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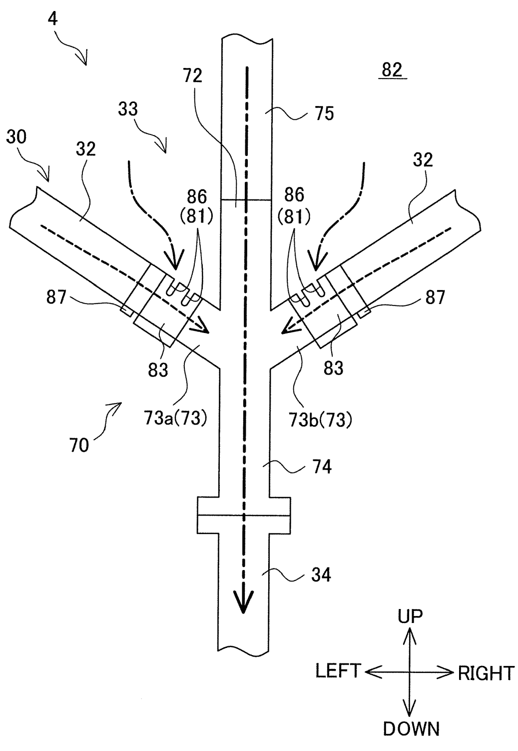
(54) MELT SPINNING SYSTEM

(57) An object of the present invention is to suppress airflow in the vicinity of filaments from being disturbed.

A melt spinning system 1 comprises a spinning unit 2 which spins the filaments out, a cooling unit 3 which cools the filaments, and an exhaust unit 4 which includes a waste channel 30 sucking and discharging the gas being generated from the filaments. The exhaust unit 4 includes a sucking unit 31 which includes a suction port of the gas, a duct 32 which is placed downstream of the sucking unit 31 in the gas discharge direction, an aspirator 33 which is placed downstream of the duct 32 and sucks and discharges the gas, a connecting pipe 34 which is placed downstream of the aspirator 33 and connected to an intermediate part of a fixed pipe 100 being fixedly provided, and an inflow suppressor 70 which suppresses inflow of the gas into the connecting pipe 34 from the fixed pipe 100.

FIG.10



EP 3 730 678 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a melt spinning system.

[0002] A melt spinning device recited in Patent Literature 1 (DE102013012869A1) spins molten polymer out as filaments from a spinneret. The filaments spun out are cooled by cooling wind which is supplied through a cooling cylinder being provided below the spinneret. In this process, from the filaments immediately after being spun out, monomer gas is generated. Monomers are raw materials of polymer. When the gas is solidified and adheres to such as the spinneret or the cooling cylinder, etc., the quality of yarns may be deteriorated because the filaments are shaken by the disturbed cooling wind. In addition to that, problems such as yarn breakage or facility malfunction, etc., may happen.

[0003] Therefore, the melt spinning device described above is configured to be able to discharge the gas. To be more specific, between the spinneret and the cooling cylinder, a suction member which is formed suction ports in a wall surface and ring-shaped is provided. Typically, a melt spinning device includes an exhaust device which sucks and discharges gas through the suction ports by generating negative pressure. The gas which is sucked by the exhaust device passes through a connecting pipe connected with the exhaust device. Then, the gas flows toward the downstream side in the direction in which the gas is discharged (gas discharge direction).

SUMMARY OF THE INVENTION

[0004] In a yarn production plant, typically, melt spinning devices each of which includes an exhaust device are provided to form one large melt spinning system. In addition to that, typically, connecting pipes each of which is connected with the exhaust device are provided to be merged with a fixed pipe which is fixedly provided in the production plant. In other words, the connecting pipe is connected to an intermediate part of the fixed pipe. In this case, for example, when airflow is disturbed at the junction of the fixed pipe and the connecting pipe, part of the gas may flow into the connecting pipe from the fixed pipe (i.e., to the upstream side in the gas discharge direction). Because of this, the pressure in a space on the upstream side in the gas discharge direction is changed. On this account, airflow is disturbed at around filaments immediately after being spun out, and the filaments are shaken. As a result, the quality of yarns may be deteriorated.

[0005] An object of the present invention is to suppress airflow at around filaments from being disturbed.

[0006] A melt spinning system according to a first aspect of the invention includes: a spinning unit which includes a spinneret for spinning out filaments; a cooling unit which includes a cooling cylinder provided below the spinneret, the cooling unit cooling the filaments which are spun out from the spinneret; and at least one exhaust unit which is provided between the spinning unit and the cooling unit in a running direction of the filaments, the at least one exhaust unit including a waste channel for sucking and discharging gas which is generated from the filaments, the at least one exhaust unit including: a sucking unit which is provided between the spinneret and the cooling cylinder and includes a suction port for sucking the gas; a duct unit which is provided downstream of the sucking unit in the gas discharge direction in which the gas is discharged; an exhaust device which is provided downstream of the duct unit in the gas discharge direction and sucks and discharges the gas; a connecting pipe which is connected to an intermediate part of a fixed pipe which is fixedly provided, the connecting pipe being provided downstream of the exhaust device in the gas discharge direction; and an inflow suppressor which suppresses inflow of the gas into the connecting pipe from the fixed pipe.

[0007] In the present invention, the connecting pipe is connected to an intermediate part of the fixed pipe. In this case, when airflow is disturbed at the junction of the fixed pipe and the connecting pipe, part of the gas may flow backward into the connecting pipe from the fixed pipe. Because of this, airflow at around the filaments is disturbed on an upstream side in the gas discharge direction, and the filaments are easily shaken. As a result, the quality of yarns may be deteriorated, and yarn breakage may occur. In the present invention, the gas inflow into the connecting pipe from the fixed pipe is suppressed by the inflow suppressor. Therefore, airflow in the vicinity of the filaments is suppressed from being disturbed.

[0008] According to a second aspect of the invention, in the melt spinning system of the first aspect, the exhaust device is configured to be able to change output and includes a gas inlet for allowing the gas to flow in, at least one of the gas inlet and the duct unit includes an outside air intake which connects the waste channel with a space outside the waste channel, and the inflow suppressor includes the exhaust device and the outside air intake.

[0009] In the present invention, by increasing an output of the exhaust device, a flow amount of the gas flowing in the connecting pipe is increased, and the gas inflow into the connecting pipe from the fixed pipe is suppressed. Meanwhile, when the output of the exhaust device is augmented simply, the negative pressure of a space upstream of the exhaust device in the gas discharge direction may be increased, with the result that the discharge speed of the gas at around the filaments may become excessive and the airflow in the vicinity of the filaments may be easily disturbed. As a further step, for example, by providing a valve between the sucking unit and the exhaust device in the gas discharge direction in order to increase passage resistance, the flow amount of the gas on the upstream side may be decreased. However, this method is disadvantageous in that the waste channel of the gas is narrowed by the valve, and when monomer gas is solidified, the channel tends to be clogged.

[0010] To solve this problem, in the present invention, at least one of the gas inlet and the duct unit is provided with an outside air intake. Because of this, when the exhaust device is in operation, outside air can be taken into the waste channel through the outside air intake. On this account, by merging the gas which flows in the waste channel with the outside air, the sucking pressure (the negative pressure) can be decreased. Therefore, the flow rate of the gas which flows from the upstream of the outside air intake in the gas discharge direction is decreased as compared to a case where the outside air intake is not formed. As a result, even when the output of the exhaust device is high, the discharge speed of the gas at around the filaments is suppressed from being too high and airflow in the vicinity of the filaments f is suppressed from being disturbed, without narrowing the waste channel of the gas.

[0011] According to a third aspect of the invention, the melt spinning system of the second aspect is arranged such that the at least one exhaust unit further includes an adjustment unit for adjusting an opening degree of the outside air intake.

[0012] In the present invention, when a flow amount of outside air which is taken in through the outside air intake needs to be adjusted, the flow amount is adjustable by adjusting the opening degree of the outside air intake by the adjustment unit.

[0013] According to a fourth aspect of the invention, the melt spinning system of the third aspect is arranged such that the adjustment unit includes a cover member for covering a part of the outside air intake, and by being moved along a surface which includes a periphery of the outside air intake, the cover member is able to change an area of a part which covers the outside air intake.

[0014] In the present invention, by a simple operation of moving the cover member along a surface which includes a periphery of the outside air intake, the opening degree of the outside air intake is easily adjusted.

[0015] According to a fifth aspect of the invention, the melt spinning system of the third or fourth aspect includes two or more exhaust units.

[0016] When the plural exhaust units are provided (i.e., plural connecting pipes are connected to a fixed pipe), the optimal flow amount of outside air which is taken in through the outside air intake may be different between the exhaust units. In this case, providing the adjustment unit at each exhaust unit as in the present invention is especially effective.

[0017] According to a sixth aspect of the invention, the melt spinning system of any one of the third to fifth aspects further includes, as the spinning unit, a first spinning unit and a second spinning unit which is different from the first spinning unit, and the at least one exhaust unit further including: a first sucking unit corresponding to the first spinning unit and second sucking unit corresponding to the second spinning unit, as the sucking unit; a first duct unit corresponding to the first sucking unit and a second duct unit corresponding to the second sucking unit, as the duct unit, and the exhaust device further including: a first gas inlet corresponding to the first duct unit and a second gas inlet corresponding to the second duct unit, as the gas inlet unit, and a first outside air intake corresponding to the first duct unit and the first gas inlet and a second outside air intake corresponding to the second duct unit and the second gas inlet, as the outside air intake, and a first adjustment unit for adjusting an opening degree of the first outside air intake and a second adjustment unit for adjusting an opening degree of the second outside air intake being provided as the adjustment unit.

[0018] In a structure in which the first gas inlet and the second gas inlet are provided for one exhaust device, the optimal flow amount of outside air which is taken in through the outside air intake may be different between the gas inlets. In the structure, providing the first adjustment unit and the second adjustment unit as the present invention is especially effective.

[0019] According to a seventh aspect of the invention, the melt spinning system of any one of the second to sixth aspects is arranged such that the outside air intake is formed at the gas inlet of the exhaust device.

[0020] When the outside air intake at which the gas being discharged and outside air are merged is provided in the vicinity of the sucking unit in the gas discharge direction, airflow in the vicinity of the suction port may be easily disturbed and the filaments may be easily shaken. In the present invention, the outside air intake is formed at the gas inlet of the exhaust device to be far from the sucking unit. Therefore, the airflow in the vicinity of the suction port is suppressed from being easily disturbed, with the result that the filaments are suppressed from being easily disturbed.

[0021] According to an eighth aspect of the invention, the melt spinning system of any one of the first to the seventh aspects is arranged such that the inflow suppressor includes a wind shield member which is provided downstream of the connecting pipe in the gas discharge direction and provided to extend toward inside of the fixed pipe in order to prevent the gas in the fixed pipe from flowing into the connecting pipe.

[0022] In the present invention, by the wind shield member which is provided to extend toward the inside of the fixed pipe, the gas in the fixed pipe is prevented from flowing into the connecting pipe. Therefore, without change of output of the exhaust device, or in addition to the change of the output of the exhaust device, the gas is prevented from flowing backward.

[0023] According to a ninth aspect of the invention, the melt spinning system according to any one of the first to eighth aspects is arranged such that the gas is discharged from one side to the other side in an extending direction of the fixed pipe, and the wind shield member extends in an orthogonal direction which is orthogonal to the extending direction or is provided to lean to the other side in the extending direction relative to the orthogonal direction.

[0024] In a structure in which the wind shield member leans to one side in the extending direction relative to the orthogonal direction, the gas hitting the wind shield member flows backward to one side in the extending direction and flows to the other side again, with the result that the gas hitting the wind shield member may flow into the connecting pipe. In the present invention, the gas hitting the wind shield member is suppressed from flowing backward to one side in the extending direction. Therefore, the gas inflow into the connecting pipe from the fixed pipe is effectively suppressed.

[0025] According to a tenth aspect of the invention, the melt spinning system of any one of the first to ninth aspects is arranged such that the sucking unit includes: a sucking ring which is provided to surround the filaments being spun out from the spinneret and includes the suction port formed in a circumferential wall; and an enclosure member which is connected to the exhaust device, is provided to surround the sucking ring, and includes an internal space in which the gas discharged from inside of the sucking ring flows.

[0026] In the present invention, the sucking ring and the enclosure member form an internal space which is substantially sealed. With this, even when the negative pressure which is generated by the exhaust device is weak, the gas is efficiently sucked into the internal space. Because of this, a small variation of the negative pressure may greatly change the flow rate of the gas, with the result that the airflow may be disturbed and the filaments may be shaken. In the structure, as in the present invention, the following arrangement is especially effective: the gas inflow is suppressed from flowing backward into the connecting pipe from the fixed pipe by the inflow suppressor.

[0027] According to an eleventh aspect of the invention, the melt spinning system of any one of the first to tenth aspects is arranged such that the exhaust device is an aspirator which includes: a water inlet which is different from the gas inlet and allows water to flow in; and an outlet which is connected to the connecting pipe and allows the gas and the water to flow out.

[0028] In a structure in which the aspirator is used as the exhaust device, the negative pressure is generated by an accompanied flow which is generated by water flowing in the aspirator, with the result that the gas is sucked. The aspirator has advantages that the aspirator is able to generate very low negative pressure by adjusting a flow amount of water and to discharge monomer by dissolving monomer into water.

[0029] Meanwhile, into the fixed pipe, because water flows through the outlet and the connecting pipe, a strong accompanied flow may be generated by a great deal of water flowing in the fixed pipe. When such an accompanied flow flows backward into the connecting pipe from the fixed pipe, the negative pressure may be changed greatly on the upstream side in the gas discharge direction. Therefore, in order to suppress the accompanied flow which flows into the connecting pipe from the fixed pipe, an amount of water which flows in the aspirator must be increased to augment the accompanied flow which flows into the fixed pipe from the connecting pipe. Meanwhile, when the accompanied flow for sucking the gas is increased, the negative pressure may become excessive, with the result that the filaments may be shaken significantly. In the structure, as in the present invention, the following arrangement is especially effective: the gas inflow is suppressed from flowing backward into the connecting pipe from the fixed pipe by the inflow suppressor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030]

FIG. 1 is a schematic representation of a melt spinning system related to the present embodiment.
FIG. 2 is an enlarged view of a spinning beam and its surroundings.
FIG. 3 is a cross section taken along a line III-III in FIG. 2.
FIG. 4 is a plan view of a sucking unit and its surroundings.
FIG. 5 is a cross section taken along a line V-V in FIG. 4.
FIG. 6 shows an aspirator and its surroundings.
FIGs. 7(a) and 7(b) show a detailed structure of the aspirator.
FIGs. 8(a) and 8(b) show an adjustment member.
FIGs. 9(a) and 9(b) show a change of the opening degree of a slit.
FIG. 10 shows airflow at around a slit.
FIG. 11 shows an exhaust unit related to a modification.
FIG. 12 shows an exhaust unit related to another modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] The following will describe an embodiment of the present invention. Directions shown in FIG. 1 and FIG. 2 are defined as the front-rear, left-right, and up-down directions.

(Melt Spinning System)

[0032] To begin with, the following will describe a schematic structure of a melt spinning system 1 related to the present embodiment with reference to FIG. 1 to FIG. 3. FIG. 1 is a schematic representation of the melt spinning system 1 related to the present embodiment. FIG. 2 is an enlarged view of a spinning beam 2 described below and its surroundings. FIG. 3 is a cross section taken along a line III-III in FIG. 2.

[0033] As shown in FIG. 1, the melt spinning system 1 includes spinning beams 2 (spinning units of the present invention), yarn coolers 3 (cooling units of the present invention), and exhaust units 4. Each spinning beam 2 spins out filaments f which are made of molten polymer. The yarn cooler 3 which is provided to correspond to each spinning beam 2 cools the filaments f spun out. The exhaust unit 4 sucks and discharges monomer (raw materials of polymer) gas which is generated from the filaments f immediately after being spun out. In the present embodiment, corresponding to two spinning beams 2 and two yarn coolers 3, one exhaust unit 4 is provided. To be more specific, an exhaust unit 4a is provided to correspond to a spinning beam 2a (first spinning unit of the present invention), a spinning beam 2b (second spinning unit of the present invention) which is different from the spinning beam 2a, and yarn coolers 3a and 3b. In addition to that, an exhaust unit 4b is provided to correspond to spinning beams 2c and 2d and yarn coolers 3c and 3d. The gas which is sucked by each exhaust unit 4 is discharged through a fixed pipe 100 which is fixedly provided.

[0034] The spinning beam 2 spins out yarns Y which are made of molten polymer. Molten polymer which is spun out in the present embodiment is, for example, nylon 6 (PA6). As shown in FIG. 2, the spinning beam 2 includes pack housings 11. To the pack housings 11, spinning packs 12 are attached, respectively. In the present embodiment, to twelve pack housings 11, twelve spinning packs 12 are attached, respectively. The pack housings 11 (spinning packs 12) are, for example, staggered to form two lines along the left-right direction. Each spinning pack 12 is supplied with molten polymer from an unillustrated pipe, etc. The pack housings 11 are not necessarily arranged in this way. For example, the pack housings 11 may be, for example, aligned to form a line along the left-right direction. In addition to that, the pack housings 11 may be aligned to form three or more lines. Furthermore, when the pack housings 11 are arranged to form plural lines, the pack housings 11 may be staggered, or may be aligned in both the front-rear direction and the left-right direction. Moreover, the pack housings 11 may not be aligned to be rectilinear. For example, the pack housings 11 may be arranged to form a virtual circle when viewed in the up-down direction.

[0035] At the lower end portion of each spinning pack 12, a spinneret 13 having nozzles 14 is provided. The spinning pack 12 spins molten polymer out as filament f from each of the nozzles 14 of the spinneret 13. To put it differently, from one spinneret 13, one multi-filament yarn (yarn Y) which is formed of plural filaments f is spun out. In this process, from the filaments f immediately after being spun out, monomer gas is generated as described above. The monomer gas is sucked and discharged by the exhaust unit 4.

[0036] The yarn cooler 3 is an apparatus for cooling the filaments f which are spun out from the spinning packs 12. The yarn cooler 3 is provided below the spinning beam 2. As shown in FIG. 2 and FIG. 3, the yarn cooler 3 includes members such as a box 20, cooling cylinders 21, and partitioning cylinders 22. The cylinders 21 and 22 are housed in the box 20.

[0037] As shown in FIG. 2, an internal space of the box 20 is partitioned into an upper space and a lower space by a flow adjustment plate 23. The flow adjustment plate 23 is a member which is formed of a material having flow adjustment capability such as punching metal. The flow adjustment plate 23 is provided horizontally. In the upper space of the box 20 (upper than the flow adjustment plate 23) and directly below the spinning packs 12, the cooling cylinders 21 are provided. The cooling cylinders 21 are staggered along the left-right direction to correspond to the respective spinning packs 12 (as shown in FIG. 3). The wall of the cooling cylinder 21 is, in the same manner as the flow adjustment plate 23, formed of a material having flow adjustment capability such as punching metal, etc. In the lower space of the box 20 (lower than the flow adjustment plate 23) and directly below the cooling cylinders 21, the partitioning cylinders 22 are provided. The wall of the partitioning cylinder 22 is, being different from the cooling cylinder 21, formed of an air-impermeable material. The filaments f pass through the internal space of the cooling cylinder 21 which is directly below the spinning pack 12 and the internal space of the partitioning cylinder 22 in order.

[0038] To a rear part of a lower portion of the box 20, a duct 25 is connected. To the duct 25, air for cooling the filaments f is supplied by an unillustrated compressed air source. The air is supplied into the lower space of the box 20 through the duct 25. The cooling air which flows into the lower space of the box 20 is adjusted upward while passing through the flow adjustment plate 23 provided horizontally. Subsequently, the cooling air flows into the upper space of the box 20. The air which flows into the upper space of the box 20 is adjusted while passing through the wall of the cooling cylinder 21. Subsequently, the air flows into the cooling cylinder 21. As a result, in the cooling cylinder 21, the air blows against the filaments f from the outside of the entire circumference of the cooling cylinder 21. Because of this, the filaments f are cooled. In this regard, because the wall of the partitioning cylinder 22 is air-impermeable, the air does not flow directly into the partitioning cylinder 22 from the lower space of the box 20.

[0039] The exhaust unit 4 is provided between the spinning beam 2 and the yarn cooler 3 in the running direction of the filaments f. The exhaust unit 4 sucks and discharges monomer gas which is generated from molten polymer immediately after being spun out from the nozzles 14 of the spinneret 13. The details will be given later.

[0040] Below the cooling cylinder 21 and the partitioning cylinder 22, an oil guide 5 is provided in order to apply oil to a yarn Y. With the oil guide 5, the yarn Y having been cooled at the cooling cylinder 21 makes a contact. At this stage, the oil guide 5 dispenses and applies oil to the yarn Y. The yarn Y to which oil is applied by the oil guide 5 is taken up by a take-up roller (unillustrated) which is provided below the oil guide 5. Subsequently, the yarn Y is sent to a winding device (unillustrated), and wound to a bobbin (unillustrated) at the winding device.

(Exhaust Unit)

[0041] The structure of the exhaust unit 4 will be described with reference to FIG. 4 to FIG. 6. FIG. 4 is a plan view of a suction member 31 described below and its surroundings. FIG. 5 is a cross section taken along a line V-V in FIG. 4. FIG. 6 shows an aspirator 33 described below and its surroundings.

[0042] The exhaust unit 4 sucks and discharges gas which includes monomer gas being generated from molten polymer immediately after being spun out (hereinafter, this gas will be simply referred to as gas). In other words, the exhaust unit 4 is provided with a waste channel 30 (as shown in FIG. 1 and FIG. 4) in order to suck and discharge the gas. As shown in FIG. 4 to FIG. 6, the exhaust unit 4 includes two suction members 31 (sucking units of the present invention), two ducts 32 (duct units of the present invention), an aspirator 33 (exhaust device of the present invention), and a connecting pipe 34 (as shown in FIG. 6). By means of negative pressure which is generated by water flowing in the aspirator 33, the exhaust unit 4 sucks the gas from spaces which are radially inside sucking rings 42 (described below) provided at the suction member 31. By the same means, the exhaust unit 4 discharges the gas through the duct 32, the aspirator 33, and the connecting pipe 34 (see arrows in FIG. 4). In the present embodiment, one suction member 31 is provided to correspond to one spinning beam 2 (as shown in FIG. 1). For example, a suction member 31a (first sucking unit of the present invention) is provided to correspond to the spinning beam 2a. In addition to that, a suction member 31b (second sucking unit of the present invention) is provided to correspond to the spinning beam 2b.

[0043] As shown in FIG. 4, each suction member 31 includes an enclosure member 41 and the sucking rings 42. The enclosure member 41 is a member which encloses the sucking rings 42 by being attached the sucking rings 42. In addition to that, the enclosure member 41 directs the gas which is discharged from the inside of the sucking rings 42 toward the aspirator 33 in the direction to which the gas is discharged (gas discharge direction). The enclosure member 41 is connected to the aspirator 33 through the duct 32. The enclosure member 41 is roughly flat as the entire shape. In the enclosure member 41, by two flat plates 43 and 44 these of which are aligned to be substantially horizontal in the up-down direction and a side wall 45 which connects outer peripheries of the flat plates 43 and 44, an internal space 46 is defined (as shown in FIG. 5). The internal space 46 is, except the part being provided with a suction port 52 described below, a space in which is substantially sealed from a space in which the melt spinning system 1 is provided.

[0044] The enclosure member 41 includes an enclosure part 47 which encloses the sucking rings 42 and two passage parts 48 which are provided closer than the enclosure part 47 to the aspirator 33 in the gas discharge direction (as shown in FIG. 5, the enclosure part 47 and two passage parts 48 are partitioned by a two-dot chain line 101). The enclosure part 47 is rectangular when viewed from above (as shown in FIG. 4). The enclosure part 47 is provided between the spinning beam 2 and the yarn cooler 3 in the up-down direction (as shown in FIG. 5). At the enclosure part 47, fitting holes 49 are provided so that the sucking rings 42 are fitted to the fitting holes 49, respectively. The fitting holes 49 are, corresponding to the spinnerets 13, staggered along the left-right direction. The two passage parts 48 are connected to the front end of the enclosure part 47. The two passage parts 48 are provided to be aligned in the left-right direction. Each of the two passage parts 48 has a roughly triangular shape when viewed from above. Each of the front end portions of the two passage parts 48 is connected to the duct 32.

[0045] The sucking rings 42 are members for discharging the gas which is generated from the filaments f immediately after being spun out. As shown in FIG. 5, each sucking ring 42 is provided between the spinning pack 12 and the cooling cylinder 21 in the up-down direction. Each sucking ring 42 is provided to surround the filaments f immediately after being spun out. The sucking rings 42 fit to the fitting holes 49 of the enclosure member 41, respectively. The sucking rings 42 are attached to be enclosed by the enclosure member 41. On the circumferential wall 51 of each sucking ring 42, along the circumferential direction of each sucking ring 42, the suction ports 52 are provided. Through the suction ports 52, a space inside the sucking ring 42 and the internal space 46 of the enclosure member 41 intercommunicate.

[0046] The duct 32 connects the enclosure member 41 with the aspirator 33. In other words, the duct 32 is provided on the downstream of the enclosure member 41 in the gas discharge direction. In addition to that, the duct 32 is provided on the upstream of the aspirator 33 in the gas discharge direction. The duct 32 includes two upstream portions 61 and one downstream portion 62. To the two upstream portions 61, the front end portions (downstream end portions in the gas discharge direction) of the two passage parts 48 of the enclosure member 41 are attached, respectively. The two upstream portions 61 are merged with each other by being connected to an upstream end portion of the downstream portion 62. A downstream end portion of the downstream portion 62 in the gas discharge direction is connected to the aspirator 33. In the present embodiment, one duct 32 is provided to correspond to one suction member 31. For example, as shown in FIG. 4, a duct 32a (first duct unit of the present invention) is provided to correspond to the suction member 31a. In addition to that, a duct 32b (second duct unit of the present invention) is provided to correspond to the suction member 31b.

[0047] The aspirator 33 is an apparatus for sucking and discharging the gas. The aspirator 33 is provided on the downstream of the suction member 31 and the duct

32 in the gas discharge direction. The aspirator 33 is, by an accompanied flow which is generated by water flowing in the aspirator 33, able to generate very low sucking pressure (for example, -5Pa). Furthermore, the aspirator 33 is able to discharge monomer gas by dissolving monomer gas into water. The aspirator 33 is able to change output by changing a condition of a flow amount of water flowing in the aspirator 33. As shown in FIG. 6, the aspirator 33 includes a main body 71, a water inlet 72, two gas inlets 73, and an outlet 74.

[0048] The main body 71 is a cylindrical part which extends in the up-down direction. At an upper portion of the main body 71, the water inlet 72 is provided in order to allow water to flow in. In both left and right side faces of the main body 71, two gas inlets 73 are provided in order to allow the gas to flow in. At a lower portion of the main body 71, the outlet 74 is provided in order to allow the water and the gas to be discharged.

[0049] The water inlet 72 is provided at the upper portion of the main body 71, and attached to a pipe 75 which is connected to an unillustrated water source. At the water inlet 72, a water inflow port 76 (as shown in FIG. 7(a)) is provided in order to allow water to flow in.

[0050] The two gas inlets 73 are roughly cylindrical parts which are provided in both left and right side faces of the main body 71. At the two gas inlets 73, gas inflow ports 77 (as shown in FIG. 7(a)) are provided in order to allow the gas to flow in, respectively. Each of the two gas inlets 73 is connected to the suction member 31 through the duct 32. For example, a gas inlet 73a (first gas inlet of the present invention) is provided to correspond to the duct 32a. In addition to that, a gas inlet 73b (second gas inlet of the present invention) is provided to correspond to the duct 32b.

[0051] The outlet 74 is provided at the lower portion of the main body 71, and connected to the connecting pipe 34. At the outlet 74, an outflow port 78 (as shown in FIG. 7(a) is provided in order to allow water and the gas to be discharged.

[0052] The connecting pipe 34 is, in the gas discharge direction, provided on the downstream of the aspirator 33. To an upstream end portion of the connecting pipe 34 in the gas discharge direction, the outlet 74 of the aspirator 33 is attached. A downstream end portion of the connecting pipe 34 in the gas discharge direction is, in an extending direction of the fixed pipe 100, attached to an intermediate part of the fixed pipe 100.

[0053] As described above, at the exhaust unit 4, the waste channel 30 is formed of the suction member 31, the duct 32, the aspirator 33, and the connecting pipe 34 in order to allow the gas to be discharged.

[0054] In the exhaust unit 4 having the structure described above, because water which enters from the water inlet 72 of the aspirator 33 flows in the main body 71 (see two-dot chain line arrows in FIG. 6), a downward accompanied flow is generated. By the accompanied flow, the negative pressure is generated in the vicinity of the suction port 52 of the sucking ring 42 (as shown in FIG. 4). As a result, the gas is sucked into the internal space 46 (as shown in FIG. 4) of the enclosure member 41 from the inside of the sucking ring 42. Subsequently, the gas flows into the gas inlet 73 of the aspirator 33 through the inside of the duct 32 (see dashed line arrows FIG. 6). The gas which flows into the gas inlet 73 exits from the outlet 74 with water. Then, after passing through the connecting pipe 34, the gas flows into the fixed pipe 100. As a result, the gas is sucked and discharged by the exhaust unit 4. In this regard, as described above, the internal space 46 which is defined by the enclosure member 41 is substantially sealed. Therefore, even though the negative pressure which is generated by the aspirator 33 is low, strong sucking force is generated in the vicinity of the suction port 52 of the sucking ring 42.

[0055] In this stage, as described above, the connecting pipe 34 is connected to an intermediate part of the fixed pipe 100. In this case, for example, when airflow is disturbed at the junction of the fixed pipe 100 and the connecting pipe 34, part of the gas may flow into the connecting pipe 34 from the fixed pipe 100 (see dashed line arrows in FIG. 6). Especially, in a structure in which plural aspirators 33 are provided, a great deal of water flows into the fixed pipe 100. Then, because the great deal of water W (as shown in FIG. 6) flows into the fixed pipe 100, a strong accompanied flow may be generated. When such an accompanied flow flows backward into the connecting pipe 34 from the fixed pipe 100, the negative pressure may be changed greatly on the upstream side in the gas discharge direction. Because of this, the airflow may be disturbed in the vicinity of the filaments f immediately after being spun out (as shown in FIG. 2). As a result, the filaments f may be shaken, and the quality of yarns may be deteriorated.

[0056] Therefore, inflow of gas into the connecting pipe 34 from the fixed pipe 100 must be suppressed. For that reason, for example, the flow amount of water which flows in the aspirator 33 may be increased so that an accompanied flow which flows from the connecting pipe 34 toward the fixed pipe 100 (i.e., toward the downstream side in the gas discharge direction) is augmented. As a result, the gas inflow into the connecting pipe 34 from the fixed pipe 100 is suppressed.

[0057] Meanwhile, when the accompanied flow is augmented in this way, the negative pressure in the space upstream of the aspirator 33 in the gas discharge direction may be increased, with the result that the discharge speed of the gas at around the filaments f may become excessive and the filaments f may be shaken significantly. As a further step, for example, by providing a valve between the suction member 31 and the aspirator 33 in the gas discharge direction in order to increase passage resistance, the flow amount of the gas may be suppressed to be small. However, this method is disadvantageous in that the waste channel 30 of the gas is narrowed by the valve, and when monomer is solidified, the channel tends to be clogged. Therefore, in the present embodiment, the exhaust unit 4 includes a structure described below for the purpose that, even when the output of the aspirator 33 is high (i.e., the flow amount of water is large), the discharge speed of the gas at around the filaments f is suppressed from being too high, without narrowing the waste channel 30 of the gas. To be more specific, the exhaust unit 4 includes an inflow suppressor 70 (as shown in FIGs. 7(a) and 7(b)) in order to suppress the gas inflow into the connecting pipe 34 from the fixed pipe 100. The inflow suppressor 70 includes the aspirator 33 described above and an outside air intake 81 described below.

(Exhaust Unit)

[0058] The detailed structure of the exhaust unit 4 will be described with reference to FIGs. 7(a) and 7(b), FIGs. 8(a) and 8(b), and FIGs. 9(a) and 9(b). FIG. 7(a) is a cross section of the aspirator 33. The cross section cuts the aspirator 33 at right angles in the front-rear direction. FIG. 7(b) is a perspective view of the gas inlet 73. FIG. 8 (a) is a front view of an aspirator 33 which includes an adjustment member 83 described below. FIG. 8(b) is a perspective view of the adjustment member 83. FIG. 9(a) is a view of the adjustment member, viewed along an arrow IXa in FIG. 8(b). FIG. 9(b) shows a state of the adjustment member 83 after being moved from the state which is shown in the FIG. 9(a). In FIGs. 7(a) and 7(b), the adjustment member 83 is omitted.

[0059] As shown in FIGs. 7(a) and 7(b), each gas inlet 73 of the aspirator 33 is provided with the outside air intake 81. The outside air intake 81 causes the waste channel 30 to communicate with space outside the waste channel 30 (an external space 82), and takes outside air (air) into the waste channel 30 from the external space 82. The outside air intake 81 is, e.g., along the circumferential direction of the gas inlet 73, formed as a slit to run an roughly halfway around the gas inlet 73. The outside air intake 81 opens, for example, upward. In this way, the outside air intake 81 causes the waste channel 30 to communicate with the external space 82. An outside air intake 81a (first outside air intake of the present invention) is provided to correspond to the gas inlet 73a. In addition to that, an outside air intake 81b (second outside air intake of the present invention) is provided to correspond to the gas inlet 73b. In the present embodiment, two outside air intakes 81a and two outside air intakes 81b are provided. The number of the outside air intakes 81 is not limited to this.

[0060] As shown in FIGs. 8(a) and 8(b), to each gas inlet 73, the adjustment member 83 (adjustment unit of the present invention) is attached. The adjustment member 83 is provided to adjust an opening degree of the outside air intake 81. An adjustment member 83a (first adjustment unit of the present invention) is provided to correspond to the outside air intake 81a. In addition to that, an adjustment member 83b (second adjustment unit of the present invention) is provided to correspond to the outside air intake 81b. The adjustment member 83 includes a cylindrical portion 84 (cover member of the present invention) and a handle 85.

[0061] The cylindrical portion 84 is a cylindrical part which is provided to surround the part at which the outside air intake 81 of the gas inlet 73 is provided. The cylindrical portion 84 is, along the circumferential direction of the cylindrical portion 84, provided with a slit 86 which runs an roughly halfway around the cylindrical portion 84. The slit 86 is, in the direction in which the gas inlet 73 extends, provided roughly at the same place with the outside air intake 81. The cylindrical portion 84 is, along a plane which includes the periphery of the outside air intake 81 of the gas inlet 73 (i.e., a circumferential surface of the gas inlet 73), arranged to be rotatable (i.e., movable) in the circumferential direction of the cylindrical portion 84 (as indicated by an arrow in FIG. 8(b)).

[0062] The handle 85 is a protrusion part which protrudes outward in the radial direction of the cylindrical portion 84 from a part of the cylindrical portion 84 in the circumferential direction. The handle 85 has a size with which an operator can pinch the handle 85 by hand so that the operator can rotate the cylindrical portion 84 manually.

[0063] As an operator pinches the handle 85 by hand and rotates the cylindrical portion 84, the slit 86 of the cylindrical portion 84 is moved along the circumferential surface of the gas inlet 73. With this, by changing the positional relationship between the slit 86 and the outside air intake 81, the opening degree of the outside air intake 81 is adjusted. For example, the opening degree of the outside air intake 81 with which the slit 86 completely overlaps (as shown in FIG. 9(a)) is twice as large as the opening degree of the outside air intake 81, a half of which overlaps with the slit 86 (see a hatched part in FIGs. 9(a) and 9(b)).

[0064] In the vicinity of the outside air intake 81 of the gas inlet 73, a pressure gauge 87 which detects pressure of the gas (as shown in FIG. 8(a)) is provided.

(Airflow in Vicinity of Outside Air Inlet)

[0065] Referring to FIG. 10, the following will describe an airflow nearby the outside air intake 81 of the gas inlet 73 in the exhaust unit 4 which includes the inflow suppressor 70 described above.

[0066] When water flows in the aspirator 33 (as indicated by two-dot chain line arrows in FIG. 10), negative pressure is generated by an accompanied flow. As a result, the gas is sucked through the gas inlet 73 (as indicated by broken line arrows in FIG. 10). In this stage, as a flow amount of water is increased, the accompanied flow described above is augmented. The gas inflow into the connecting pipe 34 from the fixed pipe 100 (as shown in FIG. 6) is therefore suppressed. In addition to that, by the negative pressure described above, through the outside air intake 81 which is provided at the gas inlet 73, outside air is taken into the gas inlet 73 from the external space 82 (as indicated by dashed line arrows in FIG. 10).

Because of this, nearby the outside air intake 81, the gas which flows in the waste channel 30 and the outside air are merged. As a result, sucking pressure (the negative pressure) is decreased. Therefore, even though a flow amount of water which flows in the aspirator 33 is increased and the accompanied flow is augmented, the flow rate of the gas flowing from the upstream of the outside air intake 81 in the gas discharge direction is small as compared to a case where the outside air intake 81 is not formed. Consequently, at around the filaments f (as shown in FIG. 2) immediately after being spun out, increase in the discharge speed of the gas is suppressed. In this way, by the aspirator 33 and the outside air intake 81, while the filaments f are suppressed from being easily shaken, the gas inflow into the connecting pipe 34 from the fixed pipe 100 is suppressed.

[0067] As an operator moves the adjustment member 83 based on the detection result by the pressure gauge 87 so as to adjust the opening degree of the outside air intake 81, a flow amount of outside air which is taken in through the outside air intake 81 is finely adjusted at each gas inlet 73. With this, between the suction members 31 (as shown in FIG. 4), a variation of a flow rate in the vicinity of the suction port 52 (as shown in FIG. 5) is suppressed. In this regard, the adjustment of the opening degree of the outside air intake 81 may be performed before the melt spinning system 1 is activated. In other words, when the melt spinning system 1 is in operation, the adjustment of the opening degree of the outside air intake 81 does not need to be performed at any time.

[0068] As described above, by the inflow suppressor 70, the gas inflow into the connecting pipe 34 from the fixed pipe 100 is suppressed. Therefore, airflow in the vicinity of the filaments f is suppressed from being disturbed.

[0069] At the gas inlet 73, the outside air intake 81 is provided. Because of this, when the aspirator 33 is in operation, outside air can be taken into the waste channel 30 through the outside air intake 81. On this account, by merging the gas which flows in the waste channel 30 with the outside air, the sucking pressure (the negative pressure) can be decreased. Therefore, the flow rate of the gas which flows from the upstream of the outside air intake 81 in the gas discharge direction is decreased as compared to a case where the outside air intake 81 is not formed. As a result, even when the output of the aspirator 33 is high (a flow amount of water is large), the discharge speed of the gas at around the filaments f is suppressed from being too high and airflow in the vicinity of the filaments f is suppressed from being disturbed, without narrowing the waste channel 30 of the gas.

[0070] When a flow amount of outside air which is taken in through the outside air intake 81 needs to be adjusted, the flow amount described above is adjustable by adjusting the opening degree of the outside air intake 81 by the adjustment member 83.

[0071] As the cylindrical portion 84 of the adjustment member 83 is rotated (moved) along the circumferential surface of the gas inlet 73, the opening degree of the outside air intake 81 is adjusted. As described above, by a simple operation of moving the cylindrical portion 84, the opening degree of the outside air intake 81 is easily adjusted.

[0072] In a structure in which plural exhaust units 4 are provided (i.e., plural connecting pipes 34 are connected to the fixed pipe 100), the optimal flow amount of outside air which is taken in through the outside air intake 81 may be different between the exhaust units 4. In this case, providing the adjustment member 83 at each exhaust unit 4 is especially effective.

[0073] In a structure in which a gas inlet 73a and a gas inlet 73b are provided for one aspirator 33, the optimal flow amount of outside air which is taken in through the outside air intake 81 may be different between the gas inlets 73. In this case, providing the adjustment member 83a and the adjustment member 83b is especially effective.

[0074] The outside air intake 81 is provided at the gas inlet 73 of the aspirator 33 to be far from the suction member 31. As a result, comparing with a case in which the outside air intake 81 is placed near the suction member 31, an airflow in the vicinity of the filaments f is suppressed from being disturbed, and the filaments f are suppressed from being easily shaken.

[0075] In the present embodiment, the sucking ring 42 and the enclosure member 41 form the internal space 46 which is substantially sealed. With this, when the negative pressure which is generated by the aspirator 33 is weak, the gas is efficiently sucked into the internal space 46. Because of this, a small variation of the negative pressure may greatly change the suction quantity of the gas, with the result that the airflow may be disturbed and the filaments f may be shaken. In this case, the following arrangement is especially effective: the negative pressure in the vicinity of the filaments f is decreased and the discharge speed of the gas is prevented from becoming high by taking in outside air through the outside air intake 81.

[0076] In a structure in which the aspirator 33 is used as an apparatus for discharging the gas, a great deal of water flows in the fixed pipe 100, and a strong accompanied flow may be generated. Therefore, in order to suppress the accompanied flow which flows into the connecting pipe 34 from the fixed pipe 100, an amount of water which flows in the aspirator 33 must be increased to augment the accompanied flow which flows into the fixed pipe 100 from the connecting pipe 34. In this case, the following arrangement is especially effective: the negative pressure in the vicinity of the filaments f is decreased and the discharge speed of the gas is prevented from becoming high by taking in outside air through the outside air intake 81.

[0077] The following will describe modifications of the above-described embodiment. The members which are identical with those in the above-described embodiment will be denoted by the same reference numerals, and the explanations thereof are not repeated.

(1) In the embodiment described above, the outside air intake 81 extends as a slit along the circumferential direction of the gas inlet 73. However, the disclosure is not limited to this. The outside air intake 81 may, e.g., extend as a slit along the direction in which the gas inlet 73 extends. Alternatively, the outside air intake 81 may be a round hole. In other words, the outside air intake 81 may have any kind of shape.

(2) In the embodiment described above, the cylindrical portion 84 of the adjustment member 83 is rotatable along the circumferential surface of the gas inlet 73. However, the disclosure is not limited to this. For example, the cylindrical portion 84 may be configured to be movable in the direction in which the gas inlet 73 extends.

(3) In the embodiment described above, by being moved along the circumferential surface of the gas inlet 73, the adjustment member 83 changes the opening degree of the outside air intake 81. However, the disclosure is not limited to this. For example, the adjustment member 83 may include an unillustrated slidable component which is able to slide relative to the slit 86. Furthermore, the opening degree of the outside air intake 81 may be changed by changing the opening degree of the slit 86 by sliding the slidable component.

(4) In the embodiment described above, the outside air intake 81 is provided at the gas inlet 73 of the aspirator 33, and the adjustment member 83 for adjusting the opening degree of the outside air intake 81 is placed to surround the gas inlet 73. However, the disclosure is not limited to these arrangements. For example, as shown in FIG. 11, an outside air intake 92 may be provided at a duct 91. In addition to that, at a gas inlet 94 of an aspirator 93, an outside air intake may not be provided. Furthermore, the adjustment member 83 may be placed to surround the duct 91. Alternatively, the outside air intake 92 may be provided at each of the gas inlet 94 and the duct 91. Alternatively, the outside air intake may be provided at, e.g., the passage part 48 of the enclosure member 41. In this case, the passage part 48 is also equivalent to a duct unit of the present invention. In addition to that, the enclosure part 47 of the enclosure member 41 and sucking ring 42 are equivalent to a sucking unit of the present invention.

(5) In the embodiment described above, the melt spinning system 1 includes plural exhaust units 4. However, the disclosure is not limited to this. The number of the exhaust units 4 may be one.

(6) In the embodiment described above, the aspirator 33 includes two gas inlets 73. However, the disclosure is not limited to this. In other words, the number of the gas inlets 73 included in one aspirator 33 may be one or may be three or more.

(7) In the embodiment described above, the exhaust unit 4 includes the adjustment member 83. However, the disclosure is not limited to this. The adjustment member 83 is not necessarily provided.

(8) In the embodiment described above, the inflow suppressor 70 includes the aspirator 33 and the outside air intake 81. However, another component may function as an inflow suppressor. The following explanation is given with reference to FIG. 12. To begin with, as shown in FIG. 12, the gas in the fixed pipe 100 flows from a left side (one side of the present invention) to a right side (the other side of the present invention) in the extending direction of the fixed pipe 100 (the left-right direction). On the downstream of the connecting pipe 34 in the gas discharge direction, a wind shield member 96 which extends to the inside of the fixed pipe 100 is provided. The wind shield member 96 is a cylindrical member which is formed of, for example, a hose. Alternatively, the wind shield member 96 may be formed of a sheet metal. A shape of the wind shield member 96 is not necessarily cylindrical. For example, the shape of the wind shield member 96 may be semi-cylindrical. In other words, the wind shield member 96 may at least extend to the inside of the fixed pipe 100 from a lower left end portion of the connecting pipe 34. In this regard, the wind shield member 96 is, so that the gas in the fixed pipe 100 flows reliably to the extending direction, provided not to contact with water W which flows in the fixed pipe 100. By the wind shield member 96 described above, the gas in the fixed pipe 100 is guided downward (as indicated by dashed line arrows in FIG. 12), and hence the gas is suppressed from flowing into the connecting pipe 34. The wind shield member 96 may extend, e.g., along the up-down direction (the orthogonal direction of the present invention) which is orthogonal to the left-right direction. Alternatively, the wind shield member 96 may be placed to lean rightward relative to the up-down direction (as shown in FIG. 12). With this, comparing with a structure in which the wind shield member 96 leans leftward relative to the up-down direction, the gas which hits the wind shield member 96 is less likely to flow backward to the left side and then flow rightward again. Therefore, the gas inflow into the connecting pipe 34 from the fixed pipe 100 is effectively suppressed.

In the structure described above, the outside air intake 81 may be provided (as shown in FIG. 12), or may not be provided. In other words, besides the inflow suppressor 70, the wind shield member 96 may also suppress the gas inflow into the connecting pipe 34 from the fixed pipe 100. Alternatively, the outside air intake 81 may not be provided, and only the wind shield member 96 may suppress the gas inflow into the connecting pipe 34 from the fixed pipe 100. In this case, it is not necessary to enhance the output of the aspirator 33. In other words, in this case, the wind shield member 96 is equivalent to the inflow suppressor of the present invention.

(9) In the embodiment described above, the suction member 31 includes the sucking ring 42 which is provided to surround the filaments f and the enclosure member 41 to which the sucking ring 42 is attached. However, the disclosure is not limited to this. In other words, the suction member 31 is not necessarily provided to surround the filaments f.

(10) In the embodiment described above, the aspirator 33 is provided as the exhaust device. However, the disclosure is not limited to this. In addition to the aspirator 33, or instead of the aspirator 33, for example, a known blower, etc., may be provided. In this regard, when the blower is provided instead of the aspirator 33, water W does not flow in the fixed pipe 100 (in other words, in the fixed pipe 100, only gas flows by sucking of the blower). In the structure, as the embodiment described above, it is effective to suppress the gas inflow into the connecting pipe 34 from the fixed pipe 100.

(11) In the embodiment described above, the spinning beam 2 spins nylon 6 out as polymer. However, the disclosure is not limited to this. The present invention can be applied to cases where polymer which is made of other kind of nylon or polyester, etc., is spun out, as a matter of course.

Claims

1. A melt spinning system (1) comprising:

a spinning unit (2) which includes a spinneret (13) for spinning out filaments (f);
a cooling unit (3) which includes a cooling cylinder (21) provided below the spinneret (13), the cooling unit (3) cooling the filaments (f) which are spun out from the spinneret (13); and
at least one exhaust unit (4) which is provided between the spinning unit (2) and the cooling unit (3) in a running direction of the filaments (f), the at least one exhaust unit (4) including a waste channel (30) for sucking and discharging gas which is generated from the filaments (f), the at least one exhaust unit (4) including:

a sucking unit (31) which is provided between the spinneret (13) and the cooling cylinder (21) and includes a suction port (52) for sucking the gas;
a duct unit (32) which is provided downstream of the sucking unit (31) in a gas discharge direction in which the gas is discharged;
an exhaust device (33) which is provided downstream of the duct unit (32) in the gas discharge direction and sucks and discharges the gas;
a connecting pipe (34) which is connected to an intermediate part of a fixed pipe (100) which is fixedly provided, the connecting pipe (34) being provided downstream of the exhaust device (33) in the gas discharge direction; and
an inflow suppressor (70) which suppresses inflow of the gas into the connecting pipe (34) from the fixed pipe (100) .

2. The melt spinning system (1) according to claim 1, wherein, the exhaust device (33) is configured to be able to change output and includes a gas inlet (73) for allowing the gas to flow in,
at least one of the gas inlet (73) and the duct unit (32) includes an outside air intake (81) which connects the waste channel (30) with a space outside the waste channel (30), and
the inflow suppressor (70) includes the exhaust device (33) and the outside air intake (81).

3. The melt spinning system (1) according to claim 2, wherein, the at least one exhaust unit (4) further includes an adjustment unit (83) for adjusting an opening degree of the outside air intake (81).

4. The melt spinning system (1) according to claim 3, wherein, the adjustment unit (83) includes
a cover member for covering a part of the outside air intake (81), and
by being moved along a surface which includes a periphery of the outside air intake (81), the cover member is able to change an area of a part which covers the outside air intake (81).

5. The melt spinning system (1) according to claim 3 or 4, comprising two or more exhaust units (4).

6. The melt spinning system (1) according to any one of claims 3 to 5, further comprising, as the spinning unit (2), a first spinning unit (2a) and a second spinning unit (2b) which is different from the first spinning unit (2a), and
the at least one exhaust unit (4) including:

a first sucking unit (31a) corresponding to the first spinning unit (2a) and a second sucking unit (31b) corresponding to the second spinning unit (2b), as the sucking unit (31);
a first duct unit (32a) corresponding to the first sucking unit (31a) and a second duct unit (32b) corresponding to the second sucking unit (31b), as the duct unit (32), and
the exhaust device (33) further including: a first gas inlet (73a) corresponding to the first duct unit (32a) and a second gas inlet (73b) corresponding to the second duct unit (32b), as the

gas inlet unit (73), and
a first outside air intake (81a) corresponding to the first duct unit (32a) and the first gas inlet (73a) and a second outside air intake (81b) corresponding to the second duct unit (32b) and the second gas inlet (73b), as the outside air intake (81), and
a first adjustment unit (83a) for adjusting an opening degree of the first outside air intake (81a) and a second adjustment unit (83b) for adjusting an opening degree of the second outside air intake (81b) being provided as the adjustment unit (83).

7. The melt spinning system (1) according to any one of claims 2 to 6, wherein, the outside air intake (81) is formed at the gas inlet (73) of the exhaust device (33).

8. The melt spinning system (1) according to any one of claims 1 to 7, wherein, the inflow suppressor (70) includes
a wind shield member (96) which is provided downstream of the connecting pipe (34) in the gas discharge direction and provided to extend toward inside of the fixed pipe (100) in order to prevent the gas in the fixed pipe (100) from flowing into the connecting pipe (34).

9. The melt spinning system (1) according to claim 8, wherein, the gas is discharged from one side to the other side in an extending direction of the fixed pipe (100), and
the wind shield member (96)
extends in an orthogonal direction which is orthogonal to the extending direction or is placed to lean to the other side in the extending direction relative to the orthogonal direction.

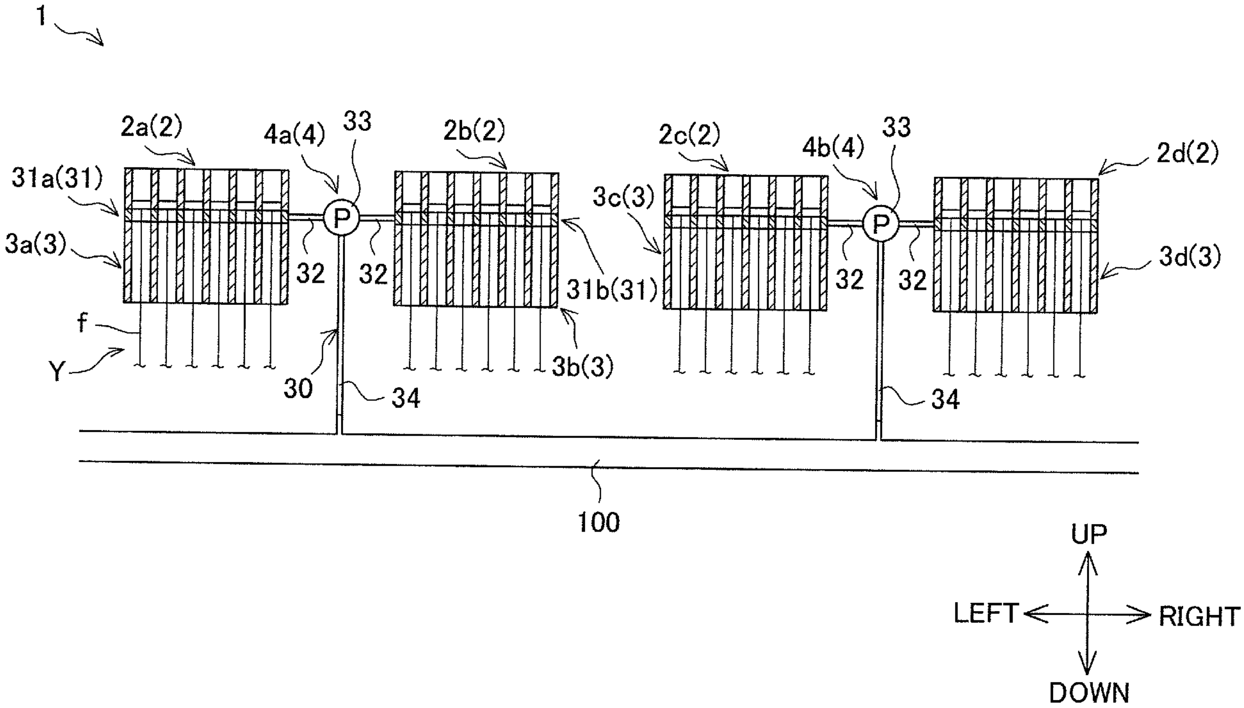
10. The melt spinning system (1) according to any one of claims 1 to 9, wherein, the sucking unit(31) includes:

a sucking ring (42) which is provided to surround the filaments (f) being spun out from the spinneret (13) and includes the suction port (52) formed in a circumferential wall; and
an enclosure member (41) which is connected to the exhaust device (33), is provided to surround the sucking ring (42), and includes an internal space in which the gas discharged from inside of the sucking ring (42) flows.

11. The melt spinning system (1) according to any one of claims 1 to 10, wherein, the exhaust device (33) is an aspirator (33) which includes:

a water inlet (72) which is different from the gas inlet (73) and allows water to flow in; and
an outlet (74) which is connected to the connecting pipe (34) and allows the gas and the water to flow out.

FIG.1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f
Y
30
34
2c(2)
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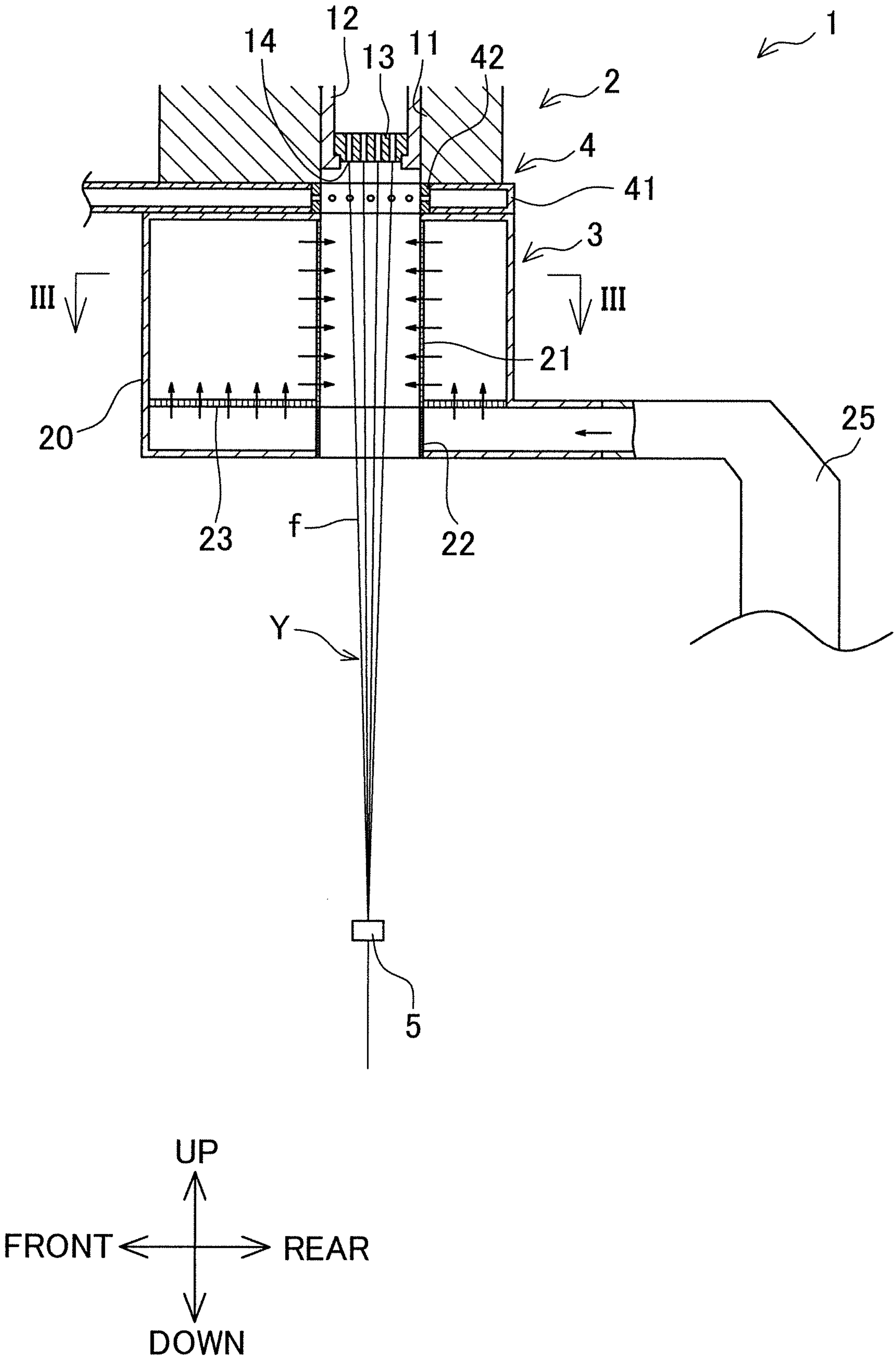
DOWN

FIG.2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12
14
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11
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III
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21
20
23
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25
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Y
5
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FRONT
REAR
DOWN

FIG.3

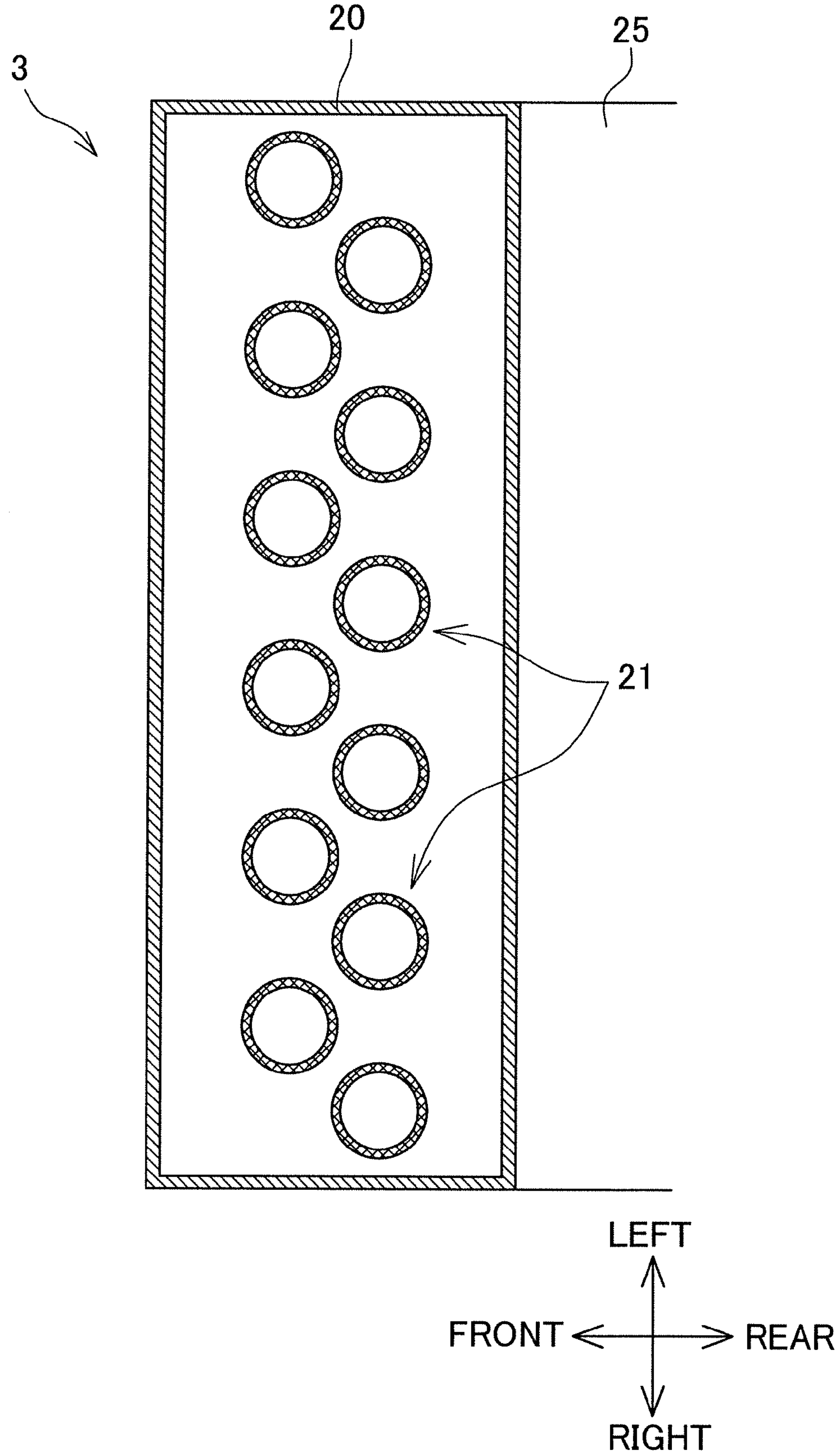
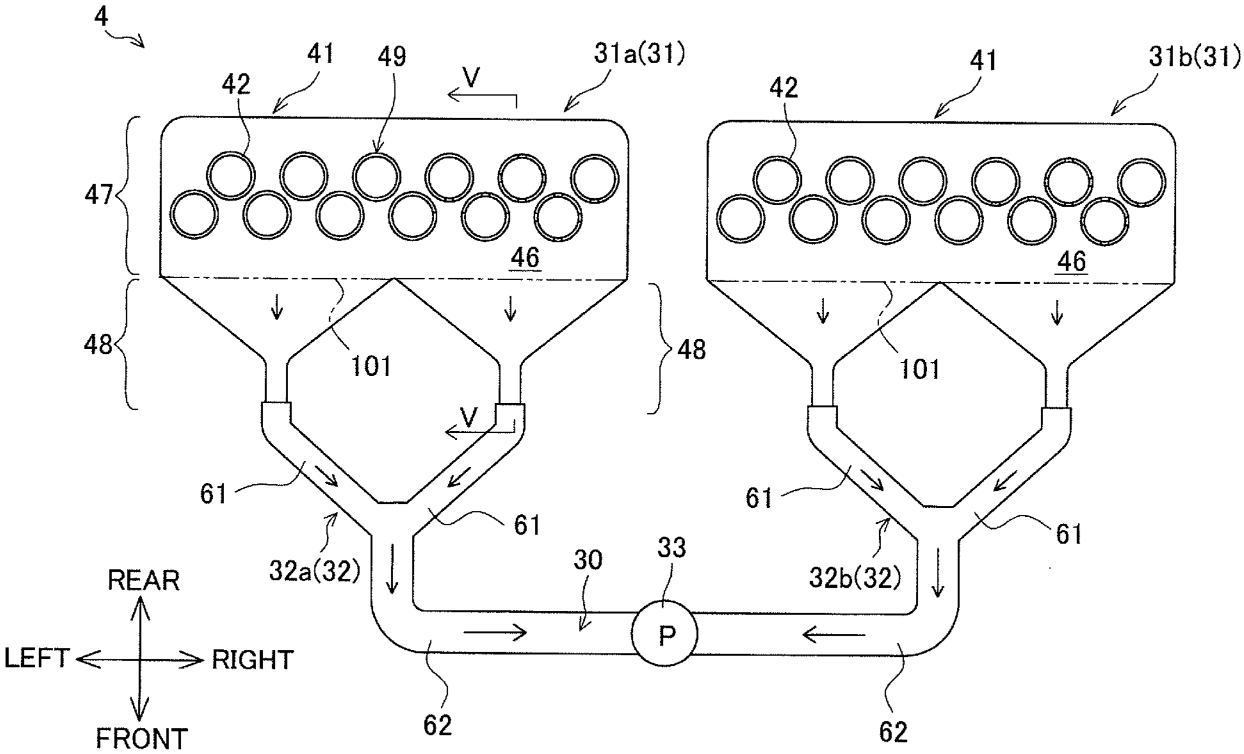


FIG.4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41
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46
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48
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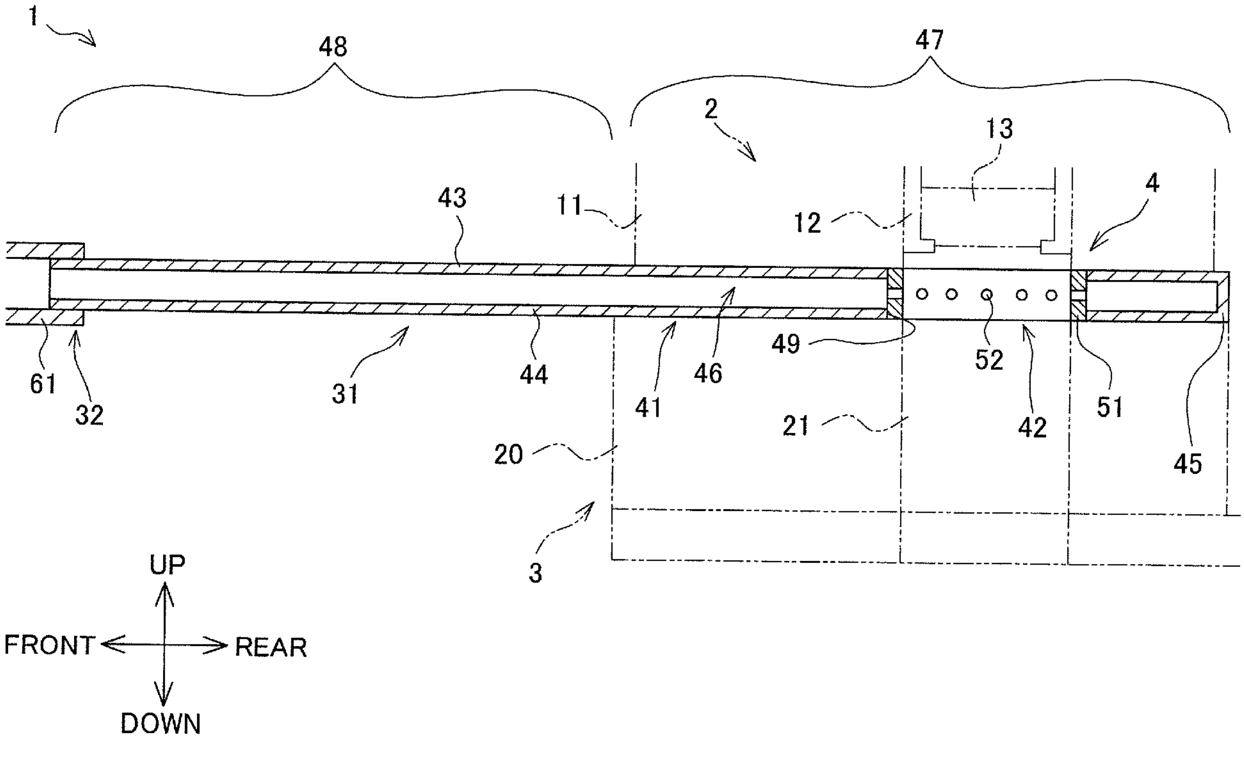
62
62

FIG.5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11
12
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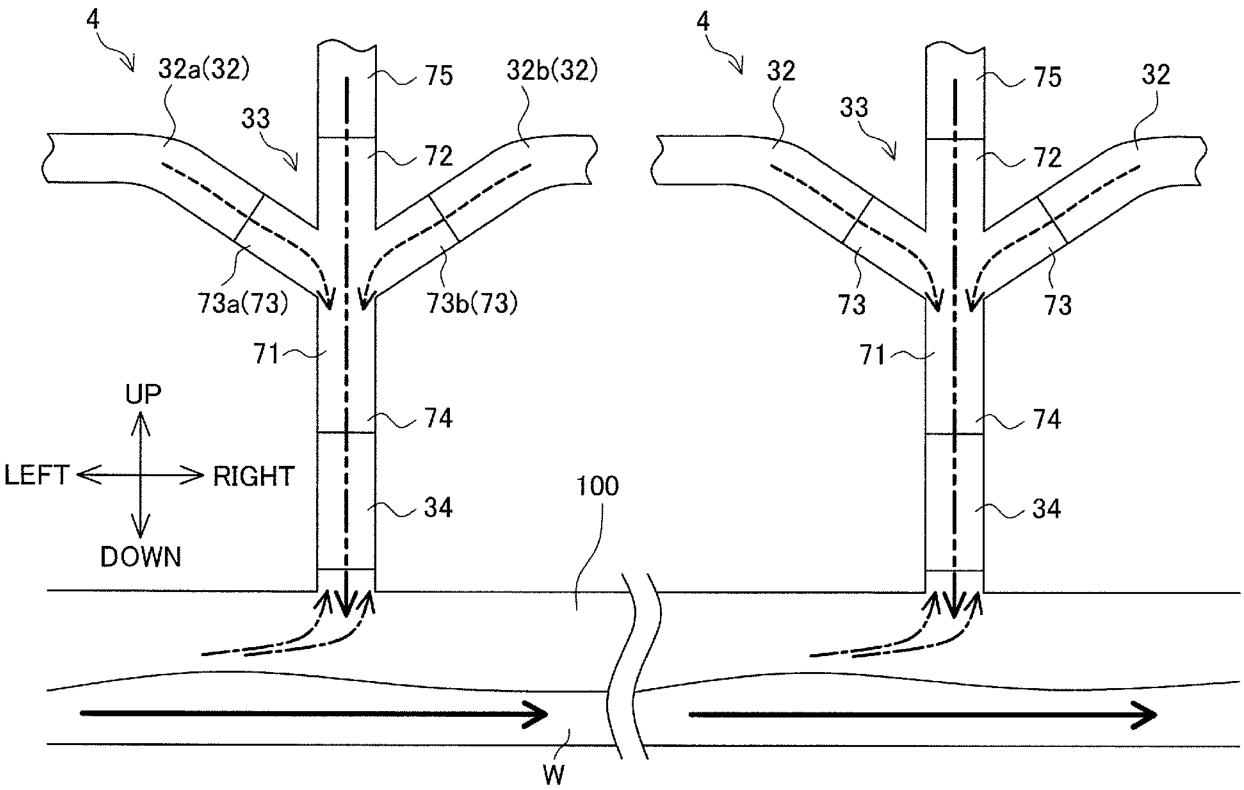
3
UP
FRONT
REAR
DOWN

FIG.6



4
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33
75
32b(32)
72
73a(73)
73b(73)
71
UP
LEFT
RIGHT
DOWN
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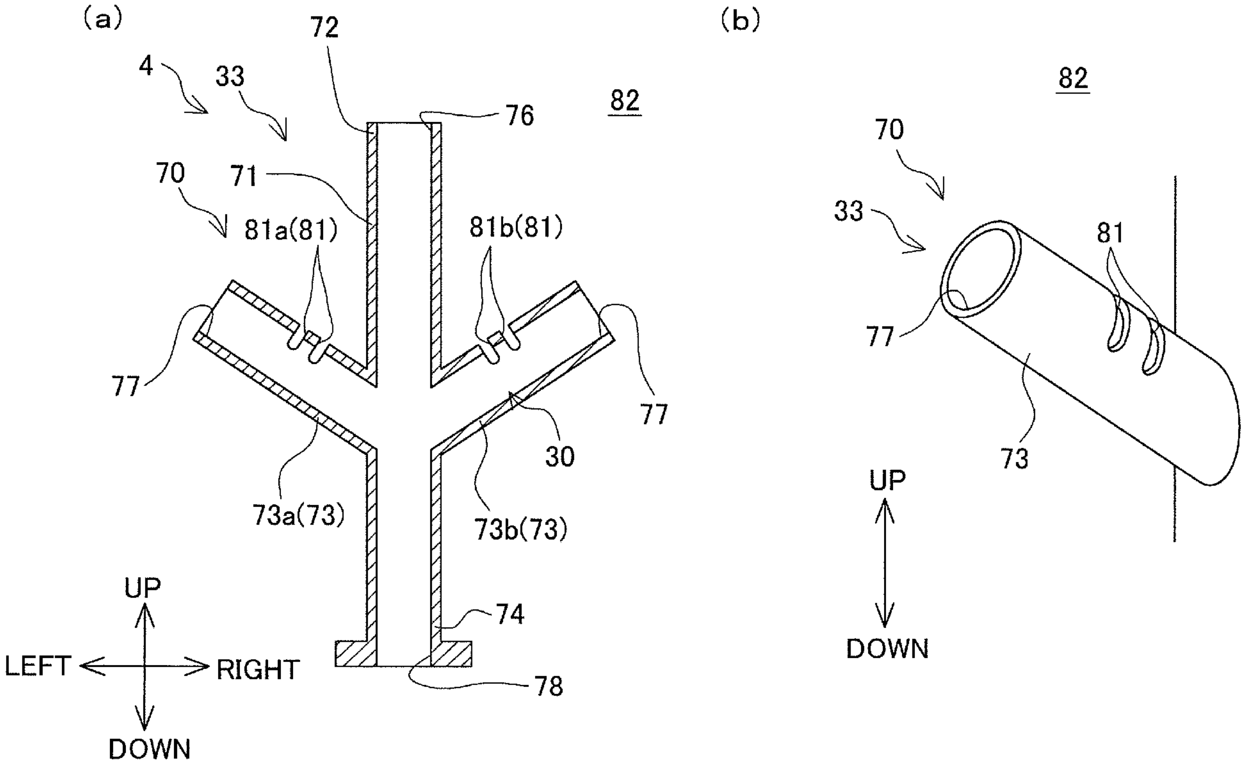
W
4
32
33
75
32
72
73
73
71
74
34

FIG.7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DOWN
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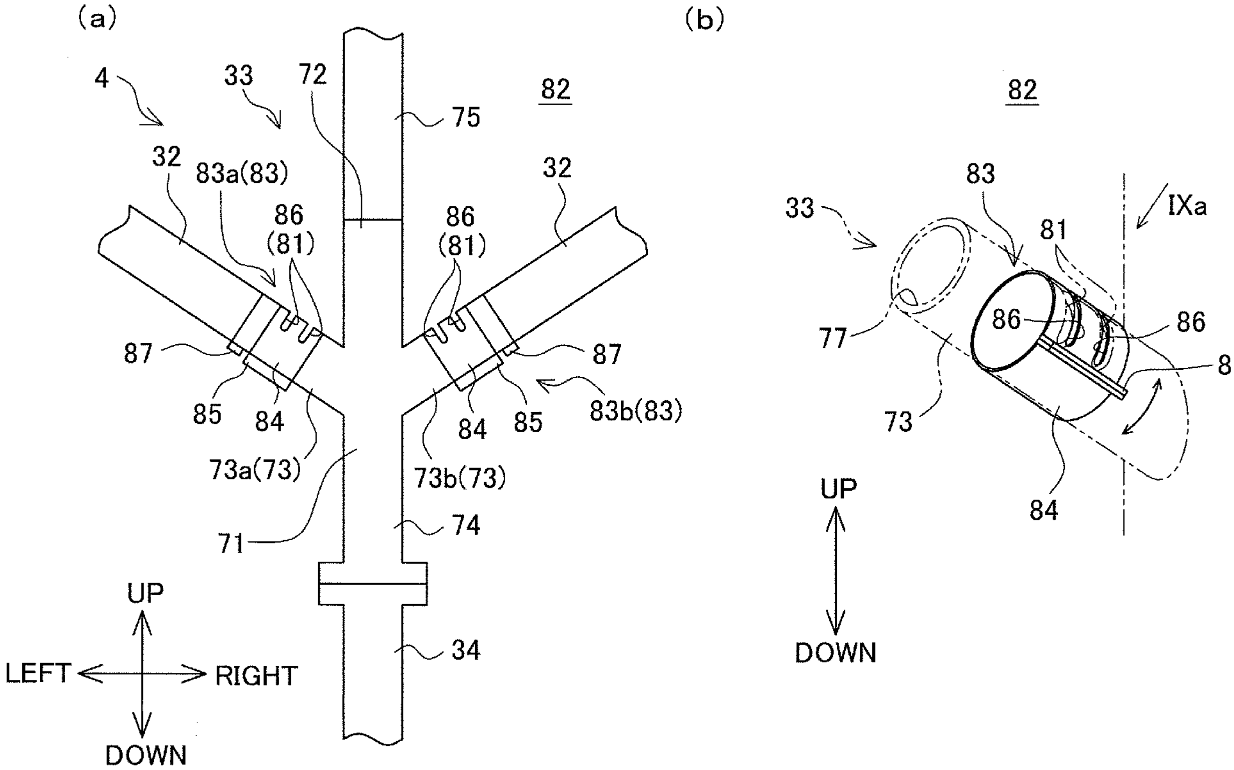
33
81
77
73
UP
DOWN

FIG.8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(b)
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(81)
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84
84
85
83b(83)
73a(73)
73b(73)
71
74
34
UP
DOWN
LEFT
RIGHT
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83
33
81
IXa
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86
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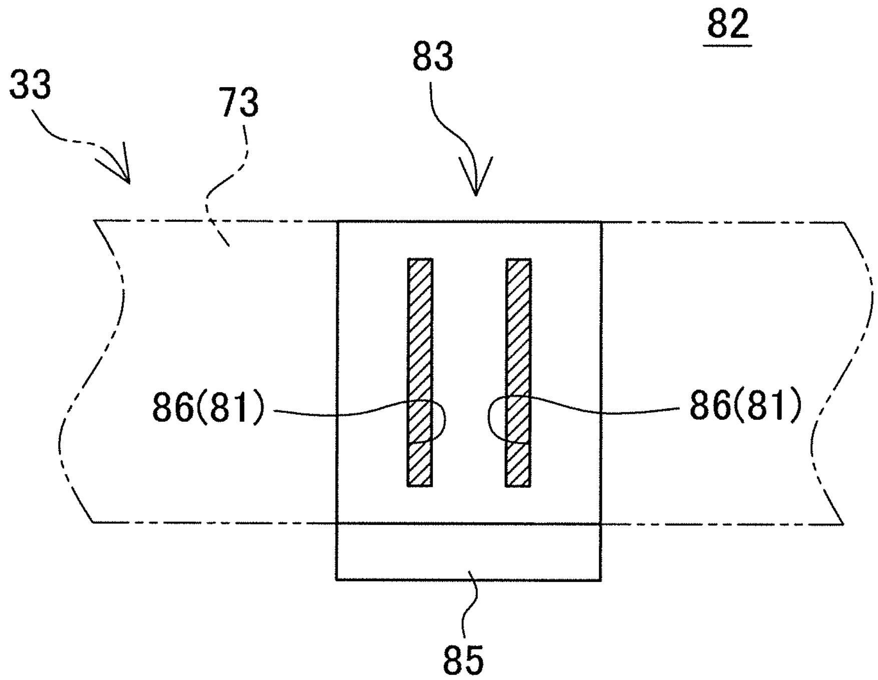
73
84
UP
DOWN

FIG.9

(a)



(b)

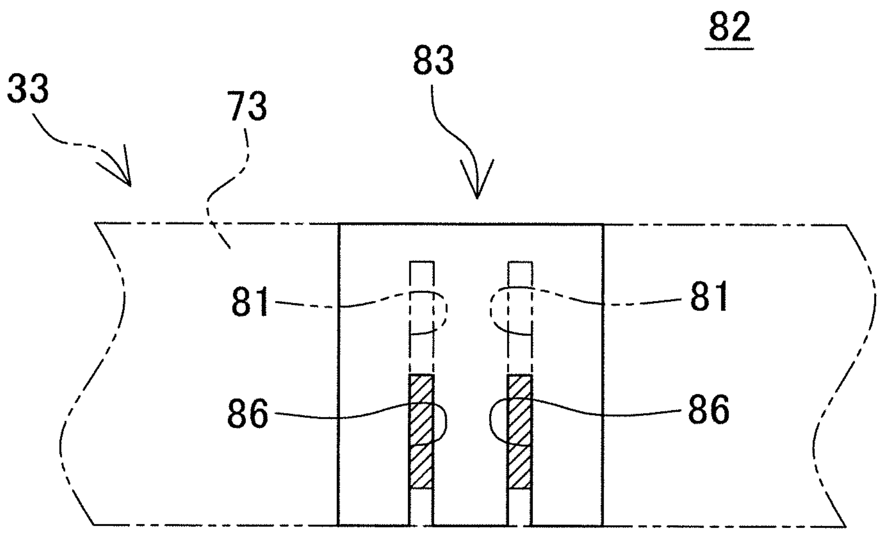
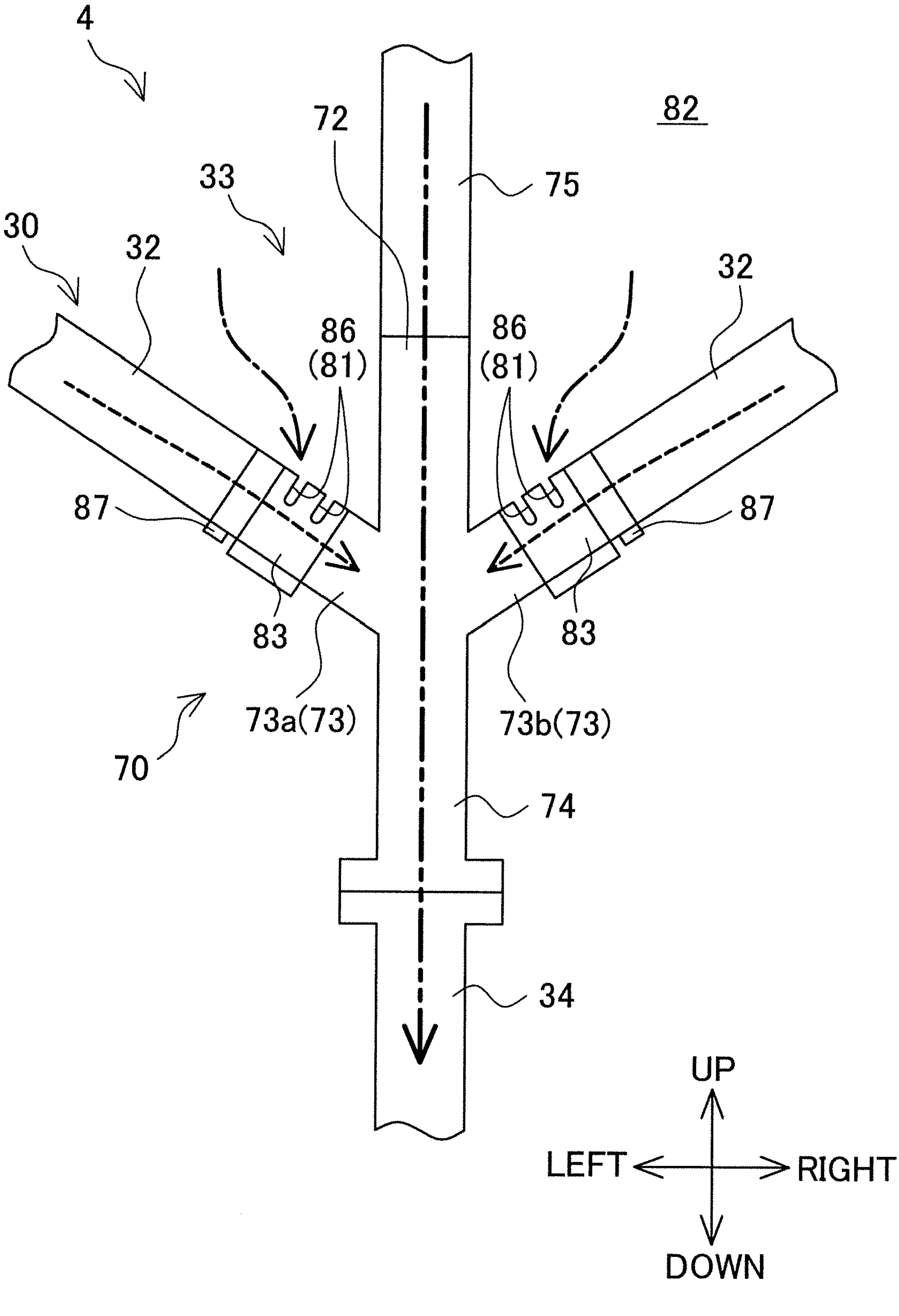


FIG.10



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(81)
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73b(73)
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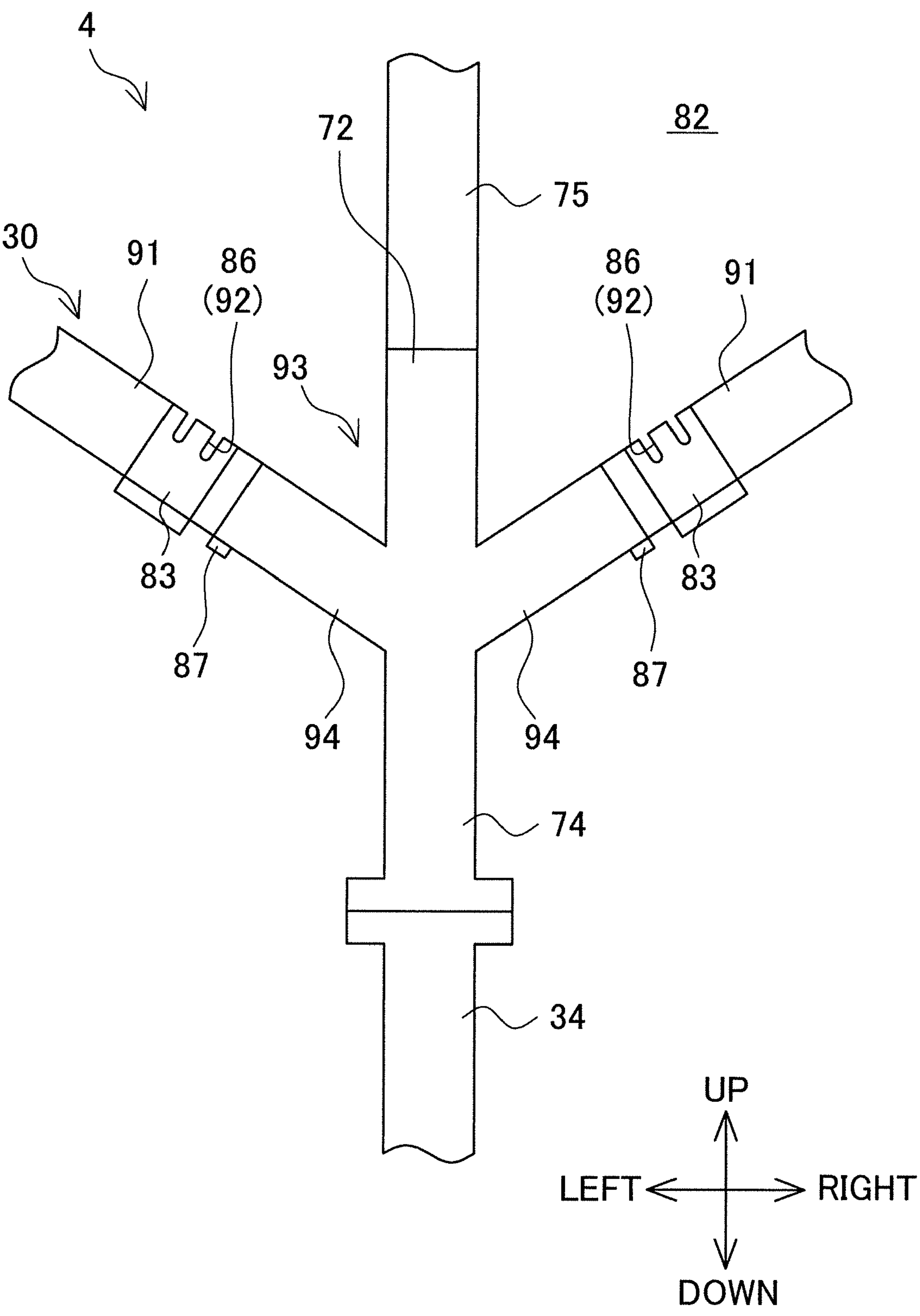
UP
LEFT
RIGHT
DOWN

FIG.11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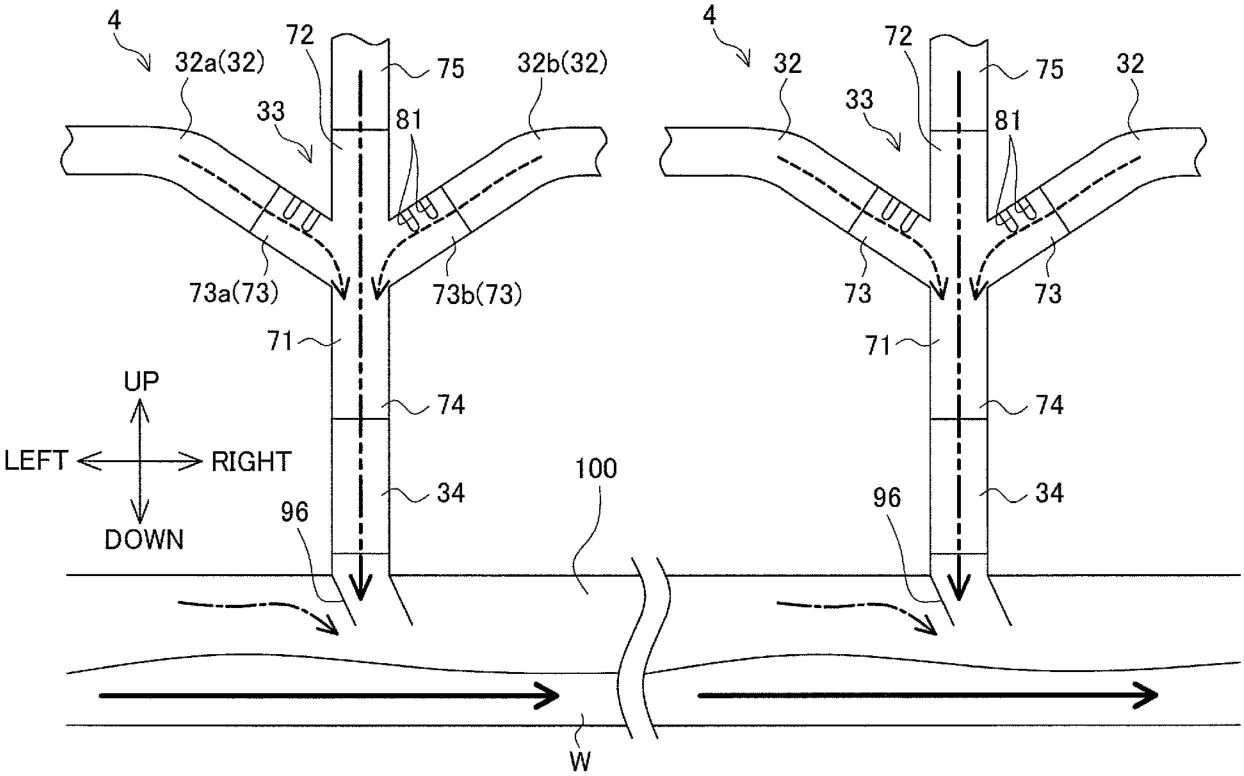
UP
LEFT
RIGHT
DOWN

FIG.12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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
The Hague	11 August 2020	Malik, Jan

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