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(54) **Splicer unit**

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a yarn splicer unit that performs a yarn splicing operation. Specifically, the present invention relates to a configuration that collects yarn waste generated during yarn splicing performed by the splicer unit.

Description of Related Art

[0002] A splicer of this kind is disclosed in, for example, the Unexamined Japanese Patent Application Publication (Tokkai) 2001-199637. The splicer (yarn splicing device) in the Unexamined Japanese Patent Application Publication (Tokkai) 2001-199637 is configured to blow away yarn waste generated during untwisting from an untwisting pipe to an area behind a winder unit frame.

BRIEF SUMMARY OF THE INVENTION

[0003] However, with the configuration in the Unexamined Japanese Patent Application Publication (Tokkai) 2001-199637, the blown-away yarn waste may disperse to surroundings and adhere to a package, the quality of which may thus be degraded.

[0004] The dispersion may be prevented by a method of collecting the yarn waste using the untwisting pipe and a negative pressure source which are coupled together with a hose. However, with this method, the capacity of the negative pressure source may be insufficient. WO 2007/142311 discloses a splicer unit comprising a dedicated dust collector according to the preamble of claim 1.

[0005] The present invention has been made in view of the above-described circumstances. An object of the present invention is to provide a splicer unit that collects the yarn waste to prevent the yarn waste from dispersing to the surroundings.

[0006] The problems to be solved by the present invention have been described. Now, means for solving the problems and the effects thereof will be described.

[0007] An aspect of the present invention provides a splicer unit comprising a dedicated duct collector in which yarn waste is collected.

[0008] This prevents the yarn waste from dispersing to the surroundings to adhere to a frame main body or a package. Thus, an operational environment and package quality can be improved. Furthermore, provision of the dust collector in the splicer unit eliminates the need for a complicated dust collecting path. This simplifies the device and prevents the yarn waste from disadvantageously clogging in the middle of the dust collecting path. As a result, the amount of required maintenance operation can be reduced.

[0009] In the splicer unit, the dust collector comprises a dust collecting chamber shaped like a substantial cylinder or cone, and a whirling air stream is generated inside the dust collecting chamber to collect the yarn waste. A specific example of the substantially cylindrical or conical dust collecting chamber may have a donut-like cross section taken along a plane that is perpendicular to an axial direction of the dust collecting chamber.

[0010] Thus, the whirling air stream allows the yarn waste to be efficiently collected in the dust collecting chamber.

[0011] The splicer unit is configured as follows. That is, the splicer unit comprises an untwisting pipe into which during yarn splicing, a yarn end is introduced and untwisted by compressed air. The dust collector comprises a yarn waste introduction port through which the yarn waste is introduced into the dust collecting chamber in a substantially tangential direction thereof. An air stream from the untwisting pipe generated by ejection of the compressed air is blow into the yarn waste introduction port to generate the whirling air stream.

[0012] Thus, the yarn waste generated during yarn splicing is introduced directly into the dust collecting chamber. This significantly facilitates dust collection. Furthermore, the air stream from the untwisting pipe is utilized to generate the whirling air stream. This enables the yarn waste to be collected without the need for a negative pressure source for collecting the yarn waste.

[0013] In the splicer unit, an air vent filter is preferably provided at least at one axial end of the substantially cylindrical or conical dust collecting chamber.

[0014] Thus, the air vent filter can inhibit the yarn waste from dispersing from the dust collecting chamber. Furthermore, the whirling air stream can be smoothly discharged via the air vent filter. Thus, the air stream containing the yarn waste can be prevented from flowing back to the untwisting pipe side.

[0015] In the splicer unit, a yarn waste discharge opening is preferably formed at least at one axial end of the substantially cylindrical or conical dust collecting chamber so that the collected yarn waste is discharged to an exterior of the dust collecting chamber through the yarn waste discharge opening.

[0016] Thus, the collected yarn waste can be easily discharged to the exterior through the yarn waste discharge opening.

[0017] In the splicer unit, a bar-like member with a circular cross section is preferably provided in a central portion of the dust collecting chamber.

[0018] Thus, the yarn waste can be held together in the central part of the dust collecting chamber while being entangled with the bar-like member. Consequently, the yarn waste can be easily collected from the dust collecting chamber.

[0019] In the splicing unit, at least one end of the bar-like member is tapered.

[0020] Thus, the yarn waste can be easily collected by moving the yarn waste entangled with a periphery of the bar-like member toward a tapered end of the bar-like

member and slipping the yarn waste off the bar-like member.

[0021] In the splicer unit, at least one axial end of the substantially cylindrical or conical dust collecting chamber can be opened.

[0022] Thus, a maintenance operation such as cleaning of the interior of the dust collecting chamber can be easily performed.

[0023] Other features, elements, processes, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the present invention with reference to the attached drawings.

Brief Description of the Drawings

[0024]

Figure 1 is a side view of a winder unit 10 including a splicer device according to an embodiment of the present invention.

Figure 2 is a perspective view of an appearance of the splicer device.

Figure 3 is a schematic sectional view showing that an upper yarn and a lower yarn are set in the splicer device.

Figure 4 is a schematic sectional view showing how the splicer device untwists a yarn end.

Figure 5 is a schematic sectional view showing how the splicer device twists yarn ends together for yarn splicing.

Figure 6 is a schematic sectional view showing how yarn waste is discharged from a dust collector in the splicer device.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] A preferred embodiment of the present invention will be described below with reference to the drawings. Figure 1 is a side view of a winder unit (winding unit) 10 including a splicer device 14 according to an embodiment of the present invention.

[0026] A winder unit 10 shown in Figures 1 and 2 winds a spun yarn 20 unwound from a yarn supplying bobbin 21 around a yarn winding bobbin 22 while traversing the spun yarn 20, to form a package 30 with a predetermined length and a predetermined size. An automatic winder (yarn winding device) according to the present embodiment includes a plurality of the winder units 10 arranged in a line, a machine frame control device (not shown in the drawings) located at one end of the arrangement of the winder units 10 in a direction in which the winder units 10 are arranged, and a blower box (sucking means; not shown in the drawings) located at the other end of the arrangement.

[0027] Each of the winder units 10 includes a unit frame 1] (Figure 1) provided on one lateral side of the winder unit 10 in a front view, and a winding unit main body 16 provided on a side of the unit frame 11.

[0028] The winding unit main body 16 includes a cradle 23 configured to be able to grip a yarn winding bobbin 22, and a winding drum (traverse drum) 24 which traverses the spun yarn 20 and drives the yarn winding bobbin 22. The cradle 23 is configured to be swingable in a direction in which the cradle 23 approaches or leaves the winding drum 24. Thus, the cradle 23 allows the package 30 to contact with or leave the winding drum 24. A spiral traverse groove (not shown in the drawings) is formed in an outer peripheral surface of the winding drum 24. The spun yarn 20 is traversed through the traverse groove.

[0029] The cradle 23 includes a liftup mechanism and a package brake mechanism (neither of the mechanisms are shown in the drawings). When the spun yarn 20 is broken, the liftup mechanism can elevate the cradle 23 to separate the package 30 from the winding drum 24. The package brake mechanism is configured to stop rotating the package 30 gripped by the cradle 23 at the same time when the cradle 23 is elevated by the liftup mechanism.

[0030] The winding unit main body 16 is configured such that an unwinding assisting device 12, a tensioning device 13, a splicer device (splicer unit) 14, and a clearer (yarn quality measuring instrument) 15 are arranged in this order from the yarn supplying bobbin 21 side, in a yarn traveling route between the yarn supplying bobbin 21 and the winding drum 24.

[0031] As shown in Figure 1, the winder unit 10 includes a magazine-type supply device 60 that supplies the yarn supplying bobbin 21. The magazine-type supply device 60 includes a magazine holding section 61 extending obliquely forward and upward from a lower portion of the winder unit 10, and a bobbin housing device 62 attached to a tip of the magazine holding section 61.

[0032] The bobbin housing device 62 includes a magazine pocket 63. A plurality of housing holes are formed in the magazine pocket 63 in a circle. A supply bobbin 70 can be set in each of the housing holes in an inclined posture. The magazine can 63 can be intermittently drivingly fed by a motor (not shown in the drawings). This intermittent driving and a control valve (not shown in the drawings) provided in the magazine pocket 63 enable the supply bobbins 70 to be dropped one by one onto a bobbin supply path (not shown in the drawings) in the magazine holding section 61. The supply bobbin 70 supplied to the bobbin supply path is guided to a supplying bobbin holding section 71 while remaining in the inclined posture.

[0033] The supplying bobbin holding section 71 includes a pivotally moving means (not shown in the drawings). Upon receiving the supply bobbin 70 via the bobbin supply path, the supplying bobbin holding section 71 pivotally moves the supply bobbin 70 so that the supplying bobbin 70 is raised from the oblique posture to an upright posture. Thus, the supply bobbin 70 is appropriately supplied to the lower portion of the winding unit main body

16 as a yarn supplying bobbin 21 so that the winder unit 10 can perform a winding operation. Alternatively, instead of the magazine-type supply device 60 as shown in Figure 1, a conveyor (not shown in the drawings) provided in a lower portion of the automatic winder may be used to feed the yarn supplying bobbin 21 from a supplying bobbin supply section (not shown in the drawings) to the supplying bobbin holding section 71 of each winder unit 10.

[0034] The unwinding assisting device 12 lowers a regulating member 40 that covers a core tube of the yarn supplying bobbin 21, in conjunction with unwinding of the yarn from the yarn supplying bobbin 21. The unwinding assisting device 12 thus assists in unwinding the spun yarn 20 from the yarn supplying bobbin 21. The regulating member 40 contacts with a balloon formed above the yarn supplying bobbin 21 by the rotation and centrifugal force of the spun yarn 20 unwound from the yarn supplying bobbin 21. The regulating member 40 thus applies the appropriate tension to the balloon to assist in unwinding the spun yarn 20. A sensor (not shown in the drawings) is provided in the vicinity of the regulating member 40 to detect a chase portion of the yarn supplying bobbin 21. When the sensor detects that the chase portion is being lowered, then the regulating member 40 can be lowered in conjunction with the lowering of the chase portion by an air cylinder (not shown in the drawings).

[0035] The tensioning device 13 applies a predetermined tension to the traveling spun yarn 20. The tensioning device 13 may be of, for example, a gate type having movable comb teeth arranged with respect to fixed comb teeth. The movable comb teeth can be pivotally moved by a rotary solenoid so as to be engaged with or released from the fixed comb teeth. The tensioning device 13 can apply the given tension to the spun yarn 20 being wound, to improve the quality of the package 30. Besides the above-described gate type, for example, the tensioning device 13 of a disc type may be adopted.

[0036] When for example, the spun yarn 20 is cut because of a yarn defect detected by a clearer 15 or a yarn breakage occurs during unwinding of the spun yarn 20 from the yarn supplying bobbin 21, the splicer device 14 splices a lower yarn on the yarn supplying bobbin 21 side and an upper yarn on the package 30 side. Furthermore, the splicer device 14 includes a dust collector 80. A configuration of the splicer device 14 will be described below in detail.

[0037] A clearer head 49 in the clearer 15 includes a sensor (not shown in the drawings) that detects the thickness of the spun yarn 20. The clearer 15 is configured to detect a defect by monitoring a yarn thickness signal from the sensor. A cutter (not shown in the drawings) is installed in the vicinity of the clearer head 49 to immediately cut the spun yarn 20 when the clearer 15 detects a yarn defect.

[0038] A lower yarn guide pipe 25 is provided below the splicer device 14 to catch and guide the lower yarn on the yarn supplying bobbin 21 side. An upper yarn guide pipe 26 is provided above the splicer device 14 to catch and guide the upper yarn on the package 30 side. Furthermore, the lower yarn guide pipe 25 and the upper yarn guide pipe 26 are configured so as to be pivotally movable around shafts 33, 35, respectively. A suction port 32 is formed at a tip of the lower yarn guide pipe 25. A suction mouth 34 is provided at a tip of the upper yarn guide pipe 26. An appropriate negative pressure source is connected to each of the lower yarn guide pipe 25 and the upper yarn guide pipe 26. Thus, suction flows can be generated at the suction port 32 and the suction mouth 34.

[0039] The spun yarn 20 unwound from the yarn supplying bobbin 21 is wound around the yarn winding bobbin 22, located on a downstream side of the splicer device 14. The yarn winding bobbin 22 is driven by rotationally driving the winding drum 24, located opposite the yarn winding bobbin 22. The winding drum 24 is coupled to an output shaft of a drum driving motor (not shown in the drawings). The operation of the drum driving motor is controlled by a motor control section (not shown in the drawings).

[0040] In the above-described configuration, when the magazine-type supply device 60 supplies a bobbin to the supplying bobbin holding section 71, the yarn winding bobbin 22 is driven. Then, the package 30 of a predetermined length can be formed by winding the spun yarn 20 unwound from the yarn supplying bobbin 21, around the yarn winding bobbin 22.

[0041] Now, the splicer device 14 will be described with reference to Figure 2. Figure 2 is a perspective view of an appearance of the splicer device 14 according to the present embodiment.

[0042] The splicer device 14 is fixed, by a bolt 88, to a panel 91 comprising the winding unit main body 16. The splicer device 14 is configured such that removing the bolt 88 allows the splicer device 14 to be removed. Furthermore, the splicer device 14 includes a yarn splicing nozzle 94, a yarn drawing lever 96, a clamp section 97, a yarn pressing lever 98, cutters 92, 93, an untwisting pipe 82, and the dust collector 80 as main components.

[0043] The yarn splicing nozzle 94 is located on a front side of a main body of the splicer device 14. A yarn splicing hole 90 is formed in the yarn splicing nozzle 94. An ejection port (not shown in the drawings) is formed inside the yarn splicing hole 90 so that compressed air is ejected through the ejection port. The yarn splicing nozzle 94 is thus configured such that the compressed air allows a whirling air stream to be generated inside the yarn splicing hole 90.

[0044] A pair of the yarn drawing levers 96 is provided such that one of the yarn drawing levers 96 is located above the yarn splicing nozzle 94, whereas the other is located below the yarn splicing nozzle 94. A pair of the clamp sections 97 is provided such that one of the clamp sections 97 is located above the yarn splicing nozzle 94, whereas the other is located below the yarn splicing nozzle 94. A pair of the yarn pressing levers 98 is provided

such that one of the yarn pressing levers 98 is located above the yarn splicing nozzle 94, whereas the other is located below the yarn splicing nozzle 94. The yarn drawing levers 96 are configured to draw the lower yarn guided by the lower yarn guide pipe 25 and the upper yarn guided by the upper yarn guide pipe 26, to the yarn splicing nozzle 94. Furthermore, the clamp sections 97 are configured to clamp a predetermined portion of the upper yarn guided to the yarn splicing nozzle 94 and a predetermined portion of the lower yarn guided to the yarn splicing nozzle 94. The yarn pressing levers 98 are configured to be able to fixedly press the upper and lower yarns during yarn splicing performed in the yarn splicing nozzle 94.

[0045] The splicer device 14 includes untwisting pipes 82 for an upper yarn end and a lower yarn end, respectively. The two untwisting pipes 82 are each shaped like an elongate cylinder and arranged parallel to each other so that a longitudinal direction of the untwisting pipes 82 coincides with a front-back direction of the splicer device 14. The two untwisting pipes 82 are arranged in a vertical direction, and one end of each of the untwisting pipes 82 is open toward a front surface of the splicer device 14. The open end of the untwisting pipe 82 for the upper yarn end is located below the yarn splicing nozzle 94. The open end of the untwisting pipe 82 for the lower yarn end is located above the yarn splicing nozzle 94.

[0046] The untwisting pipes 82 are configured such that compressed air is injected into each of the untwisting pipes 82 through a compressed air passage (not shown in the drawings). An air stream guiding tube 89 is connected to an end of each of the untwisting pipes 82 which is positioned at a rear surface side of the splicer device 14. The air stream guiding tube 89 allows an air stream injected into the untwisting pipe 82 to be guided to the dust collector 80 on a rear side of the splicer device 14.

[0047] The dust collector 80 is fixed to the main body of the splicer device 14 by an appropriate means such as a screw. The dust collector 80 includes a dust collecting chamber 81, a yarn waste introduction port 83, a bar-like member 86, and a cover section 87.

[0048] The dust collecting chamber 81 is formed inside a cylindrical casing, shaped like a substantial cylinder, and configured to be able to internally generate a whirling air stream. Specifically, the dust collector 80 includes the yarn waste introduction port 83 through which an air stream is introduced into the dust collecting chamber 81 in a substantially tangential direction thereof. By blowing the air stream into the yarn waste introduction port 83, the whirling air stream can be generated inside the dust collecting chamber 81. The air stream guiding tubes 89 guide the air stream toward the yarn waste introduction port 83. A material for the dust collecting chamber 81 is not particularly limited. However, the dust collecting chamber 81 is suitably composed of a transparent or translucent resin because this allows the amount of accumulated yarn waste and the like to be externally checked.

[0049] As shown in Figure 3, the bar-like member 86 is provided such that an axis thereof coincides substantially with a central portion of the cylindrical dust collecting chamber 81. Furthermore, the bar-like member 86 is formed to have a circular cross section. The bar-like member 86 is provided so as to project upward from a lower portion of the dust collecting chamber 81. A lower half of the bar-like member 86 is shaped like a cylinder with a uniform thickness. An upper half of the bar-like member 86 is tapered (substantially conical).

[0050] The cover section 87 includes an air vent filter 84 and a yarn waste discharging opening 85. The cover section 87 is installed, for example, via a threadably fitting portion, so as to cover an open portion formed in an upper portion of the dust collecting chamber 81. The cover section 87 is rotationally removable. The air vent filer 84 is composed of, for example, a wire screen-line filter with a coarseness sufficient to minimize air resistance and to allow the yarn waste to be caught therein. The yarn waste discharging opening 85 is circularly formed in a central portion of the cover section 87. The dust collecting chamber 81 is configured such that the yarn waste accumulated inside the dust collecting chamber 81 can be discharged to the exterior by connecting a suction pipe 95 to the yarn waste discharging opening 85 and using an external sucking device to suck the yarn waste. Furthermore, a part of the tapered portion at a tip of the bar-like member 86 is inserted into a center of the yarn waste discharging opening 85.

[0051] Now, an operation of the splicer device 14 during yarn splicing will be described. The yarn splicing is performed when the lower yarn on the yarn supplying bobbin 21 side and the upper yarn on the package 30 side need to be joined together, for example, when the spun yarn 20 on the yarn supplying bobbin 21 is exhausted and a new yarn supplying bobbin 21 is supplied or when the clearer 15 detects a yarn defect and cuts the spun yarn 20 using the cutter, to remove the yarn defect.

[0052] In this case, first, the liftup mechanism (not shown in the drawings) is used to raise the cradle 23 to separate the package 30 from the winding drum 24. At the same time, the package brake mechanism (not shown in the drawings) stops rotation of the package 30 gripped by the cradle 23. When winding of the package 30 is stopped, the splicer device 14 starts a yarn splicing operation.

[0053] When the yarn splicing operation is started, the suction port 32 of the lower yarn guide pipe 25 catches the lower yarn at a position shown in Figure 1. Thereafter, the lower yarn guide pipe 25 moves pivotally upward around the shaft 33 to guide the lower yarn to the splicer device 14. Furthermore, almost at the same time, the upper yarn guide pipe 26 moves pivotally upward around the shaft 35 from the illustrated position. The upper yarn guide pipe 26 allows the suction mouth 34 to catch the upper yarn unwound from the package 30 reversed by the drum driving motor (not shown in the drawings). Subsequently, the upper yarn guide pipe 26 moves pivotally downward around the shaft 35 to guide the upper yarn

to the splicer device 14.

[0054] The upper and lower yarns guided to the splicer device 14 are drawn by the yarn drawing levers 96 and inserted into the yarn splicing hole 90 in the yarn splicing nozzle 94 as shown in Figure 3. At this time, the upper and lower yarns are clamped by the respective clamp sections 97, and the lower yarn is introduced into the lower yarn cutter 92, and the upper yarn is introduced into the upper yarn cutter 93. In Figure 3 and subsequent figures, the lower yarn is shown by a dashed line in order to easily distinguish the upper yarn from the lower yarn.

[0055] The upper and lower yarns are cut to a predetermined length by the cutters 92, 93, respectively, to form yarn ends. Remaining parts of the yarns resulting from the cutting are sucked into the suction port 32 and the suction mouth 34, respectively, for removal.

[0056] Almost simultaneously with the yarn cutting, compressed air is injected to an interior of each of the untwisting pipes 82 through compressed air passages 73. Then, as shown in Figure 4, the yarn ends formed by the yarn cutting are sucked into the untwisting pipes 82, and fibers at the yarn end of each of the upper and lower yarns are untwisted by an air stream inside the corresponding untwisting pipe 82. At this time, fine pieces of yarn waste 75 are generated and blown off by the air stream.

[0057] The yarn waste 75 blown off by the air stream is introduced into the dust collecting chamber 81 through the yarn waste introduction port 83 in the dust collector 80 via the air stream guiding tube 89 connected to the untwisting pipe 82. At this time, the air stream from the untwisting pipe 82 is introduced into the dust collecting chamber 81 in the substantially tangential direction thereof. Thus, a whirling air stream 74 is generated inside the dust collecting chamber 81. As a result, on the basis of the principle of cyclone (powder separator), the yarn waste 75 is blown off toward an outer peripheral side by a centrifugal force and deposited in the lower portion of the dust collecting chamber 81 by gravity. A clean air stream from which the yarn waste 75 has been separated is emitted to the exterior of the dust collecting chamber 81 via the air vent filter 84. Furthermore, at this time, the yarn waste 75 is entangled with the bar-like member 86 and can thus be efficiently collected in the dust collecting chamber 81.

[0058] Once the untwisting of the yarn ends is completed, the yarn drawing operation of the yarn drawing levers 96 and the yarn pressing operation of the yarn pressing levers 98 allow both yarn ends of the upper and lower yarns to be drawn out of the untwisting pipes 82 and set in the yarn splicing hole 90 in the yarn splicing nozzle 94 so as to overlap each other, as shown in Figure 5. In this condition, compressed air from an ejection hole 72 is injected into the yarn splicing hole 90 to generate a whirling stream of the compressed air. Thus, the fibers in the upper yarn are entangled with the fibers in the lower yarn, and the upper and lower yarns are then twisted for yarn splicing. Once the yarn splicing is completed, the operations of the levers 96, 98 are canceled, and the clamping of the spun yarns 20 by the clamp sections 97 is also canceled. Furthermore, at almost the same time, the cradle 23 is operated to contact the package 30 with the winding drum 24 to resume the winding of the spun yarn 20.

[0059] Now, discharge of the yarn waste 75 accumulated in the dust collecting chamber 81 will be described. As the splicer device 14 is continuously operated over a long period of time, fine pieces of the yarn waste 75 are accumulated in the lower portion of the dust collecting chamber 81. An excessively large amount of accumulated yarn waste 75 may inhibit the whirling air stream 74 to degrade the collecting capability. Finally, the yarn waste 75 may overflow the yarn waste discharging opening 85. Thus, the yarn waste 75 needs to be discharged to the exterior of the dust collecting chamber 81 at an appropriate timing.

[0060] In the present embodiment, the yarn waste 75 can be discharged by an operator or a maintenance worker connecting the suction pipe 95 to the yarn waste discharging opening 85. The suction valve 95 is connected, via the control valve (not shown in the drawings), to the blower located in the blower box and serving as a negative pressure source. In this configuration, for example, in response to the operator's operation, the control section keeps the control valve open for a predetermined time, to allow the suction pipe 95 to suck and discharge the yarn waste 75 accumulated inside the dust collecting chamber 81, to the exterior, as shown in Figure 6.

[0061] In the present embodiment, the bar-like member 86 is located inside the dust collecting chamber 81. Thus, where an approximately given amount of the yarn waste 75 is accumulated, the yarn waste 75 may come together around a periphery of the bar-like member 86 and grow into a ring form but is prevented from forming a large ball-like mass. Thus, even if a large amount of the yarn waste 75 is accumulated, the yarn waste 75 can be easily sucked without clogging in the yarn waste discharging opening 85 and the suction pipe 95. This enables a reduction in the frequency of suctions to be performed by the suction pipe 95 and in the amount of required maintenance operation. Furthermore, since the bar-like member 86 is tapered toward the yarn waste discharging opening 85, even the yarn waste 75 grown into a ring form and entangled with the bar-like member 86 can be easily slipped off the bar-like member 86 and collected through the yarn waste discharging opening 85.

[0062] Furthermore, the sucking operation involves suction performed by a powerful negative pressure source and may thus affect the untwisting of the yarn end performed by the untwisting pipe 82. To avoid this, the suction pipe 95 preferably sucks the yarn waste 75 performed at a timing except during untwisting.

[0063] On the other hand, where the yarn waste 75 is entangled with the bar-like member 86 or a large amount of the yarn waste 75 is accumulated, the suction pipe 95 may fail to suck the yarn waste 75. In this case, the upper

portion of the dust collecting chamber 81 can be opened by removing the cover section 87. Thus, the maintenance worker can easily clean the interior of the dust collecting chamber 81 and thus pick up and remove the yarn waste 75 by the hand.

[0064] Furthermore, when for example, the whole splicer device 14 is heavily contaminated or a failure occurs in the splicer device 14, the whole splicer device 14 can be removed by removing the bolt 88. Then, the whole splicer device 14 can be washed or replaced with a new one.

[0065] As shown above, the splicer device 14 according to the present embodiment includes the dedicated dust collector 80, which allows the yarn waste 75 to be collected.

[0066] Thus, the yarn waste 75 is prevented from dispersing to the surroundings to adhere to the machine frame main body of the winder unit 10 or the package 30. Consequently, an operational environment and package quality can be improved. Furthermore, the provision of the dust collector 80 in the splicer device 14 eliminates the need for a complicated dust collecting path, thus simplifying the device. This also prevents the yarn waste 75 from disadvantageously clogging in the middle of the dust collecting path, thus reducing the amount of required maintenance operation.

[0067] Furthermore, the splicer device 14 according to the present embodiment, the dust collector 80 includes the dust collecting chamber 81 shaped like the substantial cylinder. The whirling air stream 74 is generated inside the dust collecting chamber 81 to collect the yarn waste 75.

[0068] Thus, the whirling air stream 74 allows the yarn waste 75 to be efficiently collected in the dust collecting chamber 81.

[0069] The splicer device 14 according to the present embodiment includes the untwisting pipe 82 into which during yarn splicing, the yarn end is introduced and untwisted by compressed air. Furthermore, the dust collector 80 includes the yarn waste introduction port 83 through which the yarn waste 75 is introduced into the dust collecting chamber 81 in the substantially tangential direction thereof. The air stream from the untwisting pipe 82 generated by ejection of the compressed air is blown into the yarn waste introduction port 83 to generate the whirling air stream 74.

[0070] Thus, the yarn waste 75 generated during yarn untwisting is introduced directly into the dust collecting chamber 81. This significantly facilitates dust collection. Furthermore, the air stream from the untwisting pipe 82 is utilized to generate the whirling air stream 74. This enables the yarn waste 75 to be collected in the dust collecting chamber 81 without the need for, for example, a negative pressure source.

[0071] In the splicer device 84 according to the present embodiment, the air vent filter 84 is provided at least at one axial end of the cylindrical dust collecting chamber 81.

[0072] Thus, the air vent filter 84 can inhibit the yarn waste 75 from dispersing from the dust collecting chamber 81. Furthermore, the whirling air stream 74 can be smoothly discharged via the air vent filter 84. Thus, the air stream containing the yarn waste 75 can be prevented from flowing back to the untwisting pipe 82 side.

[0073] Furthermore, in the splicer device 14 according to the present embodiment, the yarn waste discharge opening 85 is formed at one axial end (upper end) of the substantially cylindrical dust collecting chamber 81 so that the collected yarn waste 75 is discharged to an exterior of the dust collecting chamber 81 through the yarn waste discharge opening 85.

[0074] Thus, the yarn waste 75 collected in the dust collector 80 can be easily discharged to the exterior through the yarn waste discharge opening 85.

[0075] In the splicer device 14 according to the present embodiment, the bar-like member 86 with the circular cross section is provided in the central portion of the dust collecting chamber 81.

[0076] Thus, the yarn waste 75 can be held together in the central part of the dust collecting chamber while being entangled with the bar-like member 86. Consequently, the yarn waste 75 can be easily collected from the dust collecting chamber 81.

[0077] Furthermore, in the splicer device 14 according to the present embodiment, one end of the bar-like member 86 is tapered.

[0078] Thus, the yarn waste 75 can be easily collected by moving the yarn waste 75 entangled with a periphery of the bar-like member 86 toward a tapered end of the bar-like member 86 and slipping the yarn waste 75 off the bar-like member 86.

[0079] In the splicer device 14 according to the present embodiment, the substantially cylindrical dust collecting chamber 81 is configured such that one axial end side (upper end side) of the dust collecting chamber 81 can be opened by removing the cover section 87.

[0080] Thus, a maintenance operation such as cleaning of the interior of the dust collecting chamber 81 can be easily performed.

[0081] Furthermore, the splicer device 14 according to the present embodiment with the dust collector 80 mounted therein can be installed in and removed from the frame (above-described panel 91) of the winder unit 10.

[0082] Thus, the maintenance operation, replacement of the splicer device 14, or the like can be easily performed. Furthermore, the splicer main body for yarn splicing and the dust collector 80 can be integrally handled together and thus easily installed in and removed from the frame of the winder unit 10.

[0083] Furthermore, the automatic winder according to the present embodiment includes a plurality of the winder units 10 each including the splicer device 14.

[0084] Thus, the yarn waste 75 is prevented from d i spers i ng to adhere to the package. Consequently, high-quality packages can be manufactured.

[0085] Furthermore, the automatic winder according

to the present embodiment includes the blower box that discharges the yarn waste 75 collected in the dust collector 80 to the exterior of the dust collector 80.

[0086] Thus, the yarn waste 75 can be efficiently discharged to the exterior of the dust collector 80, allowing the maintenance operation to be more easily performed.

[0087] The preferred embodiment of the present invention has been described. The above-described configuration can be modified, for example, as follows.

[0088] The sectional shape of the dust collecting chamber 81 is preferably circular in order to allow the whirling air stream to be smoothly generated. However, the dust collecting chamber 81 is not limited to the cylindrical shape but may be, for example, tapered (annular). The tapered shape preferably increases the centrifugal force as the whirling air stream advances from a larger diameter portion to a smaller diameter portion of the taper. This improves the dust collecting capability. Alternatively, the dust collecting chamber may be formed like a hollow donut.

[0089] The arrangement in which the yarn waste discharging opening 85 and the air vent filter 84 are formed in the cover section 87 may be changed to, for example, an arrangement in which the yarn waste discharging opening 85 and the air vent filter 84 are formed directly in a member comprising the dust collecting member 81.

[0090] Furthermore, the arrangement in which the yarn waste discharging opening 85 and the air vent filter 84 are formed at the top portion of the dust collecting chamber 81 may be changed to, for example, an arrangement in which the yarn waste discharging opening 85 and the air vent filter 84 are formed at the bottom (lower portion) of the dust collecting chamber 81. However, since the yarn waste 75 is collected in the lower portion by the whirling air stream, while air is discharged from the upper portion, the air vent filter 84 is preferably provided in the upper portion of the dust collecting chamber 81.

[0091] The yarn waste discharging opening 85 can be omitted. However, in this case, the sucking operation using the suction pipe 95 is impossible. Thus, the dust collecting chamber 81 is partly open so that the yarn waste 75 can be manually removed.

[0092] The air vent filter 84 configured like a wire screen may be changed to a finer filter. However, a filter with low air resistance is preferably used in order to prevent the air stream from flowing back to the untwisting pipe 82 side.

[0093] In an alternative arrangement, the cover section 87 may be formed of an elastic body, for example, rubber, instead of resin so as to be fixed to the dust collecting chamber 81 by being elastically deformed during attachment.

[0094] The arrangement in which the lower portion of the bar-like member 86 is cylindrical, while the upper portion thereof is substantially conical may be changed to an arrangement in which the bar-like member 86 is entirely cylindrical or conical. Alternatively, the bar-like member 86 may have a tapered shape other than a conical one.

[0095] The bar-like member 86 may be omitted. However, the bar-like member 86 is preferably provided in order to prevent the yarn waste 75 from growing into a ball form, thus avoiding blockage of the yarn waste discharging opening 85.

[0096] In connection with the timing for the sucking operation, suction may be performed, for example, every time yarn splicing is completed, rather than after the yarn waste 75 has accumulated. Furthermore, the arrangement may be changed to one in which for example, the suction pipe 95 is always connected to the yarn waste discharging opening 85 so that after completion of yarn splicing, the control valve is automatically opened to suck the yarn waste 75. The automatic opening of the control valve is particularly suitable in that the possible accumulation of the yarn waste 75 is avoided and in that the suction is prevented from affecting the untwisting of the yarn end. When the yarn waste discharging openings 85 in the plurality of winder units 10 are all connected to the single blower, the control valve is preferably provided in each of the winder units 10 because this allows the discharge of the yarn waste 75 to be controlled for each of the winder units 10.

[0097] In an alternative arrangement, instead of the blower in the blower box in the automatic wider, a compact negative pressure source that can be carried by the maintenance worker may be connected to the yarn waste discharging opening 85.

[0098] The arrangement in which the cover section 87 is located in the top portion of the dust collecting chamber 81 may be changed to for example, an arrangement in which the lower portion (bottom) of the dust collecting chamber 81 is open, with the cover section located so as to close the open portion. In this case, the yarn waste 75 accumulates on the cover section forming the bottom of the dust collecting chamber 81. Thus, the yarn waste 75 can be easily collected by opening the cover section to allow the yarn waste 75 to fall under the weight of the yarn waste 75. Instead of the structure that the splicer device 14 with the dust collector 80 mounted therein can be installed in and removed from the frame of the winder unit 10, a structure may be adopted in which the splicer device 14 and the dust collector 80 can be individually installed in and removed from the winder unit 10.

[0099] The embodiment has been described in conjunction with the automatic winder. However, the scope of the present invention is not limited to this aspect. The present invention is applicable to other yarn winding machines, for example, a spinning machine including a splicer device with a dust collector.

Claims

1. A splicer unit (14) comprising a dedicated dust collector (80) in which yarn waste is collected, **characterized in that** the dust collector (80) comprises a

dust collecting chamber (81) shaped like a substantial cylinder or cone, and a whirling air stream is generated inside the dust collecting chamber (81) to collect the yarn waste, and by comprising an untwisting pipe (82) into which during yarn splicing, a yarn end is introduced and untwisted by compressed air, and **in that** the dust collector (80) comprises a yarn waste introduction port through which the yarn waste is introduced into the dust collecting chamber (81) in a substantially tangential direction thereof, and an air stream from the untwisting pipe (82) generated by ejection of the compressed air is blown into the yarn waste introduction port to generate the whirling air stream.

2. The splicer unit (14) according to Claim 1, **characterized in that** an air vent filter (84) is provided at least at one axial end of the collecting chamber (81).

3. The splicer unit (14) according to Claim 2, **characterized in that** a yarn waste discharge opening (85) is formed at least at one axial end of the collecting chamber (81) so that the collected yarn waste is discharged to an exterior of the dust collecting chamber (81) through the yarn waste discharge opening (85).

4. The splicer unit (14) according to Claim 3, **characterized in that** a bar-like member (86) with a circular cross section is provided in a central portion, of the dust collecting chamber (81).

5. The splicer unit (14) according to Claim 4, **characterized in that** at least one end of the bar-like member (86) is tapered.

6. The splicer unit (14) according to Claim 5, **characterized in that** at least one axial end of the collecting chamber (81) can be opened.

Patentansprüche

1. Spleißeinheit (14), enthaltend einen fest zugeordneten Staubsammler (80), in welchem Garnabfall gesammelt wird,
dadurch gekennzeichnet, dass der Staubsammler (80) eine Staubsammelkammer (81) aufweist, die im Wesentlichen zylindrisch oder kegelförmig geformt ist, und ein Wirbelluftstrom innerhalb der Staubsammelkammer (81) erzeugt wird, um den Garnabfall zu sammeln, und
dadurch, dass er ein Aufdrehrohr (82) aufweist, in welches während des Garnspleißens ein Garnende eingeführt wird und durch Druckluft aufgedreht wird, und **dadurch**, dass der Staubsammler (80) eine Garnabfalleinführöffnung aufweist, durch welche der Garnabfall in die Staubsammelkammer (81) in einer im Wesentlichen tangentialen Richtung zu dieser eingeführt wird, und ein Luftstrom von dem Aufdrehrohr (82), welcher durch Ausstoßen der Druckluft erzeugt wird, in die Garnabfalleinführöffnung geblasen wird, um den Wirbelluftstrom zu erzeugen.

2. Spleißeinheit (14) nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Entlüftungsfilter (84) mindestens an einem axialen Ende der Sammelkammer (81) vorgesehen ist.

3. Spleißeinheit (14) nach Anspruch 2, **dadurch gekennzeichnet, dass** eine Gamabfallaustragöffnung (85) mindestens an einem axialen Ende der Sammelkammer (81) gebildet ist, so dass der gesammelte Garnabfall durch die Gamabfallaustragöffnung (85) nach außerhalb der Staubsammelkammer (81) ausgetragen wird.

4. Spleißeinheit (14) nach Anspruch 3, **dadurch gekennzeichnet, dass** ein stabähnliches Element (86) mit einem kreisförmigen Querschnitt in einem zentralen Abschnitt der Staubsammelkammer (81) vorgesehen ist.

5. Spleißeinheit (14) nach Anspruch 4, **dadurch gekennzeichnet, dass** mindestens ein Ende des stabähnlichen Elements (86) verjüngt ist.

6. Spleißeinheit (14) nach Anspruch 5, **dadurch gekennzeichnet, dass** mindestens ein axiales Ende der Sammelkammer (81) geöffnet werden kann.

Revendications

1. Unité d'épissage (14) comprenant un collecteur de poussière spécialisé (80), dans lequel on recueille les déchets de fils, **caractérisée en ce que** le collecteur de poussière (80) comprend une chambre collectrice de poussière (81) façonnée sous une forme sensiblement cylindrique ou conique et un courant d'air tourbillonnant est généré à l'intérieur de la chambre collectrice de poussière (81) pour collecter les déchets de fils, en prévoyantun tuyau de détorsion (82) dans lequel, pendant l'épissage des fils, on introduit une extrémité de fil qui est détordue par de l'air comprimé, et **en ce que** le collecteur de poussière (80) comprend un orifice d' introduction de déchets de fils par lequel les déchets de fils sont introduits dans la chambre collectrice de poussière (81) dans sa direction sensiblement tangentielle, et un courant d'air issu du tuyau de détorsion (82) généré par éjection d'air comprimé est soufflé dans l'orifice d'introduction de déchets de fils pour générer le courant d'air tourbillonnant.

2. Unité d'épissage (14) selon la revendication 1, **caractérisée en ce que** le filtre d'échappement d'air

(84) est disposé au moins à une extrémité axiale de la chambre collectrice (81).

3. Unité d'épissage (14) selon la revendication 2, **caractérisée en ce qu'**une ouverture de décharge de déchets de fils (85) est formée au moins à une extrémité axiale de la chambre collectrice (81) de sorte que les déchets de fils recueillis soient déchargés vers l'extérieur de la chambre collectrice de poussière (81) par l'ouverture de décharge de déchets de fils (85).

4. Unité d'épissage (14) selon la revendication 3, **caractérisée en ce qu'**un élément en forme de barre (86) avec une section transversale circulaire est aménagé dans une portion centrale de la chambre collectrice de poussière (81).

5. Unité d'épissage (14) selon la revendication 4, **caractérisé en ce qu'**au moins une extrémité de l'élément en forme de barre (86) est amincie.

6. Unité d'épissage (14) selon la revendication 5, **caractérisée en ce qu'**au moins une extrémité axiale de la chambre collectrice (81) peut être ouverte.

FIGURE 1

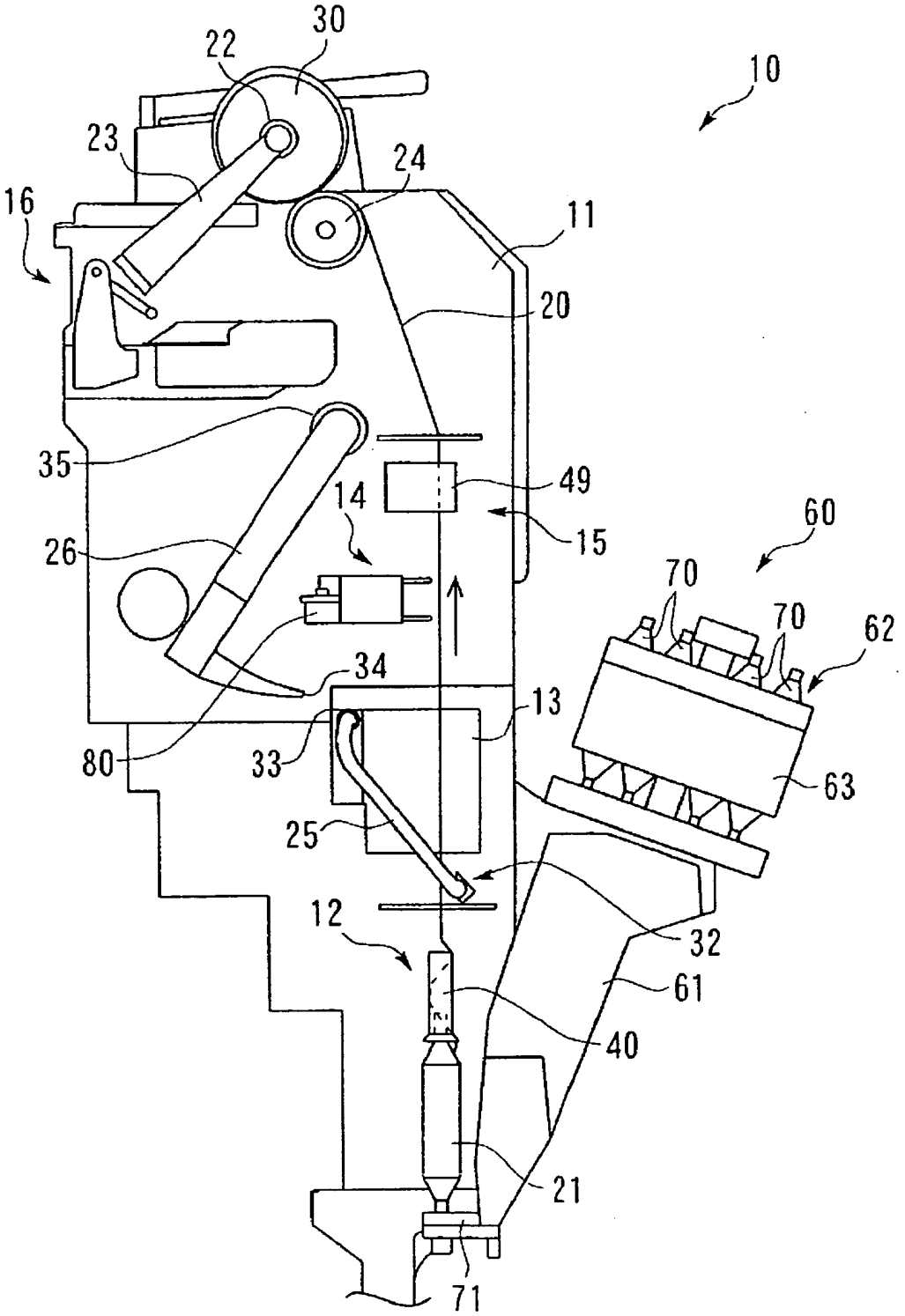
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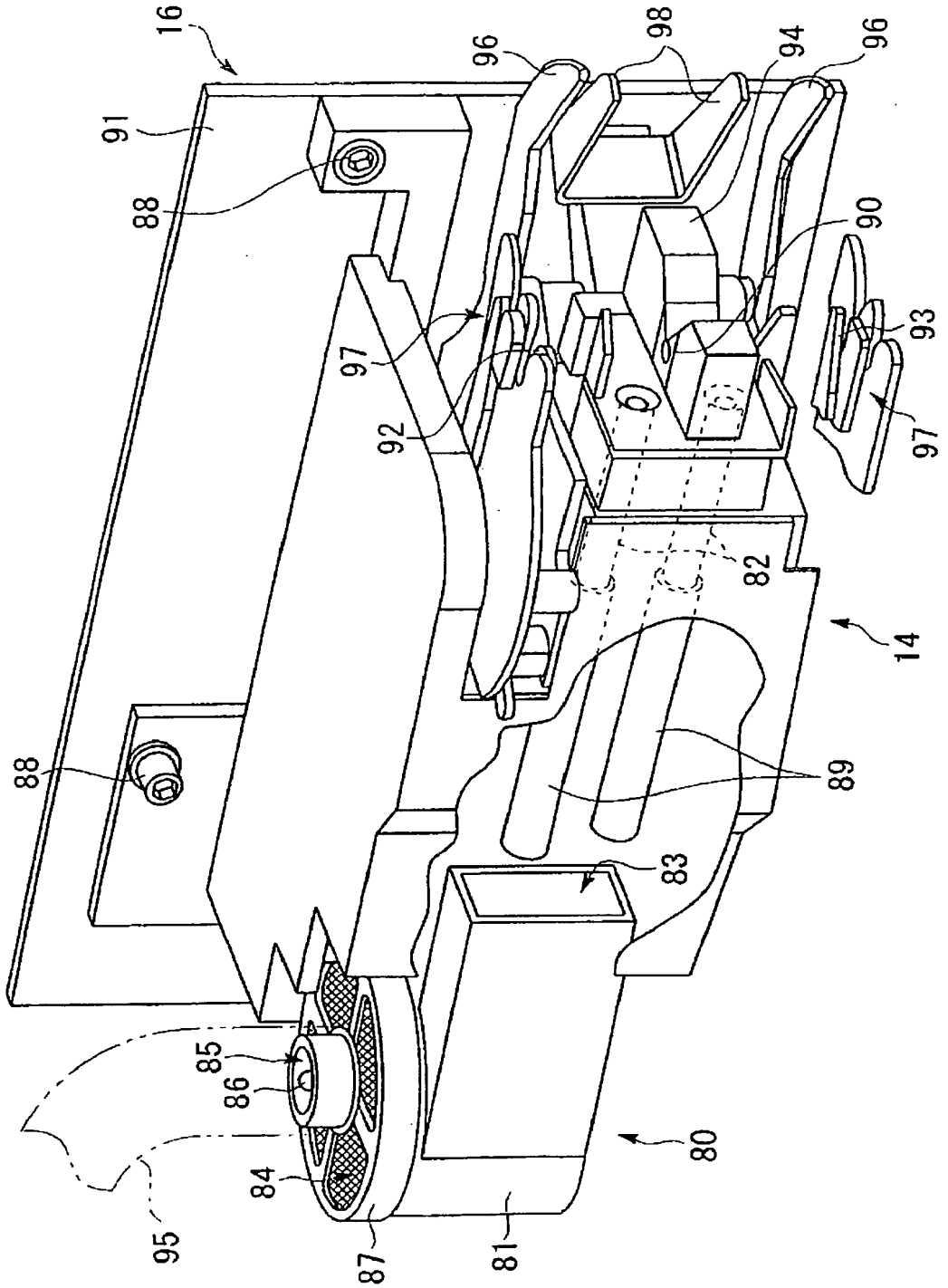
FIGURE 2



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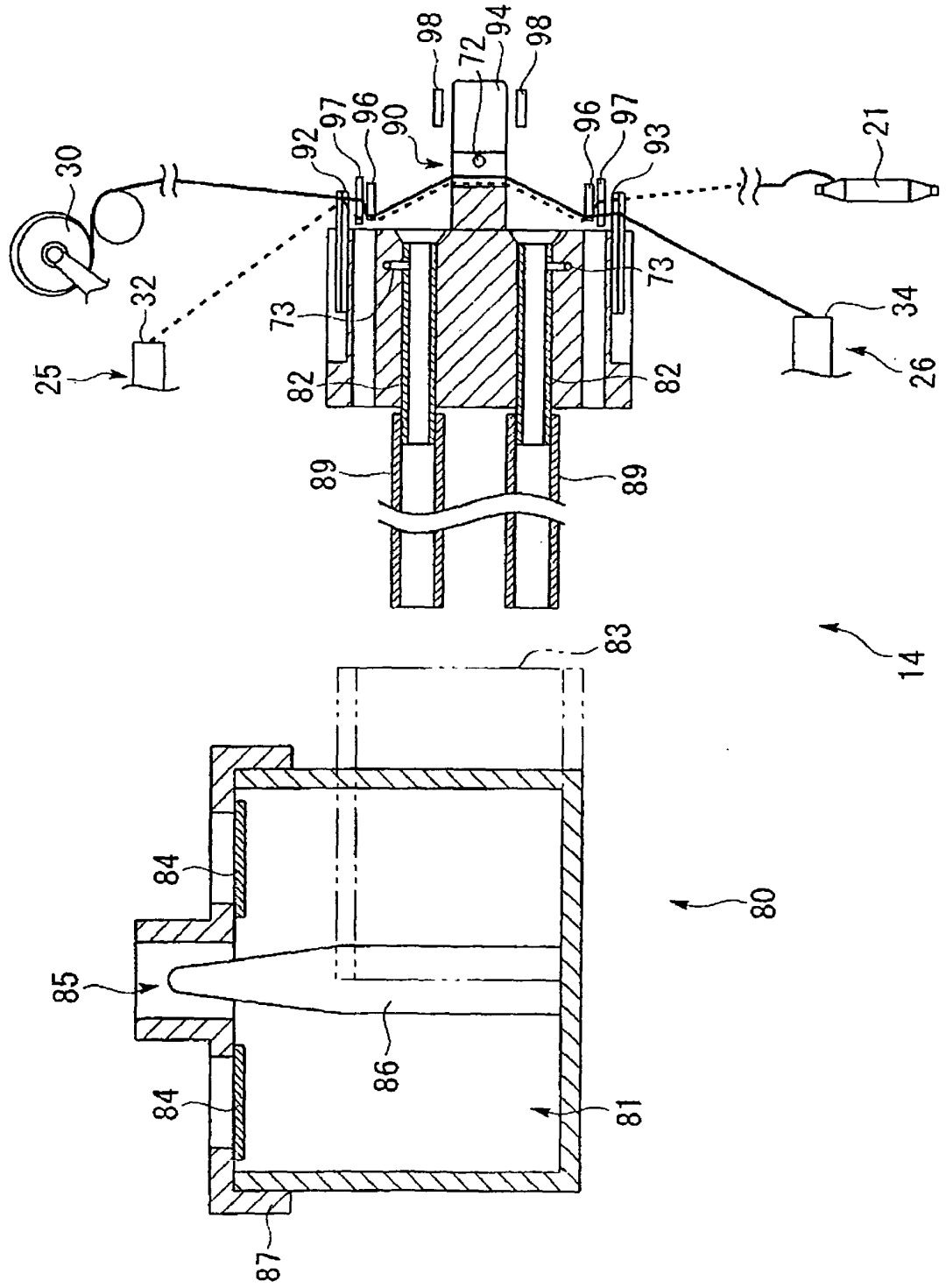
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FIGURE 4

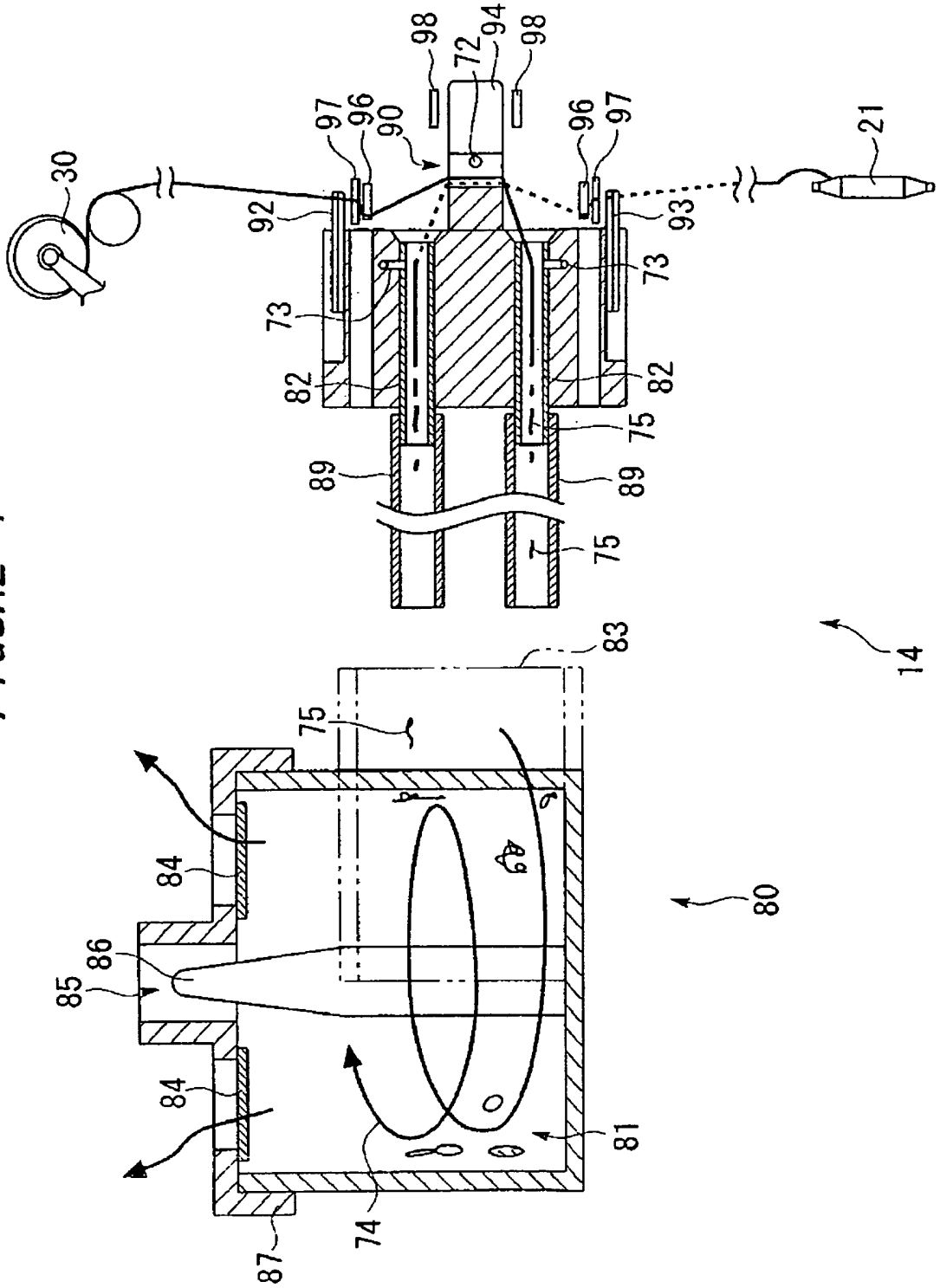
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FIGURE 5

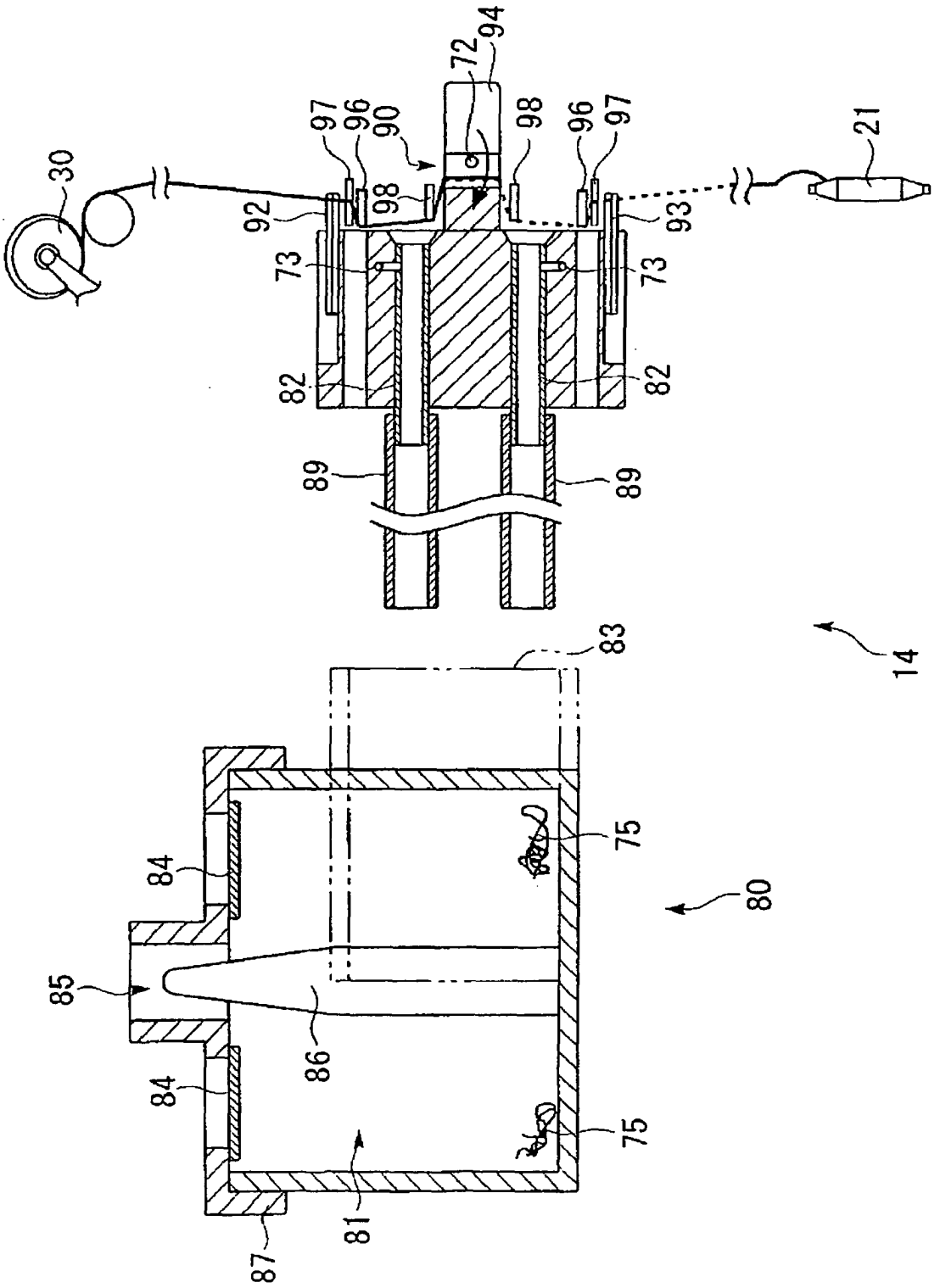
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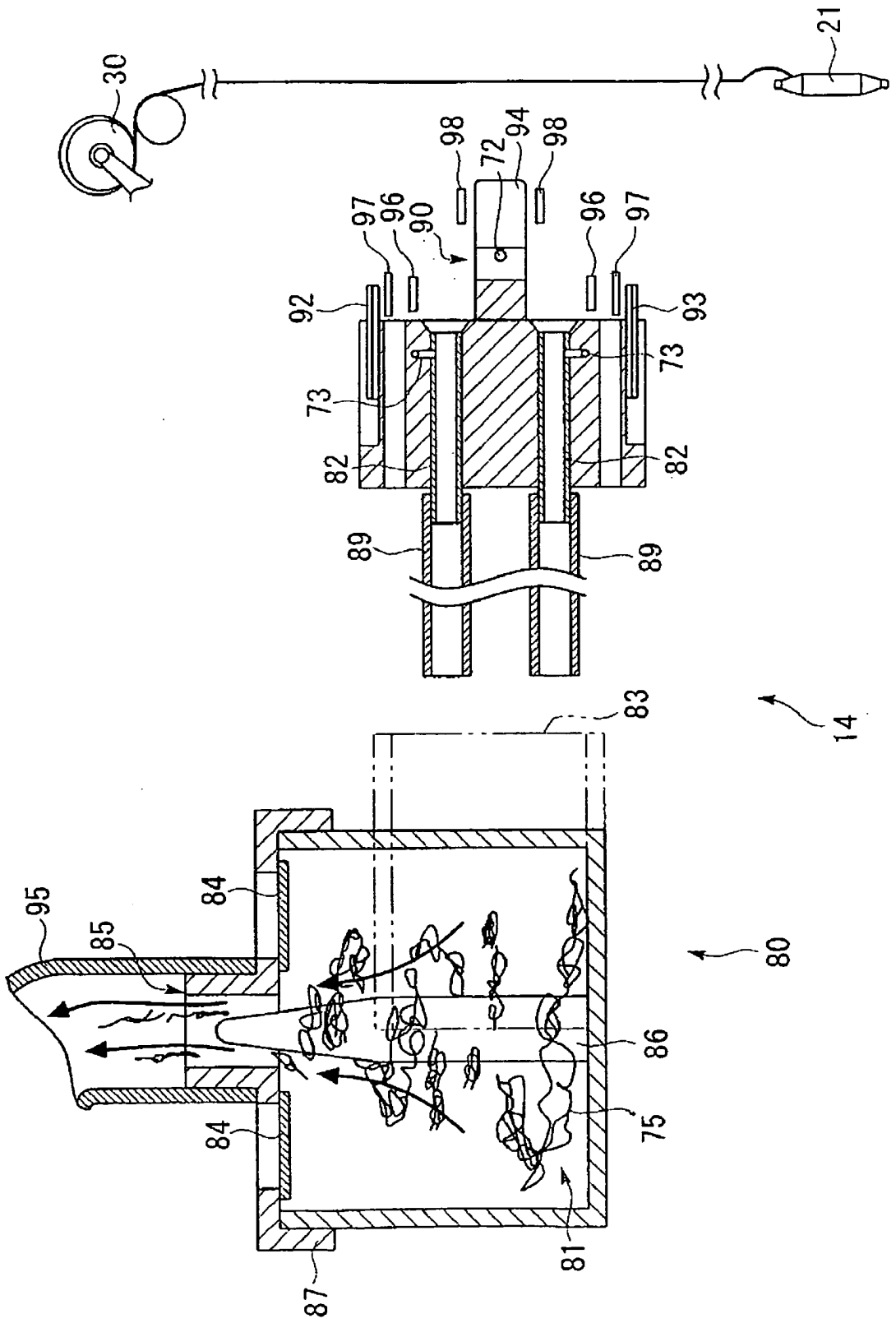
FIGURE 6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REFERENCES CITED IN THE DESCRIPTION

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- WO 2007142311 A **[0004]**