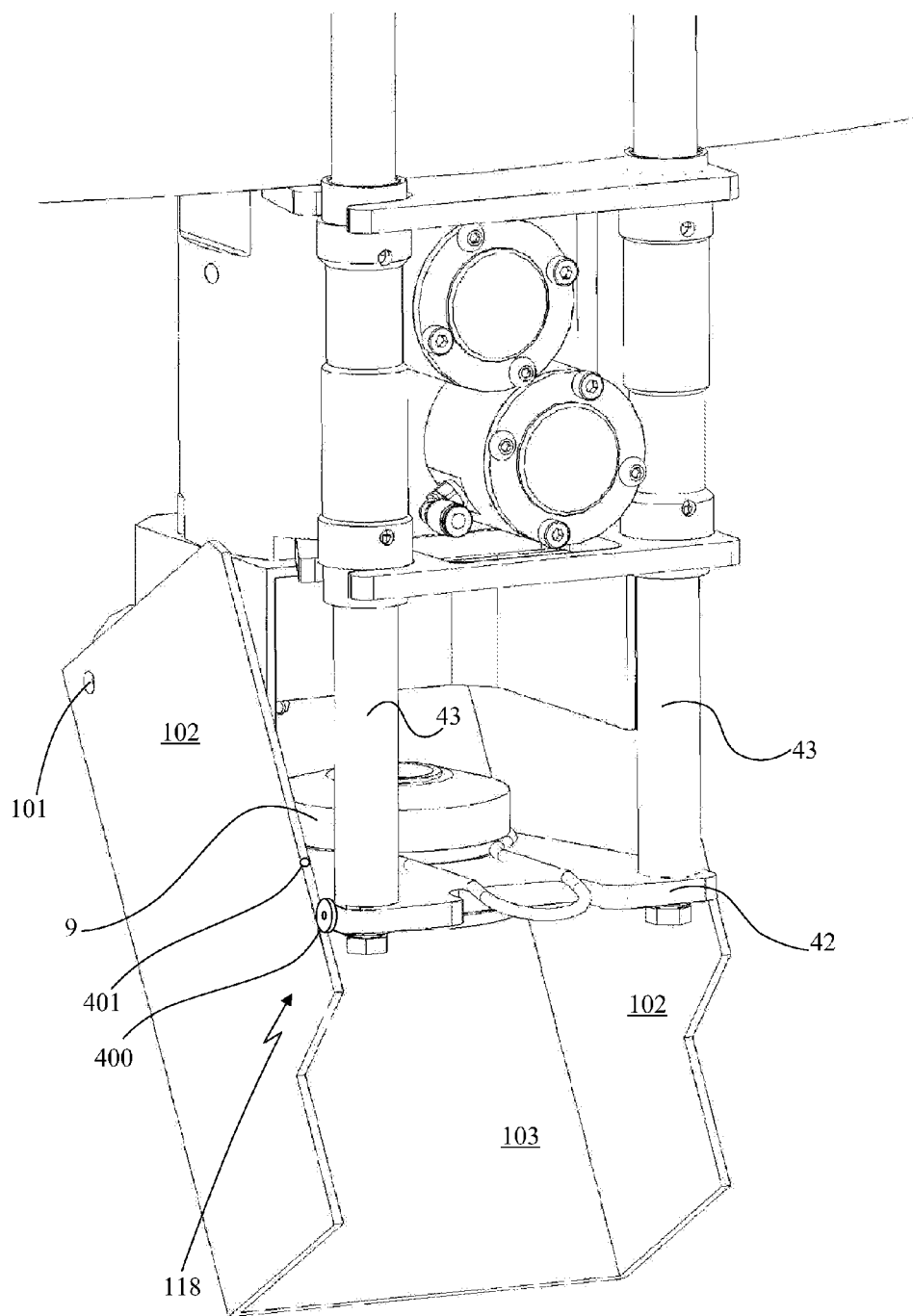


Fig. 8

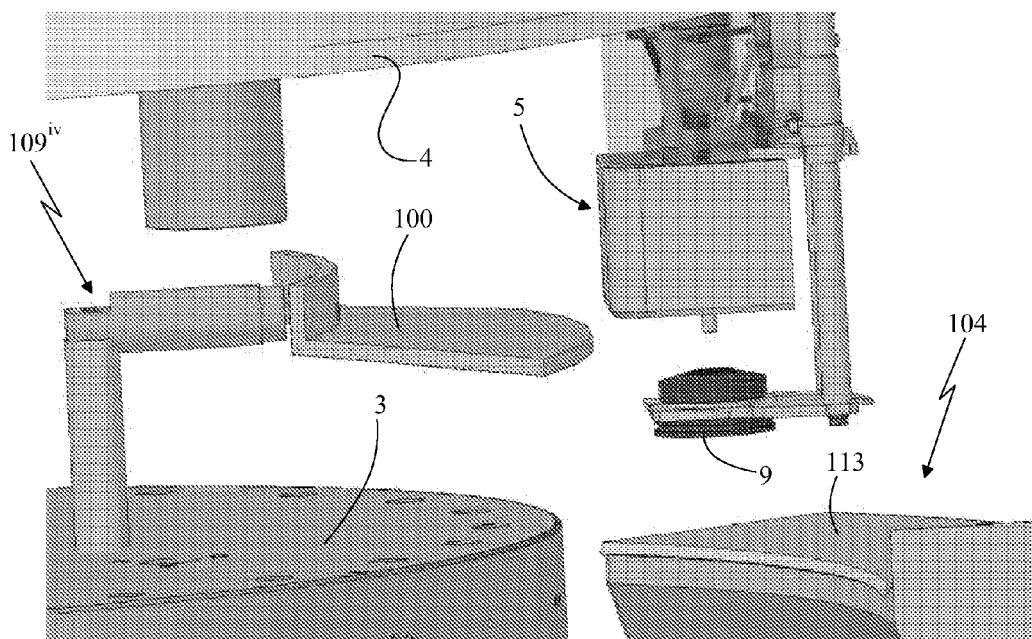


Fig. 9

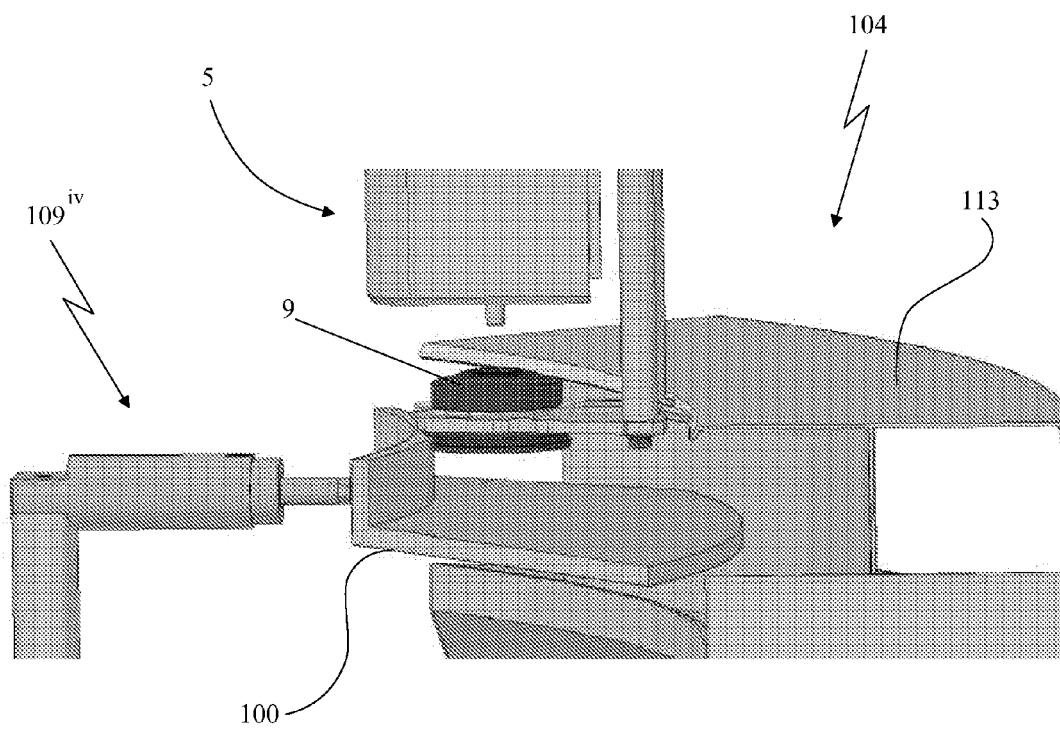


Fig. 10



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Application Number
EP 10 17 3119

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		18 November 2010	Wartenhorst, Frank
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