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(54) **FILLING APPARATUS**

(57) To provide a filling apparatus (1) capable of filling a liquid (5) containing solids (5A) into a container (3) without hindrance.

When a liquid (5) containing solids (5A) in a liquid tank (13) is introduced into a manifold (8), the liquid (5) containing the solids is supplied to filling nozzles (4) through distribution pipes (9) connected to respective distribution ports (8a), and is filled into a container (3) through the filling nozzles (4).

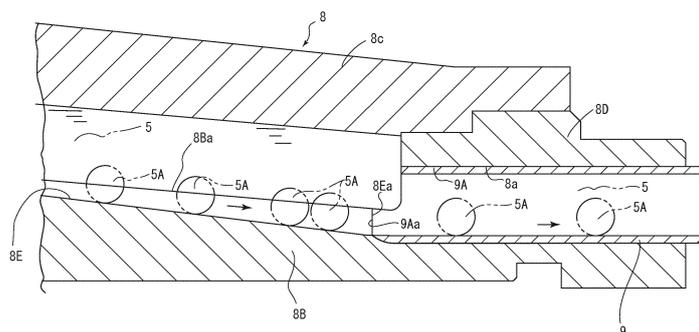
On an upper surface (8Ba) of a bottom plate (8B) in the manifold (8), guide grooves (8E) are radially formed to extend from a center portion to the respective distribution ports (8a). Each of the guide grooves (8E) is formed to be gradually deepened from the center portion

toward the distribution port (8a).

When the liquid (5) containing the solids is introduced into the manifold (8), the solids (5A) contained in the liquid (5) enter the guide grooves (8E), and are arranged in a radial direction and guided to the respective distribution ports (8a) and then sent into the respective distribution pipes (9). Then, the liquid (5) containing the solids is filled into the container (3) through the filling nozzles (4) without hindrance.

The plurality of solids (5A) can be prevented from being simultaneously collected in the distribution port (8a), and the distribution port (8a) can be prevented from being clogged with the plurality of solids (5A).

Fig. 4



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a filling apparatus, and more particularly, to a filling apparatus suitable for filling a liquid containing solids into a container.

Description of the Related art

[0002] There has been conventionally known a filling apparatus capable of filling a liquid containing solids into a container (for example, Japanese Patent Laid-Open No. 2011-084324). Here, the liquid containing solids means a liquid containing, for example, *nata de coco*, juice sacs of citrus fruits, or pulp of mango, grape, apple, pineapple or the like.

[0003] A conventional filling apparatus is configured to fill a liquid into the containers by supplying the liquid to a plurality of filling nozzles through respective distribution pipes via a manifold from a liquid tank. The above-described filling apparatus is adapted to prevent the filling nozzles from being clogged with the solids by changing a filling operation according to whether the solids are contained in the liquid or according to the sizes of the solids contained in the liquid.

[0004] In the conventional filling apparatus, the above-described measures prevent the filling nozzles from being clogged with the solids, but the clogging occurs not only in the filling nozzles but also in the manifold on the upstream side of the filling nozzles. Specifically, since distribution ports to which a number of distribution pipes are to be connected, respectively, are formed in the manifold as distribution means, a problem has occurred in that when the liquid flows into the manifold from the liquid tank and then flows into each of the distribution pipes through the respective distribution ports, a plurality of solids simultaneously enter the distribution port, which causes the distribution port to be clogged with the solids, or the plurality of solids are crushed or damaged when the solids pass through the distribution port.

SUMMARY OF THE INVENTION

[0005] The present invention has been made in view of the above-described circumstances, and an object thereof is to provide a filling apparatus comprising: a plurality of filling nozzles configured to fill a liquid containing solids into a container; a liquid tank configured to store the liquid containing solids; and a manifold configured to distribute the liquid introduced from an introduction port provided above into the filling nozzles from a plurality of distribution ports, the liquid in the liquid tank being introduced into the manifold from the introduction port, the liquid being supplied to the filling nozzle through the plurality of distribution

ports from the manifold, so that the liquid is filled into the container,

characterized in that on an upper surface of a bottom portion in the manifold, guide grooves are formed toward the respective distribution ports, and the solids contained in the liquid which has been introduced into the manifold are arranged by the guide grooves and are supplied to the filling nozzles through the respective distribution ports.

[0006] Such a configuration can satisfactorily prevent the distribution port from being clogged with the solids contained in the liquid and prevent the solids from being crushed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is a longitudinal sectional view illustrating an embodiment of the present invention;

FIG. 2 is a plan view of a principal part of FIG. 1;

FIG. 3 is an enlarged view of a principal part of FIG. 2; and

FIG. 4 is an enlarged view of a principal part of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0008] Hereinafter, an embodiment of the present invention illustrated in the drawings will be described. In FIG. 1 to FIG. 3, a reference numeral 1 denotes a rotary-type filling apparatus. The rotary-type filling apparatus 1 is adapted to fill liquid 5 containing solids by a predetermined amount into a container 3 through a filling nozzle 4 while holding a neck portion of the container 3 and conveying the container 3 using a gripper 2.

[0009] In the present embodiment, it is assumed that the liquid 5 containing solids is a liquid containing, for example, *nata de coco*, juice sacs of citrus fruits, or pulp of mango, grape, apple, pineapple or the like as solids 5A. The rotary-type filling apparatus 1 of the present embodiment is configured to be capable of filling the liquid 5 containing such solids into the container 3 through the filling nozzle 4 without hindrance.

[0010] The rotary-type filling apparatus 1 includes a rotating body 7 configured to rotate around a rotating shaft 7A extending in a vertical direction as a rotational center, a number of grippers 2 disposed at an equal pitch on an outer peripheral portion of the rotating body 7 and configured to hold and convey the container 3 and to be movable upward and downward, a filling nozzle 4 provided above each of the grippers 2 in the rotating body 7 and configured to fill the liquid 5 into the container 3, a manifold 8 horizontally provided at a center of an upper casing 7B of the rotating body 7 and configured to rotate integrally with the rotating body 7, a plurality of distribution pipes 9 each having an upstream end 9A connected to a corresponding distribution port 8a of the manifold 8 and

having a downstream end 9B connected to the corresponding filling nozzle 4, and a liquid tank 13 configured to store the liquid 5 and introduce the liquid 5 into the manifold 8 through a rotary joint 11 and a liquid supply pipe 12.

[0011] The rotating body 7 includes three upper, middle and lower disk plates 7C to 7E, centers of which being fitted with an outer peripheral portion of the rotating shaft 7A, and the upper casing 7B configured to cover the entire upper disk plate 7C from above to be coupled thereto. The rotating shaft 7A is interlocked with a motor 14 configured to rotate the lower disk plate 7E through a gear 10, and the operation of the motor 14 is controlled by a control device (not illustrated). When the control device operates the motor 14, the rotating body 7 and the manifold 8 are adapted to rotate around the rotating shaft 7A as a rotational center.

[0012] A number of lifting and lowering members 15 are provided on the outer peripheral portion in the lower disk plate 7E and the middle disk plate 7D at an equal pitch in a circumferential direction, to be freely moved upward and downward, and a gripper 2 for holding a neck portion of the container 3 is attached to the upper end portion of each of the lifting and lowering members 15.

[0013] The lifting and lowering member 15 can be moved upward from a lower end to an upper end by a lifting and lowering mechanism 16 including a cam and a cam follower, in a filling region from a supply position A to a position just before a discharge position B when the rotating body 7 is rotated.

[0014] The filling nozzle 4 is vertically attached to a position in the outer peripheral portion of the upper disk plate 7C above each of the grippers 2, and the downstream end 9B of the above-described distribution pipe 9 is connected to the filling nozzle 4.

[0015] The upstream end 9A of the distribution pipe 9 is fitted to the distribution port 8a of the manifold 8, so that the liquid 5 containing solids in the liquid tank 13 flows into the manifold 8 through the rotary joint 11 and the liquid supply pipe 12 from an introduction port 8A at the center portion. Thus, the liquid 5 containing solids that has flowed into the manifold 8 from the introduction port 8A is supplied to each of the filling nozzles 4 through the respective distribution pipes 9 connected to the respective distribution ports 8a.

[0016] In the filling nozzle 4, a liquid passage is formed in a housing of the filling nozzle 4, and a valve body configured to be moved upward and downward by an air cylinder for opening and closing an upper valve is disposed in the liquid passage. When the valve body is moved upward by operation of the air cylinder, the valve body is moved away from a valve seat, to open the liquid passage and start filling of the liquid into the container 3. When the valve body is moved downward by operation of the air cylinder, the valve body is seated to the valve seat formed in an inner surface of the lower end portion of the liquid passage, to close the liquid passage. When the liquid passage is opened by operation of the air cyl-

inder, the filling of the liquid 5 into the container 3 is started. When a predetermined amount of liquid is filled into the container 3, the air cylinder is operated to close the liquid passage, thereby stopping the filling of the liquid 5 into the container.

[0017] Note that, since a configuration of the filling nozzle 4 and configurations of the gripper 2 and the lifting and lowering mechanism 16 are conventionally known, a detailed description herein is omitted.

[0018] Since the liquid 5 containing solids is stored in the liquid tank 13, a stirring device 17 is provided in a lower portion in the liquid tank 13. A motor 18 serving as a drive source of the stirring device 17 is rotated at required time, so that the liquid 5 stored in the liquid tank 13 can be stirred. In this way, the solids 5A contained in the liquid 5 are uniformly mixed, and the liquid 5 in such a state flows into the manifold 8 through the rotary joint 11 and liquid supply pipe 12.

[0019] In the above-described configuration, when the rotating body 7 is rotated by the motor 14, at the supply position A in FIG. 1, the gripper 2 is positioned at the lower end position by the lifting and lowering mechanism 16.

[0020] A supply star wheel (not illustrated) is disposed at a position adjacent to the supply position A. When an empty container 3 is supplied to the supply position A from the supply star wheel, the neck portion of the container 3 is held by the gripper 2 at the supply position A.

[0021] The gripper 2 by which the neck portion of the container 3 is held is lifted up to the upper end by the lifting and lowering mechanism 16 when moving in the filling region along with the rotation of the rotating body 7, and its state is kept.

[0022] When in this state, the air cylinder of the filling nozzle 4 is operated to open the liquid passage of the filling nozzle 4, the liquid 5 supplied in the filling nozzle 4 through the distribution pipe 9 from the manifold 8 is filled by a predetermined amount into the container 3, and then the air cylinder is operated to close the liquid passage of the filling nozzle 4 and thereby stop the filling of the liquid 5 from the filling nozzle 4.

[0023] Then, when the container 3 passes through the filling region along with the rotation of the rotating body 7, the gripper 2 is lowered to an original lower end by the lifting and lowering mechanism 16. When the container 3 is moved to the discharge position B, a barrel portion of the container 3 is held by the gripper of the discharge star wheel (not illustrated) provided at the discharge position B, and the container is discharged to the downstream side.

[0024] The liquid 5 containing solids is filled into the containers 3 from the filling nozzles 4 while the containers 3 whose neck portions are thus held by the respective gripper 2 at the supply position A are moved in the filling region along with the rotation of the rotating body 7, and then the containers 3 are discharged to the downstream side at the discharge position B.

[0025] The present embodiment is characterized in

that the manifold 8 is improved as follows based on the above-described configuration of the rotary-type filling apparatus 1, to thereby satisfactorily prevent the distribution port 8a from being clogged with the solids 5A and fill the liquid 5 containing such solids into the container 3 without hindrance.

[0026] That is, in FIG. 2 to FIG. 4, the manifold serving as the distribution means of the liquid 5 includes a bottom plate 8B formed in a substantially conical shape in which a center portion becomes higher than an outer peripheral portion, and a top plate 8C formed in a substantially conical shape in which a center side becomes higher than the outer peripheral portion in the same way as the bottom plate 8B. Thus, in the manifold 8, a flat circular internal space is formed. Then, a cylindrical introduction port 8A is formed at a center portion of the top plate 8C, and the liquid 5 is introduced into the internal space of the manifold 8 from the introduction port 8A.

[0027] Through holes as the above-described distribution ports 8a provided at an equal pitch in the circumferential direction are pierced along a radial direction in an annular portion 8D as an outer peripheral portion of the bottom plate 8B, and the upstream end 9A of the above-described distribution pipe 9 corresponding to each of the distribution ports 8a is maintained to ensure the liquid tightness and is fitted to each of the distribution ports 8a.

[0028] In the present embodiment, an upper surface 8Ba of the bottom plate 8B which is positioned in the internal space is set to a conical surface being inclined by about 5° with respect to a horizontal surface.

[0029] In the upper surface 8Ba of the bottom plate 8B, guide grooves 8E extending in the radial direction are formed toward the respective distribution ports 8a from the center portion of the upper surface 8Ba. Each of the guide groove 8E is formed so that the depth of the guide groove 8E is the shallowest at the center portion of the bottom plate 8B, is gradually deepened toward the distribution port 8a as the outer peripheral portion, and is the deepest at a distal end portion 8Ea adjacent to the distribution port 8a. In the present embodiment, each of the guide grooves 8E is formed to be inclined by about 7° with respect to a horizontal surface.

[0030] The cross section (cross section in a tangent line direction) perpendicular to a longitudinal direction of the guide groove 8E is formed in a substantially semi-circular shape, and a width or a diameter of the distal end portion 8Ea adjacent to the distribution port 8a is set to have the same dimension as the inner diameter of the distribution pipe 9 fitted to the distribution port 8a. Thus, the distal end portion 8Ea of the guide groove 8E and the distal end portion 9Aa of the upstream end 9A of the distribution pipe 9 are substantially continuous in the radial direction. The width (diameter) of the distal end portion 8Ea of the guide groove 8E is set to a dimension larger than a maximum diameter of the solids 5A contained in the liquid 5.

[0031] As described above, in the manifold 8 of the present embodiment, the guide grooves 8E as many as

the distribution ports 8a are formed in the upper surface 8Ba of the bottom plate 8B toward the radial direction. When the liquid 5 is introduced into the manifold 8 from the introduction port 8A, the liquid 5 flows toward the distribution ports 8a and the upstream ends 9A of the respective distribution pipes 9 along the inclined upper surface of the bottom plate 8B. At this time, a number of solids 5A contained in the liquid 5 enter each of the guide grooves 8E, and are arranged in a row, and then are guided to the corresponding upstream end 9A of the distribution pipe 9, so that the solids 5A flows smoothly into the distribution pipe 9 (see FIG. 4).

[0032] As described above, in the present embodiment, a number of guide grooves 8E are formed in the upper surface 8Ba of the bottom plate 8B in the manifold 8, and the solids 5A contained in the liquid 5 are guided to the distribution ports 8a and the upstream ends 9A of the respective distribution pipes 9 in a state in which the solids 5A are arranged in a row in the radial direction by the respective guide grooves 8E.

[0033] Therefore, this can satisfactorily prevent a plurality of solids 5A from being collected at the distribution port 8a and prevent the distribution port 8a from being clogged with the plurality of solids 5A. Accordingly, even when the liquid 5 containing solids is used, the liquid 5 can be filled into the container 3 through the above-described filling nozzle 4 without hindrance.

[0034] Since a plurality of solids 5A is prevented from being simultaneously collected in the distribution ports 8a and the upstream ends 9A of the respective distribution pipes 9, the plurality of solids 5A can be satisfactorily prevented from being crushed and damaged at the distribution ports 8a and the upstream ends of the respective distribution pipes 9. Accordingly, even when the liquid 5 containing solids is used, the liquid 5 can be filled into the container 3 through the above-described filling nozzle 4 without hindrance.

[0035] Note that although in the above-described embodiment, the bottom plate 8B of the manifold 8 is formed in a substantially conical shape, the entire upper surface of the bottom plate 8B may be a flat surface and the above-described guide grooves 8E may be formed on the upper surface of the bottom plate 8B.

[0036] Note that in the above-described embodiment, a cross-sectional shape of the guide groove 8E is a substantially semi-circular shape, but is not limited thereto. The cross section of the guide groove 8E may be formed in a V-shape or a recessed shape.

[0037] Furthermore, the above-described embodiment describes a case where the present invention is applied to the manifold 8 of the rotary-type filling apparatus 1, but it is needless to say that the present invention can be applied to the manifold of a line type filling apparatus.

Reference Signs List

[0038]

1	Rotary-type filling apparatus	
4	Filling nozzle	
5	Liquid	
5A	Solid	
8	Manifold	5
8A	Introduction port	
8a	Distribution port	
8B	Bottom plate	
8Ba	Upper surface	
8E	Guide groove	10
13	Liquid tank	

formed in a substantially semi-circular shape, and a diameter of a distal end portion of the guide groove on a distribution port side is larger than a maximum diameter of the solids contained in the liquid.

Claims

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1. A filling apparatus, comprising:
- a plurality of filling nozzles configured to fill a liquid containing solids into a container;
- a liquid tank configured to store the liquid containing solids; and
- a manifold configured to distribute the liquid introduced from an introduction port provided above into the respective filling nozzles from a plurality of distribution ports,
- the liquid in the liquid tank being introduced into the manifold from the introduction port, the liquid being supplied to the respective filling nozzles through the plurality of distribution ports from the manifold, so that the liquid is filled into the container,
- characterized in that** on an upper surface of a bottom portion in the manifold, guide grooves are formed toward the respective distribution ports, and the solids contained in the liquid which is introduced into the manifold are arranged by the guide grooves and are supplied to the filling nozzles through the respective distribution ports.
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2. The filling apparatus according to claim 1, **characterized in that**,
- a bottom portion of the manifold is formed in a substantially conical shape in which a center portion becomes higher than an outer peripheral portion, and the guide grooves are formed in a radial direction toward the respective distribution ports on an outer peripheral side from a center portion of the manifold, and
- an inclination angle of each of the guide grooves is larger than the inclination angle of the upper surface of the bottom portion so that the guide grooves are gradually deepened toward the respective distribution ports.
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3. The filling apparatus according to claim 1 or claim 2, **characterized in that**
- a cross section of each of the guide grooves is

Fig. 1

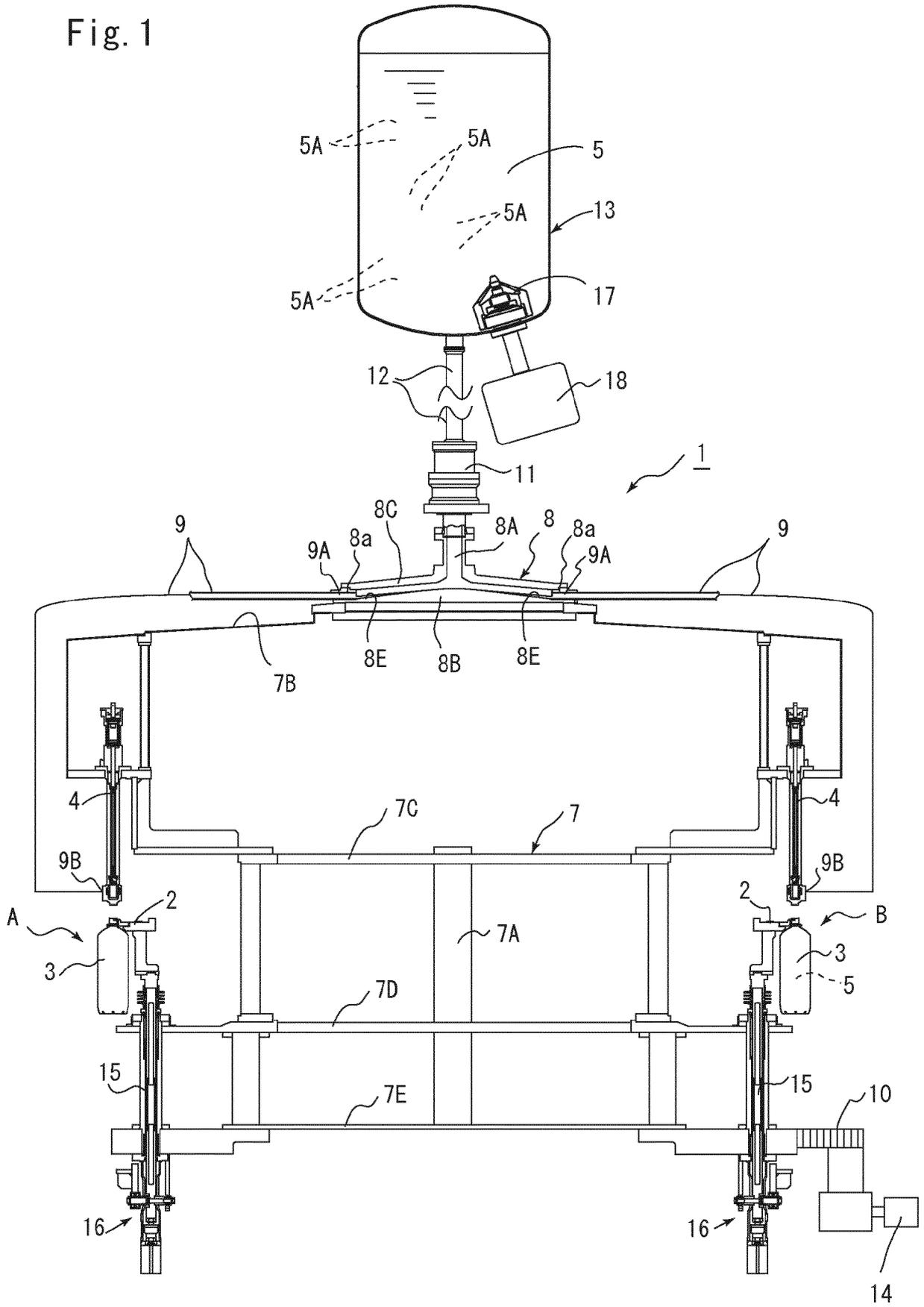
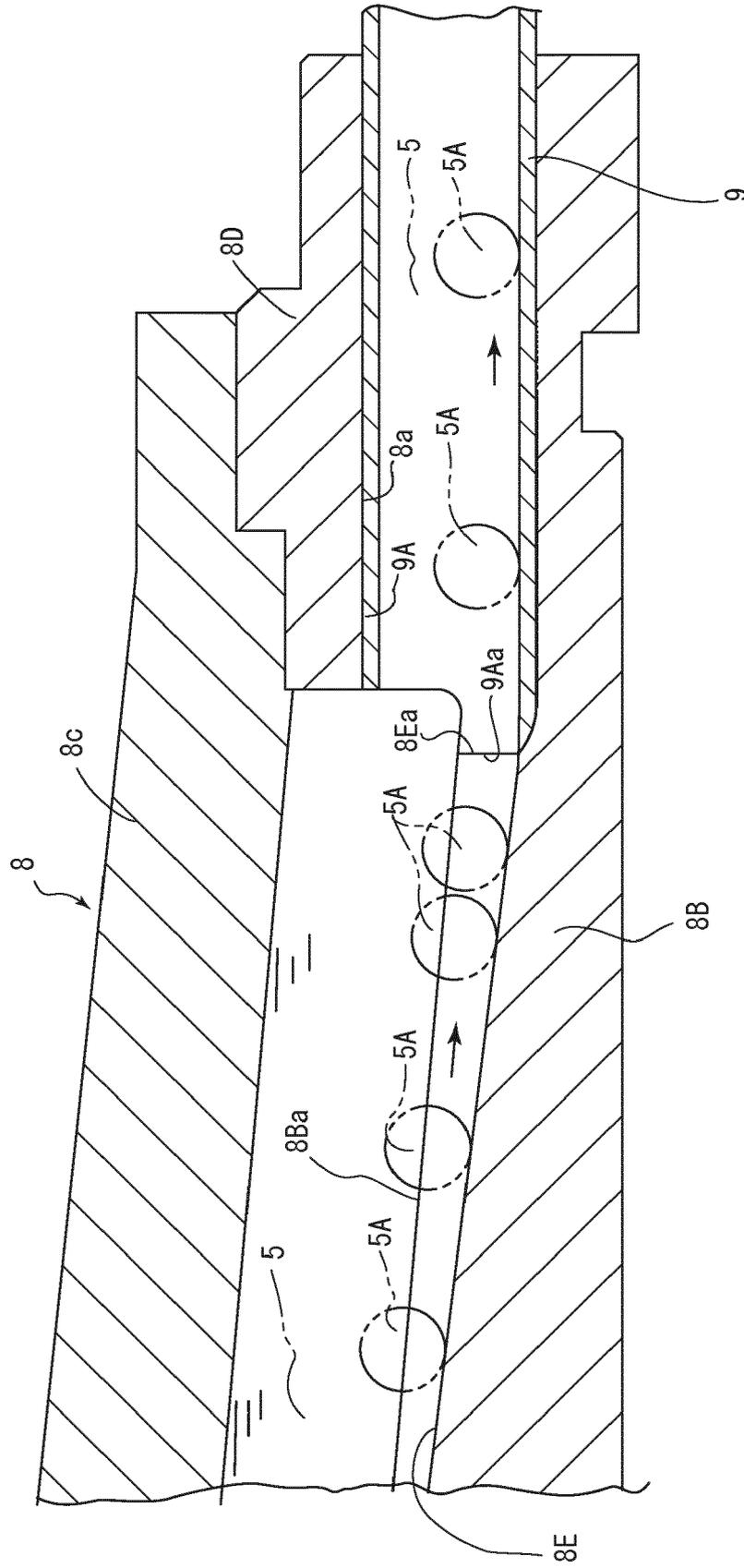


Fig. 4





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Application Number
EP 19 21 2592

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Place of search The Hague		Date of completion of the search 25 May 2020	Examiner Wartenhorst, Frank
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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