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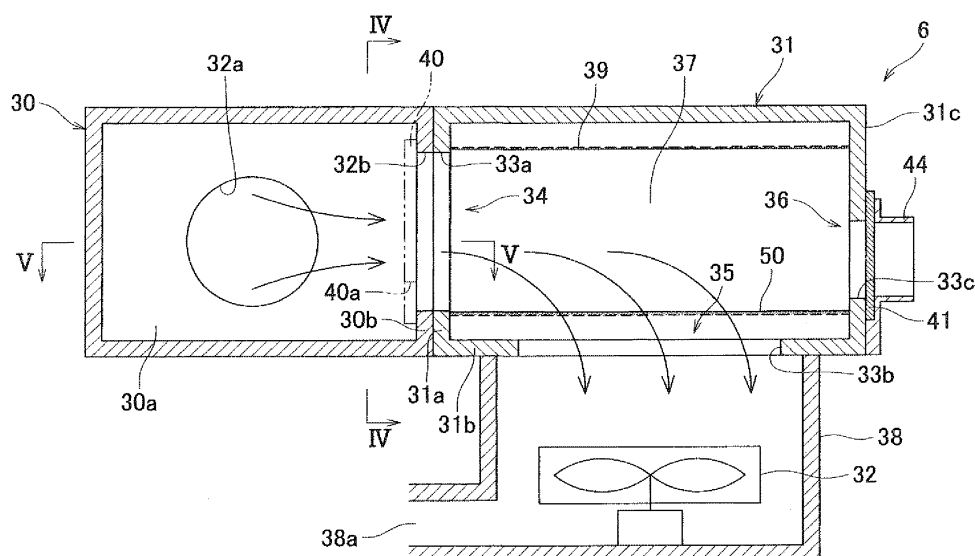
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(54) **Fly waste gathering device, textile machine, and fly waste gathering method**

(57) A fly waste gathering device (6) includes a fly waste gathering box (31) with a fly waste gathering chamber (37), an introducing section (34) adapted to introduce air to the fly waste gathering chamber (37), and a first discharging section (35) and a second discharging section (36) adapted to discharge the air in the fly waste gathering chamber (37); a suction fan (32) connected to the first discharging section (35) and adapted to depress-

surize the fly waste gathering chamber (37); and a filter (39) adapted to catch the fly waste in the air discharged from the first discharging section (35). The second discharging section (36) is connected to a main blower. The fly waste gathering device (6) further includes an open/close means (41) adapted to open/close the second discharging section (36) and a shielding member (40) adapted to narrow an opening area of the introducing section (34).

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a fly waste gathering device adapted to gather a fly waste produced by the operation of a textile machine.

2. Description of the Related Art

[0002] In a field of textile machines such as a winding device of a yarn, a device adapted to gather and collect cotton flies produced during the operation of the machine is conventionally known. This device is generally configured to suck the air around the area where the cotton flies are produced with a duct and the like, and catch the cotton flies in the suctioned air with a filter arranged inside the duct and the like. The fly waste gathering function by the filter lowers as the gathered cotton flies accumulate on the filter, and thus a configuration for cleaning the filter of collecting the cotton flies accumulated on the filter every prescribed time is also normally arranged.

[0003] Japanese Unexamined Patent Publication No. 8-2819 discloses a device adapted to collect the cotton flies produced in a plurality of winding units of an automatic winder in a dust box. This device includes a main duct common to the plurality of winding units of the automatic winder connected to a line flow fan, which is adapted to generate a negative pressure, a suction duct branched from the main duct and opened near each winding unit, and a filter bridged in a manner applied with tension in the main duct, where the fly waste floating in the surrounding area of each winding unit is sucked from the suction duct and caught by the filter in the main duct. Furthermore, a suction nozzle arranged at one end of the filter and connected to a blower in the dust box and a scraper, which moves along the filter, are also arranged, so that the fly waste is conveyed to the suction nozzle while scraping the fly waste accumulated on the filter with the scraper and discharged from the suction nozzle to the dust box, thus cleaning the filter.

[0004] Japanese Unexamined Patent Publication No. 2004-308107 discloses a fly waste processing device of a spinning machine. This device includes a cotton collecting chamber in which the pressure is depressurized by a suction fan so that air is taken in from an external connection port, a fly waste attachment filter adapted to catch the fly waste in the air taken into the cotton collecting chamber, a collecting means adapted to remove the fly waste from the fly waste attachment filter and supply the same to the collecting chamber, and the like. A configuration of ejecting compressed air along the surface of the fly waste attachment filter is disclosed for the collecting means.

[0005] In the device of Japanese Unexamined Patent Publication No. 8-2819, the scraper adapted to scrape

the surface of the filter, and the configuration adapted to drive the scraper are required, and thus the number of components increases and the device configuration becomes complex. In the device of Japanese Unexamined Patent Publication No. 2004-308107, the configuration adapted to separately supply the compressed air and the configuration such as an ejection tube or a valve adapted to eject the compressed air along a surface of the filter are required, and hence the device configuration again becomes complex.

BRIEF SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to provide a fly waste gathering device capable of removing the fly waste accumulated on the filter with a simple configuration.

[0007] A fly waste gathering device of a first aspect is a fly waste gathering device adapted to gather a fly waste generated by an operation of a textile machine, the fly waste gathering device including a fly waste gathering box including a fly waste gathering chamber, an introducing section adapted to introduce air containing the fly waste to the fly waste gathering chamber, and a first discharging section and a second discharging section adapted to discharge the air in the fly waste gathering chamber; a fly waste gathering negative pressure source connected to the first discharging section and adapted to depressurize the fly waste gathering chamber; and a fly waste shielding member arranged in the fly waste gathering chamber and adapted to catch the fly waste in the air discharged from the first discharging section; wherein the second discharging section of the fly waste gathering box is connected to a fly waste collecting negative pressure source different from the fly waste gathering negative pressure source adapted to collect the fly waste gathered in the fly waste gathering box; and an open/close means adapted to open/close the second discharging section and a narrowing member adapted to narrow an opening area of the introducing section are further arranged.

[0008] When the interior of the fly waste gathering chamber is depressurized by the fly waste gathering negative pressure source connected to the first discharging section of the fly waste gathering box, the air containing the fly waste is introduced from the introducing section into the fly waste gathering chamber, where the fly waste in the air is caught by the fly waste shielding member before the air is passed through the fly waste shielding member and discharged from the first discharging section. When collecting the fly waste gathered by the fly waste gathering box, the second discharging section connected to the fly waste collecting negative pressure source is opened by the open/close means, and the opening area of the introducing section is narrowed by the narrowing member. The flow rate of the air introduced from the introducing section thus rises, and the fly waste of the fly waste shielding member is blown away by such

fast airflow thus being discharged to the second discharging section. As the fly waste accumulated on the fly waste shielding member can be reliably removed by effectively using the negative pressure generated by the fly waste collecting negative pressure source by simply narrowing the opening area of the introducing section, the configuration for cleaning the fly waste shielding member becomes very simple.

[0009] In the present invention, when referring to "gathering" the fly waste, the fly waste at the periphery of the textile machine is once gathered in the fly waste gathering box of the fly waste gathering device. When referring to "collecting" the fly waste, the fly waste gathered in the fly waste gathering box is collected by the negative pressure source (fly waste collecting negative pressure source) connected to the fly waste gathering device.

[0010] According to the fly waste gathering device of a second aspect, in the first aspect, the narrowing member is a shielding member adapted to shield an opening of the introducing section excluding one portion.

[0011] The opening area of the introducing section is narrowed by shielding the opening of the introducing section with the shielding member excluding one portion thereof, so that the flow rate of the air to be introduced becomes faster.

[0012] According to the fly waste gathering device of a third aspect, in the second aspect, the shielding member is formed with a cutout or a hole for opening one part of the opening of the introducing section when the opening of the introducing section is shielded.

[0013] The opening area of the introducing section is narrowed by opening one part of the opening of the introducing section with the cutout or the hole formed in the shielding member when the opening of the introducing section is shielded by the shielding member. Therefore, the opening area does not need to be adjusted (controlled) every time the fly waste shielding member is cleaned since the opening area of the introducing section of when cleaning the fly waste shielding member is determined by the size of the cutout or the hole of the shielding member.

[0014] According to the fly waste gathering device of a fourth aspect, in the third aspect, the first discharging section is arranged in a first wall portion for forming the fly waste collecting box; the fly waste shielding member is arranged along the first wall portion to cover the first discharging section; the introducing section is arranged on a second wall portion that intersects the first wall portion of the fly waste gathering box; and the cutout or the hole is formed at an end positioned on the first wall portion side when the opening of the introducing section is shielded of the shielding member.

[0015] Since the introducing section is arranged on the second wall portion intersecting the first wall portion where the first discharging section of the fly waste gathering box is arranged, the air introduced from the introducing section flows along the fly waste shielding member covering the first discharging section. Furthermore,

the cutout or the hole of the shielding member is formed at the end positioned on the first wall portion side of when the introducing section is shielded, so that a small open portion of the introducing section narrowed by the shielding member is positioned on the first discharging section side. Therefore, the flow of air having a fast flow rate that flowed in from the open portion flows along the fly waste shielding member covering the first discharging section, and hence the fly waste accumulated on the fly waste shielding member can be effectively removed.

[0016] According to the fly waste gathering device of a fifth aspect, in the second aspect, the introducing section includes a first opening and a second opening having a smaller opening area than the first opening; and the shielding member narrows the opening area of the introducing section by closing the first opening and opening the second opening.

[0017] When cleaning the fly waste shielding member, the opening area of the entire introducing section is narrowed by shielding the first opening of the introducing section by the shielding member and opening the second opening having a smaller opening area than the first opening. The opening area of the introducing section of when cleaning the fly waste shielding member is determined by the size of the second opening, and hence the opening area does not need to be adjusted (controlled) every time the fly waste shielding member is cleaned. The second opening for cleaning of the fly waste shielding member can be arranged at a position (position where air flow is effectively acted on the fly waste shielding member) suited for the cleaning of the fly waste shielding member, apart from the first opening for gathering the fly waste.

[0018] According to the fly waste gathering device of a sixth aspect, in the second aspect, the shielding member is configured to be movable along one wall portion of the fly waste gathering box including the introducing section, and includes a drive means adapted to adjust the opening area of the introducing section by moving the shielding member along the one wall portion.

[0019] When cleaning the fly waste shielding member, the opening area of the introducing section is adjusted by moving the shielding member by the drive means along one wall portion of the fly waste gathering box provided with the introducing section, and controlling the position thereof. The opening area of the introducing section thus can be freely changed.

[0020] In the sixth aspect, the drive means may be a stepping motor (seventh aspect). Therefore, the opening area of the introducing section can be easily changed by adjusting the number of drive pulses of the stepping motor.

[0021] According to the fly waste gathering device of an eighth aspect, in the first aspect, the fly waste shielding member is arranged along a wall portion where the first discharging section of the fly waste gathering box is arranged; and the introducing section, the first discharging section, and the second discharging section are arranged

so that a line connecting the introducing section and the second discharging section is parallel to a wall portion of the fly waste gathering box where the first discharging section is arranged.

[0022] Therefore, the air introduced from the introducing section into the fly waste gathering chamber flows to the second discharging section along the fly waste shielding member, so that the fly waste accumulated on the fly waste shielding member can be easily stripped and the fly waste can be easily removed.

[0023] According to the fly waste gathering device of a ninth aspect, in the eighth aspect, the narrowing member narrows the opening area of the introducing section by shielding the opening of the introducing section leaving one portion on the first discharging section side.

[0024] Therefore, only one portion on the first discharging section side of the opening of the introducing section is opened, so that the air introduced from the open portion flows at a fast flow rate along the first wall portion. Therefore, the flow of fast flow rate acts on the portion covering the first discharging section of the fly waste shielding member, and the fly waste can be effectively removed.

[0025] According to the fly waste gathering device of a tenth aspect, in the eighth or ninth aspect, the fly waste shielding member is a cylindrical filter arranged to connect the introducing section and the second discharging section, and extended along the wall portion where the first discharging section is arranged.

[0026] In such a tubular filter, the area where the fly waste attaches increases, and hence the filter is less likely to be clogged.

[0027] A textile machine according to an eleventh aspect includes a yarn processing device adapted to process a yarn; a fly waste gathering device adapted to gather a fly waste produced by an operation of the yarn processing device; and a fly waste collecting negative pressure source connected to the fly waste gathering device and adapted to collect the fly waste gathered in the fly waste gathering device; wherein the fly waste gathering device includes a fly waste gathering box including a fly waste gathering chamber, an introducing section adapted to introduce air containing the fly waste to the fly waste gathering chamber, and a first discharging section and a second discharging section adapted to discharge the air in the fly waste gathering chamber; a fly waste gathering negative pressure source connected to the first discharging section and adapted to depressurize the fly waste gathering chamber; and a fly waste shielding member arranged in the fly waste gathering chamber and adapted to catch the fly waste in the air discharged from the first discharging section; the second discharging section of the fly waste gathering box is connected to the fly waste collecting negative pressure source; and the fly waste gathering device further includes an open/close means adapted to open/close the second discharging section and a narrowing member adapted to narrow an opening area of the introducing section.

[0028] According to the present invention, the opening

area of the introducing section is narrowed by the narrowing member with the second discharging section opened by the open/close means and the fly waste collecting negative pressure source communicated to the fly waste collecting negative pressure source, so that the flow rate of the air introduced from the introducing section becomes fast and the fly waste on the fly waste shielding member is blown away by such fast airflow to be discharged to the second discharging section.

[0029] According to the textile machine of a twelfth aspect, in the eleventh aspect, a plurality of fly waste gathering devices are arranged, the fly waste collecting negative pressure source being commonly connected to the plurality of fly waste gathering devices.

[0030] Therefore, the cleaning of the fly waste shielding member of each fly waste gathering device can be carried out using the negative pressure of one fly waste collecting negative pressure source for collecting the fly waste gathered by a plurality of fly waste gathering devices.

[0031] A fly waste collecting method of a thirteenth aspect is a method of collecting a fly waste in a textile machine according to claim 11 or 12, the method including the steps of driving the fly waste collecting negative pressure source to catch a fly waste in an air introduced by the fly waste shielding member while discharging to the first discharging section the air introduced from the introducing section to the fly waste collecting chamber with the second discharging section closed by the open/close means and the opening area of the introducing section not narrowed by the narrowing member when collecting the fly waste with the fly waste gathering device; discharging the fly waste caught by the fly waste shielding member to the second discharging section by the air introduced from the introducing section, which opening area is narrowed, to the fly waste gathering chamber with the second discharging section opened by the open/close means and the opening area of the introducing section narrowed by the narrowing member when collecting the fly waste gathered by the fly waste gathering device with the fly waste collecting negative pressure source.

[0032] Therefore, the open/close operation of the second discharging section by the open/close means and the narrowing operation of the opening area of the introducing section by the narrowing member are switched, so that the fly waste gathering (capturing) by the fly waste shielding member in the fly waste gathering chamber and the removal of the fly waste caught by the fly waste shielding member (cleaning of fly waste shielding member) are carried out.

[0033] According to the fly waste collecting method of a fourteenth aspect, in the thirteenth aspect, the fly waste gathering negative pressure source of the fly waste gathering device is continuously driven even while collecting the fly waste gathered by the fly waste gathering device by the fly waste collecting negative pressure source.

[0034] The amount of air flowed in from the introducing section and directed towards the second discharging

section can be increased by continuously driving the fly waste gathering negative pressure source connected to the first discharging section even while opening the second discharging section and collecting by the fly waste collecting negative pressure source the fly waste caught at the fly waste shielding member. Therefore, a great amount of air introduced from the introducing section flows to the second discharging section, and such airflow acts to strip the fly waste attached to the fly waste shielding member thus effectively removing the fly waste. Furthermore, one part of the great amount of air flowed in from the introducing section into the fly waste gathering chamber is not discharged from the first discharging section and the second discharging section, and a whirling flow of returning to the introducing section is generated. The effect of stripping the fly waste in the fly waste gathering chamber from the fly waste shielding member by the whirling flow is further improved, and the fly waste can be collected from the second discharging section without being left in the fly waste gathering chamber. Furthermore, the number of start/stop can be reduced by continuously driving the fly waste gathering negative pressure source, and the lifespan of the fly waste gathering negative pressure source (lifespan of electrical components such as conductor) can be lengthened.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] FIG. 1 is a front view of an automatic winder according to a present embodiment;

[0036] FIG. 2 is a front view of one winding unit of the automatic winder;

[0037] FIG. 3 is a longitudinal cross-sectional view of a fly waste gathering device (when gathering fly waste);

[0038] FIG. 4 is a cross-sectional view taken along line IV-IV of the fly waste gathering device of FIG. 3;

[0039] FIG. 5 is a cross-sectional view taken along line V-V of the fly waste gathering device of FIG. 3;

[0040] FIG. 6 is a right side view of the fly waste gathering device of FIG. 3;

[0041] FIG. 7 is a longitudinal cross-sectional view of the fly waste gathering device (when collecting fly waste);

[0042] FIG. 8 is a cross-sectional view corresponding to FIG. 4 of a fly waste gathering device of a first variant;

[0043] FIG. 9 is a cross-sectional view corresponding to FIG. 4 of a fly waste gathering device of a second variant;

[0044] FIG. 10 is a longitudinal cross-sectional view of a fly waste gathering device of a third variant;

[0045] FIG. 11 is a cross-sectional view corresponding to FIG. 4 of a fly waste gathering device of a fourth variant;

[0046] FIG. 12 is a longitudinal cross-sectional view of a fly waste gathering device of a fifth variant;

[0047] FIG. 13 is a longitudinal cross-sectional view of a fly waste gathering device of a sixth variant; and

[0048] FIG. 14 is a longitudinal cross-sectional view of a fly waste gathering device of a seventh variant.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0049] Embodiments of the present invention will now be described. The present embodiment serves as an example in which the present invention is applied to an automatic winder (textile machine) including a great number of winding units adapted to wind a yarn unwound from a yarn supplying bobbin around a winding tube to form a wound package. FIG. 1 is a front view of an automatic winder according to the present embodiment, and FIG. 2 is a front view of one winding unit of the automatic winder.

[0050] As illustrated in FIG. 1, an automatic winder 1 includes a great number of winding units 2 (yarn processing device) arranged in a row in a left and right direction of FIG. 1, a doffing device 3 arranged to freely travel in the arranged direction of the winding units 2 along the great number of winding units 2, and a machine control device 4 responsible for the overall control of the automatic winder 1. The machine control device 4 is arranged on one end side in the arranged direction of the winding units 2.

[0051] The automatic winder 1 is configured to send a command from the machine control device 4 to each winding unit 2 so that a yarn Y unwound from a yarn supplying bobbin B is wound around a winding tube to form into a package P in the respective winding unit 2. If a fully-wound package is formed in one winding unit 2, the doffing device 3 moves to the head of the relevant winding unit 2 to change the fully-wound package with an empty winding tube. The machine control device 4 controls the operation of each winding unit 2, and also carries out monitoring of an operation state, setting and storing of operation parameters, and the like.

[0052] A plurality of fly waste gathering devices 6 adapted to gather the fly waste produced by the respective operation of the winding units 2 is installed on a rear side (far side in plane of drawing of FIG. 1) of the great number of winding units 2. One fly waste gathering device 6 is arranged for every predetermined number of (e.g., 12 spindles) winding units 2. The plurality of fly waste gathering devices 6 are commonly connected to a fly waste collecting box 5 installed next to the machine control device 4 by a cotton collecting duct 7. A main blower 8 (fly waste collecting negative pressure source) and a filter 9 are arranged in the fly waste collecting box 5, where the fly waste gathered in each of the plurality of fly waste gathering devices 6 is collected in the fly waste collecting box 5 by the main blower 8. The detailed configuration and the operation of the fly waste gathering device 6 will be specifically described later.

[0053] The detailed configuration of each winding unit 2 will now be described. The winding unit 2 illustrated in FIG. 2 winds a spun yarn unwound from the yarn supplying bobbin B around a winding tube 17 while traversing the spun yarn to form into a package P of a predetermined length and a predetermined shape.

[0054] The winding unit 2 (yarn processing device) includes a unit machine 10, a yarn supplying section 11 adapted to unwind the yarn Y of the yarn supplying bobbin B and supply the yarn Y, a yarn processing executing section 12 adapted to carry out various processes with respect to the yarn Y supplied from the yarn supplying section 11, and a winding section 13 adapted to wind the yarn Y processed by the yarn processing executing section 12 around the winding tube to form into the package P. The yarn supplying section 11, the yarn processing executing section 12, and the winding section 13 are arranged from top to bottom in such an order. The unit machine 10 includes a unit controller responsible for the control of each section of the winding unit 2, a display unit showing the operation state of the winding unit 2, an input unit for signal input to the unit controller, and the like.

[0055] The yarn supplying section 11 includes a peg 15 adapted to hold the yarn supplying bobbin B, and an unwinding assisting device 16 adapted to assist the unwinding of the yarn Y from the yarn supplying bobbin B. The unwinding assisting device 16 is a type that controls a tubular body, which is movable up and down at an upper part of the yarn supplying bobbin B, such that an interval with a distal end (chess portion) of the yarn supplying bobbin B is maintained substantially constant to stabilize the unwinding of the yarn Y.

[0056] The winding section 13 includes a cradle (not illustrated) adapted to grip the winding tube 17 in a freely rotatable manner, and a traverse drum 18. A spiral-shaped traverse groove 18a is formed on a peripheral surface of the traverse drum 18, so that the spun yarn Y can be traversed by the traverse groove 18a. As the traverse drum 18 rotates making contact with the package P formed on the winding tube 17 while traversing the spun yarn Y by the traverse groove 18a, the package P rotates by a contact friction with the traverse drum 18 thus winding the yarn Y unwound from the yarn supplying bobbin B around the winding tube 17.

[0057] The yarn processing executing section 12 includes a yarn filler 19, a tension applying device 20, a yarn splicing device 21, and a yarn clearer 22 (yarn defect detecting device).

[0058] The yarn filler 19 detects the presence/absence of the spun yarn Y between the unwinding assisting device 16 and the tension applying device 20. The tension applying device 20 applies a predetermined tension on the travelling spun yarn Y. In FIG. 2, a gate type in which a movable comb tooth 20b is arranged with respect to a fixed comb tooth 20a is illustrated, by way of example.

[0059] The yarn splicing device 21 splices a lower yarn Y1 from the yarn supplying bobbin B and an upper yarn Y2 from the package P after a yarn breakage carried out to remove a yarn defect detected by the yarn clearer 22 or after a yarn cut during the unwinding, to be described later. An air splicer adapted to carry out yarn splicing by generating an airflow and entangling the fibers of the lower yarn Y1 and the upper yarn Y2 is an example of the yarn splicing device 21.

[0060] A lower yarn catching and guiding member 23 adapted to catch the lower yarn Y1 from the yarn supplying bobbin B and guiding the same to the yarn splicing device 21, and an upper yarn catching and guiding member 24 adapted to catch the upper yarn Y2 from the package P and guiding the same to the yarn splicing device 21 are arranged above and below the yarn splicing device 21. The lower yarn catching and guiding member 23 and the upper yarn catching and guiding member 24 both have one end attached to the unit machine 10 in a freely rotatable manner so as to be able to swing up and down.

[0061] At the time of the yarn cut during the unwinding from the yarn supplying bobbin B or the yarn breakage by the yarn clearer 22, a suction port 23a of the lower yarn catching and guiding member 23 sucks and catches a yarn end of the lower yarn Y1 and guides the lower yarn Y1 to the yarn splicing device 21 by being swung from the bottom to the top. At the same time, the upper yarn catching and guiding member 24 has a suction mouth 24a thereof swung to a yarn end catching position near a contact point of the package P and the traverse drum 18 to suck and catch a yarn end of the upper yarn Y2 from the package P at the yarn catching position, and then again swung downward to guide the upper yarn Y2 to the yarn splicing device 21.

[0062] The yarn clearer 22 is adapted to detect the defect of the spun yarn Y, and detects a yarn defect such as a slub by processing a signal corresponding to a thickness of the spun yarn Y from the clearer with an appropriate analyzer. A cutter 22a for cutting the yarn when the yarn defect is detected is arranged on the yarn clearer 22.

[0063] Each winding unit 2 includes two suction nozzles 25 adapted to suck the fly waste produced by the operation of the winding unit 2. As a great amount of cotton flies produce during the operation of the winding unit 2, particularly by the yarn unwinding operation from the yarn supplying bobbin B and the yarn splicing operation by the yarn splicing device 21, the two suction nozzles 25 are installed such that a suction port at a distal end is opened at a proximate position of the unwinding assisting device 16 and a lower position of the yarn splicing device 21, respectively, to efficiently suck the cotton flies.

[0064] The fly waste gathering device 6 will now be described. FIG. 3 is a longitudinal cross-sectional view of the fly waste gathering device 6, FIG. 4 is a cross-sectional view taken along line IV-IV of FIG. 3, FIG. 5 is a cross-sectional view taken along line V-V of FIG. 3, and FIG. 6 is a right side view of FIG. 3. In the following description of the fly waste gathering device 6, the up and down, left and right directions in FIG. 3 will be defined as up, down, left and right. As illustrated in FIG. 3 to FIG. 6, the fly waste gathering device 6 includes an intake box 30 adapted to introduce external air, a fly waste gathering box 31 communicated to the intake box 30 and adapted to gather the fly waste in the air introduced from the intake box 30, and a suction fan 32 (fly waste gathering negative

pressure source) connected to the fly waste gathering box 31 and adapted to depressurize the interior of a fly waste gathering chamber 37 in the fly waste gathering box 31.

[0065] An opening 32a connected to the suction nozzle 25 of the corresponding plurality of winding units 2 is formed on a back wall portion 30a (wall portion on far side in plane of drawing of FIG. 3) of the intake box 30. An opening 32b communicated to the fly waste gathering box 31 is formed on a right wall portion 30b of the intake box 30.

[0066] The fly waste gathering box 31 has a rectangular solid shape, where a left wall portion 31a is coupled to the right wall portion 30b of the intake box 30. The left wall portion 31a, a lower wall portion 31b, and a right wall portion 31c of the fly waste gathering box 31 are formed with circular openings 33a, 33b, 33c, respectively.

[0067] The opening 33a of the left wall portion 31a (second wall portion) brought into contact with the intake box 30 communicates with the opening 32b of the intake box 30, and the opening 33a configures an introducing section 34 adapted to introduce the air surrounding the winding unit 2 into the fly waste gathering chamber in the fly waste gathering box 31 through the intake box 30. The suction fan 32 is installed on the lower side of the fly waste gathering box 31, and the suction fan 32 is covered with a cover member 38 including an exhaust port 38a. The opening 33b of the lower wall portion 31b (first wall portion) of the fly waste gathering box 31 is connected to the suction fan 32 to configure a first discharging section 35 adapted to discharge the air in the fly waste gathering chamber 37. The opening 33c of the right wall portion 31c of the fly waste gathering box 31 is connected to the cotton collecting duct 7 (see FIG. 1). The opening 33c of the right wall portion 31c is connected to the main blower 8 (fly waste collecting negative pressure source: see FIG. 1) through the cotton collecting duct 7 to configure a second discharging section 36 adapted to discharge the air in the fly waste gathering chamber 37.

[0068] Furthermore, the fly waste gathering device 6 includes a filter 39 (fly waste shielding member) arranged in the fly waste gathering chamber 37 of the fly waste gathering box 31, a shielding member 40 (narrowing member) adapted to shield the introducing section 34 and narrow the opening area, and an open/close member (open/close means) 41 adapted to open/close the second discharging section 36.

[0069] As illustrated in FIG. 3 to FIG. 5, the filter 39 has a cylindrical shape, and is arranged to connect the opening 33a of the introducing section 34 formed in the left wall portion 31a of the fly waste gathering box 31 and the opening 33c of the second discharging section 36 formed in the right wall portion 31c. The cylindrical filter 39 is also extended along the lower wall portion 31b of the fly waste gathering box 31 so as to cover the opening 33b of the first discharging section 35. When the air introduced from the introducing section 34 is discharged to the first discharging section 35, the filter 39 catches

the fly waste contained in the discharged air. It is advantageous to have the filter 39 as a cylindrical shape since the area of the surface for catching the fly waste of the filter 39 increases and the filter 39 is less likely to get clogged.

[0070] As illustrated in FIG. 3 to FIG. 5, the shielding member 40 (narrowing member) is a plate-like member, and is configured to be attached in a freely swingable manner with a shaft 42 as the center at the right wall portion 30b of the intake box 30 to shield the opening 33b of the intake box 30 (opening 33a of introducing section 34 of fly waste gathering box 31). An air cylinder 43 for swing driving the shielding member 40 is arranged on the upper surface of the intake box 30. As illustrated in FIG. 3 and FIG. 5, a cutout 40a is formed at the lower end of the plate-like shielding member 40. When the shielding member 40 shields the opening 33a of the introducing section 34, the portion on the lower side (lower wall portion 31b side where first discharging section 35 is arranged) of the opening 33a of the introducing section 34 is opened at the cutout 40a.

[0071] As illustrated in FIG. 3 and FIG. 5, a connecting member 44 to be connected to the cotton collecting duct 7 (see FIG. 1) is fixed to the outer surface of the right wall portion 31c of the fly waste gathering box 31. The open/close member 41 is arranged in a freely slidable manner on the connecting member 44, where the opening 33c of the second discharging section 36 is opened/closed when the open/close member 41 is slide driven by the air cylinder 45.

[0072] In the present embodiment, the operation of the suction fan 32 of the fly waste gathering device 6, and the operation of the air cylinders 43, 45 for driving the shielding member 40 and the open/close member 41 are controlled by the machine control device 4 (see FIG. 1) of the automatic winder 1.

[0073] The operation of gathering the fly waste to the fly waste gathering box 31 of the fly waste gathering device 6 and the operation of collecting the gathered fly waste with the main blower 8 will now be described.

[0074] First, when gathering the fly waste drifting around the winding unit 2 in the fly waste gathering box 31, as illustrated in FIG. 3, the shielding member 40 does not shield the opening 33a of the introducing section 34 so as to be in a completely opened state in which the opening area of the introducing section 34 is not narrowed, and the second discharging section 36 connecting to the main blower 8 is closed by the open/close member 41 in each of the plurality of fly waste gathering devices 6. When the interior of the fly waste gathering chamber 37 is depressurized by the driving of the suction fan 32 in this state, the air containing the fly waste at the surrounding area of the winding unit 2 is sucked from the suction nozzle 25 (see FIG. 2), and introduced into the fly waste gathering chamber 37 from the introducing section 34 via the intake box 30. Furthermore, the air introduced from the introducing section 34 into the fly waste gathering chamber 37 (interior of cylindrical filter 39) is

passed through the filter 39 and discharged to the first discharging section 35, where the fly waste 50 contained in the air is caught by the filter 39.

[0075] With the continuation of the fly waste gathering operation, the fly waste 50 starts to accumulate at the filter 39 (in particular, portion covering first discharging section 35) and the gathering function gradually lowers, and hence the fly waste 50 gathered in the fly waste gathering box 31 is collected in the fly waste collecting box 5 (see FIG. 1) by the negative pressure of the main blower 8 every time a predetermined time (e.g., 10 minutes) passes. FIG. 7 is a longitudinal cross-sectional view of the fly waste gathering device 6 of when collecting the fly waste.

[0076] When collecting the fly waste 50 in the fly waste gathering box 31, as illustrated in FIG. 7, the opening 33a of the introducing section 34 is shielded by the shielding member 40 excluding one part on the lower side corresponding to the cutout 40a, so that the opening area of the introducing section 34 is narrowed. The second discharging section 36 closed by the open/close member 41 is then opened. The flow of air from the introducing section 34 towards the second discharging section 36 thus generates in the fly waste gathering chamber 37, where the flow rate of the air introduced from the introducing section 34 rises as the opening area of the introducing section 34 is narrowed, and the fly waste 50 accumulated on the filter 39 in the fly waste gathering chamber 37 is blown away by such fast air flow and discharged to the second discharging section 36. Therefore, the fly waste 50 accumulated on the filter 39 can be reliably removed by effectively using the negative pressure generated by the main blower 8 by simply narrowing the opening area of the introducing section 34.

[0077] The opening area of the introducing section 34 when cleaning the filter 39 is determined by the size of the cutout 40a of the shielding member 40, and is set to a predetermined opening area by simply shielding the introducing section 34 with the shielding member 40. That is, the opening area of the introducing section 34 does not need to be adjusted (controlled) every time the filter 39 is cleaned.

[0078] In the present embodiment, in particular, the introducing section 34 is arranged on the left wall portion 31a orthogonal to the lower wall portion 31b where the first discharging section 35 of the fly waste gathering box 31 is arranged, and the second discharging section 36 is arranged at a position facing the introducing section 34 of the right wall portion 31c opposing the left wall portion 31a. Thus, a line connecting the introducing section 34 and the second discharging section 36 is parallel to the lower wall portion 31b where the first discharging section 35 is arranged. Thus, the air introduced from the introducing section 34 into the fly waste gathering chamber 37 flows along the filter 39 covering the first discharging section 35, and hence the fly waste 50 accumulated on the filter 39 can be easily blown away.

[0079] As the fly waste 50 accumulates the most at the

portion (portion immediately above first discharging section 35) covering the first discharging section 35 of the cylindrical filter 39, it is preferable to act a strong air flow on such a portion. In this regards, in the present embodiment, the cutout 40a of the shielding member 40 is formed at the lower end thereof, that is, the portion on the lower wall portion 31b side where the first discharging section 35 is arranged. Therefore, a small opening portion of the introducing section 34 partially opened by the cutout 40a is positioned on the first discharging section 35 side, so that the flow of air along the portion covering the first discharging section 35 of the filter 39 becomes faster and the fly waste at such a portion can be reliably removed.

[0080] Furthermore, at the time of collecting the fly waste, the air in the fly waste gathering chamber 37 is discharged to the second discharging section 36, and at the same time, the suction fan 32 of the fly waste gathering device 6 is preferably continuously driven to continue the discharge of the air from the first discharging section 35. The amount of air (air amount that flows in per unit time) that flows in from the introducing section 34 towards the second discharging section 36 thus increases. The great amount of air flow flowing from the introducing section 34 towards the second discharging section 36 acts to strip the fly waste attached to the filter 39 thus effectively removing the fly waste. Furthermore, as illustrated in FIG. 7, one part of the great amount of air flowing in from the introducing section 34 to the fly waste gathering chamber 37 may not be discharged from the first discharging section 35 and the second discharging section 36, and a whirling flow returning to the introducing section 34 may occur. The effect of stripping the fly waste in the fly waste gathering chamber 37 from the filter 39 is thus improved by such whirling flow, so that the fly waste can be collected from the second discharging section 36 without being left in the fly waste gathering chamber 37. Furthermore, the suction fan 32 does not need to be stopped every time the fly waste is to be collected by continuously driving the suction fan 32. Therefore, the number of times to start/stop the suction fan 32 can be reduced, and the lifespan of the suction fan 32 (lifespan of electrical components such as conductor) can be lengthened.

[0081] Thus, according to the fly waste gathering device 6 of the present embodiment, the fly waste accumulated on the filter 39 can be removed by effectively using the negative pressure generated by the main blower 8 by simply narrowing the opening area of the introducing section 34 with the shielding member 40, so that the configuration for cleaning the filter 39 becomes very simple.

[0082] In the present embodiment, the cleaning of the filter 39 of the plurality of fly waste gathering devices 6 is carried out using the negative pressure of the one main blower 8 (see FIG. 1) commonly connected to the plurality of fly waste gathering devices 6 and adapted to collect the fly waste from the plurality of fly waste gathering devices 6.

[0083] If the collecting of the fly waste (cleaning of filter 39) of all the fly waste gathering devices 6 is simultaneously carried out, the negative pressure of the cotton collecting duct 7 weakens and the effect of cleaning the filter 39 lowers. Furthermore, in the fly waste gathering device 6 carrying out the collecting of the fly waste, the intake amount of air to the fly waste gathering box 31 is significantly reduced and the fly waste is barely gathered, and hence if the collecting of the fly waste of all the fly waste gathering devices 6 is simultaneously carried out, the gathering of the fly waste may stop substantially completely in all the winding units 2 during such time. Therefore, it is preferable to carry out the collecting of the fly waste of the fly waste gathering device 6 by the main blower 8 in order one at a time.

[0084] Variants in which various modifications are made on the embodiment described above will now be described. The same reference numerals are denoted on those having a configuration similar to the embodiment described above, and the description thereof will be appropriately omitted.

[0085] 1) The narrowing member adapted to narrow the opening area of the introducing section 34 of the fly waste gathering box 31 is not limited to the shielding member 40 of the embodiment described above, and the configuration may be appropriately changed as will be illustrated below.

(First variant)

[0086] As illustrated in FIG. 8, a hole 40b may be formed in place of the cutout 40a of the shielding member 40 of the embodiment. In such a configuration as well, the opening area of the introducing section 34 of when cleaning the filter 39 is determined with only the size of the hole 40b, similar to the cutout 40a. That is, a predetermined opening area is set by simply shielding the introducing section 34 with the shielding member 40. Similar to the cutout 40a of the embodiment, the hole 40b of the first variant is also preferably arranged at the lower end side portion of the shielding member 40 (portion positioned on first discharging section 35 side in shielding position).

(Second variant)

[0087] As illustrated in FIG. 9, the shielding member 40 including the cutout 40a (or hole 40b) may be slidable along the wall portion 31a of the fly waste gathering box 31 where the introducing section 34 is arranged, and may be driven by a driving means such as an air cylinder 46.

(Third variant)

[0088] As illustrated in FIG. 10, the introducing section 34 of the fly waste gathering box 31 may have a configuration including a first opening 34a and a second opening 34b having a smaller opening area than the first open-

ing 34a. In this case, the shielding member 40 opens the first opening 34a and shields the second opening 34b (position of chain double dashed line in FIG. 10) when gathering the cotton flies. When collecting the cotton flies, the shielding member 40 closes the first opening 34a and opens the second opening 34b (position of solid line in FIG. 10), so that the opening area of the introducing section 34 is narrowed compared to when gathering the cotton flies. In this configuration, the second opening 34b for cleaning the filter 39 can be arranged at a position suited for cleaning the filter 39 (position where airflow can be effectively acted on the filter 39) apart from the first opening 34a for gathering the cotton flies. Specifically, as illustrated in FIG. 10, the second opening 34b can be arranged at a position proximate to the lower part where most amount of the fly wastes 50 are accumulated on the cylindrical filter 39. Moreover, two shielding members 40 adapted to open/close the first opening 34a and the second opening 34b, respectively, may be provided, where one of the first opening 34a and the second opening 34b may be selectively opened by the two shielding members 40.

(Fourth variant)

[0089] If the shielding member 40 is slidably movable along the wall portion 31a of the fly waste gathering box 31 where the introducing section 34 is arranged, the position of the shielding member 40 may be adjusted by an appropriate driving means 48 to adjust the opening area of the introducing section 34, as illustrated in FIG. 11. In such a configuration, the opening area of the introducing section 34 can be freely changed. Through the use of the stepping motor for the driving means 48, the opening area of the introducing section 34 can be simply changed by adjusting the number of drive pulses of the stepping motor. In addition, an air cylinder capable of stroke adjustment may be adopted for the driving means 48.

[0090] 2) The filter 39 is not limited to a cylindrical shape, and the shape may be appropriately changed. For instance, as illustrated in FIG. 12, a flat sheet-like filter 39 adapted to cover the entire surface of the first discharging section 35 of the fly waste gathering box 31 may be adopted (fifth variant).

[0091] 3) In the embodiment described above, the introducing section 34, the first discharging section 35, and the second discharging section 36 are respectively arranged so that the air introduced from the introducing section 34 flows along the filter 39 in the fly waste gathering box 31, but a configuration in which the air introduced from the introducing section 34 hits the filter 39 may be adopted (sixth variant). For instance, as illustrated in FIG. 13, the filter 39 may be arranged to cover the first discharging section 35 arranged on the lower wall portion 31b of the fly waste gathering box 31, and then the introducing section 34 and the shielding member 40 adapted to narrow the opening area of the introducing section 34 may be arranged on the upper wall portion

31d of the fly waste gathering box 31.

[0092] 4) In the embodiment described above, as illustrated in FIG. 2 and FIG. 7, the introducing section 34 is arranged on the left wall portion 31a, the first discharging section 35 is arranged on the lower wall portion 31b, and the second discharging section 36 is arranged on the right wall portion 31c of the fly waste gathering box 31, so that the air introduced from the introducing section 34 flows to the second discharging section 36 along the filter 39 covering the first discharging section 35. As the fly waste 50 accumulated on the filter 39 can be blown away by the airflow from the introducing section 34 towards the second discharging section 36 with this configuration alone, the narrowing member (shielding member 40) adapted to narrow the opening area of the introducing section 34 may be omitted, as illustrated in FIG. 14 (seventh variant).

[0093] 5) The embodiment described above is an example in which the present invention is applied to the automatic winder, but the present invention may be applied to other textile machines that produce fly wastes during the yarn processing such as a spinning machine other than the automatic winder.

The features of all dependent claims and all embodiments can be combined with each other as long as they do not contradict each other.

Claims

1. A fly waste gathering device (6) adapted to gather a fly waste generated by an operation of a textile machine, the fly waste gathering device (6) **characterized by** comprising:

a fly waste gathering box (31) including a fly waste gathering chamber (37), an introducing section (34) adapted to introduce air containing the fly waste to the fly waste gathering chamber (37), and a first discharging section (35) and a second discharging section (36) adapted to discharge the air in the fly waste gathering chamber (37); a fly waste gathering negative pressure source (32) connected to the first discharging section (35) and adapted to depressurize the fly waste gathering chamber (37); and a fly waste shielding member (39) arranged in the fly waste gathering chamber (37) and adapted to catch the fly waste in the air discharged from the first discharging section (35); wherein the second discharging section (36) of the fly waste gathering box (31) is connected to a fly waste collecting negative pressure source (8) different from the fly waste gathering negative pressure source (32) adapted to collect the fly waste gathered in the fly waste gathering box (31); and

an open/close means (41) adapted to open/close the second discharging section (36) and a narrowing member (40) adapted to narrow an opening area of the introducing section (34) are further arranged.

2. The fly waste gathering device (6) according to claim 1, **characterized in that** the narrowing member (40) is a shielding member (40) adapted to shield an opening of the introducing section (34) excluding one portion.
3. The fly waste gathering device (6) according to claim 2, **characterized in that** the shielding member (40) is formed with a cutout (40a) or a hole (40b) for opening one part of the opening of the introducing section (34) when the opening of the introducing section (34) is shielded.
4. The fly waste gathering device (6) according to claim 3, **characterized in that** the first discharging section (35) is arranged in a first wall portion (31b) for forming the fly waste collecting box (31); the fly waste shielding member (39) is arranged along the first wall portion (31b) to cover the first discharging section (35); the introducing section (34) is arranged on a second wall portion (31a) that intersects the first wall portion (31b) of the fly waste gathering box (31); and the cutout (40a) or the hole (40b) is formed at an end positioned on the first wall portion (31b) side when the opening of the introducing section (34) is shielded of the shielding member (40).
5. The fly waste gathering device (6) according to claim 2, **characterized in that** the introducing section (34) includes a first opening (34a) and a second opening (34b) having a smaller opening area than the first opening (34a); and the shielding member (40) narrows the opening area of the introducing section (34) by closing the first opening (34a) and opening the second opening (34b).
6. The fly waste gathering device (6) according to claim 2, **characterized in that** the shielding member (40) is configured to be movable along one wall portion of the fly waste gathering box (31) including the introducing section (34), and includes a drive means (48) adapted to adjust the opening area of the introducing section (34) by moving the shielding member (40) along the one wall portion.
7. The fly waste gathering device (6) according to claim 6, **characterized in that** the drive means (48) is a stepping motor.

8. The fly waste gathering device (6) according to claim 1, **characterized in that** the fly waste shielding member (39) is arranged along a wall portion where the first discharging section (35) of the fly waste gathering box (31) is arranged; and the introducing section (34), the first discharging section (35), and the second discharging section (36) are arranged so that a line connecting the introducing section (34) and the second discharging section (36) is parallel to a wall portion of the fly waste gathering box (31) where the first discharging section (35) is arranged.
9. The fly waste gathering device (6) according to claim 8, **characterized in that** the narrowing member (40) narrows the opening area of the introducing section (34) by shielding the opening of the introducing section (34) leaving one portion on the first discharging section (35) side.
10. The fly waste gathering device (6) according to claim 8 or 9, **characterized in that** the fly waste shielding member (39) is a cylindrical filter arranged to connect the introducing section (34) and the second discharging section (36), and extended along the wall portion where the first discharging section (35) is arranged.
11. A textile machine **characterized by** comprising:
- a yarn processing device (2) adapted to process a yarn;
 - a fly waste gathering device (6) adapted to gather a fly waste produced by an operation of the yarn processing device (2); and
 - a fly waste collecting negative pressure source (8) connected to the fly waste gathering device (6) and adapted to collect the fly waste gathered in the fly waste gathering device (6); wherein the fly waste gathering device (6) includes a fly waste gathering box (31) including a fly waste gathering chamber (37), an introducing section (34) adapted to introduce air containing the fly waste to the fly waste gathering chamber (37), and a first discharging section (35) and a second discharging section (36) adapted to discharge the air in the fly waste gathering chamber (37); a fly waste gathering negative pressure source (32) connected to the first discharging section (35) and adapted to depressurize the fly waste gathering chamber (37); and a fly waste shielding member (39) arranged in the fly waste gathering chamber (37) and adapted to catch the fly waste in the air discharged from the first discharging section (35); the second discharging section (36) of the fly waste gathering box (31) is connected to the fly waste collecting negative pressure source (8); and the fly waste gathering device (6) further includes an open/close means (41) adapted to open/close the second discharging section (36) and a narrowing member (40) adapted to narrow an opening area of the introducing section (34).
12. The textile machine according to claim 11, **characterized in that** a plurality of fly waste gathering devices (6) are arranged, the fly waste collecting negative pressure source (8) being commonly connected to the plurality of fly waste gathering devices (6).
13. A method of collecting a fly waste in a textile machine according to claim 11 or 12, the method **characterized by** comprising the steps of:
- driving the fly waste collecting negative pressure source (32) to catch a fly waste in an air introduced by the fly waste shielding member (39) while discharging to the first discharging section (35) the air introduced from the introducing section (34) to the fly waste collecting chamber (37) with the second discharging section (36) closed by the open/close means (41) and the opening area of the introducing section (34) not narrowed by the narrowing member (40) when collecting the fly waste with the fly waste gathering device (6);
 - discharging the fly waste caught by the fly waste shielding member (39) to the second discharging section (36) by the air introduced from the introducing section (34), which opening area is narrowed, to the fly waste gathering chamber (37) with the second discharging section (36) opened by the open/close means (41) and the opening area of the introducing section (34) narrowed by the narrowing member (40) when collecting the fly waste gathered by the fly waste gathering device (6) with the fly waste collecting negative pressure source (8).
14. The method of collecting the fly waste according to claim 13, **characterized in that** the fly waste gathering negative pressure source (32) of the fly waste gathering device (6) is continuously driven even while collecting the fly waste gathered by the fly waste gathering device (6) by the fly waste collecting negative pressure source (8).

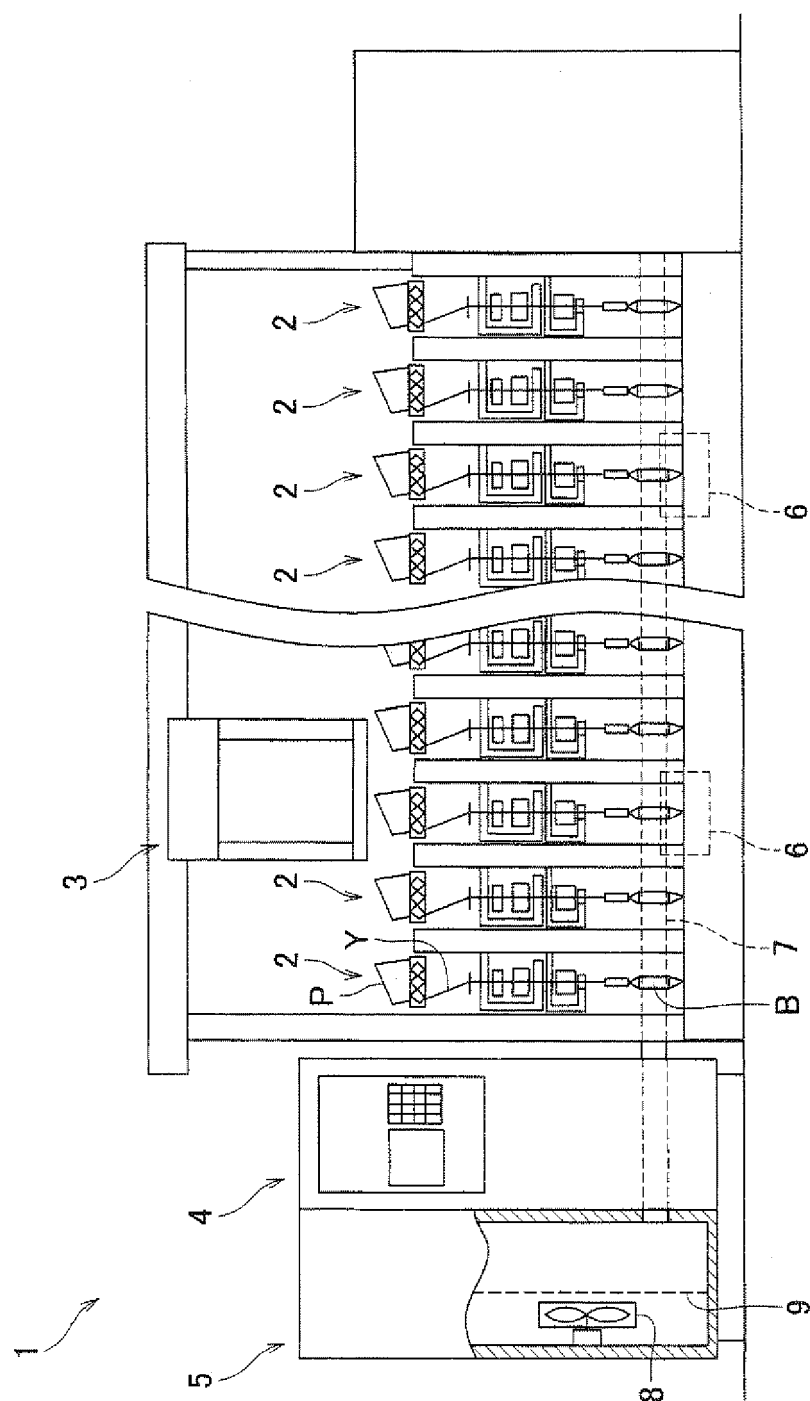


FIG. 2

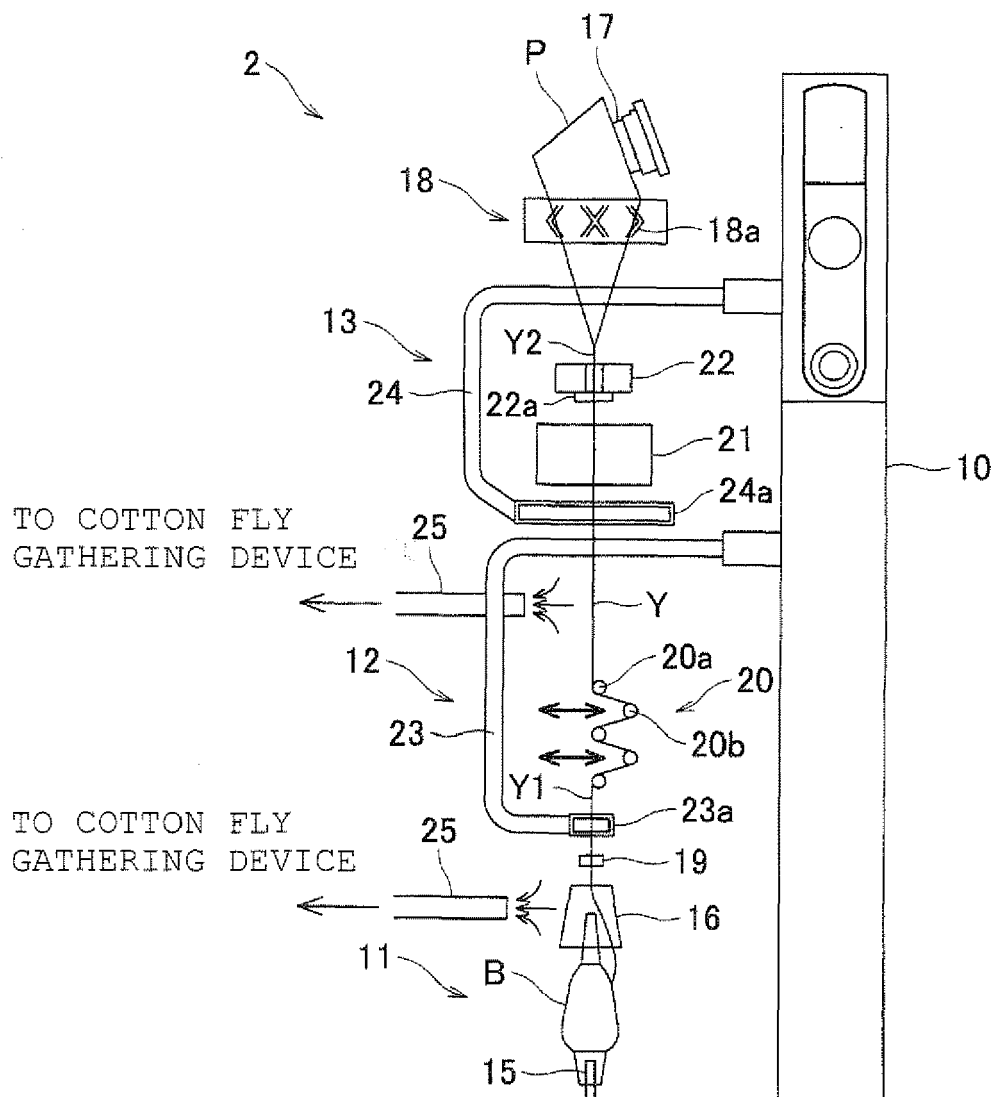


FIG. 3

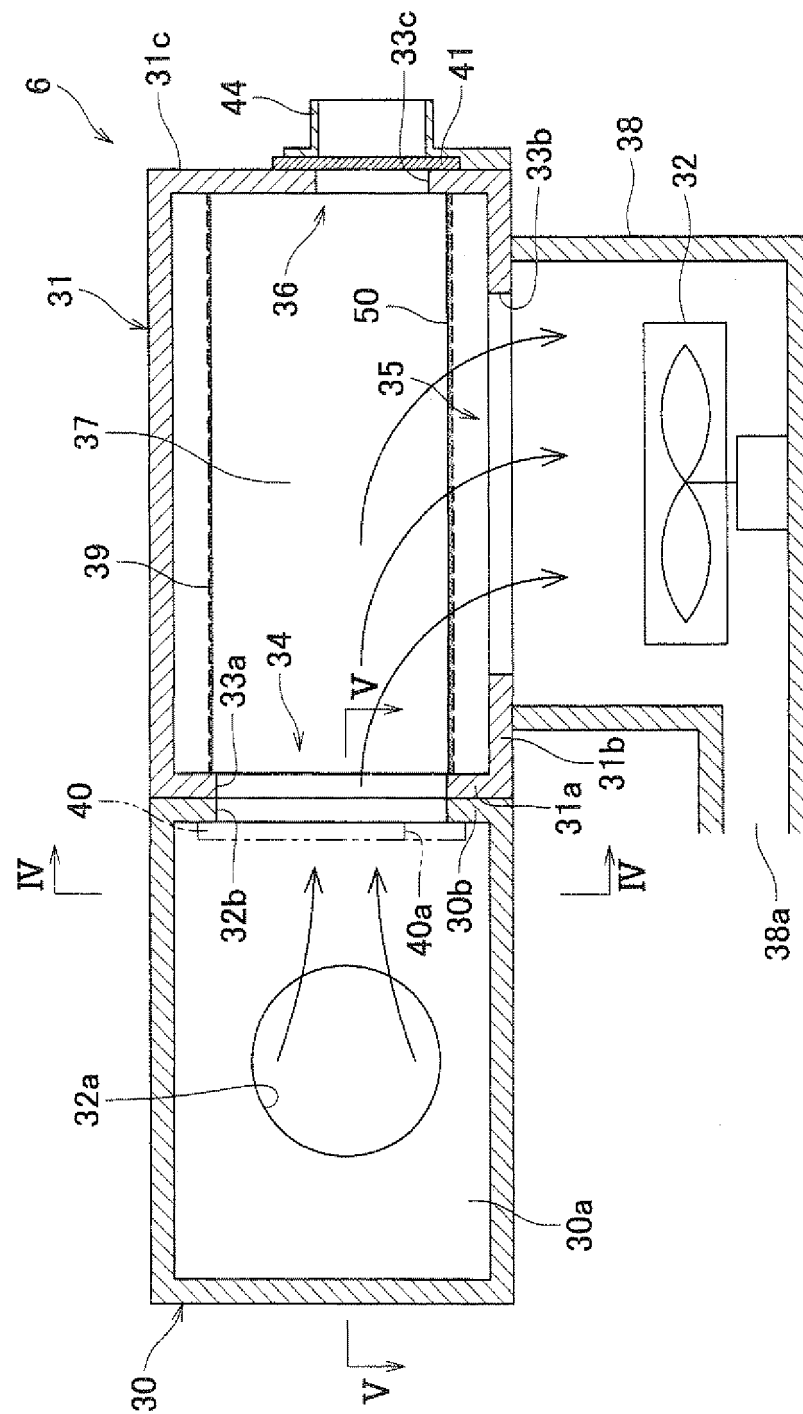


FIG. 4

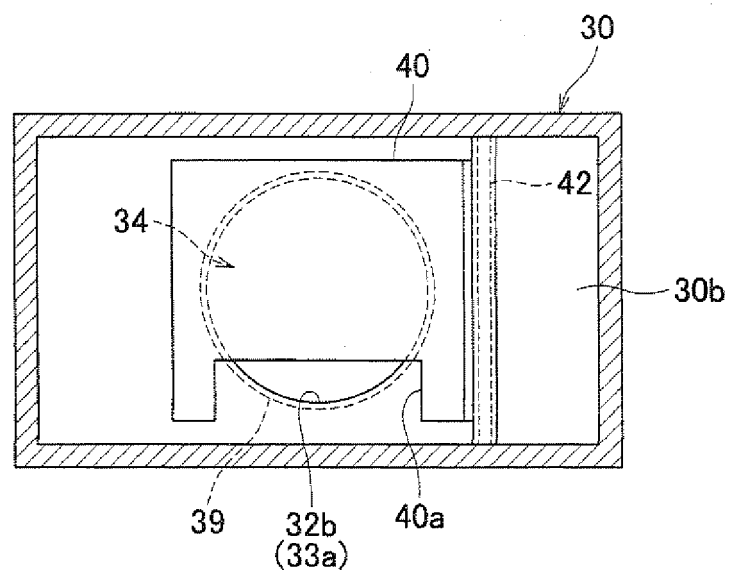


FIG. 5

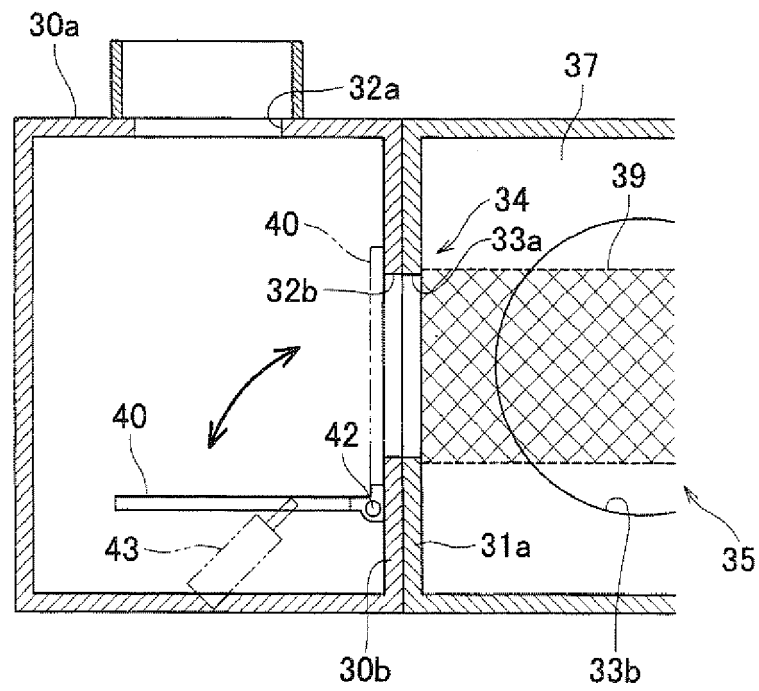


FIG. 6

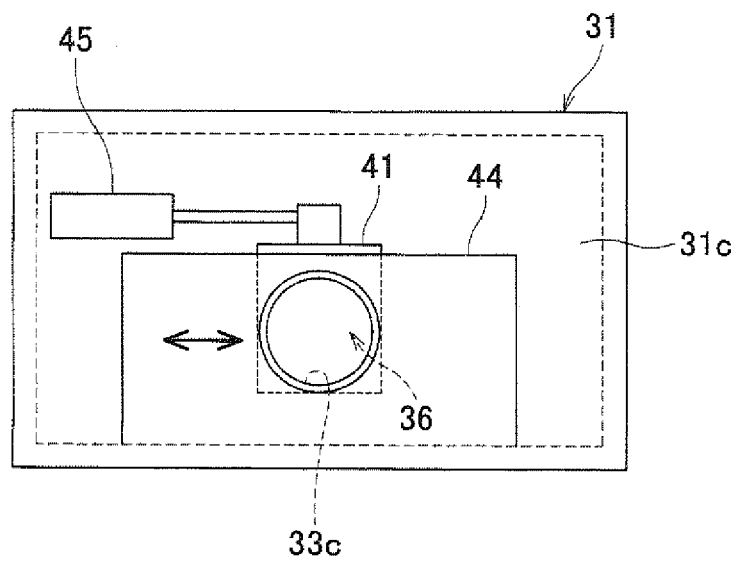


FIG. 7

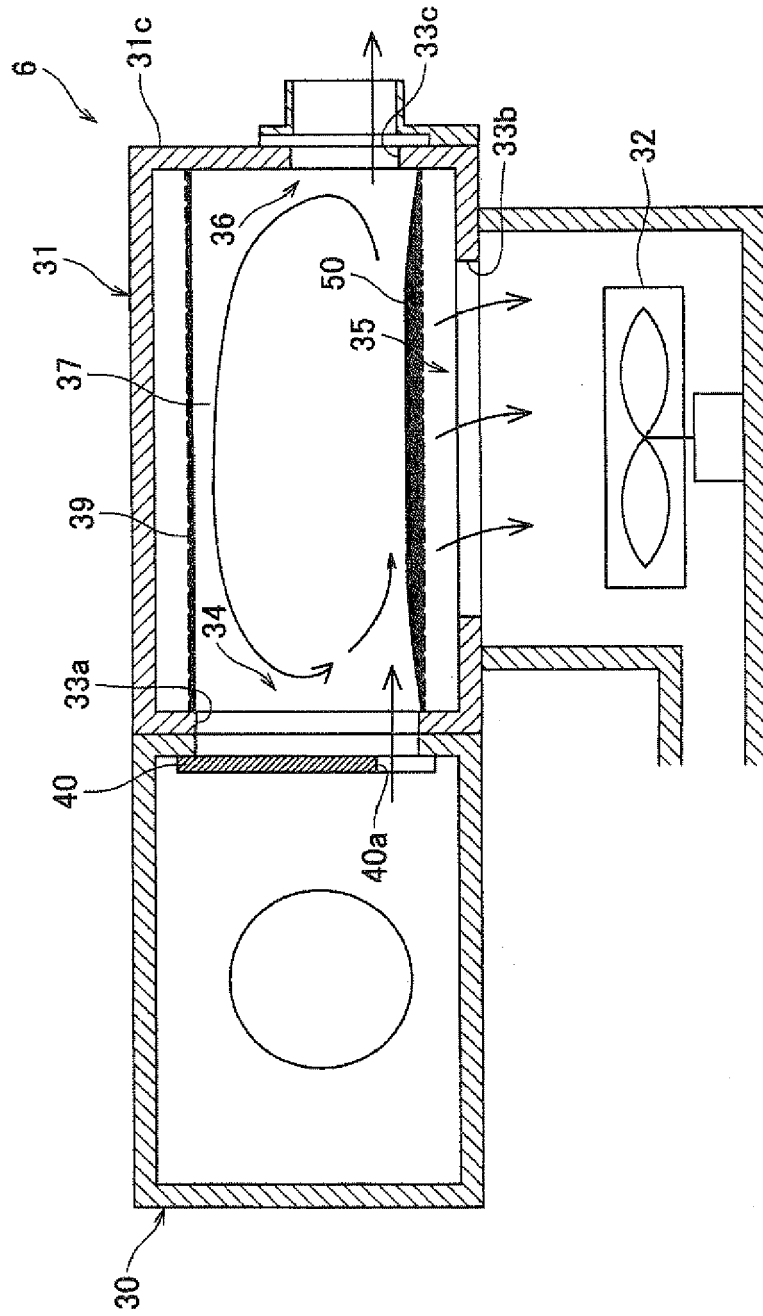


FIG. 8

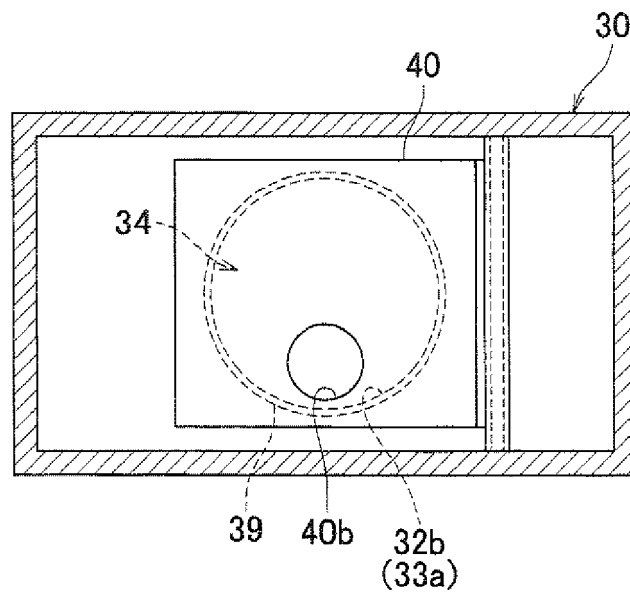


FIG. 9

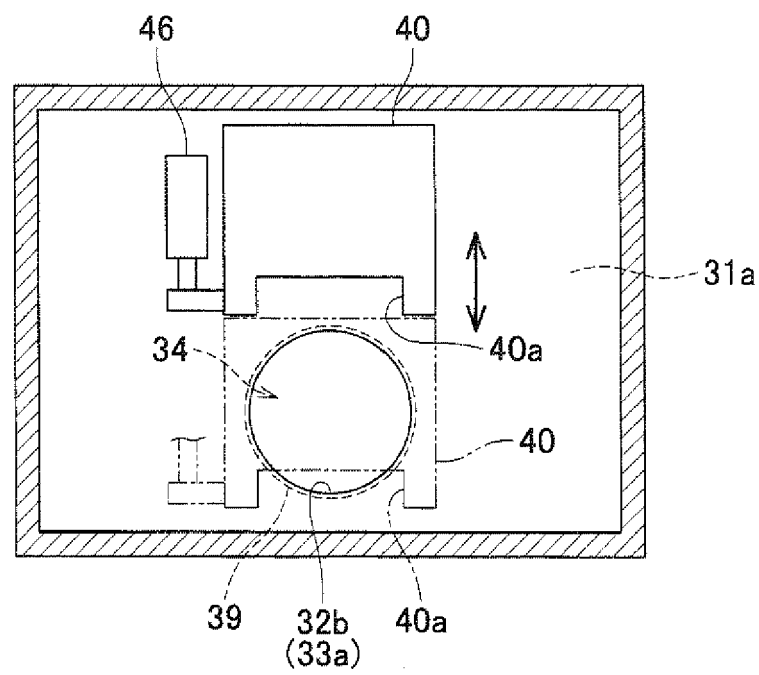


FIG. 10

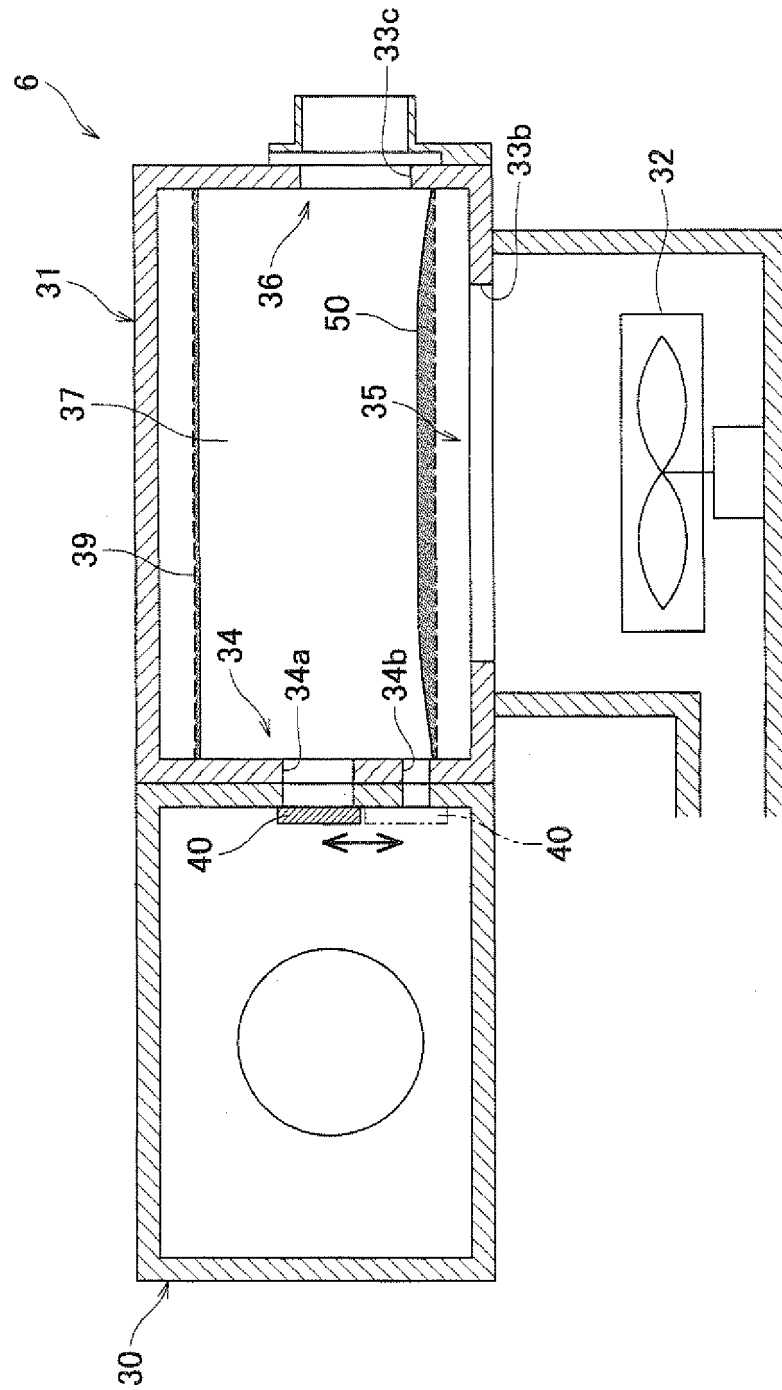


FIG. 11

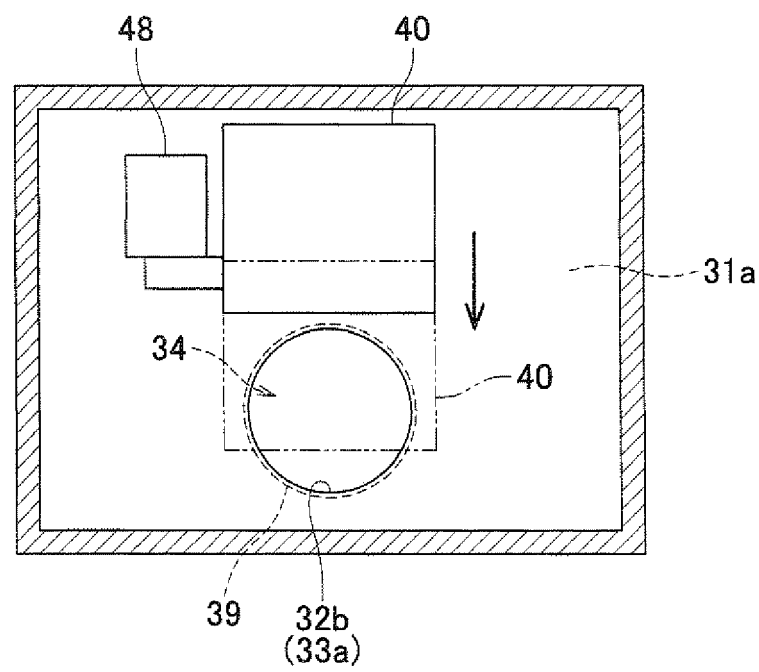


FIG. 12

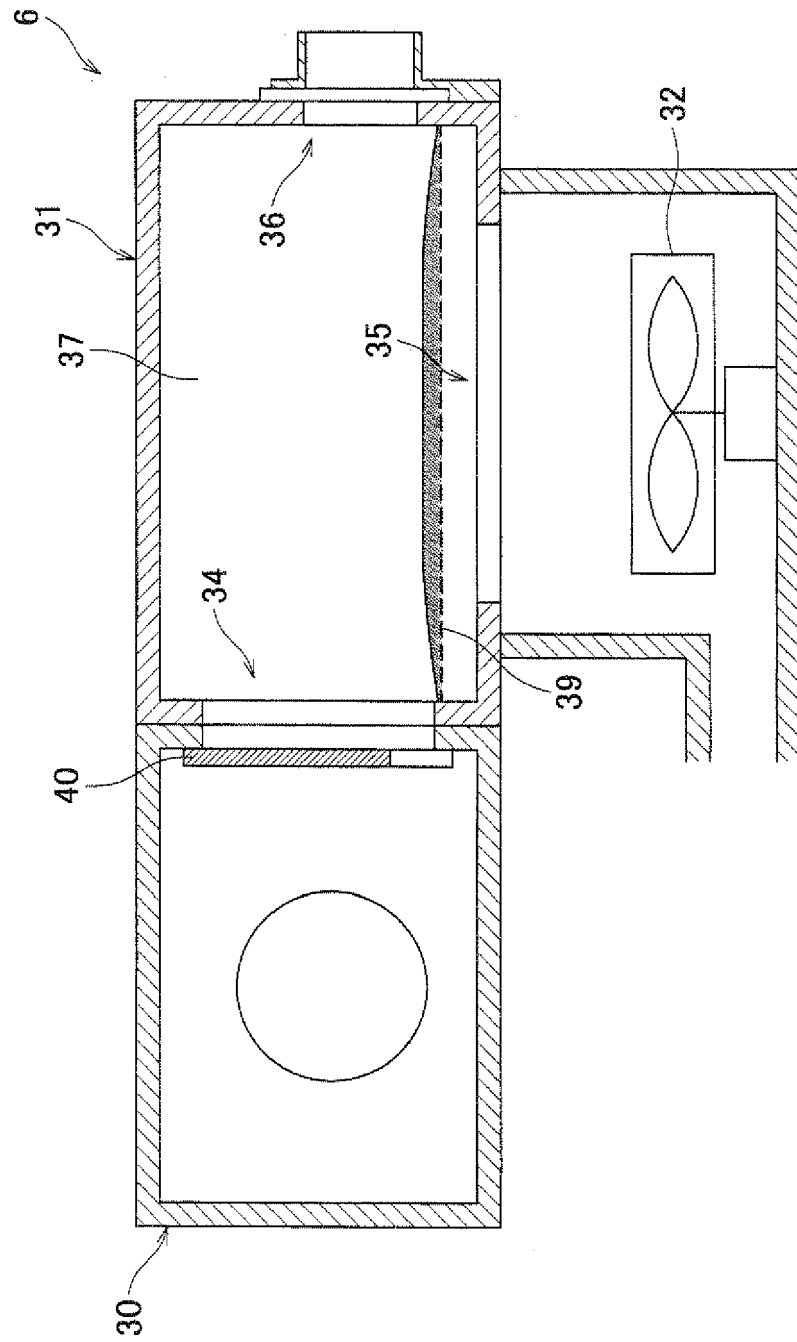


FIG. 13

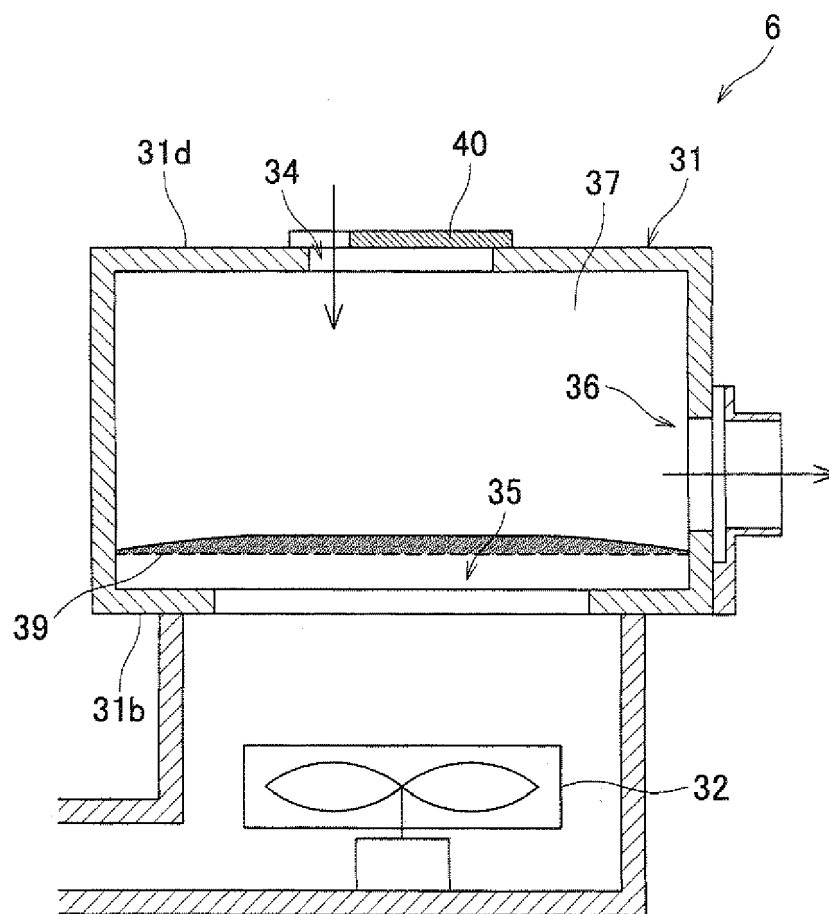
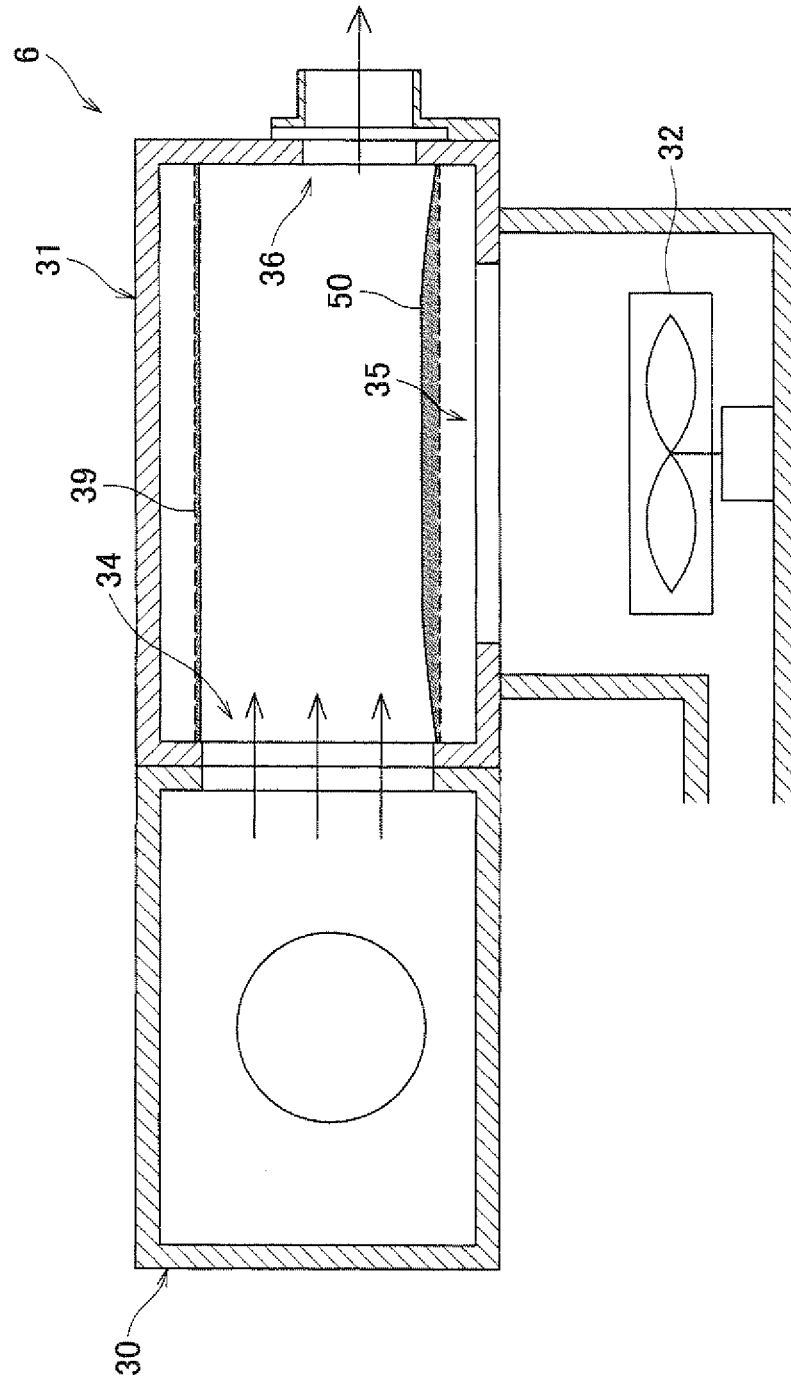


FIG. 14



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 8002819 A [0003] [0005]
- JP 2004308107 A [0004] [0005]