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(54) **Manifold for a rotatable tank of a filling unit for filling a plurality of articles with a pourable product**

(57) There is disclosed a manifold (10) for a rotatable tank (2) of a filling unit (1) for filling a plurality of articles (8) with a pourable product, comprising: a stator (11), which is stationary about an axis (A) and is connectable to a stationary first source (3) of pourable product; a rotor (12), which is rotatable to about axis (A) and is connectable to rotatable tank (2); and a plurality of annular rings (100a, 100b, 100c, 100d, 100e, 100f), which are radially interposed between stator (11) and rotor (12) and are fillable, in use, with a first aeriform so as to create respective pneumatic seals; manifold (10) comprises: a single inlet (101), which is fluidly connectable to a second source (102) of first aeriform; a single outlet (104), which is fluidly connectable to a discharging section (105) adapted to collect discharged first aeriform; and a pneumatic circuit (103), which extends between single inlet (101) and single outlet (104) and feeds in series a selectable group formed by one or more of annular rings (100a, 100b, 100c, 100d, 100e, 100f). (Figure 2)

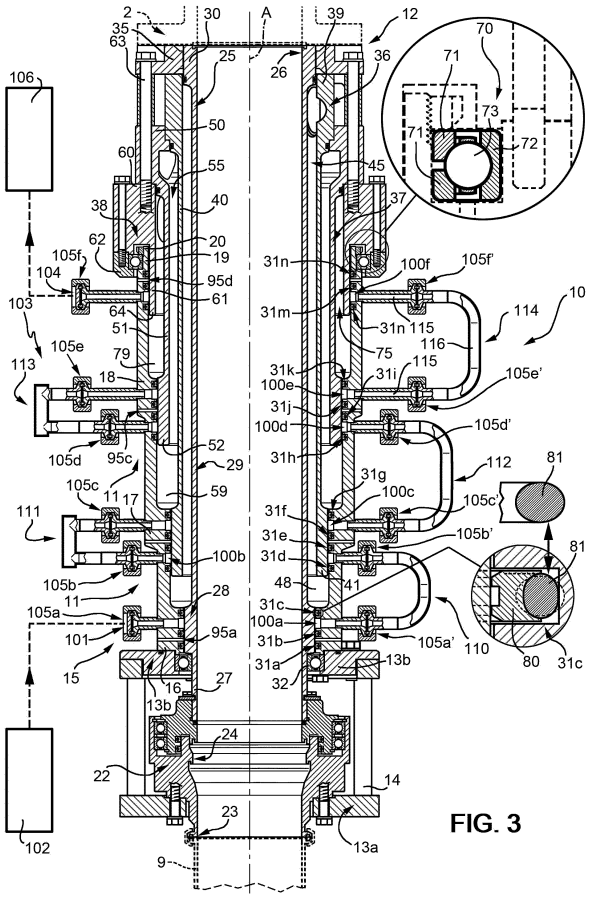


FIG. 3

EP 3 040 306 A1

Description

[0001] The present invention relates to a manifold for a rotatable tank of a filling unit for filling a plurality of articles with a pourable product, in particular containers filled with a food product.

[0002] As is known, many pourable food product comprising not only food product like milk, fruit juice or beverages in general, but also detergents are sold in containers having different shape and dimension.

[0003] These containers are typically made within bottling lines, which comprise a plurality of units for carrying out respective operations on containers.

[0004] Very briefly, the bottling line comprises at least a rinsing unit for rinsing containers, a filling unit for filling containers with a pourable food product, a capping unit for capping the containers and a grouping unit for forming groups of containers.

[0005] The known filling unit substantially comprises:

- a carousel rotating about a rotation axis;
- a tank containing the pourable food product and which rotates together with the carousel about the rotation axis; and
- a plurality of filling valves, which are fluidly connected with the tank and are supported by the carousel in a radially external position with respect to the rotation axis of the carousel.

[0006] The known filling unit further comprises a manifold, which is interposed between a stationary source of the pourable product and the rotating tank.

[0007] In detail, the manifold comprises:

- a stator, which is fixed to the stationary source; and
- a rotor, which is rotatably mounted with respect to the stator and is connected to the tank.

[0008] The rotor comprises, in turn, a rotating inlet in fluid connection with the source, a rotating outlet in fluid connection with the tank and a rotating duct which extends between the inlet and the outlet.

[0009] Manifold are known in which a plurality of seals are provided in respective position radially interposed between the stator and the rotor, in order to ensure the tight-fluid sealing between the stator and the rotor.

[0010] In particular, each seal normally comprises a shoe in contact with one of the stator and the rotor, and an elastomeric circular ring in contact with the other one of the stator and the rotor and with the shoe.

[0011] A need is felt within the industry to ensure in a more accurate way the tight-fluid sealing between the stator and the rotor.

[0012] Furthermore, a need is felt to promptly detect any leakage through the seals.

[0013] Known manifold further comprises a bush, which is interposed between the stator and the rotor and is adapted to support the axial loads, which are transmitted from the rotor to the stator.

[0014] The bush is stationary fitted to the stator and contacts with friction the stator.

[0015] Furthermore, a need is felt within the industry to reduce the wear affecting the bush and correspondingly increase the life-time of these bush.

[0016] Finally, a need is also felt within the industry to utilize the manifold for fluidly connecting a plurality of sources of the operative fluids necessary to the filling valves with the same filling valves while avoiding any contamination between those operative fluids.

[0017] In this respect, it is especially felt the need to achieve a greater flexibility in the connection of the sources with the filling valves, through the manifold, so as to meet different operative requirements of the filling unit.

[0018] It is an object of the present invention to provide a manifold for a rotatable tank of a filling unit for filling a plurality of articles with a pourable product, which meets at least one of the above requirements.

[0019] The aforementioned object is achieved by the present invention as it relates to a manifold for a rotatable tank of a filling unit for filling a plurality of articles with a pourable product, as claimed in claim 1.

[0020] One preferred embodiment is hereinafter disclosed for a better understanding of the present invention, by way of non-limitative example and with reference to the accompanying drawings, in which:

- Figure 1 is a frontal view of a manifold according to the present invention together with a tank of a filling unit;
- Figure 2 is a top view in a partial section of the manifold of Figure 1;
- Figure 3 is a section along line III-III of Figure 2 and in an enlarged view of the manifold of Figure 1 in a first configuration;
- Figure 4 is a section along line III-III of Figure 2 of the manifold of Figures 1 and 2 in a second configuration; and
- Figures 5 to 7 are respective sections along lines V-V, VI-VI and VII-VII respectively of Figure 2 of the manifold of Figures 1 to 3.

[0021] With reference to Figure 1, numeral 1 indicates a filling unit for filling articles 8 with a pourable product, especially a food product.

[0022] Filling unit 1 substantially comprises:

- a tank 2, which can rotate about an axis A, vertical in the embodiment shown;
- a source 3 (only schematically shown in Figure 1), which is stationary about axis A and is filled with the pourable product; and
- a carousel 6 (only partially shown), which is angularly integral with tank 2 and comprises a plurality of filling valves 7, which are fluidly connected with tank 2 and are supported by carousel 6 in a radially external position with respect to axis A.

[0023] In greater detail, filling valves 7 may be selectively arranged in a known way either in an open position, in which they fill respective articles 8, or in a closed position, in which they are prevented from filling the respective articles 8.

[0024] Furthermore, filling unit 1 is adapted to feed respective articles 8 with a carbonated food product, e.g. water, beer.

[0025] To this end, filling unit 1 comprises a source 4 of an aeriform in pressure, carbon dioxide.

[0026] Source 4 is stationary about axis A and is only schematically shown in Figure 1.

[0027] Accordingly, filling valves 7 may be selectively arranged, when they are set in the respective closed position,:

either in a first position in which a relative opening 21 facing the relative articles 8 is connected with source 4;
or in a second position, in which the relative opening 21 is fluidly isolated by source 4.

[0028] In greater detail, filling valves 7 are set in the respective first positions, when they are in the respective closed positions, so as to feed the aeriform in pressure inside still empty articles 8.

[0029] Accordingly, the pressure inside articles 8 reaches the level inside tank 2 before the filling of articles 8.

[0030] Filling valves 7 are also set in the respective second positions, when they are in respective open positions, so that articles 8 can be properly filled with the pourable product.

[0031] Filling unit 1 also comprises a source 5 of a sterilizing fluid. Source 5 is stationary about axis A and is only schematically shown in Figure 1.

[0032] Filling valves 7 can be selectively connected in fluidic way with source 5, so as to sterilize these filling valves 7.

[0033] In particular, filling valves 7 are in the respective open position, when they are fluidly connected with source 5; and respective movable closing elements obstruct openings 21 of relative filling valves 7, so as to prevent the sterilizing product from escaping outside filling valves 7.

[0034] Filling unit 1 further comprises a manifold 10, which is adapted to fluidly connect a stationary tube 9 of stationary source 3 with rotating tank 2.

[0035] Manifold 10 furthermore is adapted to create a first fluidic line, which allows the flow of the sterilizing product from stationary source 5 to rotating filling valves 7, in case a sterilizing step of filling valves 7 is required.

[0036] Manifold 10 is also adapted, in case it is necessary to pressurize the still empty articles 8 before the filling thereof with a carbonated pourable product, to:

- create a second fluidic line, which allows the flow of the aeriform in pressure from stationary source 4 to rotating filling valves 7; and
- create a third fluidic line, which allows the back flow of the aeriform in pressure from rotating filling valves 7 to source 4.

[0037] Manifold 10 has a main extension parallel to axis A and is axially interposed between tank 2 and source 3.

[0038] Manifold 10 substantially comprises:

- a stator 11, which is connected to source 3; and
- a rotor 12, which is connected to tank 2 and is rotatably mounted about axis A inside stator 11.

[0039] Stator 11 is shaped tubular around axis A.

[0040] Stator 11 comprises, proceeding from tube 9 to tank 2 (Figure 3):

- a pair of axially spaced flanges 13a, 13b connected by columns 14 and fitted to tube 9; and
- a hollow body 15, which is connected with flanges 13a, 13b.

[0041] Body 15 comprises, proceeding from tube 9 to tank 2, in turn, (Figure 3):

- an axial end 16;
- a portion 17, which radially protrudes from end 16 towards tube 2 and has a grater radial size than end 16;
- a portion 18, which has a greater radial size than portion 17; and
- a portion 19, which has a greater size than portion 18 and defines an axial end 20 of body 15 opposite to end 16.

[0042] Columns 14 are angularly equi-spaced around axis A and extend parallel to axis A.

[0043] Rotor 12 substantially comprises, proceeding from tube 9 to tank 2,:

- a body 22, which defines an opening 23 fluidly connected with tube 9 and a duct 24; and
- a tube 25, which is fluidly connected with duct 24 and defines an opening 26, which is opposite to opening 23 and opens inside tank 2.

[0044] Body 22 is made in two components coupled with one another, one of which is rotary and fitted to duct 24 and another one of which is stationary fitted to tube 9.

[0045] In other words, rotor 12 defines a fluidic line for the pourable product, which extends from opening 26 to opening 23 through duct 24 and tube 25.

[0046] Body 22 is, in the embodiment shown, axially contained between flanges 13a, 13b and radially contained inside columns 14.

[0047] In particular, tube 25 comprises, proceeding from body 22 towards opening 26,:

- an axial end 27;
- a protrusion 28, which radially protrudes from end 27 on the opposite side of axis A;
- a main portion 29; and
- a protrusion 30, which defines axial end of tube 25 opposite to end 27 and radially protrudes on the opposite side of axis A.

[0048] Manifold 10 comprises a bearing 32, which is radially interposed between end 27 and flange 13b.
[0049] Bearing 32 is adapted to support radial loads, which are discharged from rotor 12 to stator 11.
[0050] Bearing 32 is, in the embodiment shown, a radial bearing with rolling bodies spherically shaped.
[0051] Manifold 10 further comprises a plurality of annular seals 31a, 31b, 31c, three in the embodiment shown, which are radially interposed between protrusion 28 and end 16 of body 15.
[0052] Seals 31a, 31b, 31c are axially spaced with respect to one another.
[0053] Rotor 12 further comprises:

- a flange 35, which surrounds and is fixed to end 27;
- a tube 36, which is connected to flange 35;
- a tube 37; and
- a flange 38.

[0054] Tube 36 comprises, in turn,:

- an axial end 39, which is fixed to protrusion 30 below flange 35;
- a main portion 40, which axially protrudes from end 39 towards body 22 and surrounds with radial gap tube 25; and
- an end 41, which is opposite to end 39 and is at a certain axial distance from protrusion 28 and end 16 of body 15.

[0055] End 39 radially protrudes on the opposite side of axis A with respect to portion 40.
[0056] Manifold 10 further comprises a plurality of annular seals 31d, 31e, 31f, 31g, four in the embodiment shown, which are radially interposed between end 41 and portion 17 of body 15.
[0057] Seals 31d, 31e, 31f, 31g are axially spaced with respect to one another.
[0058] Manifold 10 defines a cavity 45, which is radially bounded between tube 25 on the radial inner side and tube 36 and portion 17 of body 15 on the radial outer side.
[0059] Cavity 45 is axially bounded between protrusion 30 of tube 25 and end 39 of flange 35 on one side, and the interface area between protrusion 28 and end 16 of body 15 on the opposite side.
[0060] As evident form Figure 7, manifold 10 comprises:

- a stationary inlet duct 46, which passes through end 16 of body 15 and is fluidly connected with source 5 of the sterilizing product; and
- a plurality of rotary outlet ducts 47, which pass through end 39 of tube 36 and are fluidly connected, in a not shown way, with respective filling valves 7.

[0061] Ducts 46, 47 open inside cavity 45.
[0062] Duct 47 extends, in the embodiment shown, on one radial side only of body 15 and end 39 respectively.
[0063] In the embodiment shown, ducts 46, 47 radially extend with respect to axis A.
[0064] Ducts 47 are angularly equi-spaced about axis A.
[0065] Furthermore, in the embodiment shown, cavity 45 comprises an annular ring 48, which is axially bounded between end 41 on one side, and the interface area between protrusion 28 and portion 16 of body 15 on the opposite side.
[0066] Duct 46 opens inside ring 48.
[0067] Tube 37 comprises, in turn,:

- an axial end 50, which is fixed to end 39 on the radial opposite side with respect to tube 25;
- a main portion 51, which axially protrudes from end 50 towards body 22 and surrounds tube 36; and
- an end 52, which is opposite to end 50 and is at a certain axial distance from end 41 of tube 36 and portion 17 of body 15.

[0068] End 50 radially protrudes on the opposite side of axis A with respect to portion 51.
[0069] Manifold 10 further comprises a plurality of annular seals 31h, 31i, 31j, 31k, four in the embodiment shown, which are radially interposed between end 41 of tube 36 and portion 18 of body 15.
[0070] Seals 31h, 31i, 31j, 31k are axially spaced with respect to one another.
[0071] Manifold 10 defines a cavity 55, which is radially bounded between tube 36 on the radially inner side, and tube 37 and portion 18 of body 15 on the radially outer side.
[0072] Furthermore, cavity 55 is axially bounded between end 39 of tube 36 and end 50 of tube 37 on one side, and the interface area between portion 17 of body 15 and end 52 of tube 37 on the other side.
[0073] As evident form Figure 6, manifold 10 comprises:

- a plurality of rotary inlet ducts 56, which are angularly spaced from one another about axis A and passes through end 50 of tube 37; and
- a stationary outlet duct 57, which passes through portion 18 of body 15.

[0074] Ducts 56, 57 open inside cavity 55.
[0075] Ducts 56 are, in the embodiment shown, angularly equi-spaced about axis A.
[0076] Duct 57 is connected with source 4 of aeriform in pressure while ducts 56 are connected with relative

filling valves 7.

[0077] Duct 57 extends, in the embodiment shown, on one radial side only of portion 18 of body 15.

[0078] In the embodiment shown, ducts 56, 57 radially extend with respect to axis A.

[0079] Furthermore, in the embodiment shown, cavity 55 comprises an annular ring 59, which is in fluid connection with duct 57 and is axially bounded between end 52 on one axial side and end 41 and portion 17 of body 15 on the opposite axial side.

[0080] Flange 38 comprises (Figure 3):

- a main body 60, which is fitted to end 50 of tube 37, and to flange 35 by a plurality of angularly spaced screwed columns 63 parallel to axis A;
- an annular wall 61, which protrudes from body 60 on the opposite side of tank 2 and surrounds portion 51 of tube 37; and
- a ring 62, which protrudes from body 60 on the opposite side of tank 2 and are radially outer with respect to wall 61.

[0081] In the embodiment shown, columns 63 pass through end 50 of tube 37.

[0082] Manifold 10 comprises a plurality of annular seals 311, 31m, 31n, three in the embodiment shown, which are radially interposed between wall 61 and the radially inner surface of portion 19 of body 15.

[0083] Seals 311, 31m, 31n are axially spaced with respect to one another.

[0084] Manifold 10 comprises a bearing 70, which is:

- radially blocked between the radially outer surface of portion 18 of body 15 and the radially inner surface of ring 62; and
- axially blocked between a screwed ferrule of wall 61 and an annular protrusion of body 60 on the side of tank 2, and respective shoulders of wall 61 and ring 62 on the side of source 3.

[0085] Advantageously, bearing 70 is a rolling bearing, which can support both axial and radial loads, which are transmitted by rotor 12 to stator 11, during the operation of manifold 10.

[0086] In the embodiment shown (Figure 3), bearing 70 comprises a pair of radially inner rings 71, a radially outer ring 72 and a plurality of spheres 73 rolling on and interposed between rings 71, 72. Spheres 73 have four contact points with rings 71, 72.

[0087] Wall 61 comprises an end 64, which is axially spaced from portion 18 of body 15 and end 52 of tube 37.

[0088] End 20 of body 15 is radially interposed between wall 61 and ring 62.

[0089] Manifold 10 further comprises a cavity 75, which is bounded radially bounded between portion 51 of tube 37 on the radially inner side, and wall 61 and portion 19 of body 15 on the radially outer side.

[0090] Cavity 75 is axially bounded between end 50 of tube 37 and body 60 on the axial side of tank 2, and by the interface between end 52 and portion 19 of body 15 on the axial side of source 3.

[0091] As evident form Figure 5, manifold 10 comprises:

- a stationary inlet duct 76, which is defined by portion 18 of body 15; and
- a plurality of rotating outlet ducts 77, which are angularly spaced from one another about axis A and are defined by body 60 of flange 38.

[0092] Ducts 76, 77 open inside cavity 75.

[0093] Duct 76 is connected with source 4 of aeriform in pressure while ducts 77 are fluidly connected with respective filling valves 7.

[0094] Duct 76 extends, in the embodiment shown, on one radial side only of portion 19 of body 15.

[0095] Ducts 77 are angularly equi-spaced about axis A, in the embodiment shown.

[0096] In the embodiment shown, ducts 76, 77 radially extend with respect to axis A.

[0097] Furthermore, in the embodiment shown, cavity 75 comprises an annular ring 79, into which duct 76 opens. Ring 79 is axially bounded between end 64 of wall 61 on one axial side, and the interface area between end 52 of tube 36 and portion 18 of body 15 on the side of source on the opposite axial side.

[0098] With reference to Figure 3, each seal 31a, 31b, 31c 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n comprises:

- a shoe 80 fitted to stator 11; and
- an elastic ring 81 fitted to rotor 12.

[0099] Ring 81 extends about axis A.

[0100] Advantageously, ring 81 is elliptic, at least when not elastically deformed, in a transversal section taken parallel to axis A.

[0101] Manifold 10 further comprises a plurality, six in the embodiment shown, of annular rings 100a, 100b, 100c, 100d, 100e, 100f.

[0102] Rings 100a, 100b, 100c, 100d, 100e, 100f are radially interposed between stator 11 and rotor 12 and are filled with a vaporised aeriform, water vapour in the embodiment shown, in order to establish a pneumatic tight-fluid sealing between stator 11 and rotor 12.

[0103] In the embodiment shown, rings 100a, 100b, 100c, 100d, 100e, 100f are defined by stator 11 and are closed by rotor 12.

[0104] Rings 100a, 100b, 100c, 100d, 100e, 100f extend about axis A.

[0105] Rings 100a, 100b, 100c are radially interposed between protrusion 28 of tube 25 and end 16 of body 15.

[0106] Rings 100d, 100e, 100f, 100g are radially interposed between end 41 of tube 36 and portion 17 of body 15.

[0107] Rings 100h, 100i, 100j, 100k are radially inter-

posed between end 52 of tube 37 and portion 18 of body 15.

[0108] Ring 1001, 100m, 100n are radially interposed between wall 61 of flange 38 and portion 19 of body 15.

[0109] In detail, ring 100a is axially interposed between seals 31b, 31c.

[0110] Ring 100b is axially interposed between seals 31d, 31e.

[0111] Ring 100c is axially interposed between seals 31f, 31g.

[0112] Ring 100d is axially interposed between seals 31h, 31i.

[0113] Ring 100e is axially interposed between seals 31j, 31k.

[0114] Ring 100f is axially interposed between seals 311, 31m.

[0115] Seal 31c is axially interposed between cavity 45 and ring 100a; seals 31d is axially interposed between cavity 45 and ring 100b; seal 31g is axially interposed between ring 100c and cavity 55; seal 31h is axially interposed between ring 100d and cavity 55; seal 31k is axially interposed between ring 100e and cavity 75; and seal 311 is axially interposed between ring 100f and cavity 75.

[0116] Furthermore, stator 11 comprises a plurality of passages 95a, 95b, 95c, 95d (Figure 3), four in the embodiment shown, which extend radially inside end 16 and portions 17, 18, 19 respectively of body 15.

[0117] In particular, each passage 95a; 95b; 95c; 95d is axially interposed between seals 31a, 31b; 31e, 31f; 31i, 31j; 31m, 31n.

[0118] Each passage 95a, 95b, 95c, 95d is closed by tube 25, 36, 37 and flange 38 respectively on the radially inner side thereof and is open on the radially outer side thereof.

[0119] Each passage 95a; 95b; 95c; 95d is adapted to detect the leakage of seals 31a, 31b; 31e, 31f; 31i, 31j; 31m, 31n.

[0120] Advantageously, manifold 10 comprises (Figure 3):

- a single inlet 101, which is connectable to a source 102 of the vaporised aeriform, water vapour in the embodiment shown;
- a single outlet 104, which is connectable to a discharge section 106 for discharging the vaporised aeriform;
- a pneumatic circuit 103, which extends between inlet 101 and outlet 102, and feeds in series at least two selectable rings 100a, 100b, 100c, 100d, 100e, 100f with the vaporised aeriform.

[0121] The expression in series is used to indicate that the same flow of vaporised aeriform passes through the at least two selectable rings 100a, 100b, 100c, 100d, 100e, 100f

[0122] In other words, on the basis of the operative needs, a plurality of configurations of pneumatic circuit 103 can be formed.

[0123] In each of the possible configurations, one of rings 100a, 100b, 100c, 100d, 100e, 100f is connected to source 102 through single inlet 101, and another one of rings 100a, 100b, 100c, 100d, 100e, 100f is connected to discharge section 106 through single outlet 104.

[0124] Furthermore, in each of the possible configurations, it is possible to selectively fluidly isolate one or more ring 100a, 100b, 100c, 100d, 100e, 100f from source 102 and discharge section 106, and to fluidly connect in series the remaining rings 100a, 100b, 100c, 100d, 100e, 100f with single inlet 101 and single outlet 104.

[0125] In greater detail, each ring 100a, 100b, 100c, 100d, 100e, 100f comprises (Figure 2) a respective pair of respective connectors 105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f'.

[0126] Connectors 105a, 105a' (105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f') are angularly spaced from one another around axis A, for an arch of 180 degrees in the embodiment shown.

[0127] Connectors 105a, 105a' (105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f') can be tight-fluidly closed by respective closing element or left open.

[0128] Pneumatic circuit 103 comprises a plurality of ducts 110, 111, 112, 113, 114 for connecting in series a selectable group of rings 100a, 100b, 100c, 100d, 100e, 100f.

[0129] Source 102 and discharging section 106 are, in the embodiment shown, stationary and defined by filling unit 1.

[0130] In the following of the present description, two possible non-limitative configurations of pneumatic circuit 103 are described.

[0131] With reference to Figure 3, a first configuration of pneumatic circuit 103 is shown.

[0132] In this first configuration, connector 105a of ring 100a defines single inlet 101, connector 105f of ring 100f defines single outlet 104, and rings 100a, 100b, 100c, 100d, 100e, 100f are connected in series by pneumatic circuit 103.

[0133] More precisely, in the configuration of Figure 3, pneumatic circuit 103 comprises:

- a duct 110, which extends between connectors 105a', 105b';
- a duct 111, which extends between connectors 105b, 105c;
- a duct 112, which extends between connectors 105c', 105d';
- a duct 113, which extends between connectors 105d, 105e; and
- a duct 114, which extends between connectors 105e', 105f'.

[0134] Accordingly, the vaporised aeriform flows from single inlet 101 to single outlet 104 through ring 100a, duct 110, ring 100b, duct 111, ring 100c, duct 112, ring

100d, duct 113, ring 100e, duct 114 and ring 100f.

[0135] In other words, pneumatic circuit 103 fluidly connects all the rings 100a, 100b, 100c, 100d, 100e, 100f in series with single inlet 101 and single outlet 104.

[0136] Each duct 110, 111, 112, 113, 114 is, in the embodiment shown, formed by a pair of arms 115 connected to respective connectors 105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f' and an arm 116 interposed between arms 115 (Figure 4).

[0137] Arm 115 extends radially with respect to axis A while arm 116 has a prevalent axial extension with respect to axis A.

[0138] With reference to Figure 4, a second configuration of pneumatic circuit 103 is shown.

[0139] In this second configuration, connector 105a of ring 100a defines single inlet 101, connector 105f of ring 100f defines single outlet 104, rings 100a, 100d, 100e, 100f are fluidly connected in series by pneumatic circuit 103, whereas rings 100b, 100c are fluidly isolated by inlet source 101 and outlet source 102.

[0140] More precisely, in the configuration of Figure 4, pneumatic circuit 103 comprises:

- a duct 110', which extends between connectors 105a', 105d';
- a duct 111', which extends between connectors 105d, 105e; and
- a duct 112', which extends between connectors 105e', 105f'.

[0141] Accordingly, the vaporised aeriform flows from single inlet 101 to single outlet 104 through ring 100a, duct 110', ring 100d, duct 111', ring 100e, duct 112', ring 100f.

[0142] During the normal operation of filling unit 1, carousel 6, tank 2 and filling valves 7 integrally rotate about axis A.

[0143] Furthermore, source 3 of pourable product, source 4 of aeriform in pressure, carbon dioxide in the embodiment showm, and source 5 of sterilizing fluid are stationary about axis A.

[0144] Filling valves 7 are switched between:

- the respective open positions, in which they fill relative articles 8 with the pourable product; or
- the respective closed positions, in which they are prevented from filling the relative articles 8 with the pourable product.

[0145] Furthermore, in case of filling of articles 8 with a pressurized pourable product, filling unit 1 is adapted to pressurize still empty articles 8, before the filling thereof with the pourable product.

[0146] To this end, filling valves 7 are set in the respective first positions, when they are in the respective closed positions, so as to feed the aeriform in pressure inside still empty relative articles 8.

[0147] Accordingly, the pressure inside articles 8 reaches the level inside tank 2 before the filling of articles 8.

[0148] Filling valves 7 are also set in the respective second positions, when they are in respective open positions, so that articles 8 can be properly filled with the pourable product.

[0149] During the normal operation of filling unit 1, manifold 10 continuously replenishes tank 2 with the pourable product.

[0150] Furthermore, in case filling valves 7 pressurize the still empty articles 8 before the filling thereof with a carbonated pourable product, manifold 10:

- conveys the flow of the aeriform in pressure from stationary source 4 to the rotating filling valves 7; and
- conveys the back flow the aeriform in pressure from the rotating filling valves 7 to stationary source 4.

[0151] In greater detail, rotor 12 of manifold 10 rotates about axis A while stator 11 of manifold remains stationary about axis A.

[0152] The pourable product flows from stationary source 3 to rotating tank 2 through rotating tube 25

[0153] In the meanwhile, the pressurized aeriform, carbon dioxide in the embodiment shown, flows from stationary source 4 towards rotating filling valves 7 through duct 76, cavity 75 and ducts 77 of manifold 10 (Figure 5).

[0154] The pressurized aeriform furthermore back returns from the rotating filling valves 7 to the stationary source 4 through ducts 56, cavity 55 and duct 57 of manifold 10 (Figure 6).

[0155] During the sterilizing step of filling valves 7, manifold 10 is further adapted to convey the flow of the sterilizing product from stationary source 5 to the rotating filling valves 7 (Figure 7).

[0156] During the sterilizing step, filling valves 7 are in the respective open positions and respective closing elements obstruct the pouring openings of filling valves 7.

[0157] In particular, the sterilizing product flows from stationary source 5 to filling valves 7 through duct 46, cavity 45 and ducts 47.

[0158] During the operation of manifold 10, bearing 70 supports both axial and radial loads, which are transmitted from rotor 12 to stator 11.

[0159] Furthermore, bearing 32 supports radial loads, which are transmitted from rotor 12 to stator 11.

[0160] Seals 31a, 31b, 31c, 31d, 31e, 31f, 31g, 31h, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n, 31n mechanically seal in a tight-fluid way rotor 12 and stator 11, thus avoiding any leakage and/or any mixing between the pourable product, the aeriform in pressure and the sterilizing product.

[0161] On the basis of the operative conditions of filling unit 1 and, therefore, of manifold 10, pneumatic circuit 103 feeds a selected group of rings 100a, 100b, 100c, 100d, 100e, 100f with the vaporised aeriform contained in stationary source 102.

[0162] In this way, on the basis of the operative con-

ditions of filling unit 1 and, therefore, of manifold 10, :

- ring 100a creates a pneumatic barrier between tube 25 and end 16 of body 15; and/or
- ring 100b, 100c create respective pneumatic barriers between tube 36 and portion 17 of body 15; and/or
- rings 100d, 100e create respective pneumatic barriers between tube 37 and portion 18 of body 15; and/or
- ring 100f creates a pneumatic barrier between wall 61 and portion 19 of body 15.

[0163] For example, in case it necessary ensure that filling valves 7 are fed with pressurized aeriform, that the latter returns back to the stationary source 4 and that the sterilizing agent is fed from stationary source 5 to filling valves 7, pneumatic circuit 103 is set in the first configuration shown in Figure 3.

[0164] In this first configuration, connector 105a of ring 100a defines single inlet 101, connector 105f of ring 100f defines single outlet 104, and rings 100a, 100b, 100c, 100d, 100e, 100f are connected in series by pneumatic circuit 103.

[0165] Furthermore, pneumatic circuit 103 comprises ducts 110, 111, 112, 113, 114.

[0166] Accordingly, the vaporised aeriform flows from single inlet 101 to single outlet 104 through ring 100a, duct 110, ring 100b, duct 111, ring 100c, duct 112, ring 100d, duct 113, ring 100e, duct 114 and ring 100f.

[0167] In other words, pneumatic circuit 103 fluidly connects all the rings 100a, 100b, 100c, 100d, 100e, 100f in series with single inlet 101 and single outlet 104.

[0168] In another different operative condition, pneumatic circuit 103 is set in the configuration shown in Figure 4.

[0169] In this second configuration, connector 105a of ring 100a defines single inlet 101, connector 105f of ring 100f defines single outlet 104.

[0170] Furthermore, in this second configuration, pneumatic circuit 103 comprises:

- a duct 110', which extends between connectors 105a', 105d';
- a duct 111', which extends between connectors 105d, 105e; and
- a duct 112', which extends between connectors 105e', 105f'.

[0171] Accordingly, the vaporised aeriform flows from single inlet 101 to single outlet 104 through ring 100a, duct 110', ring 100d, duct 111', ring 100e, duct 112', ring 100f.

[0172] Rings 100b and 100c are fluidly isolated from the stationary source 4 and therefore are not filled with vaporised aeriform.

[0173] In this second configuration, connectors 105b, 105b'; 105c, 105c', when left open, can be used for properly identifying any leakage from cavity 45; 55.

[0174] As a matter of fact, in case of leakage from cavity 45 due to the not proper operation of seal 31d, the sanitizing agent flows out from connectors 105b, 105b'.

[0175] In the same way, in case of leakage from cavity 55 due to the not proper operation of seal 31g, the pressurized aeriform flows out from connectors 105c, 105c'.

[0176] Irrespective of the configuration of pneumatic circuit 103, the not proper operation of seals 31a, 31b; 31e, 31f; 31i, 31j, 31m, 31n, can be identified by a corresponding leakage through passages 95a; 95b; 95c; 95d respectively.

[0177] From an analysis of the features of manifold 10 made according to the present invention, the advantages it allows to obtain are apparent.

[0178] In particular, pneumatic circuit 103 extends between single inlet 101 and single outlet 104 and feeds in series a selectable group formed by one or more rings 100a, 100b, 100c, 100d, 100e, 100f with the aeriform.

[0179] Accordingly, on the basis of the operative requirements of filling unit 1, it is possible to feed vaporised aeriform inside all, only group or even only one rings 100a, 100b, 100c, 100d, 100e, 100f.

[0180] In this way, it is also possible to isolate the remaining rings 100a, 100b, 100c, 100d, 100e, 100f from source 102 of vaporised aeriform.

[0181] Accordingly, it is possible optimizing, with the highest flexibility, the operation of manifold 10, on the basis of the operative requirements of the filling unit 1.

[0182] For example, with respect to the second configuration of pneumatic circuit 103 (shown in Figure 4), rings 100b, 100c are isolated from source 102.

[0183] Furthermore, ducts 110, 111, 112, 113, 114; 110', 111', 112' are external with respect to stator 11 and rotor 12.

[0184] In this way, connectors 105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f' can be left open towards the external environment of manifold 10, when corresponding rings 100a, 100b, 100c, 100d, 100e, 100f are isolated from source 102.

[0185] Accordingly, it is possible to detect any leakage from seals 31c, 31d, 31g, 31h, 31k, 311 and, therefore from the associated cavity 45, 55, 75 by simply detecting any leakage from the corresponding 105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f', which have been isolated from source 102 and left open.

[0186] Furthermore, manifold 10 comprises cavity 45, 55, 75.

[0187] It is therefore possible using only manifold 10 not only for feeding tank 2 with the pourable product, but also for feeding filling valves 7 with carbon dioxide and/or returning carbon dioxide inside source 4 and/or for feeding filling valves 7 with the sterilizing agent.

[0188] Furthermore, bearing 70 supports both axial and radial loads, which are transmitted by rotor 12 to stator 11 during the operation of manifold 10.

[0189] Accordingly, manifold 10 is no longer affected by the wearing effects, which are caused by the bush normally employed in the known manifold discussed in

the introductory part of the present description.

[0190] Finally, ring 81 has an elliptical section. Accordingly, the wearing effects acting on shoe 80 are reduced when compared with the known solution discussed in the introductory part of the present description.

[0191] In this way, the risk of leakages and of not proper operation of manifold 10 due to the wearing effect are dramatically reduced when compared with the known solution discussed in the introductory part of the present description.

[0192] Finally, it is apparent that modifications and variants not departing from the scope of protection of the claims may be made to manifold 10.

[0193] In particular, pneumatic circuit 103 can assume configurations other than the shown ones and can connect in whatsoever way one or more rings 100a, 100b, 100c, 100d, 100e, 100f.

Claims

1. A manifold (10) for a rotatable tank (2) of a filling unit (1) for filling a plurality of articles (8) with a pourable product, comprising:

   - a stator (11), which is stationary about an axis (A) and is connectable to a stationary first source (3) of said pourable product;
   - a rotor (12), which is rotatable to about said axis (A) and is connectable to said rotatable tank (2); and
   - a plurality of annular rings (100a, 100b, 100c, 100d, 100e, 100f), which are radially interposed between said stator (11) and said rotor (12) and are fillable, in use, with a first aeriform so as to create respective pneumatic seals;

   characterized by comprising:

   - a single inlet (101), which is fluidly connectable to a second source (102) of said first aeriform;
   - a single outlet (104), which is fluidly connectable to a discharging section (106) adapted to collect discharged first aeriform; and
   - a pneumatic circuit (103), which extends between said single inlet (101) and said single outlet (104) and feeds in series a selectable group formed by one or more of said annular rings (100a, 100b, 100c, 100d, 100e, 100f).

2. The manifold of claim 1, **characterized in that** said pneumatic circuit (103) comprises at least one duct (110, 111, 112, 113, 114; 110', 111', 112'), which is fluidly connected to at least one of said annular rings (100a, 100b, 100c, 100d, 100e, 100f) and is arranged external with respect to said stator (11) and said rotor (12) .

3. The manifold of claim 2, **characterized in that** each said annular rings (100a, 100b, 100c, 100d, 100e, 100f) comprises an inlet connector (105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f') and an outlet connector (105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f'), which can be selectively:

   either fluidly connected with respective ducts (110, 111, 112, 113, 114; 110', 111', 112') of said pneumatic circuit (103); or
   fluidly connected with said single inlet (101); or
   fluidly connected with said single outlet (104); or
   fluidly isolated from said single inlet (101) and said single outlet (104).

4. The manifold of claim 3, **characterized in that** at least one annular ring (100a, 100b, 100c, 100d, 100e, 100f) extends inside said stator (11) and is closed by said rotor (12).

5. The manifold of any one of the foregoing claims, **characterized by** comprising a plurality of mechanical seals (31a, 31b, 31c, 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n) radially interposed between said rotor (12) and said stator (11);
   each said annular ring (100a, 100b, 100c, 100d, 100e, 100f) being axially interposed between a pair of said seals (31a, 31b, 31c 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n).

6. The manifold of claim 5, **characterized in that** at least one of said seal (31a, 31b, 31c 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n) comprises:

   - a shoe (80), which is fitted to one (11) of said stator (11) and said rotor (12); and
   - an elastic ring (81), which is fitted to the other one (12) of said stator (11) and said rotor (12), and contacts said shoe (80);

   said ring (81) having an elliptic section in a plane parallel to said axis (A).

7. The manifold of any one of the foregoing claims, **characterized by** comprising:

   - a first radial bearing (32), which is interposed between said stator (11) and said rotor (12); and
   - a second axial and radial bearing (70), which is interposed between said stator (11) and said rotor (12);

   said second axial and radial bearing (70) comprising:

   - a first ring (71) fitted to said stator (11);
   - a second ring (72) fitted to said rotor (12); and
   - a plurality of spherical rolling bodies (73) interposed between said first ring (71) and said second ring (72);

   each said spherical rolling body (73) having four contact points with said first ring (71) and said

second ring (72).

8. The manifold of any one of the foregoing claims, **characterized by** comprising:

- a duct (25) defined by said rotor (12) and adapted to convey said pourable product inside said tank (2); and
- a first chamber (45), which is bounded, on one radial side, by said duct (25) and, on the opposite radial side, by a first tubular element (36) of said rotor (12) and a first element (16) of said stator (11);

at least one said first seal (31a, 31b, 31c) being interposed between said duct (25) and said first element (16) of said stator (11);
said first element (16) defining a stationary first inlet (46), which is fluidly connectable in a selective way to a stationary third source (5) of a sterilizing agent;
said first tubular element (36) defining at least one rotary first outlet (47), which is fluidly connectable in a selective way to at least one said respective filling valves (7).

9. The manifold of claim 8, **characterized by** comprising a second chamber (55), which is bounded, on one radial side, by said first tubular element (36) and, on the opposite radial side, by a second tubular element (37) of said rotor (12) and a second element (17) of said stator (11);
at least one said second seal (31d, 31e, 31f, 31g) being interposed between said first tubular element (36) and said second element (17) of said stator (11);
said second element (17) of said stator (11) defining a stationary second outlet (57), which is fluidly connectable in a selective way to a fourth source (4) of said pressurized aeriform, and said second tubular element (37) defining at least one rotatable second inlet (56) which is fluidly connectable in a selective way to at least one relative said filling valve (7).

10. The manifold of claim 9, **characterized by** comprising a third chamber (75), which is bounded, on one radial side, by said second tubular element (37) and, on the opposite radial side, by a third element (38) of said rotor (12) and a third element (19) of said stator (11);
at least one said third seal (31h, 31i, 31j, 31k) being interposed between said second tubular element (37) and a third element (19) of said stator (11);
said third element (19) of said stator (11) defining at least one stationary third inlet (76), which is fluidly connectable in a selective way to a fourth stationary source (4) of said pressurized aeriform;
said third element (38) of said rotor (12) defining a rotary third outlet (77), which is fluidly connectable in a selective way to said at least one filling valve (7).

11. The manifold of claim 10, **characterized in that** at least one said fourth seal (311, 31m, 31n) is interposed between said third element (38) of said rotor (12) and a fourth element (20) of said stator (11).

12. The manifold of claim 10 or 11, **characterized in that** at least one seal (31c, 31d, 31g, 31h, 31k, 311) of said pair of said seals (31a, 31b, 31c, 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n) is axially interposed between a relative one of said first chamber (45), second chamber (55), third chamber (75) and a relative annular ring (100a, 100b, 100c, 100d, 100e, 100f)
said first chamber (45) and said second chamber (55) being coaxial with respect to one another.

13. A filling unit (1) for filling a plurality of articles (8) with a pourable filling product, especially a food product, comprising:

- a manifold (10) according to any one of the foregoing claims;
- a tank (2), which can be filled by said manifold (4) with said pourable product and is rotatable about said axis (A);
- a carousel (6), which is rotatable about said axis (A) and comprises a plurality of filling valves (7); and
- a first source (3), which is stationary about said axis (A) and is fillable with said pourable product;
- a second source (102), which is filled with said first aeriform and is stationary about said axis (A);

said filing valves (7) being fluidly connected in a selective way with said tank (2) and adapted to selectively fill respective articles (8) with said pourable product.

14. The filling unit of claim 13, when depending on any one of claims 8 to 12, **characterized by** comprising said third source (5), which is fillable, in use, with said sterilizing agent and is stationary about said axis (A).

15. The filing unit of claim 13 or 14, when depending on any one of claims 8 to 11, **characterized by** comprising said fourth source (4), which is fillable, in use, with said second aeriform and is stationary about said axis (A).

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

1. A manifold (10) for a rotatable tank (2) of a filling unit (1) for filling a plurality of articles (8) with a pourable product, comprising:

- a stator (11), which is stationary about an axis (A) and is connectable to a stationary first source (3) of said pourable product;
- a rotor (12), which is rotatable to about said axis (A) and is connectable to said rotatable tank (2); and
- a plurality of annular rings (100a, 100b, 100c, 100d, 100e, 100f), which are radially interposed between said stator (11) and said rotor (12) and are fillable, in use, with a first aeriform so as to create respective pneumatic seals;
- a single inlet (101), which is fluidly connectable to a second source (102) of said first aeriform;
- a single outlet (104), which is fluidly connectable to a discharging section (106) adapted to collect discharged first aeriform; and
- a pneumatic circuit (103), which extends between said single inlet (101) and said single outlet (104);

characterized in that said pneumatic circuit (103) feeds, in use, in series a selectable group formed by one or more of said annular rings (100a, 100b, 100c, 100d, 100e, 100f);
said pneumatic circuit (103) forming, in use, a plurality of configurations, on the basis of the operative needs;
in each of said configurations, one of said annular rings (100a, 100b, 100c, 100d, 100e, 100f) being connected, in use, to said second source (102) through said single inlet (101), and another one of said rings (100a, 100b, 100c, 100d, 100e, 100f) being connected, in use, to said discharging section (106) through said single outlet (104);
in each of said possible configurations, being possible to selectively isolate, in use, one or more said annular rings (100a, 100b, 100c, 100d, 100e, 100f) from said second source (102) and said discharging section (106), and to fluidly connect, in use, in series the remaining said annular rings (100a, 100b, 100c, 100d, 100e, 100f) with said single inlet (101) and said single outlet (104).

2. The manifold of claim 1, **characterized in that** said pneumatic circuit (103) comprises at least one duct (110, 111, 112, 113, 114; 110', 111', 112'), which is fluidly connected to at least one of said annular rings (100a, 100b, 100c, 100d, 100e, 100f) and is arranged external with respect to said stator (11) and said rotor (12).

3. The manifold of claim 2, **characterized in that** each said annular rings (100a, 100b, 100c, 100d, 100e, 100f) comprises an inlet connector (105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f') and an outlet connector (105a, 105a'; 105b, 105b'; 105c, 105c'; 105d, 105d'; 105e, 105e'; 105f, 105f'), which can be selectively:

either fluidly connected with respective ducts (110, 111, 112, 113, 114; 110', 111', 112') of said pneumatic circuit (103); or
fluidly connected with said single inlet (101); or
fluidly connected with said single outlet (104); or
fluidly isolated from said single inlet (101) and said single outlet (104).

4. The manifold of claim 3, **characterized in that** at least one annular ring (100a, 100b, 100c, 100d, 100e, 100f) extends inside said stator (11) and is closed by said rotor (12).

5. The manifold of any one of the foregoing claims, **characterized by** comprising a plurality of mechanical seals (31a, 31b, 31c, 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n) radially interposed between said rotor (12) and said stator (11);
each said annular ring (100a, 100b, 100c, 100d, 100e, 100f) being axially interposed between a pair of said seals (31a, 31b, 31c 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n).

6. The manifold of claim 5, **characterized in that** at least one of said seal (31a, 31b, 31c 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n) comprises:

- a shoe (80), which is fitted to one (11) of said stator (11) and said rotor (12); and
- an elastic ring (81), which is fitted to the other one (12) of said stator (11) and said rotor (12), and contacts said shoe (80);

said ring (81) having an elliptic section in a plane parallel to said axis (A).

7. The manifold of any one of the foregoing claims, **characterized by** comprising:

- a first radial bearing (32), which is interposed between said stator (11) and said rotor (12); and
- a second axial and radial bearing (70), which is interposed between said stator (11) and said rotor (12);

said second axial and radial bearing (70) comprising:

- a first ring (71) fitted to said stator (11);
- a second ring (72) fitted to said rotor (12); and
- a plurality of spherical rolling bodies (73) interposed between said first ring (71) and said second ring (72);

each said spherical rolling body (73) having four contact points with said first ring (71) and said second ring (72).

8. The manifold of any one of the foregoing claims,

characterized by comprising:

- a duct (25) defined by said rotor (12) and adapted to convey said pourable product inside said tank (2); and
- a first chamber (45), which is bounded, on one radial side, by said duct (25) and, on the opposite radial side, by a first tubular element (36) of said rotor (12) and a first element (16) of said stator (11);

at least one said first seal (31a, 31b, 31c) being interposed between said duct (25) and said first element (16) of said stator (11);
said first element (16) defining a stationary first inlet (46), which is fluidly connectable in a selective way to a stationary third source (5) of a sterilizing agent;
said first tubular element (36) defining at least one rotary first outlet (47), which is fluidly connectable in a selective way to at least one said respective filling valves (7).

9. The manifold of claim 8, **characterized by** comprising a second chamber (55), which is bounded, on one radial side, by said first tubular element (36) and, on the opposite radial side, by a second tubular element (37) of said rotor (12) and a second element (17) of said stator (11);
at least one said second seal (31d, 31e, 31f, 31g) being interposed between said first tubular element (36) and said second element (17) of said stator (11);
said second element (17) of said stator (11) defining a stationary second outlet (57), which is fluidly connectable in a selective way to a fourth source (4) of said pressurized aeriform, and said second tubular element (37) defining at least one rotatable second inlet (56) which is fluidly connectable in a selective way to at least one relative said filling valve (7).

10. The manifold of claim 9, **characterized by** comprising a third chamber (75), which is bounded, on one radial side, by said second tubular element (37) and, on the opposite radial side, by a third element (38) of said rotor (12) and a third element (19) of said stator (11);
at least one said third seal (31h, 31i, 31j, 31k) being interposed between said second tubular element (37) and a third element (19) of said stator (11);
said third element (19) of said stator (11) defining at least one stationary third inlet (76), which is fluidly connectable in a selective way to a fourth stationary source (4) of said pressurized aeriform;
said third element (38) of said rotor (12) defining a rotary third outlet (77), which is fluidly connectable in a selective way to said at least one filling valve (7).

11. The manifold of claim 10, **characterized in that** at least one said fourth seal (311, 31m, 31n) is interposed between said third element (38) of said rotor (12) and a fourth element (20) of said stator (11).

12. The manifold of claim 10 or 11, **characterized in that** at least one seal (31c, 31d, 31g, 31h, 31k, 311) of said pair of said seals (31a, 31b, 31c, 31d, 31e, 31f, 31g, 31h, 31i, 31j, 31k, 311, 31m, 31n) is axially interposed between a relative one of said first chamber (45), second chamber (55), third chamber (75) and a relative annular ring (100a, 100b, 100c, 100d, 100e, 100f)
said first chamber (45) and said second chamber (55) being coaxial with respect to one another.

13. A filling unit (1) for filling a plurality of articles (8) with a pourable filling product, especially a food product, comprising:

- a manifold (10) according to any one of the foregoing claims;
- a tank (2), which can be filled by said manifold (4) with said pourable product and is rotatable about said axis (A);
- a carousel (6), which is rotatable about said axis (A) and comprises a plurality of filling valves (7); and
- a first source (3), which is stationary about said axis (A) and is fillable with said pourable product;
- a second source (102), which is filled with said first aeriform and is stationary about said axis (A);

said filing valves (7) being fluidly connected in a selective way with said tank (2) and adapted to selectively fill respective articles (8) with said pourable product.

14. The filling unit of claim 13, when depending on any one of claims 8 to 12, **characterized by** comprising said third source (5), which is fillable, in use, with said sterilizing agent and is stationary about said axis (A).

15. The filing unit of claim 13 or 14, when depending on any one of claims 8 to 11, **characterized by** comprising said fourth source (4), which is fillable, in use, with said second aeriform and is stationary about said axis (A).

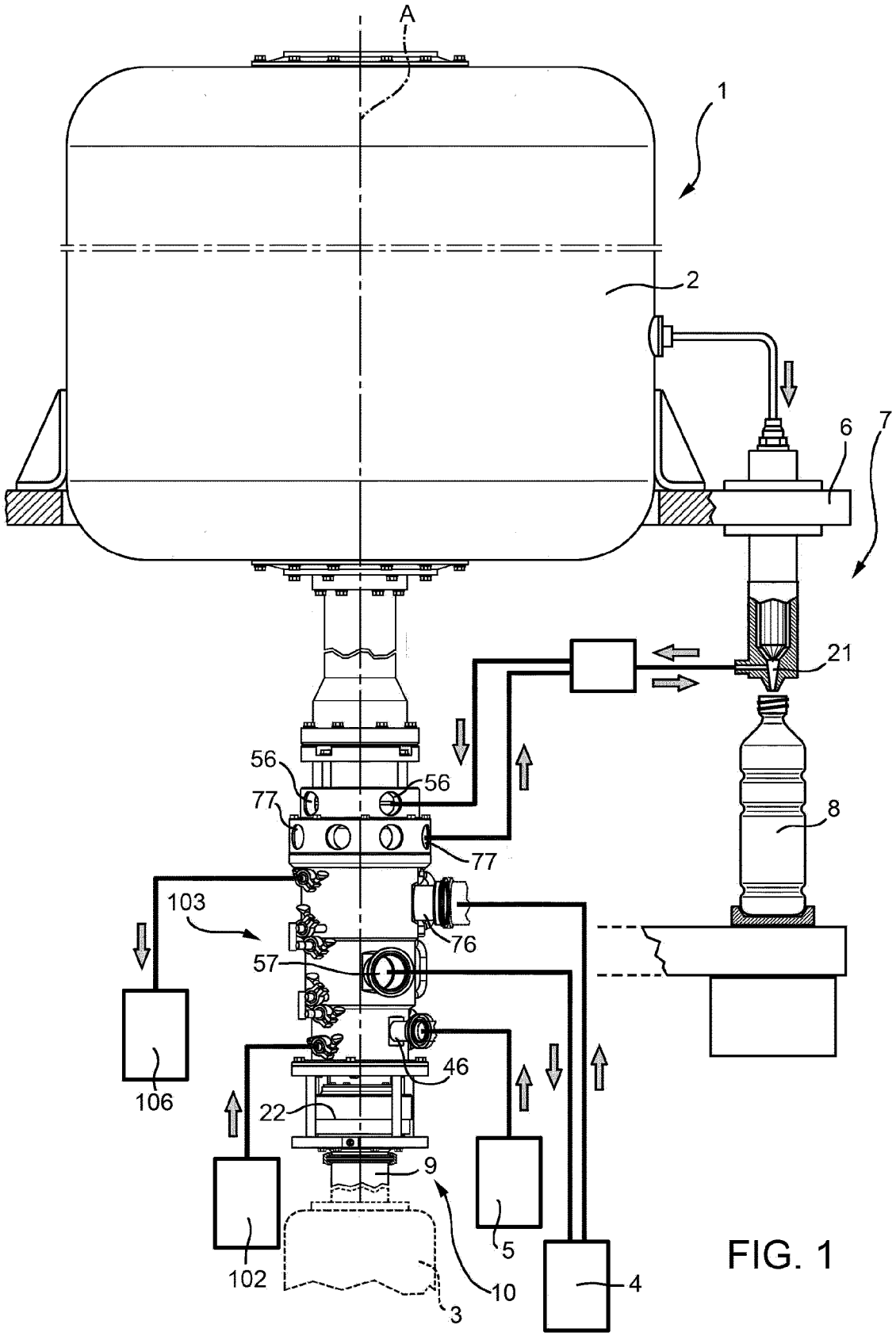
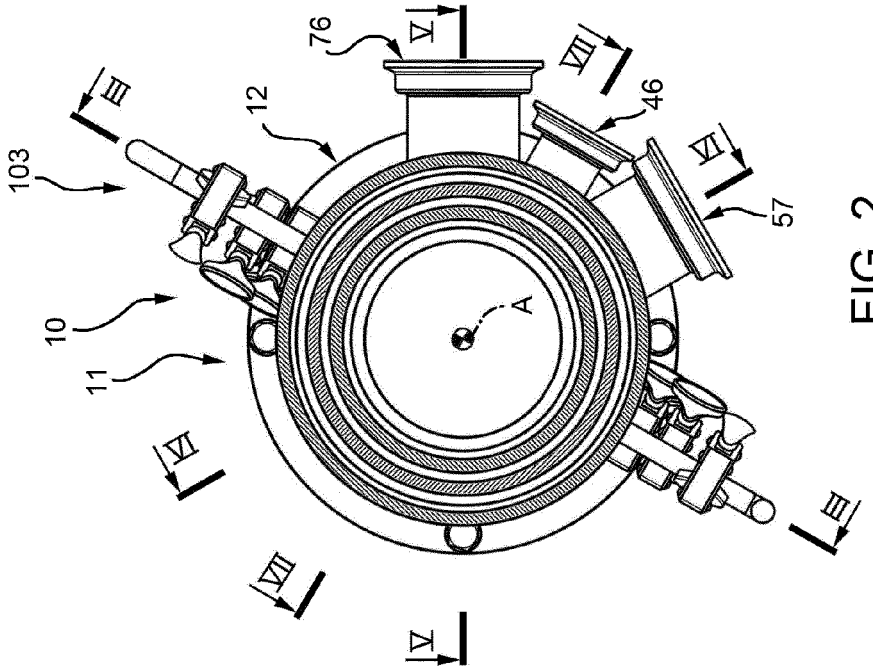


FIG. 1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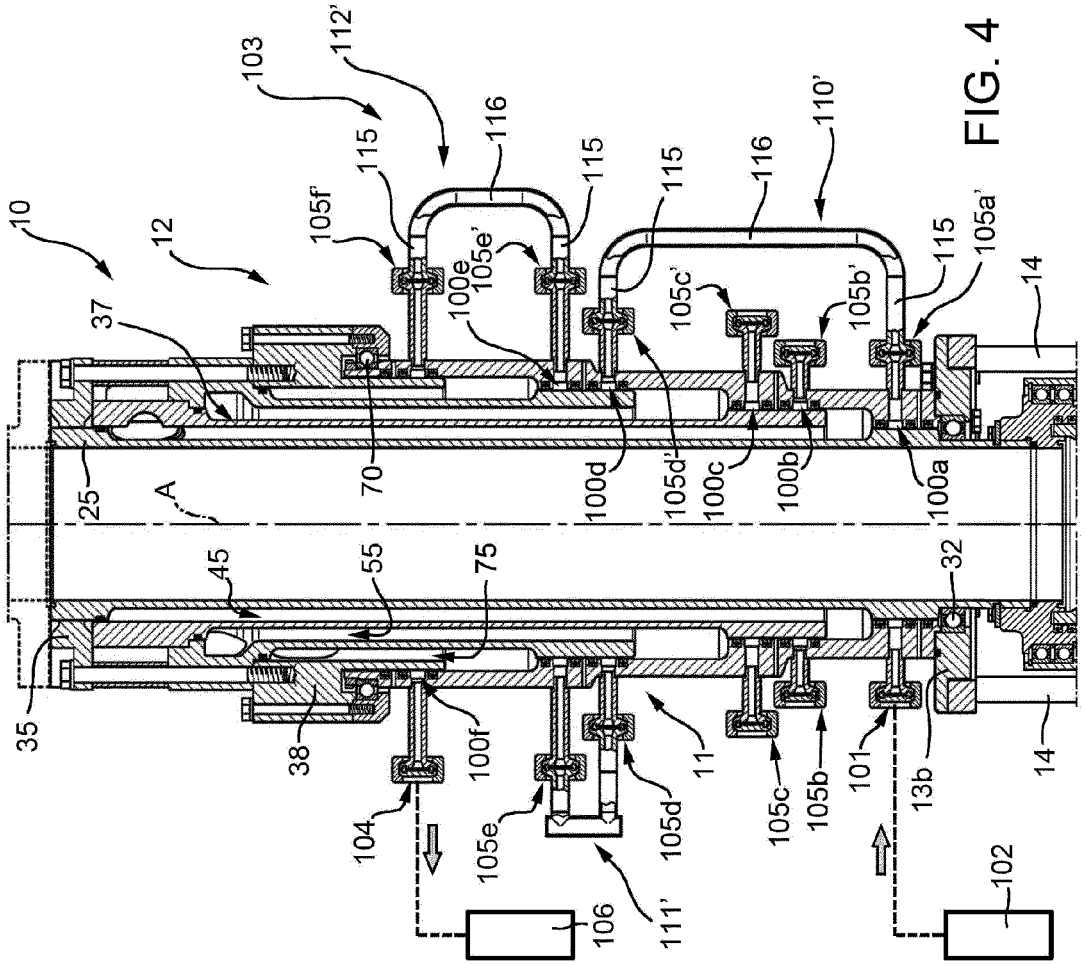
V
VII
46
III
12
103
VI
57
10
A
11
IV
III
V

FIG. 2


103
112'
116
115
105f'
115
115
116
110'
10
12
105e'
100e
105c'
105b'
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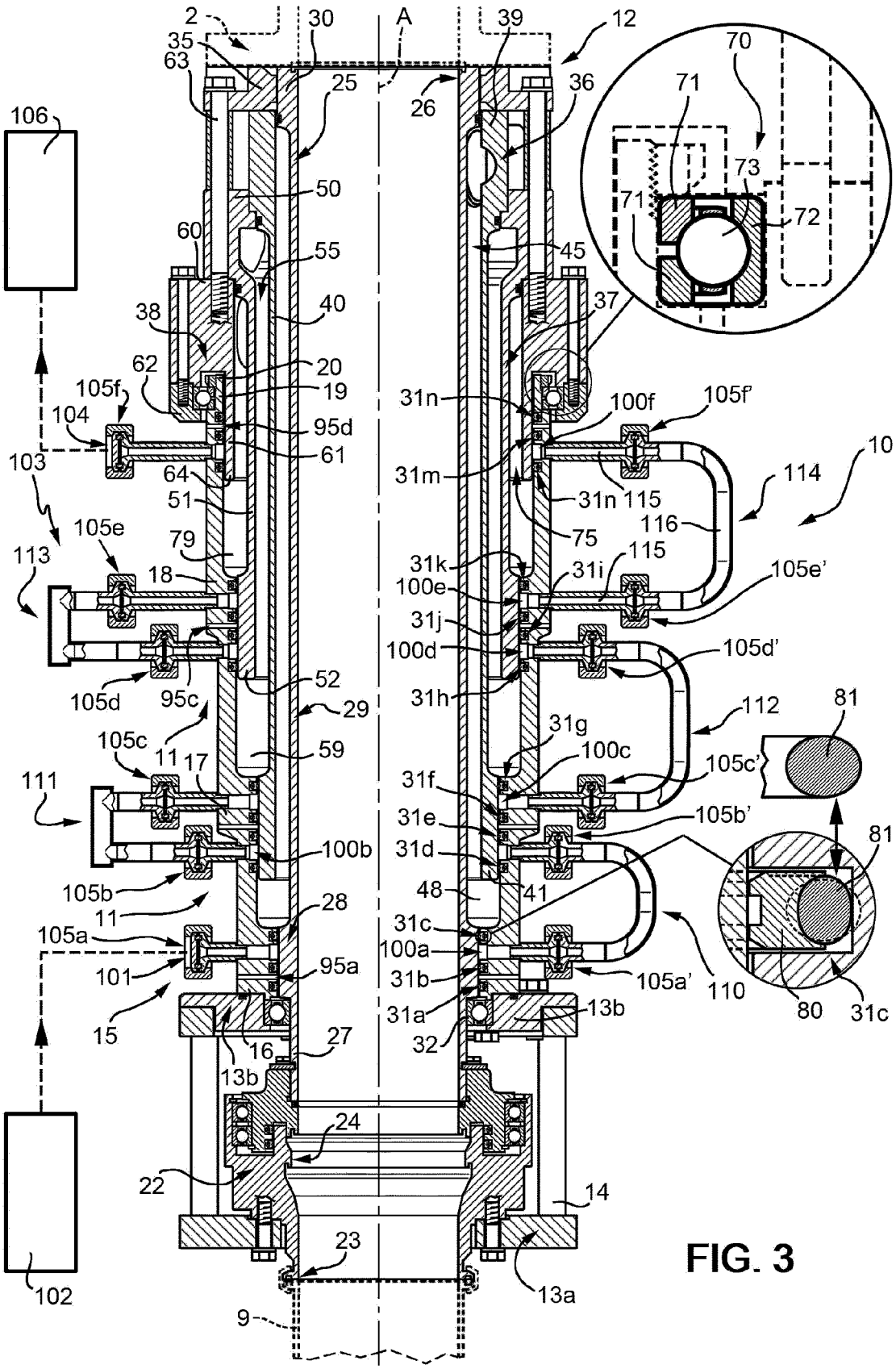
105a'
14
37
70
100d
105d'
100c
100b
100a
25
A
45
55
75
32
35
38
100f
11
105c
105b
101
13b
14
104
105e
105d
111'
106
102

FIG. 4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A
39
12
35
63
25
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36
70
71
73
72
106
50
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45
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38
20
62
19
105f
31n
100f
105f'
104
95d
61
31m
10
114
103
64
51
31n
115
116
105e
79
75
115
113
18
31k
31i
105e'
100e
31j
100d
105d'
52
105d
95c
31h
112
81
29
105c
11
17
59
31g
100c
105c'
111
31f
105b'
31e
81
100b
31d
105b
48
41
28
11
31c
105a
100a
95a
105a'
110
101
31b
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16
27
32
13b
24
22
14
23
13a
102
9

FIG. 3

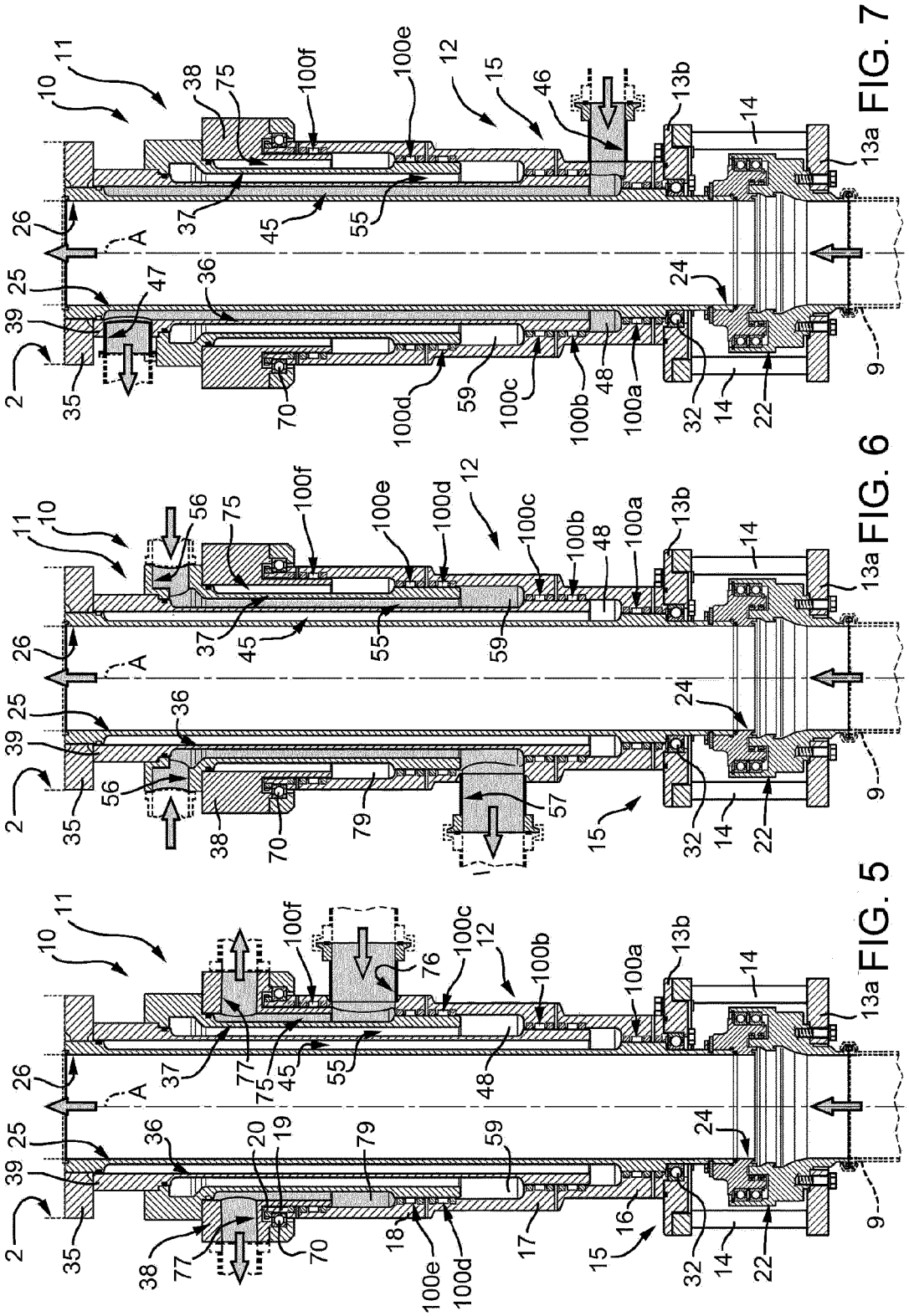

FIG. 7

FIG. 6

FIG. 5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 14 20 0457

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search	Date of completion of the search	Examiner
The Hague	1 July 2015	Wartenhorst, Frank

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