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(54) A FACILITY FOR FILLING PACKAGES IN A PRESSURE-SEALED CHAMBER AND THE METHOD OF FILLING

(57) The facility for filling packages in a pressure-sealed chamber consists of a static (1) and a rotating part (2). The following operating elements are attached to the static part: a multifunctional sterilizing needle (11), a filling head (10), a sealing head (9), a bottom valve, and a package carrier (4). The rotating part is connected to the shaft (13) that extends through the static part (1).

The method of filling packages in a pressure-sealed chamber, according to the invention, consists in the fact that the lower rotating part (2) is set in position No. 1 - sterilization, where the package (3) and the cap (20) are sterilized before being filled.

The rotating part (2) is set to position No. 2 - filling. In this step, the pressure in the storage tank of the filled product (17) is equalized with the pressure in the filling chamber (5), and the filling process begins.

The rotating part (2) is set to position No. 3 - sealing. The sealing head (9) seals the filled package (3) by moving downward; all the steps take place in a closed filling chamber.

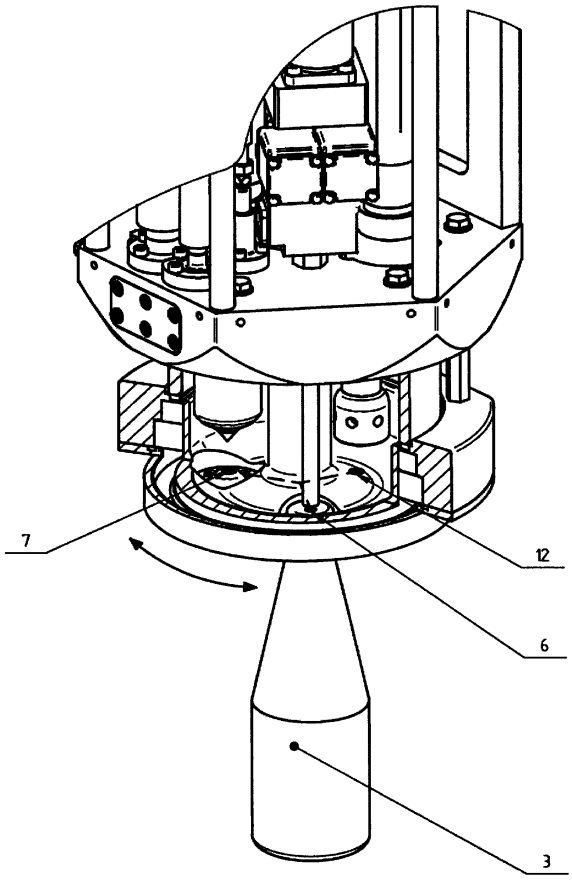

Fig. 3

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Description

Technical Field

[0001] The present invention relates to a facility designed for filling packages in a pressure-sealed chamber, and a method of filling. It relates to food processing, where the invention is used to fill the packages with beverages, but may also refer to the industrial use, as long as the invention would be used to fill packages with non-food fillings, for example, with medical drugs.

The Current State of the Art

[0002] Nowadays, several principles are used for filling of products, such as liquid substances, to packages, e.g. the gravity level filling, under- or overpressure filling, as well as volumetric filling, or filling on the principle of weighing. Currently, the filled package goes through various chambers in the processes from package preparation to its filling and sealing. During filling and sealing, there is air swirling, which can cause secondary contamination of the filled product. For example, when filling the carbonated beverages, the package, once filled, is located in the chamber, where it is pressurized, then it moves into the chamber with atmospheric pressure, and then it is sealed. However, this spatial movement negatively affects the quality of carbonation of the beverage and creates a potential risk of secondary contamination.

Principle of the Invention

[0003] The facility for filling packages in a pressure-sealed chamber, according to the invention, consists of two basic parts, i.e. the static part and the rotating part.

[0004] According to the invention, the operating elements are connected to the static part of the facility: a multifunctional sterilizing needle, a filling head, a sealing head, a bottom valve, and a package carrier. There are operating element drives, a storage tank of the filled product, and the media feed lines located above the static part of the facility.

[0005] The rotating part of the facility is connected to a shaft that passes through the static part. The shaft is terminated at the bottom by the package carrier and the rotating part carrier. In the rotating part, there is an opening with a seat for sealing the bottom valve, and an opening to insert the package.

[0006] According to the invention, a storage tank of the filled product, a peroxide evaporator, an air exchanger, and a sanitation pipe are connected by pipes to the facility, which can be attached to the support frame of the facility according to the invention.

[0007] According to the invention, the facility is connected to a sanitation circuit, through which the pipes, valves, and the entire filling chamber are purged after the production batch was completed.

[0008] According to the invention, the facility can also be designed without a rotating part, wherein the following operating elements are connected to the static part of the facility according to the invention: a multifunctional sterilizing needle, a filling head, a sealing head, a bottom valve and a package carrier. There are operating element drives, a storage tank of the filled product, and the media feed pipes located above the static part.

[0009] According to the invention, the facility is controlled by Programmable Logic Controller (PLC).

[0010] According to the invention, the facility can be attached to a supporting base frame, to which an input conveyor can be attached to supply empty packages to the facility. In addition, an output conveyor can be attached to the frame to remove filled packages from the facility, and a conveyor to feed the caps to the facility, according to the invention.

[0011] According to the invention, conveyors to feed/remove the packages and caps to/from the facility may be replaced by another suitable method or device.

[0012] The method of filling the package in a pressure-sealed chamber with both, the static and rotating parts, of the facility is based on the fact that a cap is conveyed to the sealing head, which is in the lower position, and the sealing head moves upward along with the cap.

[0013] An empty package is inserted into the package carrier, which is subsequently sealed with the bottom valve by being pressed against the seat of the rotating part. This seals the filling chamber and separates it from the external environment.

[0014] The rotating part is set to position No. 1 - sterilization. Sterilization by peroxide requires a peroxide concentration of min. 35%. The peroxide/air mixture is heated in the peroxide evaporator heating body to a minimum of 70 °C according to the selected/used packaging material.

[0015] By opening the peroxide-sterilizing valve and, subsequently, by opening the discharge valve, a mixture of peroxide and air is injected through the sterilizing-multifunction needle into the empty package, filling chamber, and onto a cap. Subsequently, the peroxide-sterilizing valve and the discharge valve are closed. Treatment with peroxide for the necessary time, depending on the packaging used, sterilizes the filling chamber, package, and the cap.

[0016] By opening the air-sterilizing valve to supply the hot sterile air, and by opening the discharge valve, the filling chamber, package, and the cap are purged through the multifunctional sterilizing needle by the pressure of the pre-prepared sterile hot air. Air pre-prepared in the air exchanger must be heated to a minimum of 100 °C according to the selected/used material of packaging. The pressure of the sterile hot air thus prepared must be at least 0.1 bar. The filling chamber and package can then be filled with inert gas, e.g. with N_2, from an inert gas tank, or with CO_2 gas.

[0017] The rotating part is set to position 2 - filling. In this step, the pressure in the product storage tank is first adjusted to the pressure in the filling chamber. The filling

process begins by opening the filling head. After the required volume controlled by the flow meter or other measuring device was filled, the filling head is closed.

[0018] The rotating part is set to position 3 - sealing. The sealing head seals the filled package by moving downwards, in some types of packages also by simultaneous rotation. When the filled package was closed, the sealing head returns to the top starting position. The filled and sealed package is removed from the package carrier.

[0019] Subsequently, the entire process is repeated from the insertion of the cap and package to the facility according to the invention, through subsequent sterilization, filling, sealing, to the removal of the filled package.

[0020] The method of filling the package in a pressure-sealed chamber on the facility with only the static part consists in the fact that the cap is conveyed to the sealing head, which is located at a lower position above the opening for inserting the package, followed by the sealing head moving upwards and turning to an intermediate position so as not to prevent another operating element from operating. An empty package is inserted into the package carrier; it is then sealed by being subsequently pressed against the seat of the static part. This will close the filling chamber and separate it from the outside environment.

[0021] Sterilization by peroxide requires a peroxide concentration of min. 35%. The peroxide/air mixture is heated in the peroxide evaporator heating body to a minimum of 70 °C according to the selected/used packaging material.

[0022] After closing the filling chamber, the sterilizing - multifunctional needle is set to a position above the empty package. By opening the peroxide-sterilizing valve and, subsequently, by opening the discharge valve, a mixture of peroxide and air is injected through the sterilizing-multifunction needle into the empty package, filling chamber, and onto a cap. Subsequently, the peroxide-sterilizing valve and the discharge valve are closed. Treatment with peroxide for the necessary time, depending on the packaging used, sterilizes the filling chamber, package, and the cap. By opening the air-sterilizing valve to supply the hot sterile air, and by opening the discharge valve, the filling chamber, package, and the cap are purged through the multifunctional sterilizing needle by the pressure of the pre-prepared sterile hot air. Air pre-prepared in the air exchanger must be heated to a minimum of 100 °C according to the selected/used material of packaging. The pressure of the sterile hot air thus prepared must be at least 0.1 bar.

[0023] The filling chamber and package can then be filled with inert gas, e.g. N_2, from an inert gas tank, or with CO_2 gas.

[0024] The multifunctional sterilizing needle is set to its initial position so that it does not hinder the next operating element from operating.

[0025] After the multifunctional sterilizing needle moves to a position, the pressure relief valve first opens, thus equalizing the pressure in the storage tank of the filled product with the pressure in the filling chamber. The filling process starts by opening the filling head. After the required volume as controlled by the flow meter or other measuring device was filled, the filling head is closed.

[0026] The operating element-the sealing head is set above the neck of the package. The sealing head seals the filled package by moving downwards, in some types of packages also by simultaneous rotation. After the filled package was sealed, the pressure relief valve is closed, and then a discharge valve is opened, through which the pressure in the filling chamber is adjusted to the ambient pressure. After the filling chamber was depressurized, the sealing head returns to the upper starting position. The filled and sealed product package is removed from the package carrier.

[0027] Subsequently, the entire process is repeated from insertion of the cap and package to the facility according to the invention, through subsequent sterilization, filling, sealing, to the removal of the filled package.

[0028] All these steps take place in a closed filling chamber, which is the main and most important benefit of this filling method over the prior state-of-the-art. The facility and method of filling according to the invention in a pressure-sealed chamber provides high purity to sterility of filling. In the above processes, the package is sealed before it leaves the filling chamber.

[0029] In case of carbonated beverages, this means that the package is sealed under pressure. The standard filling method requires releasing the filling overpressure to atmospheric pressure after the package was filled, causing foaming of the beverage and loss of carbonation gas in the product, e.g. CO_2. The filling process does not relieve pressure before sealing, which is an apparent advantage. The facility and the method of filling, according to the invention, allow for more efficient filling of carbonated beverages. The facility and the method of filling, according to the invention, do not exclude the possibility of omitting any of the steps, for example sterilization, air exchange for an inert gas, and the like.

[0030] The facility and the method of filling, according to the invention, are intended for filling conventional packages, such as e.g. PET packaging, HDPE packaging, glass packaging, aluminum packaging, doy-pack packaging, and cardboard packaging.

[0031] In a standard way of filling, secondary contamination from the surrounding area cannot be excluded. When using the facility and the filling method according to the invention in a pressure-sealed chamber, there is no secondary contamination of the beverage from the surroundings.

Description of Terms Used to Explain the Subject Matter of the Invention:

[0032] Packaging filling facility - A facility, in which the product filling process takes place Pressure-sealed chamber - A chamber, in which the required pressure can be maintained Product - Milk, beer, wine, lemonade,

baby food, juice, carbonated and non-carbonated drinks, medicines and similar liquid substances
Sterilization - A physical or chemical process, which destroys all microorganisms in a given environment, object or equipment
Carbonated drink - A drink enriched with carbon dioxide or other inert gas Sterilization-multifunctional needle - A duct leading to a filling chamber, through which a mixture of peroxide with air, sterile air, or an inert gas are injected into the filling chamber Filling head - The pipe termination to fill the product from the storage tank to the empty package
Sealing head - Used to firmly attach the cap to the package and close it Bottom valve - A valve to close the opening after the cap was inserted into the sealing head Package carrier - Used to move the package to and from the facility
Rotating part carrier - Used to move the rotating part
Storage tank of the filled product - The tank, through which the product passes, and which is designed to prevent contamination of the product from the environment and, at the same time, to maintain the required filling pressure

Overview of Images in the Figures

[0033]

Figure 1 shows a static part of the facility according to the invention.
Figure 2 shows a rotating part of the facility according to the invention.
Figure 3 shows three basic positions of the filling facility during the operating cycle.
Figure 4 shows a filling facility in the sterilization position.
Figure 5 shows a filling facility in the filling position.
Figure 6 shows a filling facility in the sealing position.
Figure 7 shows the principle of the filling facility as a whole, without the rotating part.
Figure 8 shows a filling facility without a rotating part in the sterilization position.
Figure 9 shows a filling facility without a rotating part in the filling position.
Figure 10 shows a filling facility without a rotating part in the sealing position.
Figure 11 shows the principle of a filling facility as a whole, without a rotating part and a bottom valve.
Figure 12 shows a filling facility without a rotating part and a bottom valve, in a sterilization position.
Figure 13 shows a filling facility without a rotating part and a bottom valve, in a filling position.
Figure 14 shows a filling facility without a rotating part and a bottom valve, in the sealing position.
Figure 15 shows whole filling facility. This figure is proposed to be published together with abstract.

Examples of Embodiment of the Invention

Example 1

[0034] The facility for filling packages in a pressure-sealed chamber shown in figures 1 to 6 consists of two basic parts, the static part 1 and the rotating part 2.

[0035] Operating elements are attached to the static part of the invention: a multifunctional sterilizing needle 11, a filling head 10, and a sealing head 9. There are operating element drives and media feed lines located above the static part of the facility 1.

[0036] The rotating part of the facility 2 is connected to the shaft 13 passing through the static part 1. The shaft 13 is terminated in the lower part by the package carrier 4 and the rotating part carrier 14. In the rotating part 2, there is an opening with a seat for sealing the bottom valve 15, and an opening for inserting packages 16.

[0037] A storage tank of the filled product 17, a peroxide evaporator 18, an air exchanger 19, and a sanitation pipe 26 that can be attached to the support frame of the facility according to the invention are connected to the filling head 10 via piping.

[0038] According to the invention, the facility is connected by the sanitation pipe 26 to the sanitation circuit, through which the pipes, valves, and the entire filling chamber 5 are purged after the production batch was completed.

[0039] The method of filling the package in a pressure-sealed chamber according to the invention consists of the fact that the cap 20 is conveyed to the sealing head 9, which is in the lower position, followed by the sealing head 9 with the cap 20 moving upwards.

[0040] An empty package 3 is inserted into the package carrier 4, which is then sealed by being subsequently pressed to the package-insertion opening 16 in parallel with the bottom valve 12. Thereby, the filling chamber 5 is sealed and separated from the external environment. Rotating part 2 is set to position No. 1 - sterilization 6. By opening the peroxide sterilizing valve 21, and then by opening the discharge valve 25, a mixture of peroxide and air is blown through the multifunctional sterilizing needle 11 into the empty package 3, filling chamber 5 and onto the cap 20. Subsequently, the peroxide-sterilizing valve 21 and the discharge valve 25 are closed. By treatment with peroxide, the filling chamber 5, the package 3 and the cap 20 are sterilized. By opening the air-sterilizing valve 22 for the supply of the hot sterile air, and by opening the discharge valve 25, the filling chamber 5, package 3, and the cap 20 are purged through the multifunctional sterilizing needle 11 by the pressure of the pre-prepared sterile hot air. The filling chamber 5 and the package 3 can then be filled with an inert gas through the inert gas valve 23, e.g. with N_2 from an inert gas tank 24, or with CO_2 gas. Rotating part 2 is set to position No. 2 - filling 7. In this step, the pressure in the storage tank of the filled product 17 is first adjusted to the pressure in the filling chamber 5. Opening of the filling head 10 starts

the filling process. After filling the required volume as controlled by a flow meter or other measuring facility, the filling head 10 is closed.

[0041] Rotating part 2 is set to position No. 3 - sealing 8. The sealing head 9 closes the filled package by moving downward; in some types of packages by simultaneous rotation. After closing the filled package 3, the pressure in the filling chamber 5 adjusts to the ambient pressure via the discharge valve 23. After the filling chamber 5 was depressurized, the sealing head 9 returns to the upper starting position. The filled and closed product package 3 is removed from the package carrier 4.

Example 2

[0042] The facility for filling packages in a pressure-sealed chamber shown in figures 7 to 10 consists of a static part 1, to which the following operating elements are connected: a multifunctional sterilizing needle 11, a filling head 10, a sealing head 9, a bottom valve 12, and a package carrier 4. There are operating element drives and the media feed lines located above the static part 1. The package 3 and the cap 20 are in this case at a stable position; above this position, the operating elements alternate, i.e. the multifunctional sterilizing needle 11, the filling head 10 and the sealing head 9.

[0043] The method of filling the package in a pressure-sealed chamber according to the invention consists in the fact that the cap 20 is conveyed to the sealing head 9, which is in the lower position, and subsequently the sealing head 9 moves with the cap 20 upwardly and turns into the intermediate position so as not to hinder another element from operating. An empty package 3 is inserted into the package carrier 4, and is then sealed by being subsequently pressed to the package-insertion opening 16 in parallel with the bottom valve 12. Thereby the filling chamber 5 is sealed and separated from the external environment.

[0044] After closing the filling chamber 5, the multifunctional sterilizing needle 11 is set to a position above the empty package 3. By opening the peroxide-sterilizing valve 21, and then by opening the discharge valve 25, a mixture of peroxide with air is blown from the peroxide evaporator 18 through the multifunctional sterilizing needle 11 to the empty package 3, the filling chamber 5 and the cap 20. Subsequently, the peroxide-sterilizing valve 21 and the discharge valve 25 are closed. By treatment with peroxide, the filling chamber 5, the package 3, and the cap 20 are sterilized. By opening the air- sterilizing valve 22 for the supply of the hot sterile air, and by opening the discharge valve 25, the filling chamber 5, the package 3, and the cap 20 are purged through the multifunctional sterilizing needle 11 by the pressure of the pre-prepared sterile hot air. The filling chamber 5 and the package 3 can then be filled with an inert gas through an inert gas valve 23, e.g. with N_2 from an inert gas tank 24, or with CO_2 gas. The multifunctional sterilizing needle 11 is set to the initial position so as not to hinder any other operating element from operating.

[0045] After the multifunctional sterilizing needle 11 moved to its position, the pressure relief valve 27 is first opened, thereby equalizing the pressure in the storage tank of the filled product 17 with the pressure in the filling chamber 5. The opening of the filling head starts the product filling process. After the desired volume as controlled by the flow meter or other measuring device was filled, the filling head 10 is closed.

[0046] The operating element, i.e. the sealing head 9 is set above the neck of the package. The sealing head 9 seals the filled package by moving downwards; in some types of packages by simultaneous rotation. After closing the filled package 3, the pressure relief valve 27 is closed, and then the discharge valve 25 is opened, through which the pressure in the filling chamber 5 is adjusted to the ambient pressure. After the filling chamber 5 was depressurized, the sealing head 9 returns back to the upper starting position, and the bottom valve 12 opens. The filled and closed product package 3 is removed from the package carrier 4.

Example 3

[0047] The facility for filling packages in a pressure-sealed chamber shown in figures 11 to 14 consists of a static part 1, to which the following operating elements are attached: a sterilizing-multifunction needle 11, a filling head 10, and a sealing head 9. There is a package carrier 4 and a cap carrier 28 located below the static part 1. There are the operating element drives and media supply lines located above the static part 1. In this case, the package 3 is in a stable position during the sterilization, filling and sealing processes, and the operating elements alternate above this position, i.e. the multifunctional sterilizing needle 11, the filling head 10, and the sealing head 9.

[0048] The method of filling the package in a pressure-sealed chamber, according to the invention, consists in the fact that the cap 20 is conveyed by the cap carrier 28 to the sealing head 9, which is located at a lower position above the package-insertion opening 16, followed by the sealing head 9 with the cap 20 moving upwards and turning into an intermediate position so that not to hinder another operating element from operating. An empty package 3 is inserted into the package carrier 4, which is subsequently sealed by being pressed against the package insertion opening 16 in the static part. Thereby the filling chamber 5 is sealed and separated from the external environment.

[0049] After the filling chamber 5 was closed, the multifunctional sterilizing needle 11 is set to a position above the empty package 3. By opening the peroxide-sterilizing valve 21, and then by opening the discharge valve 25, a mixture of peroxide with air is blown from the peroxide evaporator 18 through the multifunctional sterilizing needle 11 to the empty package 3, filling chamber 5, and onto the cap 20. Then, the peroxide-sterilizing valve 21

and the discharge valve 25 are closed. By treatment with peroxide, the filling chamber 5, the package 3, and the cap 20 are sterilized. By opening the air-sterilizing valve 22 for the supply of the hot sterile air, and by opening the discharge valve 25, the filling chamber 5, the package 3, and the cap 20 are purged through the multifunctional sterilizing needle 11 by the pressure of the pre-prepared sterile hot air. The filling chamber 5 and the package 3 can then be filled with an inert gas through an inert gas valve 23, e.g. with N_2 from an inert gas tank 24, or with CO_2 gas. The multifunctional sterilizing needle 11 is set to the initial position so as not to hinder any other operating element from operating.

[0050] After the multifunctional sterilizing needle 11 was moved to its position, the pressure relief valve 27 first opens, thereby equalizing the pressure in the storage tank of the filled product 17 with the pressure in the filling chamber 5. The opening of the filling head starts the product filling process. After the desired volume of the product as controlled by the flow meter or other measuring facility was filled, the filling head 10 is closed.

[0051] The operating element, i.e. the sealing head 9 is set above the neck of the package. The sealing head 9 closes the filled package by moving downwards; in some types of packages by simultaneous rotation. After closing the filled package 3, the pressure relief valve 27 is closed, and then the discharge valve 25 is opened, through which the pressure in the filling chamber 5 is adjusted to the ambient pressure. After the filling chamber 5 was depressurized, the sealing head 9 returns to the upper starting position. The filled and closed product package 3 is removed from the package carrier 4.

List of relationship tags

[0052] Legend to the attached drawings - pictures No. 1-15:

1 Static part
2 Rotating part
3 Package
4 Package carrier
5 Filling chamber
6 Position No. 1 - sterilization
7 Position No. 2 - filling
8 Position No. 3 - sealing
9 Sealing head
10 Filling head
11 Multifunctional sterilizing needle
12 Bottom valve
13 Shaft
14 Carrier of the bottom rotating part
15 Opening with a seat to seal the bottom valve
16 Package-insertion opening
17 Storage tank of the filled product
18 Peroxide Evaporator
19 Air Exchanger
20 Cap
21 Peroxide sterilizing valve
22 Air-sterilizing valve
23 Inert gas valve
24 Inert gas tank
25 Discharge valve
26 Sanitation pipe
27 Pressure relief valve
28 Cap carrier

Industrial Usability

[0053] The facility and the method of filling in a pressure-sealed chamber, according to the invention, can be applied particularly in the food and pharmaceutical industries.

Claims

1. Facility for filling packages in a pressure-sealed chamber is **characterized by the fact that** it consists of two basic parts, i.e. the static part (1) and the rotating part (2), to which the operating elements, such as the multifunctional sterilizing needle (11), a filling head (10), a sealing head (9), a bottom valve (12) and a package carrier (4), are connected, wherein the drives of the operating elements and the media feed lines are positioned above the static part of the facility (1), and the rotating part (2)) is connected to a shaft (13) that extends through the static part (1), which is terminated in the lower part by the package carrier (4) and the carrier of the rotating part (14); an opening with a seat for sealing the bottom valve (15), and a package insertion opening (16) are located in the rotating part (2); furthermore, a storage tank of the filled product (17) is connected to the filling head (10) by a pipe; a peroxide evaporator (18), air exchanger (19) and a sanitation line (26) are connected to the static part, through which the facility is connected to a sanitation circuit according to the invention.

2. Facility for filling packages in a pressure-sealed compartment is **characterized by the fact that** it consists of a static part (1), to which the following operating elements are connected: a multifunctional sterilizing needle (11), a filling head (10), a sealing head (9), the bottom valve (12) and the package carrier (4), where the drives of the operating elements and the media feed lines are located above the static part of the facility (1), and the package (3) is, in this case, in a stable position, above which the operating elements alternate, such as the multifunctional sterilizing needle (11), filling head (10) and sealing head (9); there is an opening with a seat in the static part (1) for sealing the bottom valve (15), and an opening to insert the packages (16); furthermore, a storage tank of the filled product (17) is connected to the

filling head (10) by piping; the following are connected to the static part by piping: the peroxide evaporator (18), air exchanger (19) and sanitation pipe (26), by which the facility is connected to a sanitation circuit according to the invention.

3. Facility for filling packages in a pressure-sealed compartment is **characterized by the fact that** it consists of a static part (1), to which the following operating elements are connected: a multifunctional sterilizing needle (11), a filling head (10), a sealing head (9) and the package carrier (4), where the drives of the operating elements and the media feed lines are placed above the static part of the facility (1); the package (3) is, in this case, in a stable position, above which the operating elements alternate, i.e. the multifunctional sterilizing needle (11), a filling head (10) and a sealing head (9); in the static part (1), there is an opening for inserting the package (16); furthermore, a storage tank of the filled product (17) is connected to the filling head (10) by piping; the following are connected to the static part by piping: a peroxide evaporator (18), an air exchanger (19) and a sanitation pipe (26), through which the facility is connected to a sanitary circuit according to the invention.

4. According to claim 1, the facility for filling packages in a pressure-sealed chamber is **characterized by the fact that** the operating elements, i.e. a sterilizing multifunctional needle (11), a filling head (10), and a sealing head (9) are multiplied, whereby multiple packages (3) can be sterilized, filled, and sealed in one filling chamber (5) at once.

5. According to claim 2, the facility for filling packages in a pressure-sealed chamber is **characterized by the fact that** the operating elements, i.e. a multifunctional sterilizing needle (11), a filling head (10), and a sealing head (9) are multiplied, whereby multiple packages (3) can be sterilized, filled, and sealed in one filling chamber (5) at once.

6. According to claim 3, the facility for filling packages in a pressure-sealed chamber is **characterized by the fact that** the operating elements, i.e. a multifunctional sterilizing needle (11), a filling head (10), and a sealing head (9) are multiplied, whereby multiple packages (3) can be sterilized, filled, and sealed in one filling chamber (5) at once.

7. The method for filling packages in a pressure-sealed chamber by means of the facility according to claim 1 is **characterized by the fact that** the cap (20) is conveyed to a sealing head (9), which is located in the lower position and, subsequently, the sealing head (9) makes with the cap (20) an upward movement, where it inserts into the package carrier (4) an empty package (3), which is then sealed by being subsequently pressed against the package-insertion opening (16) along with the bottom valve (12), which closes the filling chamber (5) and separates it from the external environment; then, the rotating part (2) is set to position No. 1 - sterilization where, by opening a peroxide sterilizing valve (21), and then by opening the discharge valve (25), a mixture of peroxide and air is blown through the multifunctional sterilizing needle (11) into the empty package (3), the filling chamber (5) and the cap (20), after which the peroxide-sterilizing valve (21) and the discharge valve (25) are closed and the filling chamber (5), the package (3) and the cap (20) are sterilized by the peroxide treatment; then, by opening the air-sterilizing valve (22) for the supply of the hot sterile air, and by opening the discharge valve (25), the filling chamber (5), the package (3) and the cap (20) are purged through the multifunctional sterilizing needle (11) by the pressure of the pre-prepared sterile hot air, and then the filling chamber (5) and the package (3) can be filled with the inert gas, i.e. with N_2 from the inert gas tank (24), or possibly with gaseous CO_2, while the lower portion (2) is set to position No. 2 - filling; then, the pressure in the storage tank (17) of the product is adjusted to the pressure in the filling chamber (5) and, by opening the filling head (10), the filling process starts; after the required volume as controlled by the flow meter or other measuring facility was filled, the filling head (10) closes and the rotating part (2) is set to position No. 3 - sealing, where the sealing head (9) seals the filled package by moving downwards, in some types of packages by simultaneous rotation and, after the filled package (3) was sealed, the pressure in the filling chamber (5) is adjusted through the discharge valve (25) to the ambient pressure and, after the filling chamber (5) was depressurized, the sealing head (9) returns back to the upper starting position and the filled and closed product package (3) is removed from the package carrier (4).

8. The method for filling packages in a pressure-sealed chamber by means of the facility according to claim 2 is **characterized by the fact that** the cap (20) is conveyed to a sealing head (9), which is located in the lower position and, subsequently, the sealing head (9) makes with the cap (20) an upward movement, where it inserts an empty package (3) into the package carrier (4), which is then sealed by being subsequently pressed against the package-insertion opening (16) of the static part (1) along with the bottom valve (12), which closes the filling chamber (5) and separates it from the external environment; after the filling chamber (5) was closed, the multifunctional sterilizing needle (11) is set to a position above the empty package (3); the discharge valve (25) opens and by subsequent opening of the peroxide-sterilizing (21), and then by opening the discharge valve

(25), a mixture of peroxide and air is blown through the multifunctional sterilizing needle (11) into the empty package (3) filling chamber (5) and onto the cap (20); then, the peroxide-sterilizing valve (21) and the discharge valve (25) are closed and the filling chamber (5), the package (3) and the cap (20) are sterilized by the action of peroxide for the necessary time; then, by opening the air-sterilizing valve (22) for the supply of the hot sterile air, and by opening the discharge valve (25), the filling chamber (5), package (3) and cap (20) can be purged through the multifunctional sterilizing needle (11) by the pressure of the pre-prepared sterile hot air; then, the filling chamber (5) and the package (3) can be filled with an inert gas, e.g. with N_2 from the inert gas tank (24), or with CO_2 gas; the multifunctional sterilizing needle (11) is set to the initial position so as not to hinder the next operating element from operating; then, the pressure relief valve (27) is opened to adjust the pressure in the storage tank of the filled product (17) to the pressure in the filling chamber (5); subsequent opening of the filling head (10) starts the filling process; after the desired volume as controlled by the flow meter or other measuring facility was filled, the filling head (10) is closed and the operating element, i.e. the sealing head (9) is set above the neck of the package, and the sealing head (9) seals the filled package (3) by moving downwards, in some types of packages by simultaneous rotation; then, after the filled package (3) was sealed, the pressure relief valve (27) is closed, and the discharge valve (25) is opened, through which the pressure in the filling chamber (5) is adjusted to the ambient pressure, whereby the sealing head (9) returns back to the upper starting position, the bottom valve (12) is opened and the filled and sealed product package (3) is removed from the package carrier (4).

9. The method for filling packages in a pressure-sealed chamber by means of the facility according to claim 3 is **characterized by the fact that** the cap (20) is conveyed to the sealing head (9), which is located in the lower position and; then, the sealing head (9) with the cap (20) moves upwardly and turns into an intermediate position so as not to hinder any other operating element from operating; an empty package (3) is clamped to the package carrier (4), and is sealed by being pressed against the package-insertion opening (16) of the static part (1), which closes the filling chamber (5) and separates it from the external environment; after the filling chamber (5) was closed, the multifunctional sterilizing needle (11) is set to a position above the empty package (3), the discharge valve opens (25) and then, by opening the peroxide-sterilizing valve (21), and by subsequent opening of the discharge valve (25), a mixture of peroxide with air is blown through the multifunctional sterilizing needle (11) into an empty package (3), the filling chamber (5) and onto the cap (20); then, the peroxide-sterilizing valve (21) and the discharge valve (25) are closed and, the filling chamber (5), the package (3) and the cap (20) are sterilized by the operation of peroxide for a necessary time; then, by opening the air-sterilizing valve (22) for the supply of the hot sterile air, and by opening the discharge valve (25), the filling chamber (5), the package (3) and the cap (20) are blown out through the multifunctional sterilizing needle (11) by the pressure of the pre-prepared sterile hot air; then, the filling chamber (5) and the package (3) can be filled with an inert gas, e.g. with N_2 from the inert gas tank (24), or with CO_2 gas; the multifunctional sterilizing needle (11) is set to the initial position so as not to hinder the next operating element from operating; then the pressure relief valve (27) is opened to adjust the pressure in the storage tank of the filled product (17) to the pressure in the filling chamber (5); subsequent opening of the filling head (10) starts the filling process and, after the desired volume as controlled by the flow meter or other measuring facility was filled, the filling head (10) is closed and the operating element, i.e. the sealing head (9) is set above the neck of the package, and the sealing head (9) seals the filled package (3) by moving downwards, or in some types of packages by simultaneous rotation; then, after the filled package (3) was sealed, the pressure relief valve (27) is closed, and then a discharge valve (25) is opened, through which the pressure in the filling chamber (5) is adjusted to the ambient pressure, whereby the sealing head (9) returns back to its upper starting position and the filled and closed product package (3) is removed from the package carrier (4).

Amended claims in accordance with Rule 137(2) EPC.

1. Facility for filling packages in a pressure-sealed chamber consisting of two basic parts, i.e. the static part (1) and the rotating part (2), to which the operating elements, such as the multifunctional sterilizing needle (11), a filling head (10), a sealing head (9), a bottom valve (12) and a package carrier (4), are connected, wherein the drives of the operating elements and the media feed lines are positioned above the static part of the facility (1), and the rotating part (2)) is connected to a shaft (13) that extends through the static part (1), which is terminated in the lower part by the package carrier (4) and the carrier of the rotating part (14); an opening with a seat for sealing the bottom valve (15), and a package insertion opening (16) are located in the rotating part (2); furthermore, a storage tank of the filled product (17) is connected to the filling head (10) by a pipe; a peroxide evaporator (18), air exchanger (19) and a sanitation

line (26) are connected to the static part, through which the facility is connected to a sanitation circuit **characterized by the fact that** the operating elements, i.e. a sterilizing multifunctional needle (11), a filling head (10), and a sealing head (9) are multiplied, whereby multiple packages (3) can be sterilized, filled, and sealed in one filling chamber (5) at once.

2. Facility for filling packages in a pressure-sealed chamber consisting only of a static part (1), to which the following operating elements are connected: a multifunctional sterilizing needle (11), a filling head (10), a sealing head (9), the bottom valve (12) and the package carrier (4), where the drives of the operating elements and the media feed lines are located above the static part of the facility (1), and the package (3) is, in this case, in a stable position, above which the operating elements alternate, such as the multifunctional sterilizing needle (11), filling head (10) and sealing head (9); there is an opening with a seat in the static part (1) for sealing the bottom valve (15), and an opening to insert the packages (16); furthermore, a storage tank of the filled product (17) is connected to the filling head (10) by piping; the following are connected to the static part by piping: the peroxide evaporator (18), air exchanger (19) and sanitation pipe (26), by which the facility is connected to a sanitation circuit according to the invention **characterized by the fact that** the operating elements, i.e. a sterilizing multifunctional needle (11), a filling head (10), and a sealing head (9) are multiplied, whereby multiple packages (3) can be sterilized, filled, and sealed in one filling chamber (5) at once.

3. Facility for filling packages in a pressure-sealed chamber as described under Claim 2 **characterized by the fact that** it is constructed without the bottom valve (12).

4. The method for filling packages in a pressure-sealed chamber by means of the facility according to claim 1 by which the cap (20) is conveyed to a sealing head (9), which is located in the lower position and, subsequently, the sealing head (9) makes with the cap (20) an upward movement, where it inserts into the package carrier (4) an empty package (3), which is then sealed by being subsequently pressed against the package-insertion opening (16) along with the bottom valve (12), which closes the filling chamber (5) and separates it from the external environment; then, the rotating part (2) is set to position No. 1 - sterilization where, by opening a peroxide sterilizing valve (21), and then by opening the discharge valve (25), a mixture of peroxide and air is blown through the multifunctional sterilizing needle (11) into the empty package (3), the filling chamber (5) and the cap (20), after which the peroxide-sterilizing valve (21) and the discharge valve (25) are closed and the filling chamber (5), the package (3) and the cap (20) are sterilized by the peroxide treatment; then, by opening the air-sterilizing valve (22) for the supply of the hot sterile air, and by opening the discharge valve (25), the filling chamber (5), the package (3) and the cap (20) are purged through the multifunctional sterilizing needle (11) by the pressure of the pre-prepared sterile hot air, and then the filling chamber (5) and the package (3) can be filled with the inert gas, e.g. with N_2 from the inert gas tank (24), or possibly with gaseous CO_2, while the lower portion (2) is set to position No. 2 - filling; then, the pressure in the storage tank (17) of the product is adjusted to the pressure in the filling chamber (5) and, by opening the filling head (10), the filling process starts; after the required volume as controlled by the flow meter or other measuring facility was filled, the filling head (10) closes and the rotating part (2) is set to position No. 3 - sealing, where the sealing head (9) seals the filled package by moving downwards, in some types of packages by simultaneous rotation and, after the filled package (3) was sealed, the pressure in the filling chamber (5) is adjusted through the discharge valve (25) to the ambient pressure and, after the filling chamber (5) was depressurized, the sealing head (9) returns back to the upper starting position and the filled and closed product package (3) is removed from the package carrier (4) **characterized by** the fact **that** multiple packages (3) are sterilized, filled, and sealed in one filling chamber (5) at once.

5. The method for filling packages in a pressure-sealed chamber by means of the facility according to claim 2 by which the cap (20) is conveyed to a sealing head (9), which is located in the lower position and, subsequently, the sealing head (9) makes with the cap (20) an upward movement, where it inserts an empty package (3) into the package carrier (4), which is then sealed by being subsequently pressed against the package-insertion opening (16) of the static part (1) along with the bottom valve (12), which closes the filling chamber (5) and separates it from the external environment; after the filling chamber (5) was closed, the multifunctional sterilizing needle (11) is set to a position above the empty package (3); the discharge valve (25) opens and by subsequent opening of the peroxide-sterilizing (21), and then by opening the discharge valve (25), a mixture of peroxide and air is blown through the multifunctional sterilizing needle (11) into the empty package (3) filling chamber (5) and onto the cap (20); then, the peroxide-sterilizing valve (21) and the discharge valve (25) are closed and the filling chamber (5), the package (3) and the cap (20) are sterilized by the action of peroxide for the necessary time; then, by opening the air-sterilizing valve (22) for the supply

of the hot sterile air, and by opening the discharge valve (25), the filling chamber (5), package (3) and cap (20) can be purged through the multifunctional sterilizing needle (11) by the pressure of the pre-prepared sterile hot air; then, the filling chamber (5) and the package (3) can be filled with an inert gas, e.g. with N_2 from the inert gas tank (24), or with CO_2 gas; the multifunctional sterilizing needle (11) is set to the initial position so as not to hinder the next operating element from operating; then, the pressure relief valve (27) is opened to adjust the pressure in the storage tank of the filled product (17) to the pressure in the filling chamber (5); subsequent opening of the filling head (10) starts the filling process; after the desired volume as controlled by the flow meter or other measuring facility was filled, the filling head (10) is closed and the operating element, i.e. the sealing head (9) is set above the neck of the package, and the sealing head (9) seals the filled package (3) by moving downwards, in some types of packages by simultaneous rotation; then, after the filled package (3) was sealed, the pressure relief valve (27) is closed, and the discharge valve (25) is opened, through which the pressure in the filling chamber (5) is adjusted to the ambient pressure, whereby the sealing head (9) returns back to the upper starting position, the bottom valve (12) is opened and the filled and sealed product package (3) is removed from the package carrier (4) **characterized by the fact that** multiple packages (3) are sterilized, filled, and sealed in one filling chamber (5) at once.

6. The method for filling packages in a pressure-sealed chamber by means of the facility according to claim 3 by which the cap (20) is conveyed to the sealing head (9), which is located in the lower position and; then, the sealing head (9) with the cap (20) moves upwardly and turns into an intermediate position so as not to hinder any other operating element from operating; an empty package (3) is clamped to the package carrier (4), and is sealed by being pressed against the package-insertion opening (16) of the static part (1), which closes the filling chamber (5) and separates it from the external environment; after the filling chamber (5) was closed, the multifunctional sterilizing needle (11) is set to a position above the empty package (3), the discharge valve opens (25) and then, by opening the peroxide-sterilizing valve (21), and by subsequent opening of the discharge valve (25), a mixture of peroxide with air is blown through the multifunctional sterilizing needle (11) into an empty package (3), the filling chamber (5) and onto the cap (20); then, the peroxide-sterilizing valve (21) and the discharge valve (25) are closed and, the filling chamber (5), the package (3) and the cap (20) are sterilized by the operation of peroxide for a necessary time; then, by opening the air-sterilizing valve (22) for the supply of the hot sterile air, and by opening the discharge valve (25), the filling chamber (5), the package (3) and the cap (20) are blown out through the multifunctional sterilizing needle (11) by the pressure of the pre-prepared sterile hot air; then, the filling chamber (5) and the package (3) can be filled with an inert gas, e.g. with N_2 from the inert gas tank (24), or with CO_2 gas; the multifunctional sterilizing needle (11) is set to the initial position so as not to hinder the next operating element from operating; then the pressure relief valve (27) is opened to adjust the pressure in the storage tank of the filled product (17) to the pressure in the filling chamber (5); subsequent opening of the filling head (10) starts the filling process and, after the desired volume as controlled by the flow meter or other measuring facility was filled, the filling head (10) is closed and the operating element, i.e. the sealing head (9) is set above the neck of the package, and the sealing head (9) seals the filled package (3) by moving downwards, or in some types of packages by simultaneous rotation; then, after the filled package (3) was sealed, the pressure relief valve (27) is closed, and then a discharge valve (25) is opened, through which the pressure in the filling chamber (5) is adjusted to the ambient pressure, whereby the sealing head (9) returns back to its upper starting position and the filled and closed product package (3) is removed from the package carrier (4) **characterized by the fact that** multiple packages (3) are sterilized, filled, and sealed in one filling chamber (5) at once.

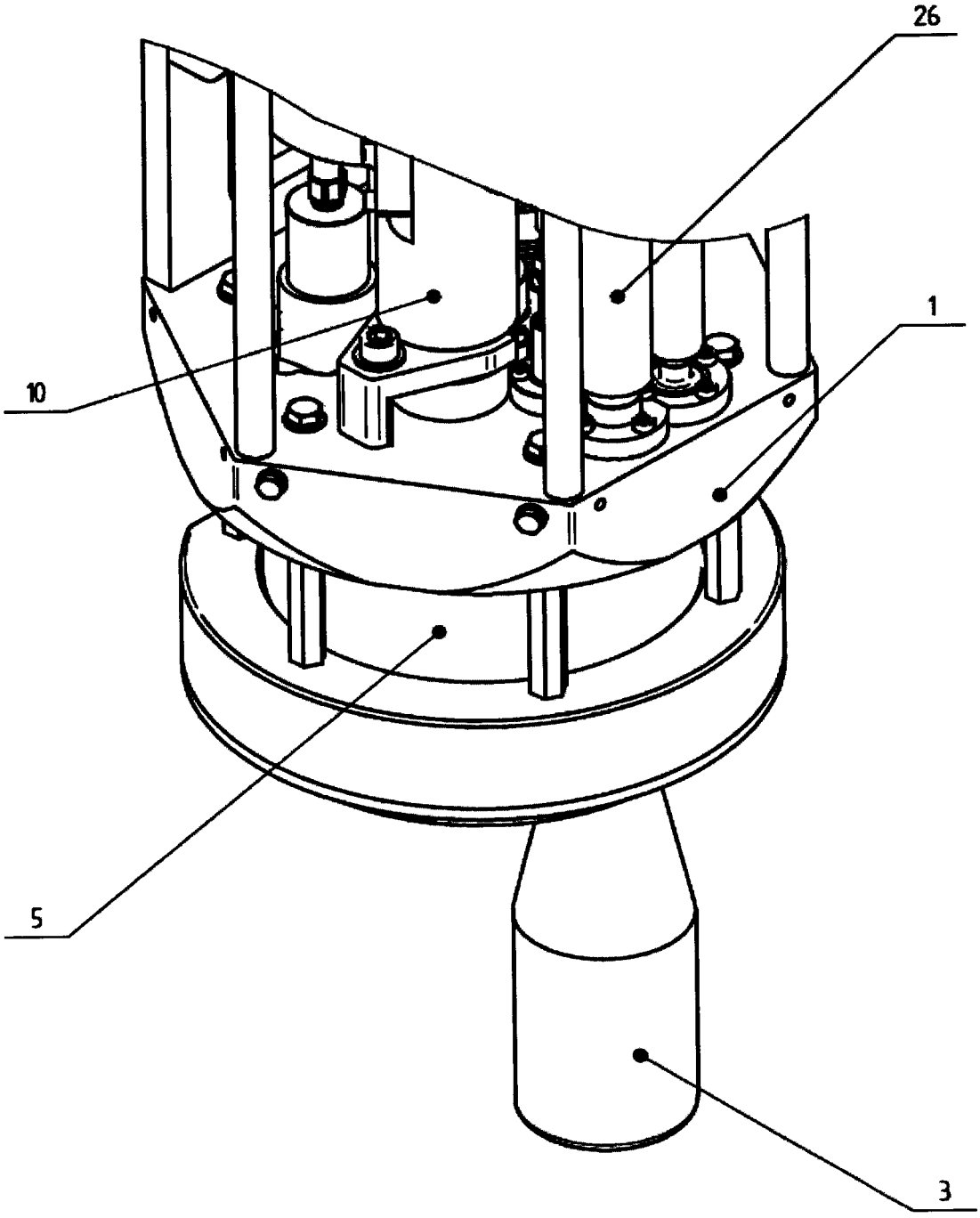

Fig. 1

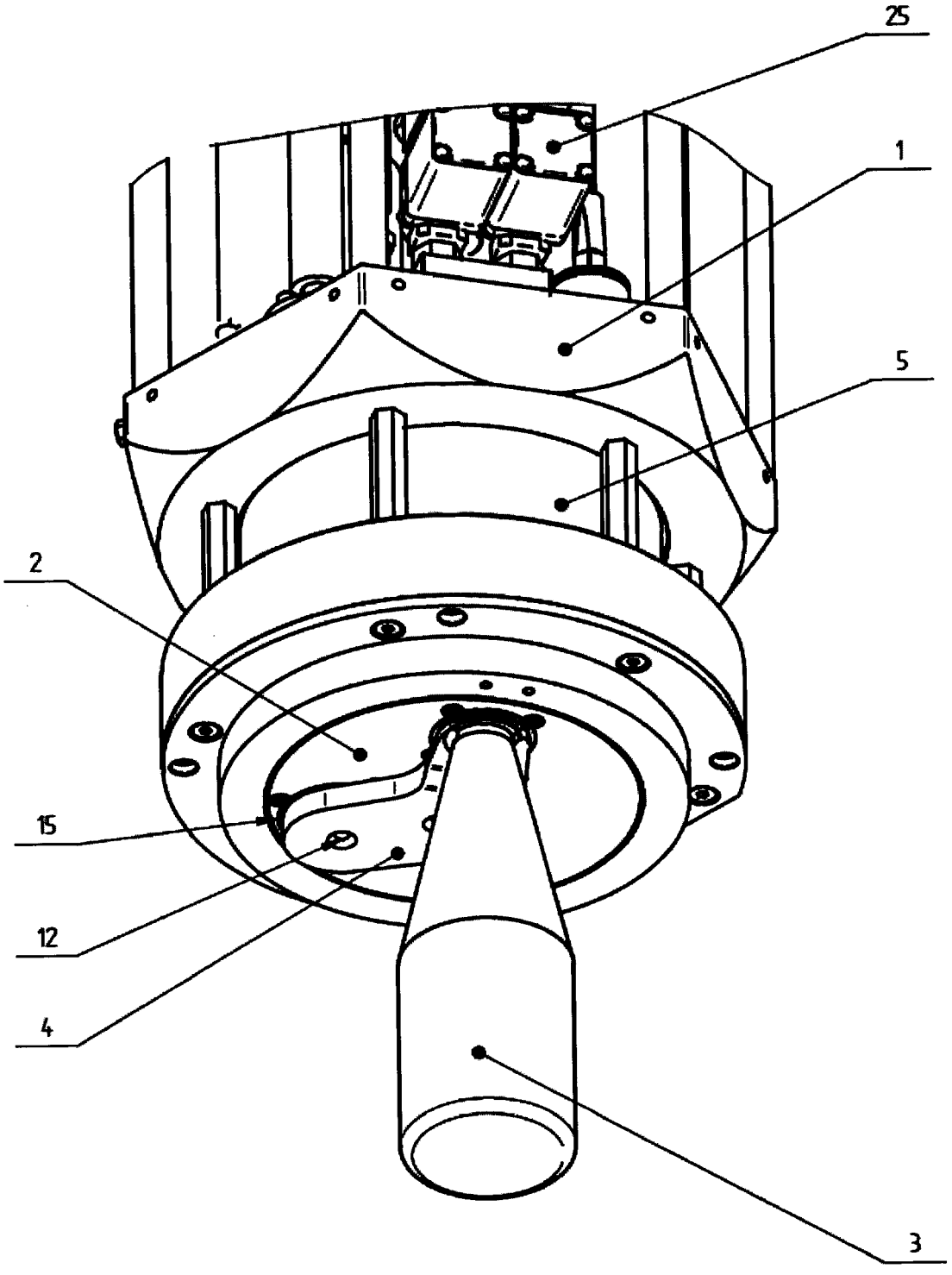

Fig. 2

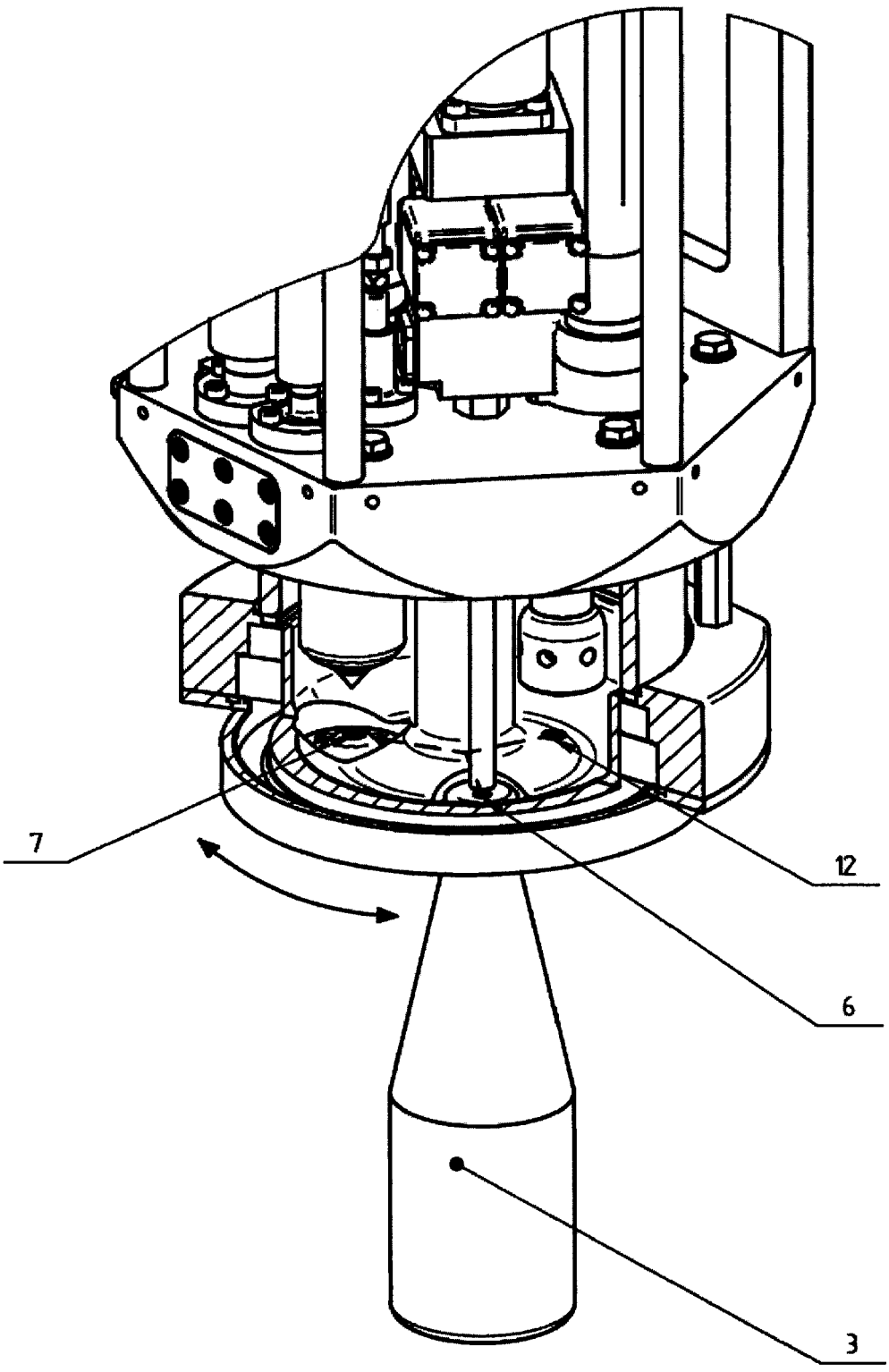

Fig. 3

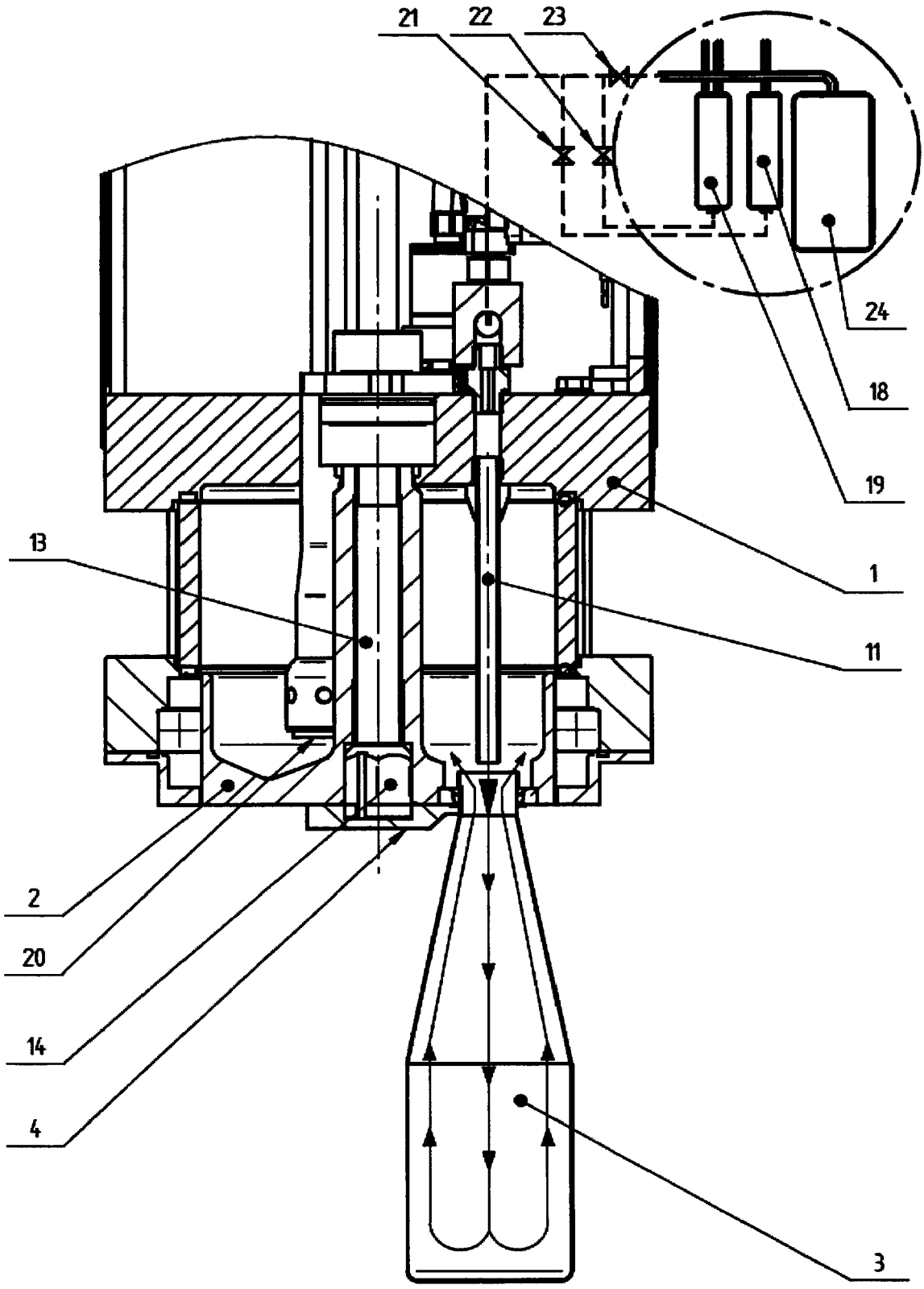

Fig. 4

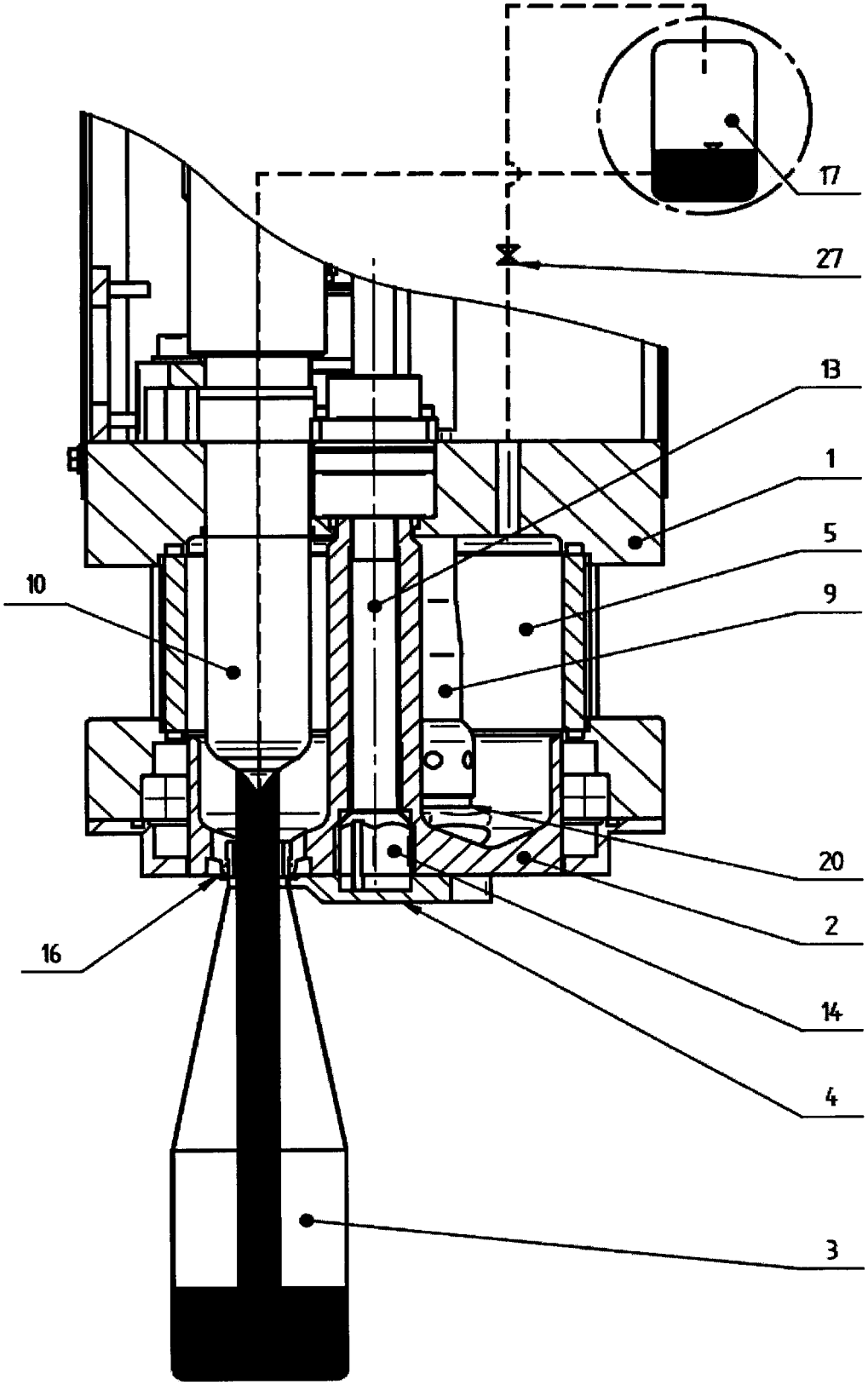

Fig. 5

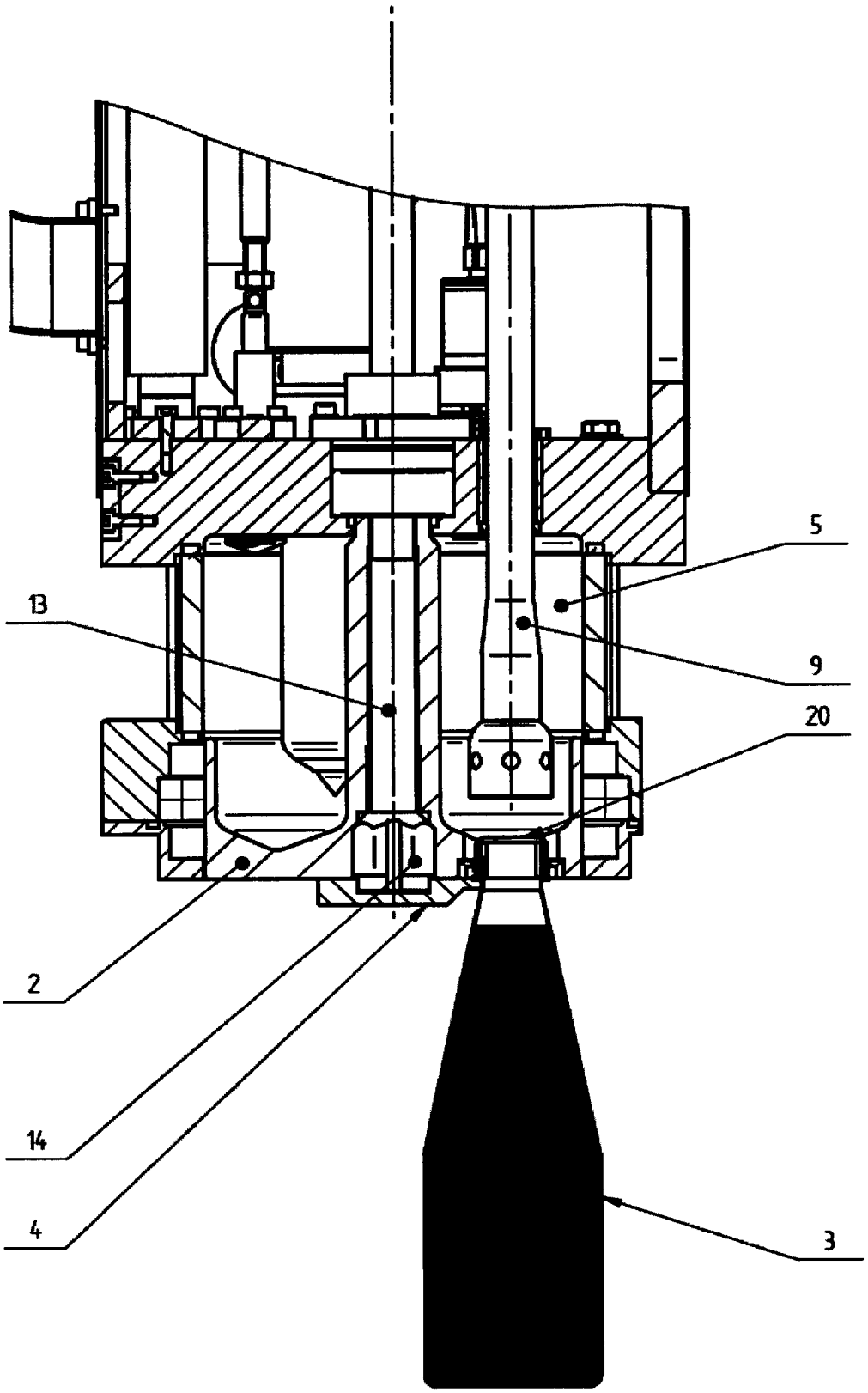

Fig. 6

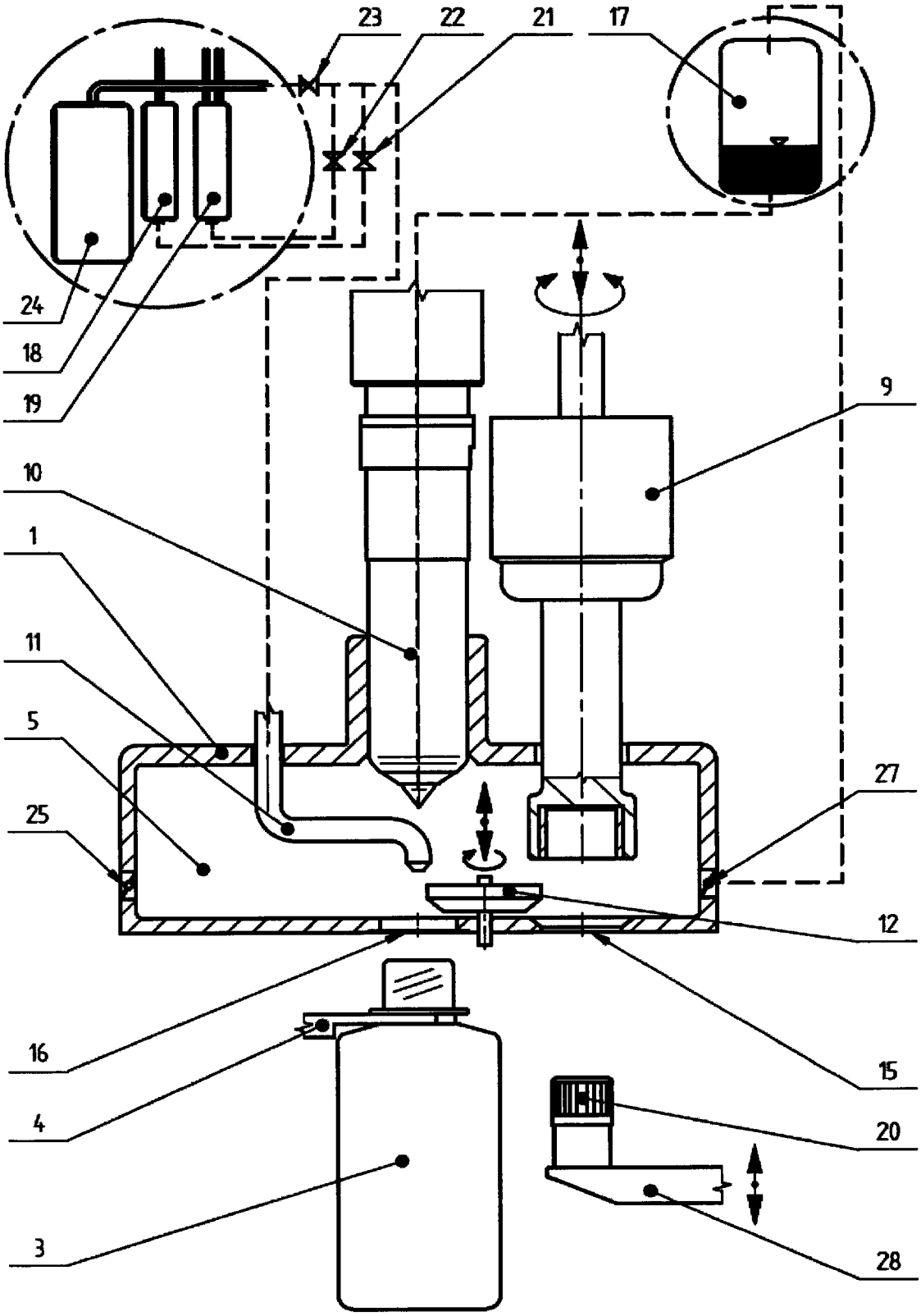

Fig. 7

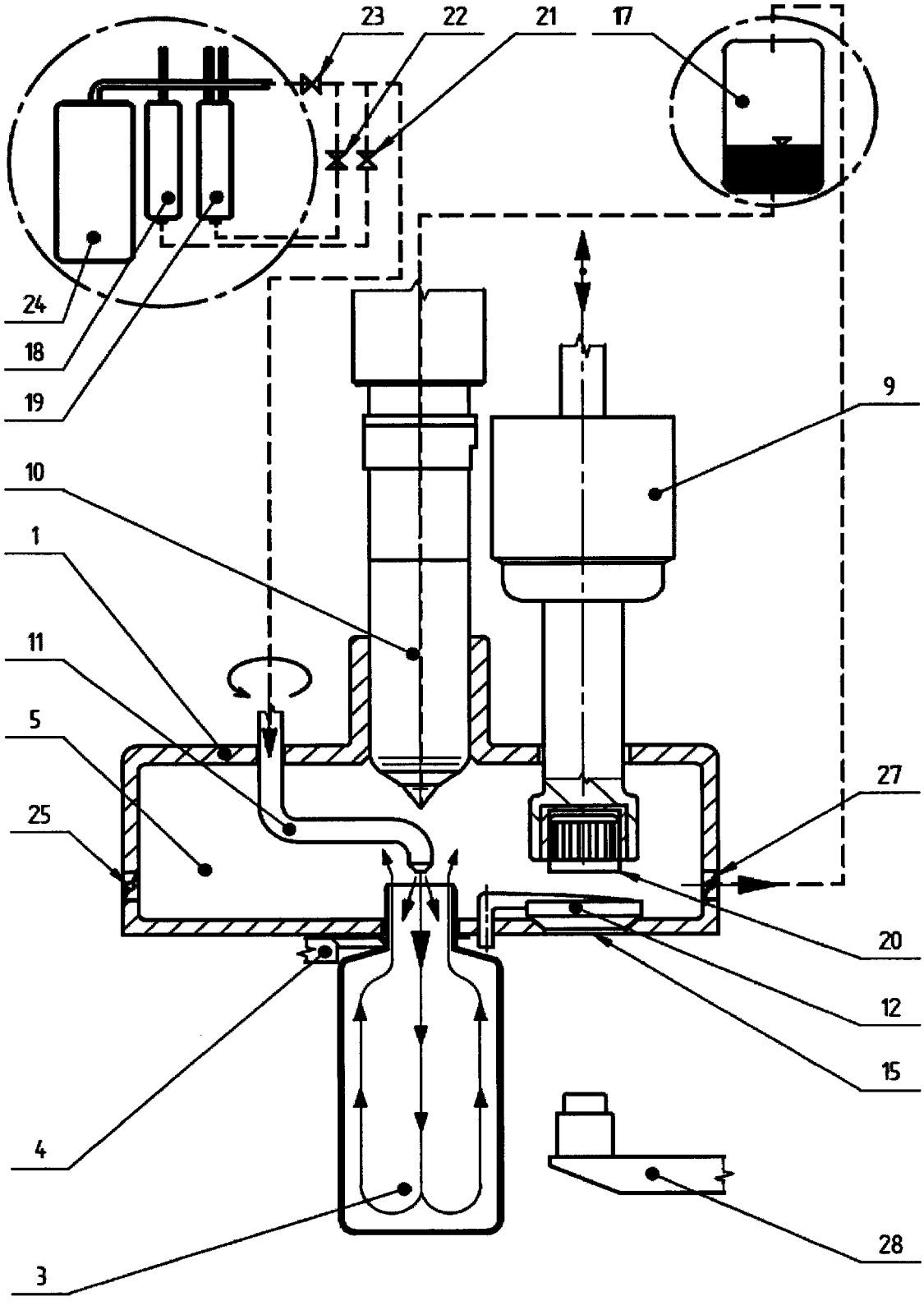

Fig. 8

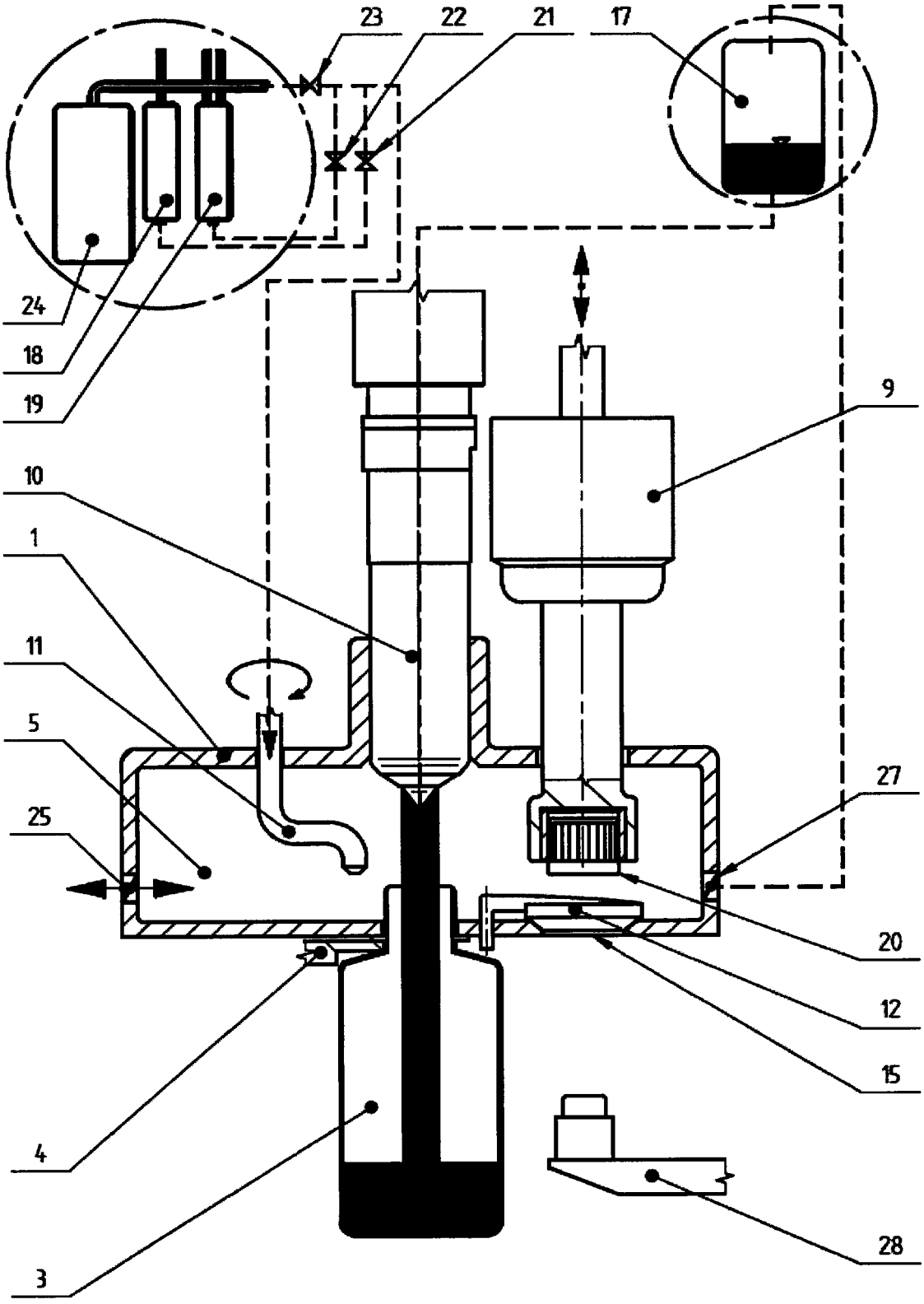

Fig. 9

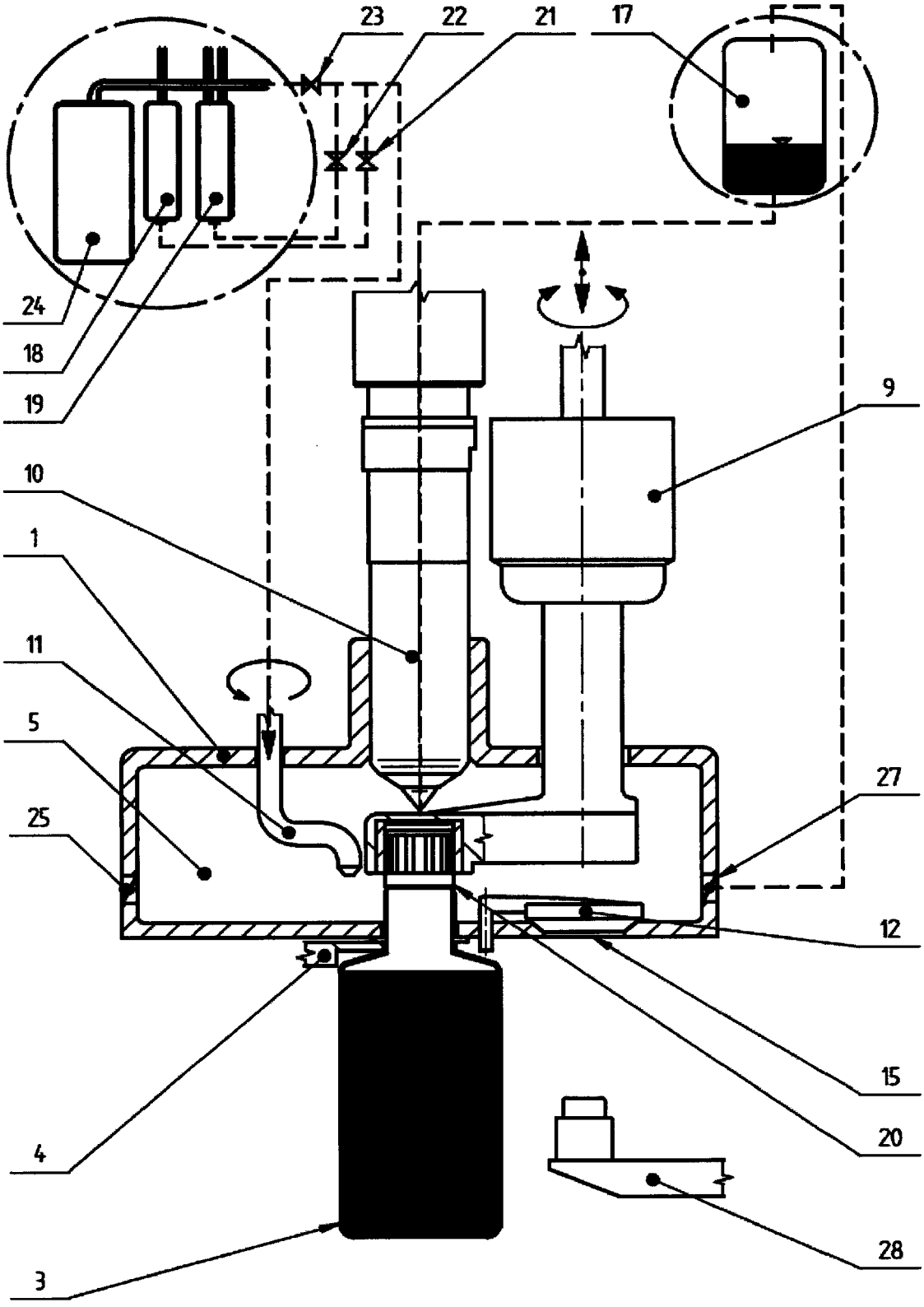

Fig. 10

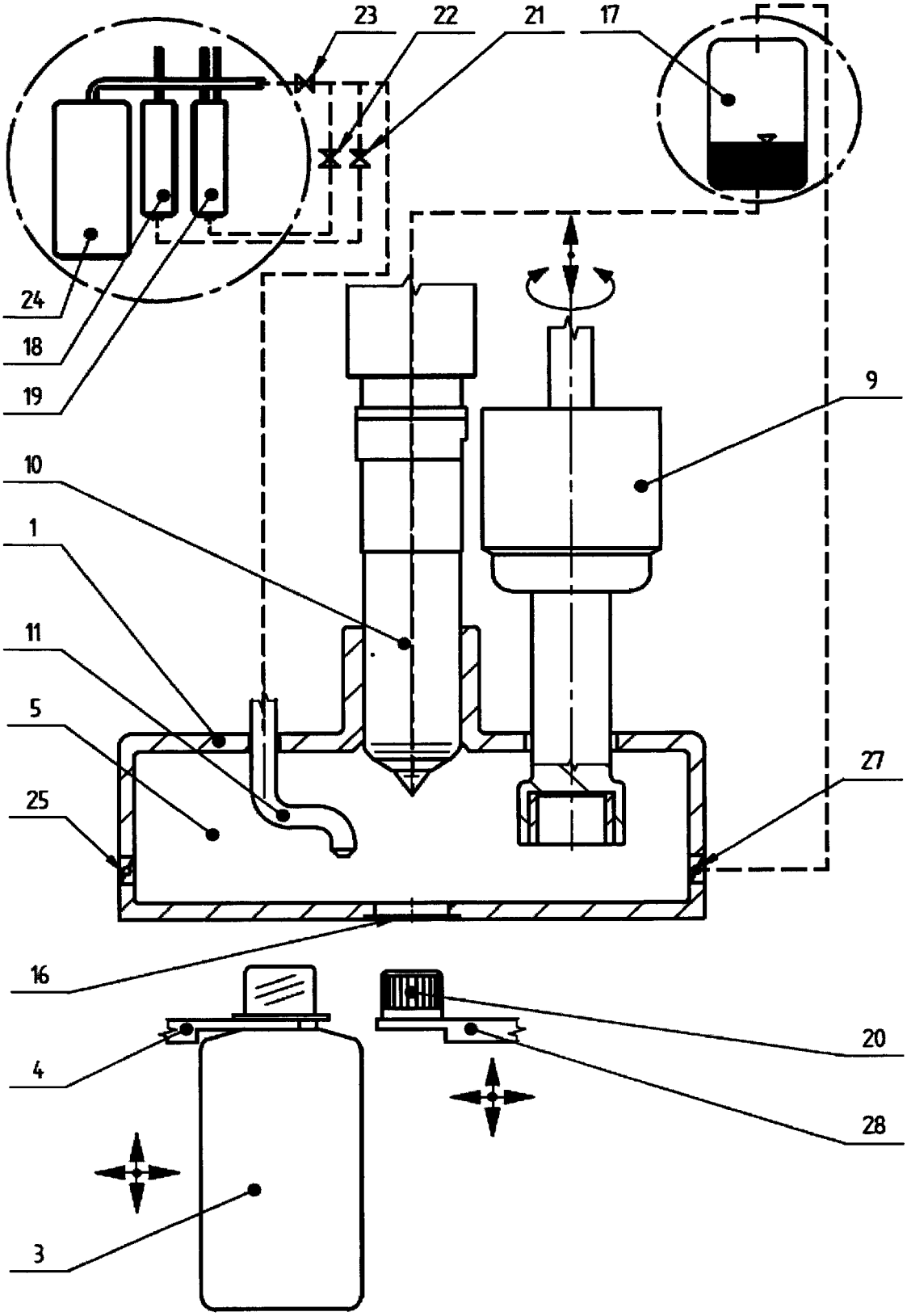

Fig. 11

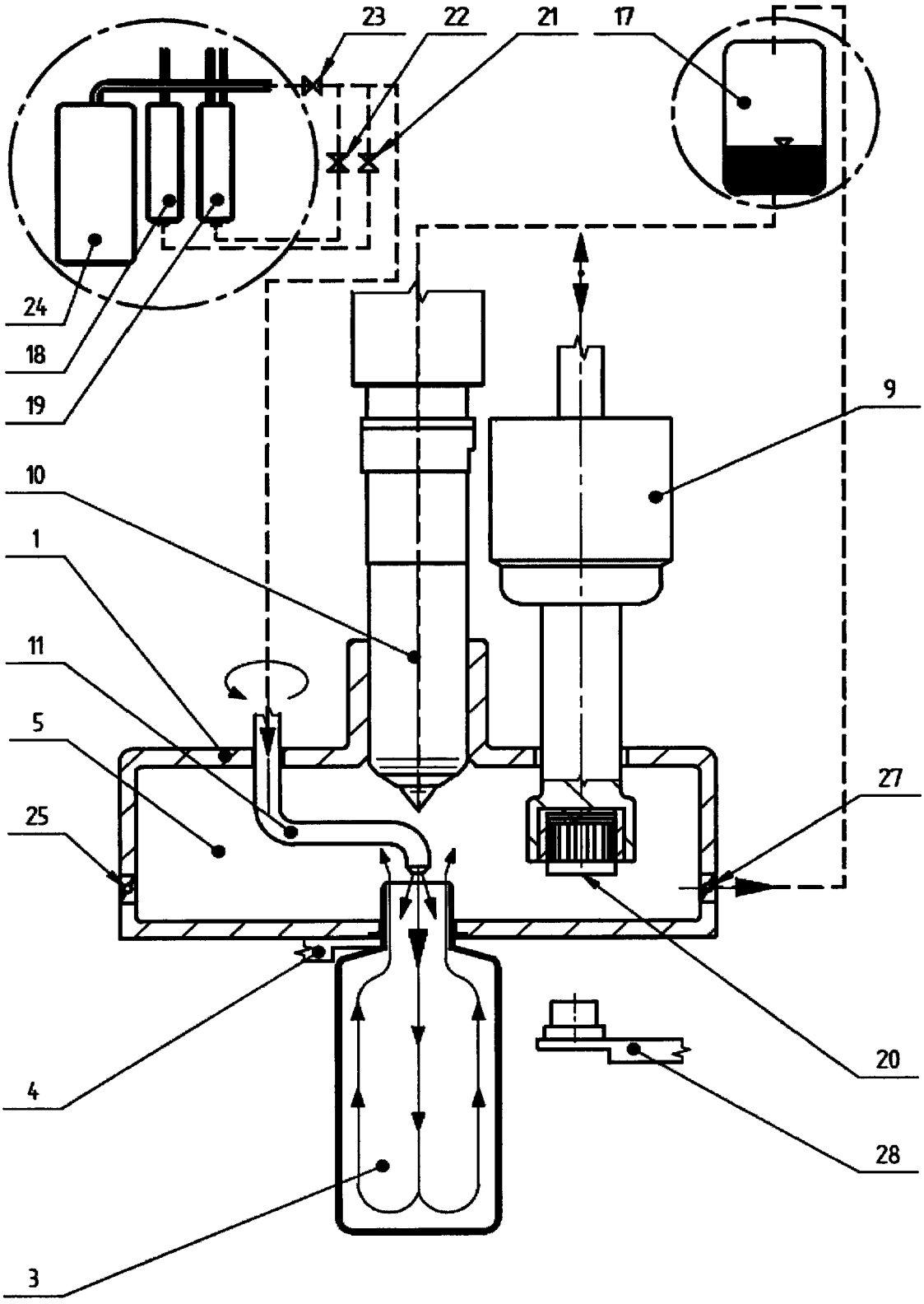

Fig. 12

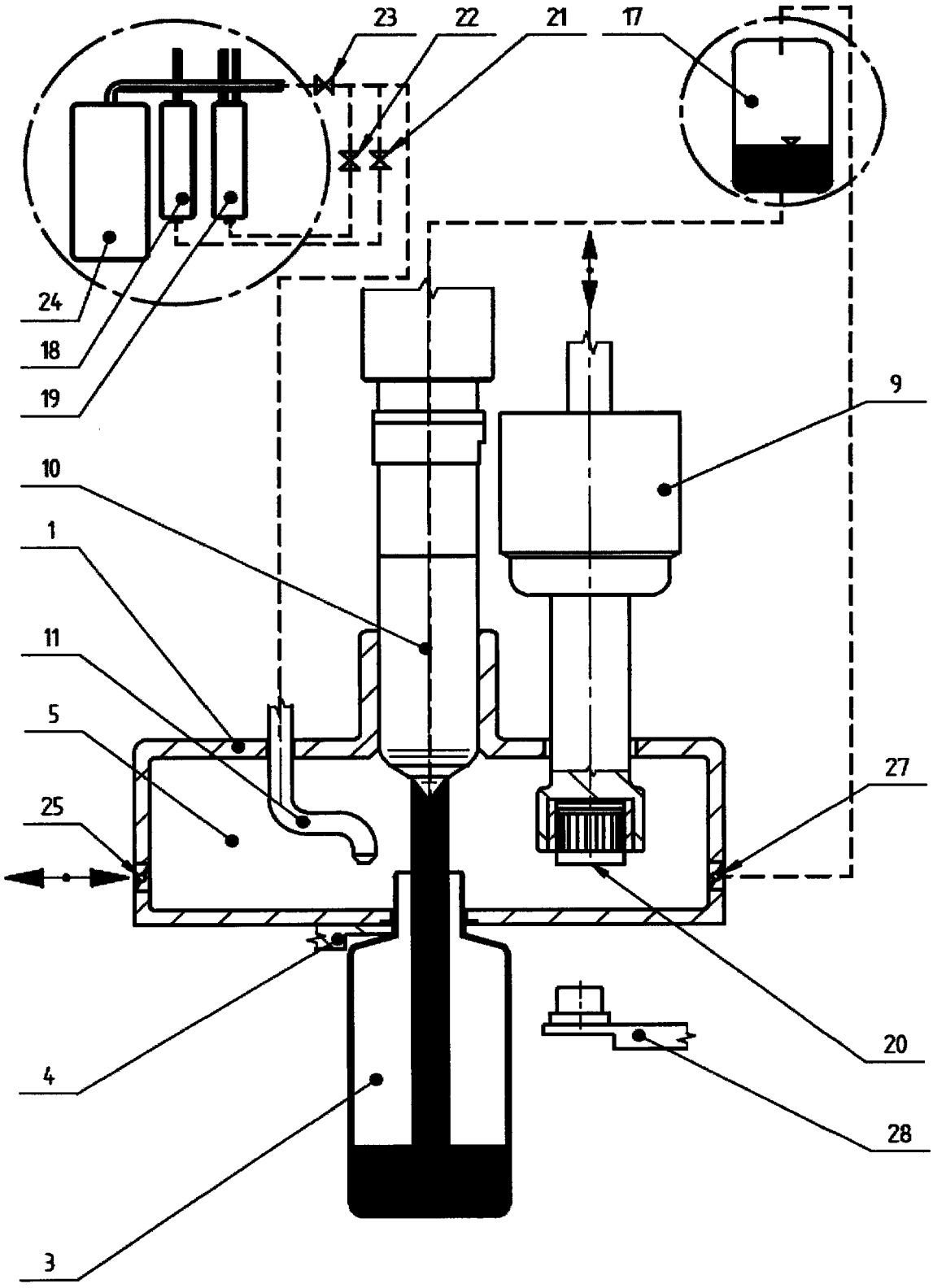

Fig. 13

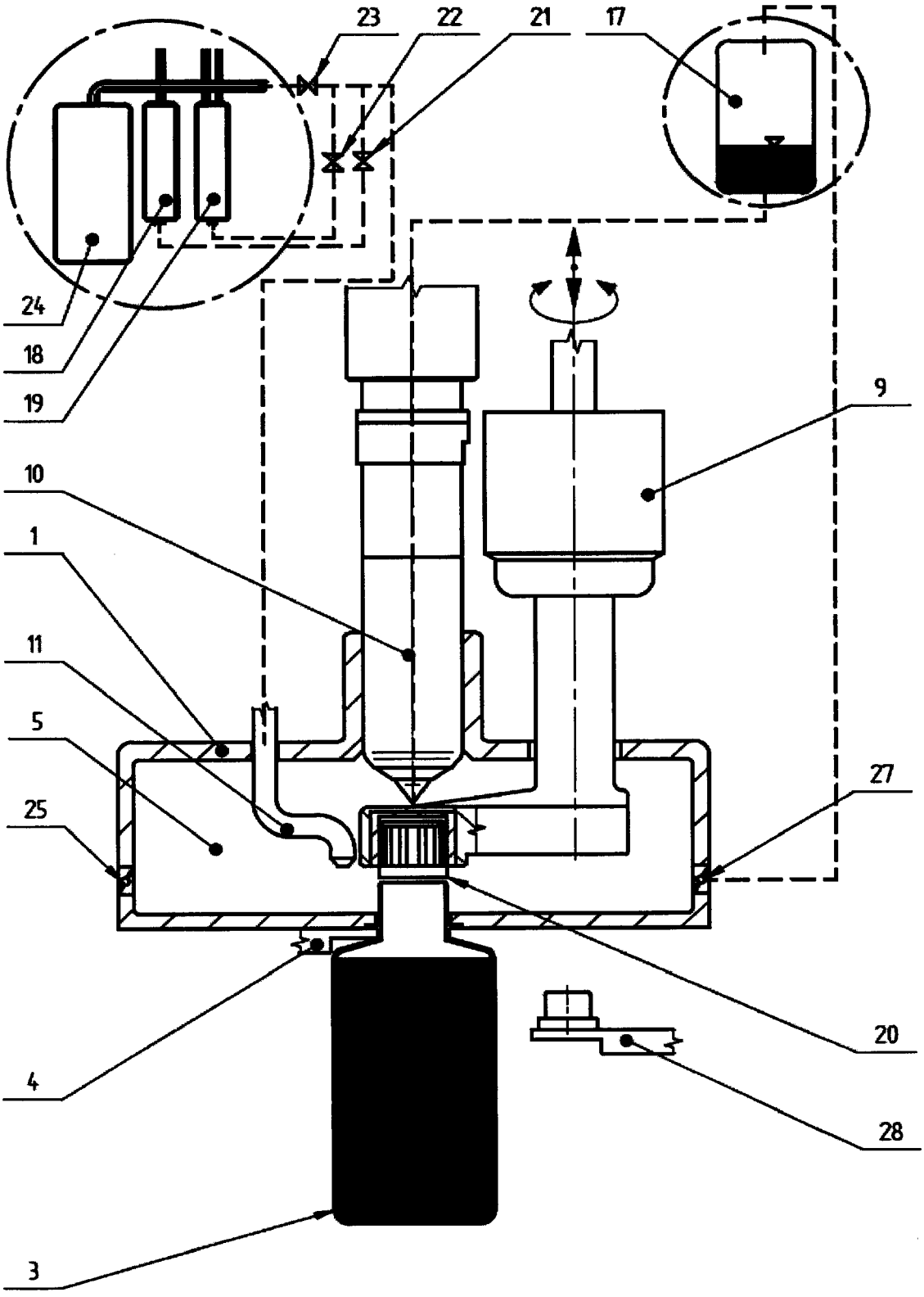

Fig. 14

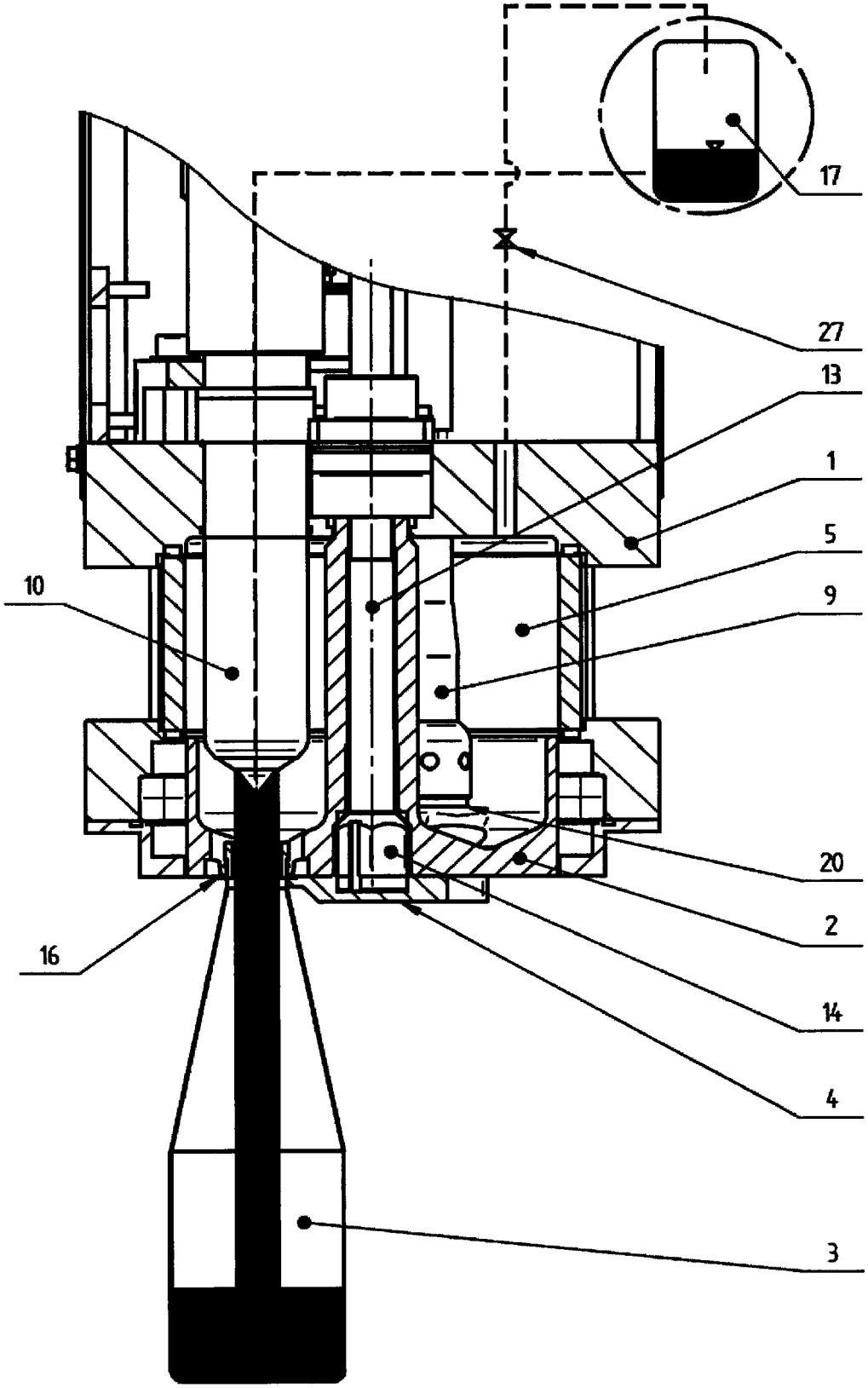

Fig. 15

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EUROPEAN SEARCH REPORT

Application Number
EP 19 00 0337

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	WO 2017/135902 A1 (SOFRANKO JÁN [SK]) 10 August 2017 (2017-08-10)	1-3,7-9	INV. B67C7/00
A	* the whole document *	4-6	
A	EP 2 937 310 A2 (KRONES AG [DE]) 28 October 2015 (2015-10-28) * abstract; figures 10-21 *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

B67C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 February 2020	Wartenhorst, Frank

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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12-02-2020

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