



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.07.2014 Bulletin 2014/27

(51) Int Cl.:
B65H 67/08 (2006.01)

(21) Application number: **13190833.7**

(22) Date of filing: **30.10.2013**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

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(30) Priority: **27.12.2012 JP 2012285714**

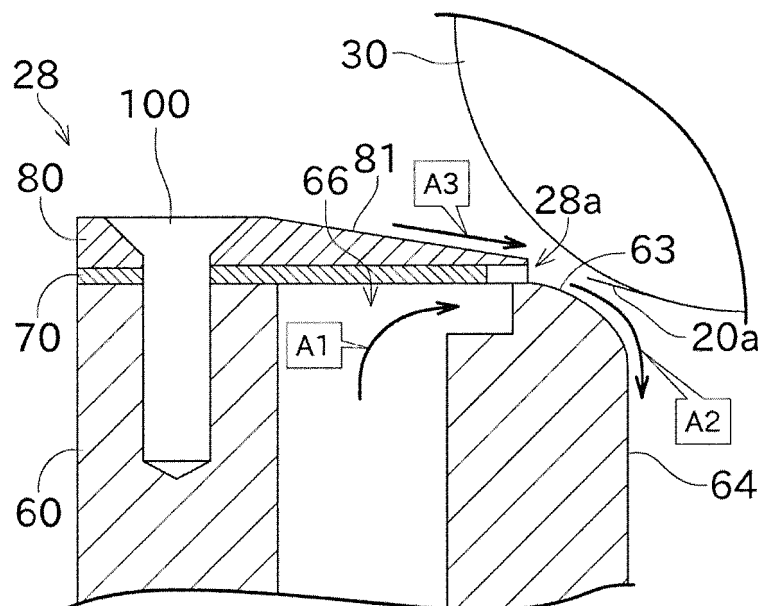
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(54) **Yarn guiding-out device and yarn winding machine**

(57) A yarn guiding-out device is proposed. Slits (28a) are formed in a yarn guiding-out device (28). The yarn guiding-out device (28) blows an airflow through the slits (28a) in a direction in which a yarn end (20a) of a package (30) is guided out from the package (30). The

slits (28a) are formed so as to generate the airflow that flows along an outer wall surface (specifically, a curved portion (63) and a flat portion (64)) having no opposing wall surface.

FIG.5



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a yarn guiding-out device that guides out a yarn end of a package.

2. Description of the Related Art

[0002] Yarn guiding-out devices that could be arranged near a package to guide out a yarn end of the package for performing, for example, yarn joining are known in the art. This type of yarn guiding-out devices is disclosed in Japanese Patent Application Laid-open No. H4-213563, Japanese Patent Application Laid-open No. H6-219649, Japanese Patent Application Laid-open No. 2000-177933, and Japanese Patent Application Laid-open No. 2000-72334.

[0003] The yarn guiding-out devices disclosed in Japanese Patent Application Laid-open No. H4-213563 and Japanese Patent Application Laid-open No. H6-219649 (suction nozzle and flat nozzle, respectively) are fixed near the package. This type of yarn guiding-out devices guides out the yarn end of the package by generating a suction airflow. In the above patent documents, however, the shapes of the openings of the suction nozzle and the flat nozzle are not described in detail.

[0004] In contrast, the yarn guiding-out device disclosed in Japanese Patent Application Laid-open No. 2000-177933 includes a movable mechanism that enables the yarn guiding-out device to be movable between a position away from the package and a position near the package. This type of yarn guiding-out device is usually caused to stand by at the position away from the package, but moved to the position near the package when performing yarn joining or the like.

[0005] The yarn guiding-out devices disclosed in Japanese Patent Application Laid-open No. 2000-177933 and Japanese Patent Application Laid-open No. 2000-72334 include a pipe-like member through which compressed air flows. The pipe-like member has a plurality of through holes for blowing the airflow. Moreover, an exhaust vent for blowing the airflow is formed on a downstream side of the pipe-like member in a direction of blow of the airflow. By generating the airflow after bringing the exhaust vent near the package, the yarn guiding-out device guides out the yarn end from the package and then downward from the exhaust vent.

[0006] However, in the yarn guiding-out devices disclosed in Japanese Patent Application Laid-open No. 2000-177933 and Japanese Patent Application Laid-open No. 2000-72334, the pipe-like member juts out above the surface of the yarn guiding-out device. Accordingly, when the pipe-like member is arranged near the exhaust vent, the exhaust vent cannot be brought sufficiently near the package. This structure, therefore, ne-

cessitates increased flow volume of the airflow to guide out the yarn.

[0007] On the other hand, when the pipe-like member is arranged distant from the exhaust vent, the exhaust vent can be brought near the package. However, the airflow blown through the pipe-like member weakens by the time it reaches the exhaust vent, again necessitating increased flow volume of the airflow to guide out the yarn.

[0008] As explained above, in the conventional yarn guiding-out devices, it is necessary to blow large volumes of airflow to reliably guide out the yarn.

SUMMARY OF THE INVENTION

[0009] It is an object of the present invention to provide a yarn guiding-out device that can reliably guide out a yarn even with a smaller flow volume of the airflow.

[0010] According to one aspect of the present invention, in a yarn guiding-out device in which a slit is formed and a direction of an airflow blown from the slit is in a direction in which a yarn of a package is guided out from the package, the slit is formed so as to generate the airflow that flows along an outer wall surface having no opposing wall surface.

[0011] According to another aspect of the present invention, a yarn winding machine includes a winding apparatus that winds a yarn to form a package; and the above yarn guiding-out device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a perspective view of an automatic winder according to an embodiment of the present invention;

FIG. 2 is a side view showing a schematic structure of a winding unit;

FIG. 3 is a perspective view of a yarn guiding-out device;

FIG. 4 is an exploded perspective view of the yarn guiding-out device;

FIG. 5 is a cross-sectional view of the yarn guiding-out device;

FIG. 6A is a plan view of a structure of a spacer member; and

FIGS. 6B and 6C are plan views of modifications of the spacer member.

DETAILED DESCRIPTION

[0013] Exemplary embodiments of the present invention are explained in detail below with reference to the accompanying drawings.

[0014] As shown in FIG. 1, an automatic winder (yarn winding machine) 1 includes a plurality of yarn winding units 10 that are arranged side by side, a doffing device 5, and a main control device 90.

[0015] Each of the yarn winding units 10, while traversing a yarn 20 that is unwound from a yarn supplying bobbin 21, winds the yarn 20 around a winding tube 22 that is supported by a cradle (winding tube supporting member) 23 to form a package 30.

[0016] When the package 30 in any of the yarn winding units 10 is fully wound, the doffing device 5 travels to the position of that yarn winding unit 10, collects the fully wound package 30, and replaces it with another winding tube 22 (empty bobbin) that does not have any yarn 20 wound around it.

[0017] The main control device 90 includes a machine setting member 91 and a machine display member 92. The machine setting member 91 is used by an operator to enter predetermined setting values, select an appropriate control method, etc., for setting each of the yarn winding units 10. The machine display member 92 displays a winding status of the yarn 20, details of any error that may have occurred, etc., of each of the yarn winding units 10.

[0018] A structure of the yarn winding unit 10 is concretely explained below with reference to FIG. 2.

[0019] The yarn winding unit 10 includes, arranged sequentially from the yarn supplying bobbin 21 in a yarn running path between the yarn supplying bobbin 21 and the winding tube 22, a yarn unwinding assisting device 12, a tension applying device 13, a yarn joining device 14, a clearer 15, and a winding section (winding apparatus) 18.

[0020] The yarn unwinding assisting device 12 assists in the unwinding of the yarn 20 from the yarn supplying bobbin 21 by lowering a regulating member 40 covering over a core tube of the yarn supplying bobbin 21 following the unwinding of the yarn 20 from the yarn supplying bobbin 21. A balloon of the yarn 20 is formed above the yarn supplying bobbin 21 due to the swinging of the yarn 20 as well as a centrifugal force generated when the yarn 20 is unwound from the yarn supplying bobbin 21. The regulating member 40 comes into contact with this balloon and regulates a size of the balloon to an appropriate size, and thereby assists in the unwinding of the yarn 20. A not shown sensor that detects a chase portion of the yarn supplying bobbin 21 is arranged near the regulating member 40. When the sensor detects a lowering of the chase portion, the regulating member 40 is lowered. The movement of the regulating member 40 is realized by, for example, a not shown air cylinder.

[0021] The tension applying device 13 applies a predetermined tension on the running yarn 20. For example, a gate-type tension applying device, in which movable comb teeth are arranged with respect to fixed comb teeth, is used as the tension applying device 13. The movable comb teeth can be rotated by a rotary solenoid to cause the movable comb teeth to be in an engaged state or in a released state with the fixed comb teeth. Other types of tension applying device, such as a disk-type tension applying device, can also be used as the tension applying device 13.

[0022] The yarn joining device 14 joins a lower yarn from the yarn supplying bobbin 21 and an upper yarn from the package 30 when yarn cutting is performed upon detection of a yarn defect by the clearer 15 or when yarn breakage occurs during the unwinding from the yarn supplying bobbin 21. The yarn joining device 14 can be of a mechanical type or of a type that uses fluid such as compressed air.

[0023] The clearer 15 includes a not shown sensor that detects the thickness of the yarn 20 or presence of foreign matters in the yarn 20. The clearer 15 detects yarn defects, such as slub, by monitoring a yarn thickness signal output by the sensor. A cutter 39 is arranged prior to the clearer 15 in the yarn path to cut the yarn 20 immediately when the clearer 15 detects a yarn defect.

[0024] A lower yarn catching member 33 that catches a yarn end of the yarn 20 from the yarn supplying bobbin 21 and guides it to the yarn joining device 14 is arranged below the yarn joining device 14. On the other hand, an upper yarn catching member (conveying device) 36 that catches a yarn end from the package 30 and guides it to the yarn joining device 14 is arranged above the yarn joining device 14.

[0025] The lower yarn catching member 33 is pivotable about a shaft 34 and the upper yarn catching member 36 is pivotable about a shaft 37. Each of the lower yarn catching member 33 and the upper yarn catching member 36 is coupled to a not shown appropriate negative pressure source. Accordingly, a suction flow is created at an opening portion at the end of each of the lower yarn catching member 33 and the upper yarn catching member 36, and the ends of the lower yarn and the upper yarn, respectively, are caught by suction by the lower yarn catching member 33 and the upper yarn catching member 36.

[0026] The winding section 18 includes the cradle 23 that detachably supports the winding tube 22, and a contact roller 29 that rotates in contact with an outer peripheral surface of the winding tube 22 or an outer peripheral surface of the package 30.

[0027] The cradle 23 is supported to pivot in a direction approaching the contact roller 29 and in a direction away from the contact roller 29. The diameter of the yarn layer on the winding tube 22 increases as winding of the yarn 20 proceeds. This increase in the diameter is absorbed by pivoting of the cradle 23.

[0028] The contact roller 29 is arranged opposing the winding tube 22 in such a way as to make contact with the winding tube 22 or the package 30. Therefore, the rotating contact roller 29 can drive the winding tube 22 or the package 30 to rotate. A not shown traverse groove that traverses the yarn 20 within a predetermined width is formed on an outer peripheral surface of the contact roller 29. Accordingly, the yarn winding unit 10 winds the yarn 20 around the winding tube 22 while traversing the yarn 20 and forms the package 30.

[0029] A yarn guiding-out device 28 and a guiding plate 27 are arranged near the contact roller 29 and the pack-

age 30. The yarn guiding-out device 28 guides out the yarn end of the package 30. The yarn 20 guided out by the yarn guiding-out device 28 is guided along the guiding plate 27 so that the yarn 20 is reliably caught by the upper yarn catching member 36. The upper yarn catching member 36 is arranged independent of the yarn guiding-out device 28 and conveys the yarn 20 guided out by the yarn guiding-out device 28.

[0030] When the yarn 20 between the yarn supplying bobbin 21 and the package 30 is disconnected (specifically, at the below explained timing), the yarn guiding-out device 28 guides out the yarn 20 from the package 30. That is, when the clearer 15 detects a yarn breakage or when the yarn is cut by the cutter 39 upon detection of a yarn defect by the clearer 15, a not shown unit controller controls the operation of the winding section 18 so as to slow down and eventually stop the rotation of the package 30. During the slowing down of the rotation of the package 30, the yarn guiding-out device 28 may be caused to blow the airflow to prevent the yarn end from adhering to the package 30. Accordingly, the yarn guiding-out device 28 can guide out the yarn 20 of the package 30 even more reliably.

[0031] The yarn guiding-out device 28 can start blowing the airflow when the package 30 is rotating (reverse rotating) in the opposite direction to a winding direction (unwinding direction) or when the package 30 has stopped rotating in the winding direction and starts to do reverse rotation. When the yarn 20 is guided out from the package 30, the winding section 18 causes a reverse rotation of the package 30. If the yarn 20 is not successfully guided out from the package 30, the reverse rotation of the package 30 is stopped, and the package 30 is rotated several times in the winding direction. The airflow can be blown by the yarn guiding-out device 28 when the package 30 is being rotated in the winding direction. The above steps ensure a greater chance of successfully guiding out the yarn 20 from the package 30 the second time around. The yarn 20 (upper yarn) that is guided out from the package 30 in this manner is caught by the upper yarn catching member 36 and is joined, by the yarn joining device 14, with the lower yarn caught by the lower yarn catching member 33.

[0032] The yarn guiding-out device 28 is explained in detail below with reference to FIGS. 3 to 5.

[0033] As shown in FIG. 3, slits 28a are formed in the yarn guiding-out device 28. The yarn guiding-out device 28 blows the airflow through the slits 28a in a direction in which the yarn end is guided out from the package 30. As a result, the yarn end is guided out from the package 30. As shown in FIGS. 3 and 4, the yarn guiding-out device 28 includes a main member 60, a spacer member 70, and a cover member 80.

[0034] The main member 60 has a rotary shaft hole 61, an air supplying hole 62, a curved portion 63, a flat portion 64, an open portion 65, an air reservoir 66, and plural fitting holes 67.

[0035] A rotary shaft 105 (adjusting member, see FIG.

3) is fit into the rotary shaft hole 61. The main member 60 is rotated by rotating the rotary shaft 105 by a not shown motor, etc. The yarn winding unit 10 rotates the rotary shaft 105 as the diameter of the package 30 increases with winding of the yarn 20 around the package 30. Accordingly, the position of the yarn guiding-out device 28 can be always maintained near the package 30 regardless of the diameter of the package 30. As an alternative structure, for example, a structure can be adopted in which the yarn guiding-out device 28 moves by sliding in accordance with the diameter of the package 30. The rotary shaft 105 is supported by an arm 26 shown in FIG. 2. One end (first end) of the arm 26 is connected to the rotary shaft 105. The other end (second end) of the arm 26 is pivotably supported by a motor, or such-like. Therefore, a distance between the yarn guiding-out device 28 and the package 30 can be adjusted by pivoting the arm 26 around the second end. An angle of the yarn guiding-out device 28 can be adjusted by pivoting the yarn guiding-out device 28 around the rotary shaft 105. Accordingly, the yarn guiding-out device 28 can always be placed at an appropriate position. It is acceptable even if the position of the yarn guiding-out device 28 itself cannot be adjusted and adjustment is only possible by the rotation of the rotary shaft 105.

[0036] An air supplying pipe 106 (see FIG. 3) is fit into the air supplying hole 62. Compressed air that is to be blown through the slits 28a is supplied through the air supplying pipe 106.

[0037] The curved portion 63 and the flat portion 64 are formed, from among wall surfaces of the main member 60 (the yarn guiding-out device 28), on a wall surface that is closer to the package 30. The curved portion 63 is located near the slits 28a further downstream relative to the slits 28a in the direction of the airflow. There is no wall surface opposing the curved portion 63 and the flat portion 64. Therefore, hereinafter, the curved portion 63 and the flat portion 64 shall be jointly termed as an outer wall surface. The outer wall surface is formed along a direction away from the package 30.

[0038] The open portion 65 is a rectangular through hole formed on the topside (the side where the spacer member 70 and the cover member 80 are located) of the main member 60. As shown in FIG. 5, the main member 60 has a level difference on the inside. This level difference makes the size of the hole larger only near the curved portion 63. The portion where the hole is larger and the immediate space surrounding it form the air reservoir 66 that temporarily stores the compressed air.

[0039] On the top surface of the main member 60 and on the side opposite to the curved portion 63, the fitting holes 67 are formed for fitting together the spacer member 70 and the cover member 80.

[0040] The spacer member 70 is a plate-like member. The spacer member 70 has a structure such that it at least partially blocks the open portion 65 of the main member 60. The spacer member 70 forms the slits 28a by forming gaps between the main member 60 and the

cover member 80. In FIGS. 3 to 5, the thickness of the spacer member 70 is shown to be large for easy visual recognition. As shown in FIG. 4, the spacer member 70 includes plural projections 71, notches 72, and fitting holes 73.

[0041] The projections 71 and the notches 72 are formed side by side. The spacer member 70 is set on the main member 60 with the side where the projections 71 and the notches 72 are formed (the side closer to the package 30) on the side of the curved portion 63. The notches 72 are formed on the flat-plate-like spacer member 70 by press-molding, etc. Once the notches 72 are formed, the remaining portions become the projections 71 that protrude beyond the notches 72.

[0042] The fitting holes 73 are formed in the spacer member 70 at positions corresponding to those of the fitting holes 67.

[0043] The cover member 80 is fitted on the main member 60, sandwiching the spacer member 70 and covering the open portion 65. As shown in FIG. 4, a wedge portion 81 and plural fitting holes 82 are formed in the cover member 80.

[0044] The wedge portion 81 is located further upstream relative to the slits 28a in the direction of the airflow. The cover member 80 is a plate-like member with a plate thickness decreasing toward the curved portion 63 (toward the side closer to the package 30). That is, the wedge portion 81 tapers toward the slits 28a. The fitting holes 82 are formed in the cover member 80 at positions corresponding to those of the fitting holes 67 and the fitting holes 73. The main member 60, the spacer member 70, and the cover member 80 are fitted together by aligning the fitting holes 67, 73, and 82 and inserting corresponding screws 100 through them.

[0045] Most of the open portion 65 is blocked by fitting together the main member 60, the spacer member 70, and the cover member 80. Only the portions where the notches 72 are formed are open as much as the thickness of the spacer member 70. In the present embodiment, the slits 28a are formed in this manner. Precise machining is required for making a tiny hole in the pipe-like member cited in Japanese Patent Application Laid-open No. 2000-177933 and Japanese Patent Application Laid-open No. 2000-72334 so that the processing cost increases. However, by adopting the method disclosed in the present embodiment, the slits 28a can be formed at a low cost.

[0046] How a yarn end 20a of the package 30 is guided out by the yarn guiding-out device 28 is explained below.

[0047] When the compressed air is supplied from the air supplying pipe 106, the air stored in the air reservoir 66 is pushed out (airflow represented by the reference symbol A1 in FIG. 5). The airflow is blown to the outside through the slits 28a. The air reservoir 66 is provided at a position located away from the slits 28a.

[0048] In Japanese Patent Application Laid-open No. 2000-177933 and Japanese Patent Application Laid-open No. 2000-72334, the airflow is blown through the

pipe-like member projecting from the wall surface. Therefore, even if the airflow is blown along the wall surface, the airflow rebounds from the wall surface and is not effectively utilized.

[0049] In the present embodiment, the curved portion 63 is located at a position that is continuous with the slits 28a. Therefore, the airflow does not rebound from the wall surface (the curved portion 63). The airflow moves along the curved portion 63 (airflow represented by the reference symbol A2 in FIG. 5). In this manner, an airflow that flows along the surface of the package 30 can be generated.

[0050] The slits 28a and the curved portion 63 are formed such that the direction of flow of the generated airflow and the direction in which the yarn end 20a of the package 30 is guided out are the same. In this manner, the yarn end 20a of the package 30 can be guided out by the airflow.

[0051] In the present embodiment, the yarn guiding-out device 28 has the wedge portion 81 that tapers so as to smoothly connect with the curved portion 63. Consequently, a surrounding airflow represented by the reference symbol A3 in FIG. 5 can be effectively pulled in to supplement the airflow represented by the reference symbol A2. In this manner, the yarn end 20a of the package 30 can be guided out even more reliably with a smaller flow volume of the airflow blown through the slits 28a.

[0052] The yarn end 20a thus guided out by the yarn guiding-out device 28 is guided by the airflow represented by the reference symbol A2 along the flat portion 64 in a direction opposite to the package 30. The upper yarn catching member 36 catches the yarn end 20a guided in the above manner and guides it to the yarn joining device 14.

[0053] The yarn guiding-out device 28, furthermore, requires a smaller flow amount of the airflow for guiding out the yarn 20 as it employs the compressed air. In a typical automatic winder, for example, as cited in Japanese Patent Application Laid-open No. 2009-155101, the yarn of the package is guided out by a suction mouth. Because the opening of the suction mouth has a large surface area, the suction flow rate is large. Therefore, when the yarn winding machine includes many such yarn winding units and a common blower for all the yarn winding units, the number of yarn winding units in which the yarns of the packages can be simultaneously guided out is restricted by the performance of the blower. However, in the automatic winder 1 according to the present embodiment, because the flow volume of the airflow blown from the yarn guiding-out device 28 is small, and in addition, a surface area of the opening of the upper yarn catching member 36 is also smaller than the opening of the suction mouth, a suction flow volume of the upper yarn catching member 36 is small. Therefore, the automatic winder 1 that includes the yarn guiding-out device 28 according to the present embodiment can simultaneously guide out the yarns 20 from more yarn winding units 10.

[0054] A shape of the spacer member 70 is explained below with reference to FIGS. 6A to 6C.

[0055] In order for the yarn guiding-out device 28 to properly guide out the yarn end 20a of the package 30, it is preferable that a length of the yarn guiding-out device 28 be the same as a length of the package 30 in a winding width direction. If supposing no projections 71 are formed in the spacer member 70, there would be a single slit 28a running over the entire length of the yarn guiding-out device 28. In this example, the flow volume of the airflow will also be large.

[0056] In contrast, in the present embodiment, the notches 72 are formed such that the width (d1) of the projections 71 is greater than the width (d2) of the notches 72, as shown in FIG. 6A. A plurality of the projections 71 and the notches 72 are formed, with all the projections 71 having the same width d1 and all the notches 72 having the same width d2. Therefore, in the spacer member 70 according to the present embodiment, a portion that obstructs the airflow from being blown is larger than a portion from where the airflow is blown. Consequently, the yarn end 20a can be guided out with a smaller flow volume of the airflow.

[0057] If the flow volume of the airflow needs to be increased because of winding conditions and/or an arrangement of the structural elements, a structure shown in FIG. 6B or FIG. 6C can be adopted.

[0058] In the example shown in FIG. 6B, the projections 71 are formed only at the ends of the spacer member 70 in a length direction of the spacer member 70 and the portion between the projections 71 forms the notch 72. In this example, the projections 71 are provided so that the blown air does not leak in a direction perpendicular to the length direction.

[0059] In the example shown in FIG. 6C, similar to the present embodiment, the projections 71 and the notches 72 are alternately formed. However, the example shown in FIG. 6C differs from the present embodiment in that the width (d1) of the projections 71 is smaller than the width (d2) of the notches 72. The shape of the spacer member 70 is not restricted to the ones stated above and can be suitably modified.

[0060] Thus, by appropriate setting of the width of the projections 71 and the width of the notches 72, the yarn guiding-out device 28 can guide out the yarn end 20a while using a suitable flow volume.

[0061] As explained above, the slits 28a are formed in the yarn guiding-out device 28 according to the present embodiment. The yarn guiding-out device 28 blows the airflow through the slits 28a in the direction in which the yarn end 20a of the package 30 is guided out from the package 30. The slits 28a are formed so as to generate the airflow that flows along the outer wall surface (specifically, the curved portion 63 and the flat portion 64) having no opposing wall surface.

[0062] Because the airflow blown through the slits 28a flows along the outer wall surface of the yarn guiding-out device 28, the portion where the airflow flows and the

package 30 can be brought close to each other. Consequently, the yarn end 20a can be reliably guided out with a smaller flow volume of the airflow.

[0063] In the yarn guiding-out device 28 according to the present embodiment, if the direction of flow of the airflow blown through the slits 28a is considered as the airflow direction, at a location that is further downstream relative to the slits 28a in the airflow direction, the outer wall surface includes the curved portion 63.

[0064] Consequently, the airflow flows along the curved portion 63. This airflow flowing along the curved portion 63 can be utilized to reliably guide out the yarn end 20a from the package 30.

[0065] The yarn guiding-out device 28 according to the present embodiment includes the main member 60, the cover member 80, and the spacer member 70. The main member 60 includes the outer wall surface and the open portion 65. The cover member 80 is fitted on the main member 60. The spacer member 70 is arranged so as to at least partially block the open portion 65, forming the slits 28a between the cover member 80 and the main member 60.

[0066] Consequently, the slits 28a are formed with ease merely by assembling the above structural elements. Furthermore, in the yarn guiding-out device 28, both the slits 28a and the outer wall surface along which the airflow flows are formed in the main member 60. Consequently, the portion from which the airflow is blown does not jut out, unlike in the invention disclosed in Japanese Patent Application Laid-open No. 2000-177933. With no wall surface to cause the airflow to rebound, the airflow can be effectively utilized.

[0067] In the yarn guiding-out device 28 according to the present embodiment, the notches 72 are formed in the spacer member 70. The airflow is blown to the outside through the notches 72.

[0068] Consequently, the airflow is prevented from being blown excessively. Consequently, the flow volume of the airflow can be reduced.

[0069] In the yarn guiding-out device 28 according to the present embodiment, in the spacer member 70, the portion that obstructs the airflow (sum of the widths of the projections 71) is larger than the portion that blows the airflow (sum of the widths of the notches 72).

[0070] Consequently, the flow volume of the airflow used for guiding out the yarn end 20a can be further reduced.

[0071] In the yarn guiding-out device 28 according to the present embodiment, the cover member 80 is a plate-like member. The cover member 80 includes the wedge portion 81. The plate thickness of the wedge portion 81 decreases toward the slits 28a.

[0072] Consequently, the surrounding air can be pulled in to supplement the blown airflow, and thereby, the yarn end 20a can be reliably guided out from the package 30 even with a smaller flow volume.

[0073] Exemplary embodiments of the present invention have been explained above. However, the following

modifications of the above structure are also possible.

[0074] In the present embodiment, one yarn joining device 14 is provided per yarn winding unit 10. However, a yarn joining device 14 that is common to some or all of the yarn winding units 10 can be mounted on a vehicle that is movable in a direction of arrangement of the yarn winding units 10. In this arrangement, the yarn 20 guided out by the yarn guiding-out device 28 is fed into the yarn joining device 14 mounted on the vehicle.

[0075] In the present embodiment, the winding section 18 traverses the yarn 20 by the traverse groove formed on the contact roller 29. Instead, a contact roller without any traverse groove formed on it can be used and the yarn 20 can be traversed by a traversing device that is arranged separately from the contact roller.

[0076] In the above embodiments, a mechanism is provided that feeds the yarn 20 guided out by the yarn guiding-out device 28 to the yarn joining device 14; however, this structure is not limited. That is, the yarn 20 can be fed to any other device. Moreover, instead of providing a mechanism for feeding the yarn 20, an operator can manually feed the yarn 20 to an appropriate device.

[0077] In the present embodiment, a cheese package was cited as an example. However, the present invention can be applied to a tapered package and/or a cone package. Furthermore, the running direction of the yarn need not be a substantially upward direction in a height direction of the machine, and can be a substantially downward direction.

[0078] The present invention should not be limited to automatic winders and can also be applied to other yarn winding machines, such as re-winding machines and spinning machines (for example, air spinning machines, open-end spinning machines, etc.). Therefore, the present invention can also be applied to a spinning machine in which a separate yarn joining device is provided for each winding unit.

[0079] According to a first aspect of the present invention, a slit is formed in a yarn guiding-out device. The yarn guiding-out device blows an airflow through the slit in a direction in which a yarn of a package is guided out from the package. The slit is formed such that the airflow that is generated flows along an outer wall surface having no opposing wall surface.

[0080] Consequently, the airflow blown from the slit flows along the outer wall surface of the yarn guiding-out device. Consequently, because the portion where the air flows and the package can be brought close to each other, the yarn can be reliably guided out even with a smaller flow volume of the airflow.

[0081] In the yarn guiding-out device, if a direction of the airflow blown through the slit is considered as an airflow direction, at a location that is further downstream relative to the slit in the airflow direction, the outer wall surface is formed along a direction away from the package.

[0082] The slit is formed in the yarn guiding-out device. The yarn guiding-out device blows the airflow through

the slit in the direction in which the yarn of the package is guided out from the package. The slit is formed such that the airflow that is generated flows along the outer wall surface. At a location that is further downstream relative to the slit in the airflow direction, the outer wall surface is formed along the direction away from the package.

[0083] In the yarn guiding-out device, if a direction of the airflow blown from the slit is considered as the airflow direction, at a location that is further downstream relative to the slit, the outer wall surface includes a curved portion.

[0084] Consequently, the airflow flows along the curved portion. This airflow flowing along the curved portion can be utilized to reliably guide out the yarn from the package.

[0085] The yarn guiding-out device includes a main member, a cover member, and a spacer member. The main member includes an outer wall surface and an opening. The cover member is detachably fitted on the main member. The spacer member at least partially blocks the open portion, forming the slit between the cover member and the main member.

[0086] Consequently, the slit is formed with ease merely by assembling the above structural elements. Furthermore, in the yarn guiding-out device, both the slit and the outer wall surface along which the airflow flows are formed in the main member. Consequently, the portion from which the airflow is blown does not jut out. With no wall surface to cause the airflow to rebound, the airflow can be effectively utilized.

[0087] In the yarn guiding-out device, a notch is formed in the spacer member. The airflow is blown to the outside through the notches.

[0088] Consequently, the airflow is prevented from being blown excessively. Consequently, the flow volume of the airflow can be reduced.

[0089] In the yarn guiding-out device, the spacer member includes alternating projections and notches. Moreover, a portion formed by the projections that obstructs the airflow from being blown is larger than a portion formed by the notches from where the airflow is blown.

[0090] Consequently, the airflow used for guiding out the yarn from the package can be further reduced.

[0091] In the yarn guiding-out device, the cover member is a plate-like member that includes a wedge portion having a plate thickness that decreases toward the slit.

[0092] Consequently, the surrounding air can be pulled in to supplement the blown airflow, and thereby, the yarn can be reliably guided out from the package even with a smaller flow volume.

[0093] It is preferable that the yarn guiding-out device include an air reservoir for temporarily storing the airflow that is to be supplied to the slit.

[0094] Consequently, compressed air can be properly blown from the slit.

[0095] The air reservoir is arranged at a position located away from the slit.

[0096] It is preferable that the yarn guiding-out device include an adjusting member that adjusts a relative dis-

tance between the yarn guiding-out device and the package in accordance with an increase in a wound diameter of the package.

[0097] Consequently, the slit of the yarn guiding-out device can be positioned closer to the package. Consequently, the act of shifting the yarn guiding-out device near the package as the yarn is guided out can be omitted.

[0098] According to a second aspect of the present invention, a yarn winding machine is provided that includes a winding apparatus that winds a yarn to form a package and the yarn guiding-out device that guides out the yarn from the package.

[0099] Consequently, a yarn winding machine is realized that requires a smaller flow volume of the airflow to guide out the yarn from the package.

[0100] The yarn winding machine further includes a conveying device. The conveying device is arranged independent of the yarn guiding-out device and conveys the yarn guided out by the yarn guiding-out device.

[0101] The yarn winding machine further includes a yarn supplying section that supplies the yarn to be wound to form the package. When the yarn is disconnected between the yarn supplying section and the package, the yarn guiding-out device blows the airflow.

[0102] Consequently, when the yarn is disconnected, yarn joining, etc. can be performed by guiding out the yarn from the package by blowing the airflow at the above timing.

[0103] Although the invention has been described with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching of the claims.

Claims

1. A yarn guiding-out device (28) in which a slit (28a) is formed and a direction of an airflow blown from the slit (28a) is in a direction in which a yarn (20) of a package (30) is guided out from the package (30), wherein the slit (28a) is formed so as to generate the airflow that flows along an outer wall surface (63, 64) having no opposing wall surface.
2. The yarn guiding-out device (28) according to Claim 1, wherein if a direction of the airflow blown from the slit (28a) is considered as an airflow direction, at a location that is further downstream relative to the slit (28a) in the airflow direction, the outer wall surface (63, 64) is formed along a direction away from the package.
3. A yarn guiding-out device (28) in which a slit (28a) is formed and a direction of an airflow blown through

the slit (28a) is in a direction in which a yarn (20) of a package (30) is guided out from the package (30), wherein

the slit (28a) is formed so as to generate the airflow that flows along an outer wall surface (63, 64), and if a direction of the airflow blown from the slit (28a) is considered as an airflow direction, at a location that is further downstream relative to the slit (28a) in the airflow direction, the outer wall surface (63, 64) is formed along a direction away from the package (30).

4. The yarn guiding-out device (28) according to any one of Claims 1 to 3, wherein if the direction of the airflow blown from the slit (28a) is considered as the airflow direction, at a location that is further downstream relative to the slit (28a) in the airflow direction, the outer wall surface (63, 64) includes a curved portion (63).

5. The yarn guiding-out device (28) according to any one of Claims 1 to 4 comprising:

a main member (60) that includes the outer wall surface (63, 64) and in which an opening (65) is formed;

a cover member (80) that is fitted to the main member (60); and

a spacer member (70) adapted to at least partially block the opening (65) and to form the slit (28a) between the cover member (80) and the main member (60).

6. The yarn guiding-out device (28) according to Claim 5, wherein a notch (72) is formed in the spacer member (70) and the airflow is blown to the outside through the notch (72).
7. The yarn guiding-out device (28) according to Claim 6, wherein the spacer member (70) includes alternate projections (71) and notches (72), and a portion, formed by the projections (71), that obstructs the airflow from being blown being larger than a portion, formed by the notches (72), from where the airflow is blown.
8. The yarn guiding-out device (28) according to any one of Claims 5 to 7, wherein the cover member (80) is a plate-like member that includes a wedge portion (81) having a plate thickness that decreases toward the slit (28a).
9. The yarn guiding-out device (28) according to any one of Claims 1 to 8, further comprising an air reservoir (66) adapted to temporarily store the airflow to be supplied to the slit (28a).
10. The yarn guiding-out device (28) according to Claim

9, wherein the air reservoir (66) is located at a position located away from the slit (28a).

11. The yarn guiding-out device (28) according to any one of Claims 1 to 10, further comprising an adjusting member (105) adapted to adjust a relative distance between the yarn guiding-out device (28) and the package (30) in accordance with an increase in a wound diameter of the package (30).
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12. A yarn winding machine (1) comprising:
a winding apparatus (18) adapted to wind a yarn (20) to form a package (30); and
the yarn guiding-out device (28) according to any one of Claims 1 to 11 adapted to guide out the yarn (20) from the package (30).
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13. The yarn winding machine (1) according to Claim 12, further comprising a conveying device (36) arranged independent of the yarn guiding-out device (28) and adapted to convey the yarn (20) guided out by the yarn guiding-out device (28).
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14. The yarn winding machine according to Claim 12 or 13, further comprising a yarn supplying section adapted to supply the yarn (20) to be wound to form the package (30),
wherein the yarn guiding-out device (28) is adapted to blow the airflow when the yarn (20) between the yarn supplying section and the package (30) is disconnected.
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FIG.1

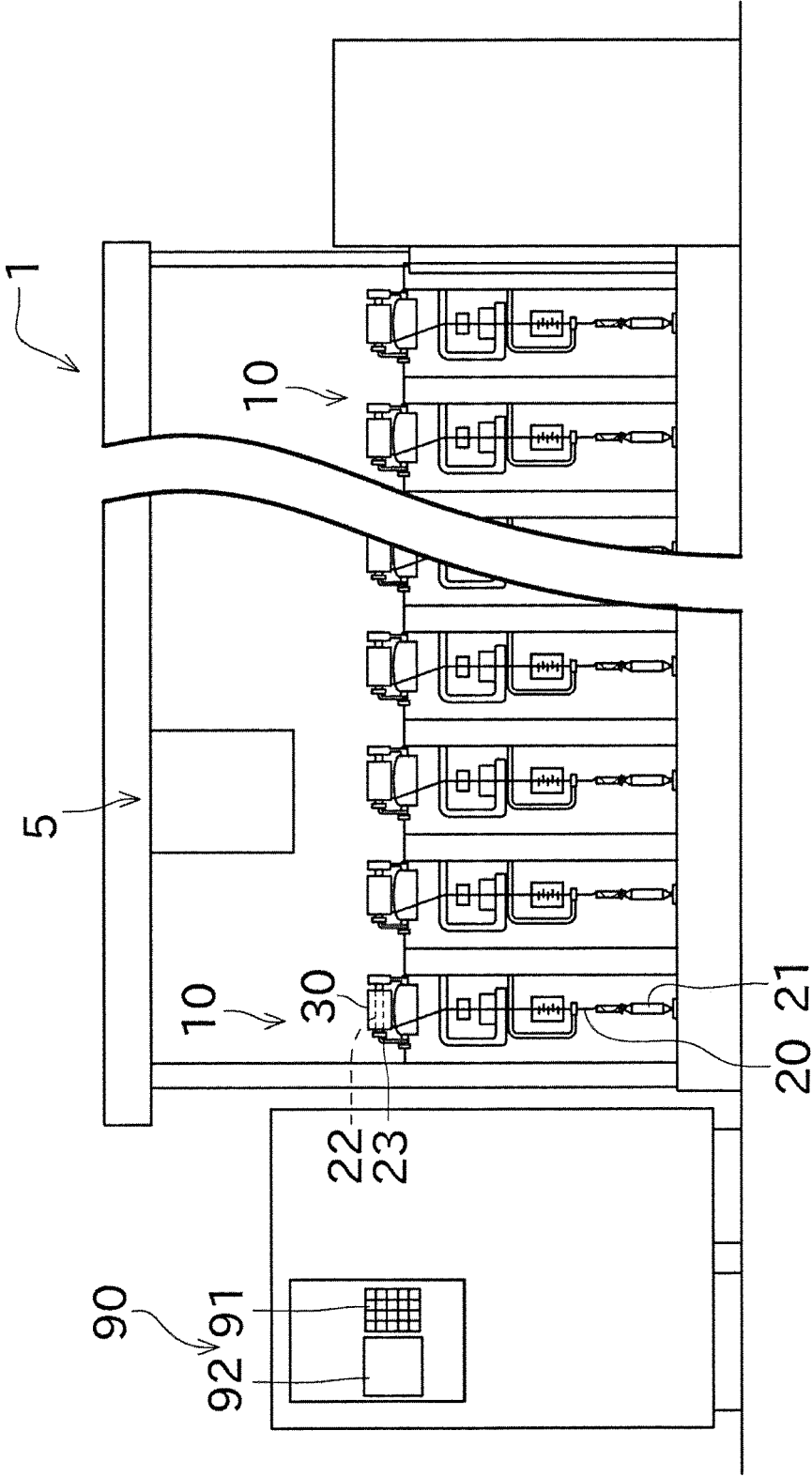


FIG.2

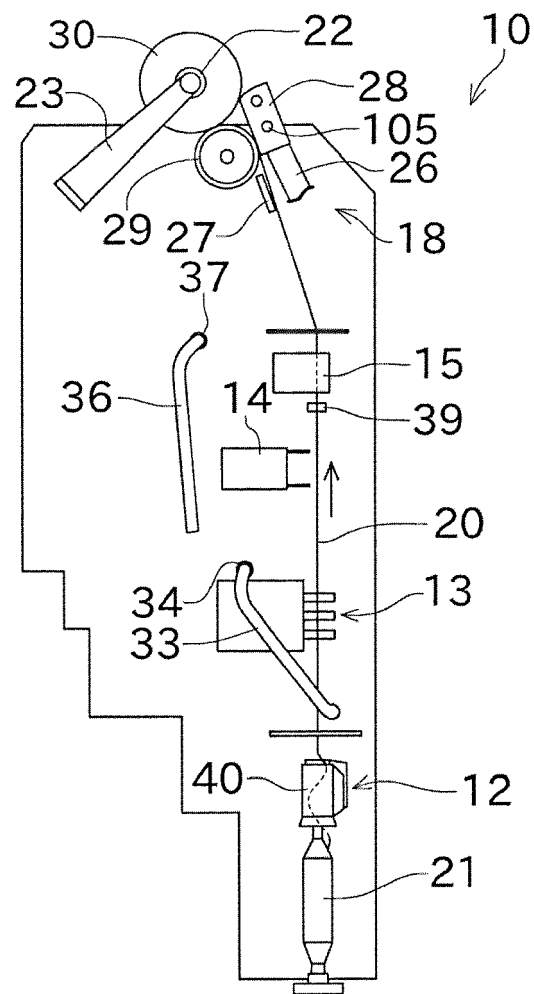


FIG.3

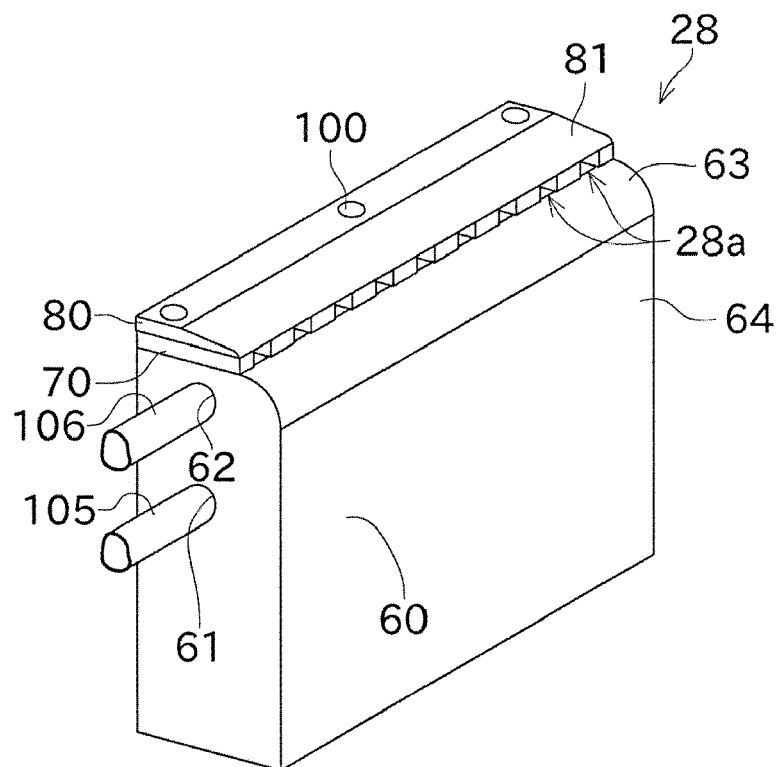


FIG.4

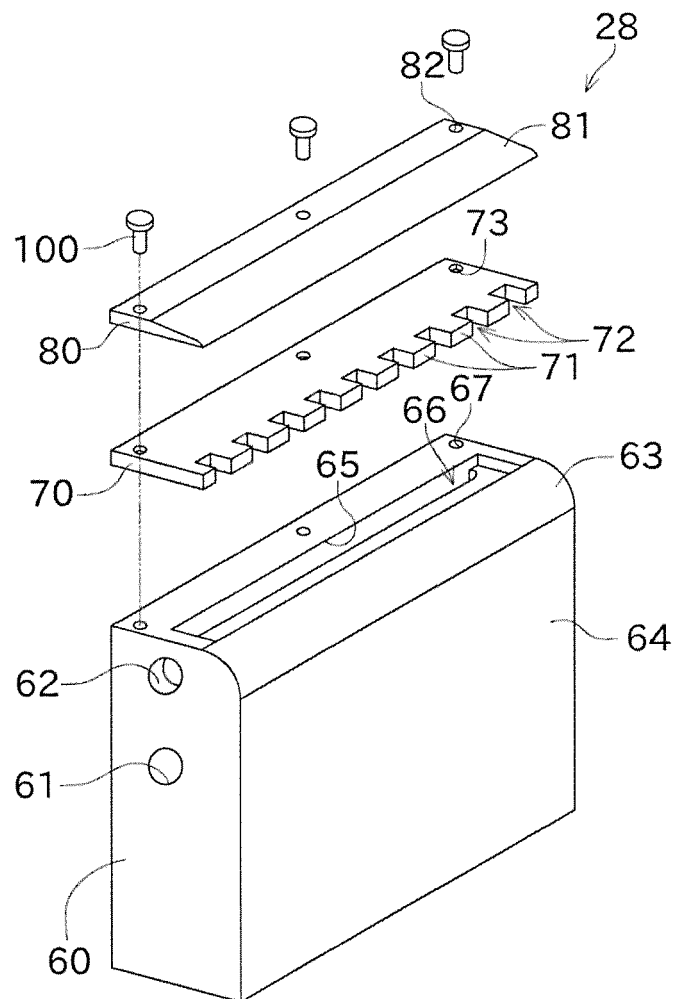


FIG.5

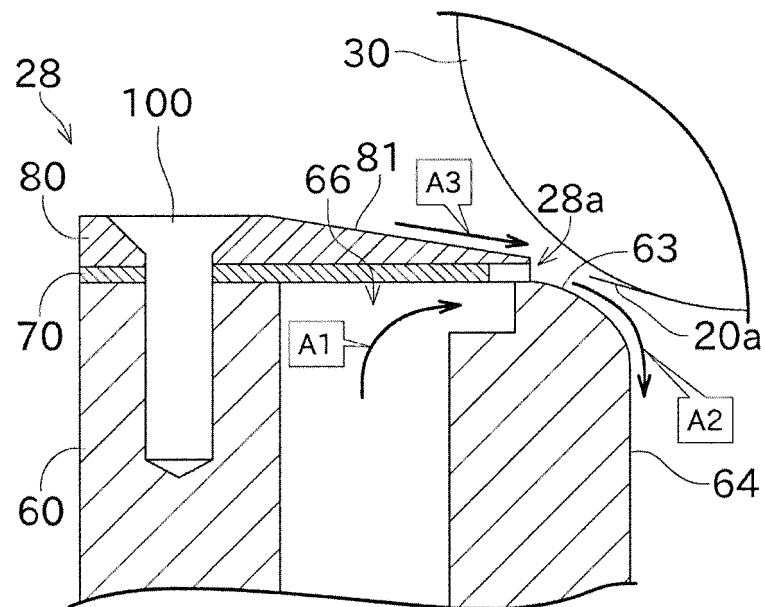


FIG.6A

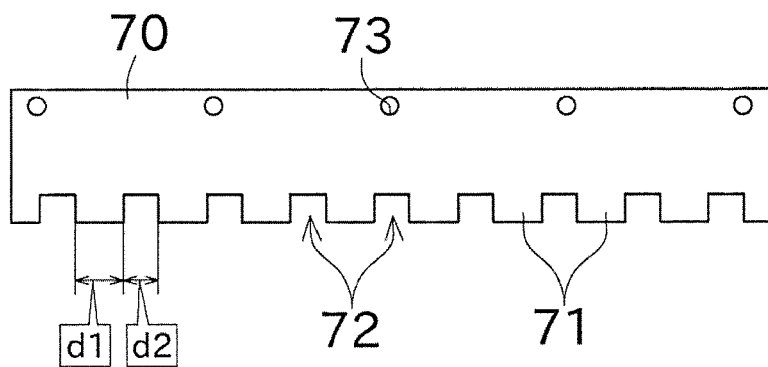


FIG.6B

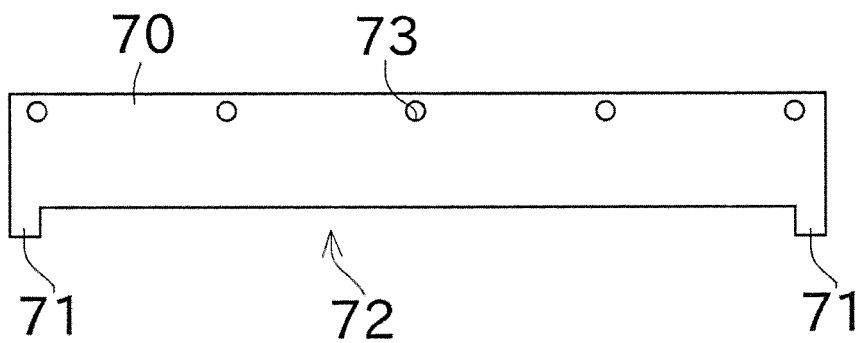
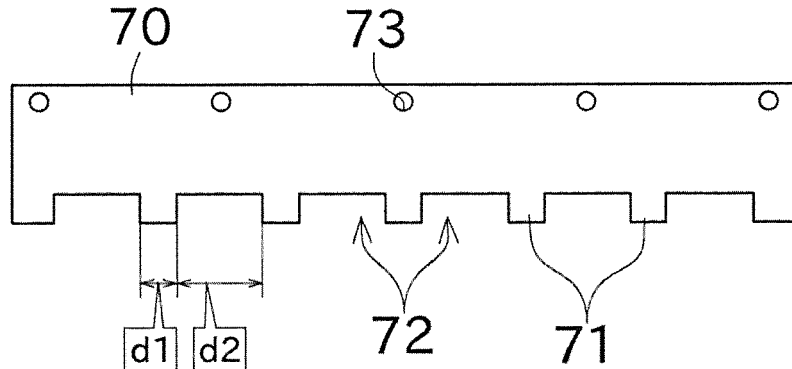


FIG.6C



REFERENCES CITED IN THE DESCRIPTION

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