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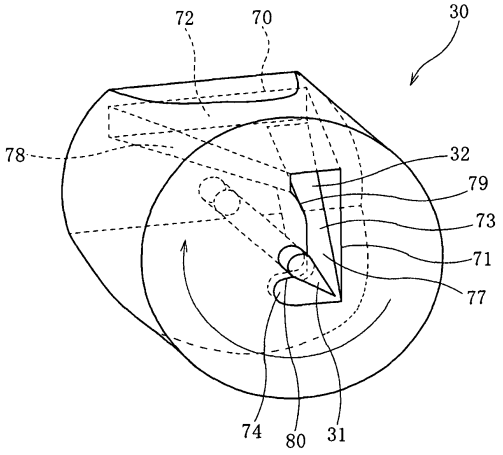
(54) Air-jet spinning device

(57) A fiber bundle guide surface of an introduction channel 32 is configured to include a first surface 78 ranging from an inlet 70 side of the introduction channel 32 to an outlet 71 of the introduction channel 32, a second surface 79 connected to the first surface 78 at a downstream side of a swirling direction of a swirling airflow and ranging from the inlet 70 side to the outlet 71, and a third surface 80 connected to the second surface 79 at the downstream side of the swirling direction and ranging from the inlet 70 to the outlet 71. Each of an angle between the first surface 78 and the second surface 79 and an angle between the second surface 79 and the third surface 80 is set to be almost right angle. If a fiber bundle fed from a draft device is introduced into the introduction channel 32, the fiber bundle is sharply bent and surely constrained by the introduction member, thereby making it difficult to separate fibers from the fiber bundle and making it possible to reduce fibers causing fiber loss (Fig. 3).

FIG. 03



EP 2 009 151 A1

Description

[0001] The present invention relates to a spinning device and particularly relates to a spinning device for manufacturing a spun yarn using a swirling airflow.

[0002] A spinning device for manufacturing a spun yarn using a swirling airflow includes a needle block including a needle along a yarn feeding direction in which a spun yarn is produced from a fiber bundle, a nozzle block in which a spatial portion is formed, and a spindle inserted into the spatial portion. An introduction channel into which the fiber bundle fed out from a draft device is formed in the needle block. The needle is attached to the needle block while a tip end of the needle protrudes to the spatial portion. The introduction channel is formed to be gradually twisted in a swirling direction of the swirling airflow as disclosed in, for example, Patent Document 1. An air nozzle having an outlet open to the hollow portion is formed in the nozzle block. A hollow yarn passage hole is formed in the spindle in an axial direction of the spindle. In the spinning device configured as state above, air is jetted from the air nozzle toward a tip end of the spindle and a swirling airflow is generated in a swirling airflow generation chamber that is a space formed between the nozzle block and the spindle. This swirling airflow introduces the fiber bundle into the swirling airflow generation chamber via the introduction channel while the fiber bundle is wound around a tip end of the needle. A part of fibers included in the fiber bundle introduced into the swirling airflow generation chamber, that is, the wound fibers are reversed and swirled along an inner peripheral wall of the nozzle block that is a peripheral wall of the spatial portion. The wound fibers are wound around a fiber at a center of the fiber bundle continuously introduced into the yarn passage hole, that is, a core fiber, thereby manufacturing a spun yarn via the yarn passage hole.

[0003] Patent Document 1: Japanese Unexamined Patent Publication No. 1995-82612

[0004] In a conventional spinning device stated above, the fiber bundle is gradually moved along an introduction channel formed to be gradually twisted in the needle block. Since a surface of the introduction channel along which the fiber bundle is moved is formed to be gradually twisted, the fiber bundle is gradually constrained. If the fiber bundle is gradually constrained, unconstrained fibers also appear. Therefore, the unconstrained fibers halfway along the introduction channel are separated from a core fiber an end of which a downstream side of a yarn feeding direction is continuously introduced into the yarn passage hole and disposed of without being produced into the spun yarn. Namely, so-called fiber loss often disadvantageously increases.

[0005] The present invention has been made to solve the conventional problems. It is an object of the present invention to provide a spinning device ensuring constraining a fiber bundle introduced into an introduction channel of a fiber bundle introduction member, making it difficult to separate fibers constituting the fiber bundle, and ensuring less fiber loss.

[0006] To attain the object, a first aspect of the present invention is a spinning device for manufacturing a spun yarn by swirling a part of fibers included in a fiber bundle by a swirling airflow, the spinning device including a fiber bundle introduction member and a nozzle block, an introduction channel for introducing the fiber bundle being formed in the fiber bundle introduction member, a spatial portion being formed in the nozzle block and an air nozzle for generating the swirling airflow being formed in the spatial portion, including:

a spindle inserted into the spatial portion, a yarn passage hole passed through by the spun yarn being formed in the spindle; and
the fiber bundle introduction member, the introduction channel connected to the spatial portion and guiding the fiber bundle toward an inlet of the yarn passage hole being formed in the introduction channel; and

wherein:

a sharply bent portion constraining the fiber bundle is formed on a fiber bundle guide surface, the fiber bundle in the introduction channel being moved along the fiber bundle guide surface.

[0007] By so constituting, convergence of the fiber bundle introduced into the introduction channel is improved.

[0008] A second aspect of the present invention is characterized, based on a configuration of the first aspect of the present invention, in that an inner sidewall includes a first surface ranging from an inlet of the introduction channel to an outlet side of the introduction channel, and a second surface connected to the first surface a downstream side of a swirling direction of the swirling airflow and ranging from an inlet side of the introduction channel to an outlet of the introduction channel; and
an angle between the first surface and the second surface is set to almost right angle.

[0009] By so constituting, the fiber bundle introduced into the introduction channel is bent almost at right angle and surely constrained by the fiber bundle introduction member.

[0010] A third aspect of the present invention is characterized, based on the configures of the first and second aspects of the present invention, in that the inner sidewall further includes a third surface connected to the second surface the downstream side of the swirling direction and ranging from the inlet side of the introduction channel to the outlet of the introduction channel; and
an angle between the second surface and the third surface is set to almost right angle.

[0011] By so constituting, the fiber bundle is bent almost at right angle again and constrained further surely

by the fiber bundle introduction member.

[0012] A fourth aspect of the present invention is characterized, based on the configuration of any of first to third aspects of the present invention, in that the fiber bundle introduction member is formed integrally with at least the fiber bundle guide surface.

[0013] By so constituting, joints generated on the fiber bundle guide surface of the introduction channel by manufacturing process are eliminated.

[0014] As stated above, in the first aspect of the present invention, convergence of the fiber bundle introduced into the introduction channel is improved. Due to this, it is difficult to separate the fibers constituting the fiber bundle from the fiber bundle and the fibers causing fiber loss can be reduced.

[0015] In the second aspect of the present invention, which exhibits not only the advantages of the first aspect of the present invention, the fiber bundle introduced into the introduction channel is bent almost at right angle and surely constrained by the fiber bundle introduction member. Due to this, it is difficult to separate the fibers constituting the fiber bundle from the fiber bundle and the fibers causing fiber loss can be further reduced.

[0016] In the third aspect of the present invention, which exhibits not only the advantage of the first or second aspect of the present invention, the fiber bundle is bent almost at right angle again and constrained further surely by the fiber bundle introduction member. Due to this, it is difficult to separate the fibers constituting the fiber bundle from the fiber bundle and the fibers causing fiber loss can be further reduced.

[0017] In the fourth aspect of the present invention, which exhibits not only the advantages any of the first to third aspects of the present invention, joints generated on the fiber bundle guide surface of the introduction channel by manufacturing process are eliminated. Due to this, the fiber bundle can be smoothly moved without being caught up in the introduction channel.

[0018]

[Fig. 1] Fig. 1 is a perspective view showing a schematic configuration of spinning machine including a spinning device according to a first embodiment of the present invention.

[Fig. 2] Fig. 2 is a longitudinal sectional view showing a schematic configuration of the spinning device shown in Fig. 1 near a tip end of a spindle.

[Fig. 3] Fig. 3 is a perspective view showing a schematic configuration of a fiber bundle introduction member of the spinning device shown in Fig. 1.

[Figs. 4(1) to 4(3)] Figs. 4(1) to 4(3) show the schematic configuration of the fiber bundle introduction member of the spinning device shown in Fig. 1, where Fig. 4(1) is a front view, Fig. 4(2) is a back view, and Fig. 4(3) is a side view of the fiber bundle introduction member.

[Figs. 5(1) to 5(2)] Fig. 5(1) is a cross-sectional view taken along a line V-V of Figs. 4(1) to 4(3), and Fig. 5(2) is a cross-sectional view taken along a line VI-VI of Figs. 4(1) and 4(2).

[0019] Embodiments of the present invention will be described hereinafter referring to the accompanying drawings.

[0020] Fig. 1 is a perspective view showing a schematic configuration of a spinning machine including a spinning device according to a first embodiment of the present invention.

[0021] Referring to Fig. 1, a spinning machine 10 includes a can 11, a draft device 12, a spinning device 13, a yarn feeding device 14, a yarn defect detection device 15, and a winding device 16 from an upstream side of a yarn feeding direction in which a spun yarn 18 is manufactured from a fiber bundle 17. The fiber bundle 17 produced by a drawing frame machine is accommodated in the can 11.

[0022] The draft device 12 is a device putting the fiber bundle 17 drawn out from the can 11 between rollers and extending the fiber bundle 17. The draft device 12 includes four pairs of rollers, i.e., a back roller pair 19, a third roller pair 20, a second roller pair 21, and a front roller pair 22 from the upstream side of the yarn feeding direction. Apron belts 26 are attached to the rollers in the second roller pair 21, respectively.

[0023] The spinning device 13 is a device manufacturing the spun yarn 18 by applying a swirling airflow to the fiber bundle 17 fed from the front roller pair 22 of the draft device 12. The spinning device 13 will be described later in detail.

[0024] The yarn feed device 14 is a device feeding out the spun yarn 18 manufactured by the spinning device 13 to the yarn winding device 16 arranged at a downstream side of the yarn feeding direction. The yarn feed device 14 includes a delivery roller 23 and a nip roller 24 provided to be contactable and separable with and from the delivery roller 23. The spun yarn 18 held between the delivery roller 23 and the nip roller 24 is fed to the winding device 16 by being driven to rotate by the delivery roller 23.

[0025] The yarn defect detection device 15 is a device detecting a yarn defect of the spun yarn 18 that is being fed to the winding device 16. A defective portion of the spun yarn 18 is removed based on the yarn defect detection information obtained by the yarn defect detection device 15, thus preventing defective yarns from being wound to a package 25. The yarn defect detection device 15 includes a cutting device, not shown, cutting the spun yarn 18 according to detection of the yarn defect. The spinning device 10 includes a yarn joint device, not shown, joining together both ends of the spun yarn 18 that has been cut once.

[0026] The winding device 16 is a device manufacturing the package 25 by winding the spun yarn 18 manufactured by the spinning device 13 around a bobbin 27 supported by a bobbin holder, not shown.

[0027] The spinning device 13 will be described.

[0028] Fig. 2 is a longitudinal sectional view showing a schematic configuration of the spinning device 13 shown in Fig. 1 near a tip end of a spindle.

[0029] Referring to Fig. 2, the spinning device 13 includes a fiber bundle introduction member 30, a nozzle block 33 in which a spatial portion 55 is formed, and a spindle 38 a tip end 42 side of which is inserted into the spatial portion 55 from the downstream side of the yarn feeding direction. Specifically, the spatial portion 55 is configured to include a cylindrical spatial portion 43 formed into a cylindrical shape and a truncated cone-shaped spatial portion 49 connected to a downstream side of the cylindrical spatial portion 43. A diameter of an upstream-side surface of the truncated cone-shaped spatial portion 49 connected to the downstream side of the cylindrical spatial portion 43 is the same as that of the cylindrical spatial portion 43 and enlarges downstream. The nozzle block 33 and the spindle 38 are arranged coaxially. The spindle 38 is arranged to be apart from the fiber bundle introduction member 30 and the nozzle block 33 so as not to contact with the fiber bundle introduction member 30 and the nozzle block 33. An introduction channel 32 into which the fiber bundle 17 fed from the draft device 12 is introduced is formed in the fiber bundle introduction member 30 to penetrate the fiber bundle introduction member 30 in the yarn feeding direction. The introduction channel 32 will be described later in detail. Furthermore, a cylindrical space, i.e., a reversing chamber 36 is formed between the fiber bundle introduction member 30 and the tip end 42 of the spindle 38. A columnar space, i.e., a swirling airflow generation chamber 37 is formed between an inner circumferential wall 44 of the nozzle block 33 and an outer circumferential wall 45 of the spindle 38. A yarn passage hole 39 is formed at an axial position of the spindle 38 to axially penetrate the spindle 38. The introduction channel 32, the swirling airflow generation chamber 37, and the yarn passage hole 39 communicate with one another via the reversing chamber 36.

[0030] The fiber bundle introduction member 30 includes a needle-like guide member 31 having a tip end protruding into the reversing chamber 36 that is a part of the cylindrical spatial portion 43 toward an inlet of the yarn passage hole 39. This guide member 31 guides a part of the fiber bundle 17 introduced into the reversing chamber 36, that is, a core fiber located at a center of the fiber bundle 17 to the yarn passage hole 39. It is to be noted that a protrusion amount of the guide member 31 to the yarn passage hole 39 side is adjustable.

[0031] A plurality of air nozzles 34 each of which is slightly inclined to the downstream side of the yarn feeding direction toward the cylindrical spatial portion 43 and which has a circular cross section is formed in the nozzle block 33. An outlet of each of the air nozzles 34 is formed to be open to the inner circumferential wall 44 of the nozzle block 33 that also serves as a circumferential wall of the cylindrical spatial portion 43. Each of the air nozzles 34 is formed in a tangential direction of a circle constituted by the inner circumferential wall 44 of the nozzle block 33. If air is jetted uniformly from the air nozzles 34 by air supply means, not shown, a swirling airflow swirling at constant speed in an axial direction of the spindle 38 indicated by arrows in Fig. 2 is generated in the reversing chamber 36 and the swirling airflow generation chamber 37. Moreover, since the air nozzles 34 are slightly inclined to the downstream side of the yarn feeding direction, a flow of the air includes not only a swirling component but also a component oriented in the yarn feeding direction.

[0032] The spindle 38 includes a cylindrical portion 40 slightly smaller than an external size of the cylindrical spatial portion 43 of the nozzle block 33 and having chamfered corners of the tip end 42 and a truncated cone-shaped portion 41. A diameter of a surface of the truncated cone-shaped portion 41 connected to the cylindrical portion 40 on an upstream side of the yarn feeding direction is the same as the diameter of the cylindrical portion 40 and enlarges downstream. The yarn passage hole 39 causing the spun yarn 18 to pass through is formed in the spindle 38. A part from the tip end 42 of the spindle to an intermediate portion of the truncated cone-shaped portion 41 is inserted into the spatial portion 55 of the nozzle block 33.

[0033] The introduction channel 32 formed in the fiber bundle introduction member 30 will next be described.

[0034] Fig. 3 is a perspective view showing a schematic configuration of the fiber bundle introduction member of the spinning device shown in Fig. 1. Figs. 4(1) to 4(3) show the schematic configurations of the fiber bundle introduction member of the spinning device shown in Fig. 1. Specifically, Fig. 4(1) is a front view, Fig. 4(2) is a back view, and Fig. 4(3) is a side view of the fiber bundle introduction member. Fig. 5(1) is a cross-sectional view taken along a line V-V of Figs. 4(1) to 4(3). Fig. 5(2) is a cross-sectional view taken along a line VI-VI of Figs. 4 (1) to 4(2).

[0035] Referring to Figs. 3 to Fig. 5(2), the fiber bundle introduction member 30 is formed out of ceramics by integral molding, and configured into a cylindrical shape the upper and lower corners of the upstream side of the yarn feeding direction of which are cut largely aslant in a side view. The guide member 31 is attached to an axial core position of a cylindrical portion so that a tip end of the guide member 31 protrudes the downstream side of the yarn feeding direction. An inlet 70 of the introduction channel 32 is formed on a surface of the upstream side of the yarn feeding direction, and an outlet 71 thereof is formed on a surface of the downstream side of the yarn feeding direction. The inlet 70 has a rectangular shape and a longitudinal direction of the inlet 70 is a horizontal direction. The inlet 70 is arranged upward of the guide member 31 along a linearly formed upper side of the fiber bundle introduction member 30. The outlet 71 has a shape partially deformed from a rectangular shape and a longitudinal direction of the outlet 71 is a perpendicular direction orthogonal to the inlet 70. The outlet 71 is arranged near the guide member 31 on the right side rel-

ative to the tip end of the guide member 31. An end of the outlet 71 closer to the guide member 31 is formed to be bent around an axis of the guide member 31 in a swirling direction of the swirling airflow. Another outward end 75 of the outlet 71 is arranged at a position at which the outlet 71 appears to overlap the inlet 70 from an axial direction of the guide member 31, that is, at a position at which the outlet 71 does not protrude relatively to an external edge of the inlet 70 from an axial direction of the guide member 31.

[0036] The introduction channel 32 is configured to connect the inlet 70 to the outlet 71 so as to be bent around the axis of the guide member 31 in the swirling direction of the swirling airflow shown by an arrow in Fig. 3. Further, the introduction channel 32 is formed so as to guide the fiber bundle 17 to the inlet of the yarn passage hole of the spindle. Specifically, the introduction channel 32 is configured to include a first introduction portion 72 spatially spreading in the longitudinal direction of the inlet 70, a second introduction portion 73 connected to a lower surface of the first introduction portion 72 and to a right side of the first introduction portion 72 relative to the tip end of the guide member 31 and spatially spreading in the longitudinal direction of the outlet 71, and a third introduction portion 74 connected downward to an outlet side of the second introduction portion 73 and to a left side of the second introduction portion 73 relative to the tip end of the guide member 31. A longitudinal width of the first introduction portion 72 is narrower to the outlet 71 side and a first surface 78 that is a lower surface of the first introduction portion 72 is horizontal and an upper surface 76 of the first introduction portion 72 is slightly inclined to the downward. A width of the second introduction portion 73 in a smaller length direction is almost constant and a width thereof in the longitudinal direction is larger to the outlet 71 side.

[0037] A fiber bundle guide surface of the introduction channel 32 along which the fiber bundle 17 is moved is configured to include the first surface 78 ranging from the inlet 70 of the introduction channel 32 to the outlet 71 side thereof, a second surface 79 connected to the first surface 78 the downstream side of the swirling direction of the swirling airflow and ranging from the inlet 70 side to the outlet 71, and a third surface 80 connected to the second surface 79 the downstream side of the swirling direction of the swirling airflow and ranging from the inlet 70 side to the outlet 71. The fiber bundle guide surface is an axial-side inner sidewall of the guide member 31. Since the fiber bundle introduction member 30 is formed by integral molding, joints that are to be generated by manufacturing process are not formed on the fiber bundle guide surface. As shown in Fig. 4(1), each of an angle $\theta 1$ between the first surface 78 and the second surface 79 and an angle $\theta 2$ between the second surface 79 and the third surface 80 is set to be almost right angle. Namely, sharply bent portions constraining the fiber bundle 17 are formed on the fiber bundle guide surface. To form the sharply bent portions constraining the fiber bundle 17, the angle $\theta 1$ between the first surface 78 and the second surface 79 is in a range from 90° to 120°, preferably 90°. The sharply bent portions are a portion where the first surface 78 is connected to the second surface 79 and a portion where the second surface 79 is connected to the third surface 80, respectively. An upper portion of the second surface 79 is formed to be slightly bulged outward of the guide member 31. If surfaces are not flat, each surface is judged as a whole by determining whether the angle between the surface and the other surface is almost right angle. Accordingly, the first surface 78, the second surface 79, and the third surface 80 are not necessarily flat. Furthermore, the angle $\theta 1$ between the first surface 78 and the second surface 79 and the angle $\theta 2$ between the second surface 79 and the third surface 80 are angles on an opposite side to the introduction channel 32 side, that is, angles on the axial side of the guide member 31. The fiber bundle 17 fed from the draft device 12 is introduced into the introduction channel 32 configured as stated above by the swirling airflow.

[0038] A method of manufacturing the spun yarn 18 will be described.

[0039] Referring back to Fig. 2, the fiber bundle 17 fed from the front roller pair 22 of the draft device 12 is introduced into the reversing channel 36 via the introduction channel 32 formed in the fiber bundle introduction member 32. Movement of the fiber bundle 17 in the introduction channel 32 will be described later in detail. The fiber bundle 17 is wound around the guide member 31 by about half turn. The swirling airflow is generated in the reversing chamber 36 and the swirling airflow generation chamber 37 connected to the downstream side of the yarn feeding direction of the reversing chamber 36 in a direction indicated by arrows in Fig. 2. As already stated, the swirling airflow includes the component oriented in the yarn feeding direction. Due to this, external air is absorbed from the introduction channel 32 to facilitate introducing the fiber bundle 17 into the reversing chamber 36.

[0040] Next, the fiber at the center of the fiber bundle 17 introduced into the reversing chamber 36, that is, the core fiber is introduced into the yarn passage hole 39 while being wound around the guide member 31. The other fibers of the fiber bundle 17, that is, wound fibers 46 are introduced into the yarn passage hole 39 while ends of fibers 46 at the downstream side of the yarn feeding direction are wound around the core fiber. Ends of the wound fibers 46 at the upstream side of the yarn feeding direction are detached from the front roller pair 22, and the wound fibers 46 are inverted by the component of the swirling airflow oriented in the yarn feeding direction as indicated by a two-dot chain line shown in Fig. 2 and introduced into the swirling airflow generation chamber 37.

[0041] Next, the inverted wound fibers 46 are swirled by the swirling component of the swirling airflow along the inner circumferential wall 44 of the nozzle block 33

and wound around the core fiber continuously introduced into the yarn passage hole 39.

[0042] The core fiber around which the wound fibers 46 are wound is fed out from the spinning device 13 via the yarn passage hole 39. In this way, the spun yarn 18 is manufactured.

[0043] The movement of the fiber bundle 17 in the introduction channel 32 will be described in detail.

[0044] Referring mainly to Figs. 5(1) and 5(2), the fiber bundle 17 moves as a whole in order of the first introduction portion 72, the second introduction portion 73, and the third introduction portion 74 as indicated by arrows in Figs. 5(1) and 5(2). The fiber bundle 17 introduced from the inlet 70 by the swirling airflow moves along the first surface 78 constituting the lower surface of the first introduction portion 72. Since the first introduction portion 72 is narrower in the horizontal direction toward the outlet 71, the fiber bundle 17 moves to converge according to the reduction in the width of the first introduction portion 72.

[0045] Next, the fiber bundle 17 is rapidly bent in the portion where the first surface 78 is connected to the second surface 79 almost at right angle, and moved along the second surface 79 constituting a side surface of the second introduction portion 73. At this time, because of the sharp bending of the fiber bundle 17, the convergence of the fiber bundle 17 is improved and the fiber bundle 17 is surely constrained by the fiber bundle introduction member 30. At the same time, the fiber bundle 17 moves in a direction closer to the tip end of the guide member 31 along an inclined surface 77 constituting a lower surface of the second introduction portion 73.

[0046] The fiber bundle 17 is bent in the portion where the second surface 79 is connected to the third surface almost at right angle, and moved along the third surface constituting an upper surface of the third introduction portion 74. At this time, because of the sharp bending of the fiber bundle 17, the fiber bundle 17 is more surely constrained by the fiber bundle introduction member 30. Furthermore, the fiber bundle 17 is further closer to the tip end of the guide member 31 at the outlet 71. Meanwhile, the fibers constituting the fiber bundle 17 are often separated from the fiber bundle 17 introduced into the yarn passage hole 39 during movement of the fiber bundle 17 in the introduction channel 32. In this case, the fiber bundle 17 is moved toward the tip end of the guide member 31 due to the influence of the swirling airflow and the shape of the introduction channel. This facilitates constraining the fibers that have been separated once again and introducing the fiber bundle 17 including the fibers have been separated once again into the yarn passage hole 39.

[0047] The fiber bundle 17 exit the outlet 71 and is introduced into the yarn passage hole 39 while being wound around the guide member 31. In this manner, the fiber bundle 17 moves in the introduction channel 32.

[0048] As stated so far, in the spinning device 13, the fiber bundle 17 introduced into the introduction channel 32 is bent almost at right angle, the convergence of the fiber bundle 17 is improved, and the fiber bundle 17 is surely constrained by the fiber bundle introduction member 30. It is, therefore, difficult to separate the fibers constituting the fiber bundle 17 from the fiber bundle 17. Specifically, it is difficult to separate the ends of the wound fibers 46 at the downstream side of the yarn feeding direction from the core fiber continuously introduced into the yarn passage hole 39. Therefore, the so-called fiber loss that fibers are destroyed without forming into the spun yarn 18 can be reduced. Moreover, joints that are to be generated by manufacturing process are eliminated on the fiber bundle guide surface of the introduction channel 32, thereby making smooth movement of the fiber bundle 17 in the introduction channel 32 without catching the fibers up halfway.

[0049] In the embodiment stated above, the third introduction portion is provided at the outlet of the introduction channel of the fiber bundle introduction member. However, the introduction portion other than the third introduction portion may be provided at the outlet of the introduction channel.

[0050] Furthermore, in the embodiment stated above, the angle between the first surface and the second surface is set to almost right angle on the axial side of the guide member. The angle may be an arbitrary angle in a range from 90° to 120°.

[0051] Moreover, in the embodiment stated above, the first surface is a flat surface and each of the second and third surfaces is a combination of a flat surface and a curved surface. Alternatively, as long as each of the angles relative to the respective surfaces is set in a range from 90° to 120°, preferably set to 90°, each of the first, second, and third surfaces may be a flat surface, a curved surface or a combination of the flat surface and the curved surface.

[0052] Further, in the embodiment, the fiber bundle introduction member is formed by integral molding as a whole. However, it suffices that at least the first surface, the second surface, and the third surface are formed integrally. Alternatively, the entire fiber bundle introduction member 30 including the guide member may be formed by integral molding.

[0053] Moreover, in the embodiment, the fiber bundle introduction member and the nozzle block are constituted by different members. However, the spinning device is not necessarily constituted as stated in the embodiment but the fiber bundle introduction member and the nozzle block may be formed integrally

[0054] Furthermore, in the embodiment, the guide member 31 is attached to the fiber bundle introduction member. However, the spinning device is not necessarily constituted as described in the embodiment but the spinning device may not include the guide member 31.

The present invention relates to a spinning device and particularly relates to a spinning device manufacturing a spun yarn using a swirling airflow.

Claims

1. A spinning device for manufacturing a spun yarn by swirling a part of fibers included in a fiber bundle by a swirling airflow, the spinning device including a fiber bundle introduction member and a nozzle block, an introduction channel for introducing the fiber bundle being formed in the fiber bundle introduction member, a spatial portion being formed in the nozzle block and an air nozzle for generating the swirling airflow being formed in the spatial portion, comprising:

   a spindle inserted into the spatial portion, a yarn passage hole passed through by the spun yarn being formed in the spindle; and
   the fiber bundle introduction member, the introduction channel connected to the spatial portion and guiding the fiber bundle toward an inlet of the yarn passage hole being formed in the introduction channel; and

   wherein:

   a sharply bent portion constraining the fiber bundle is formed on a fiber bundle guide surface, the fiber bundle in the introduction channel being moved along the fiber bundle guide surface.

2. The spinning device according to claim 1, wherein:

   the fiber bundle guide surface includes a first surface ranging from an inlet of the introduction channel to an outlet side of the introduction channel, and a second surface connected to the first surface at a downstream side of a swirling direction of the swirling airflow and ranging from an inlet side of the introduction channel to an outlet of the introduction channel; and
   an angle between the first surface and the second surface is set to almost right angle.

3. The spinning device according to claim 1 or 2, wherein:

   the fiber bundle guide surface further includes a third surface connected to the second surface the downstream side of the swirling direction and ranging from the inlet side of the introduction channel to the outlet of the introduction channel; and
   an angle between the second surface and the third surface is set to almost right angle.

4. The spinning device according to any one of claims 1 to 3, wherein:

   the fiber bundle introduction member is formed integrally with at least the fiber bundle guide surface.

FIG. 01

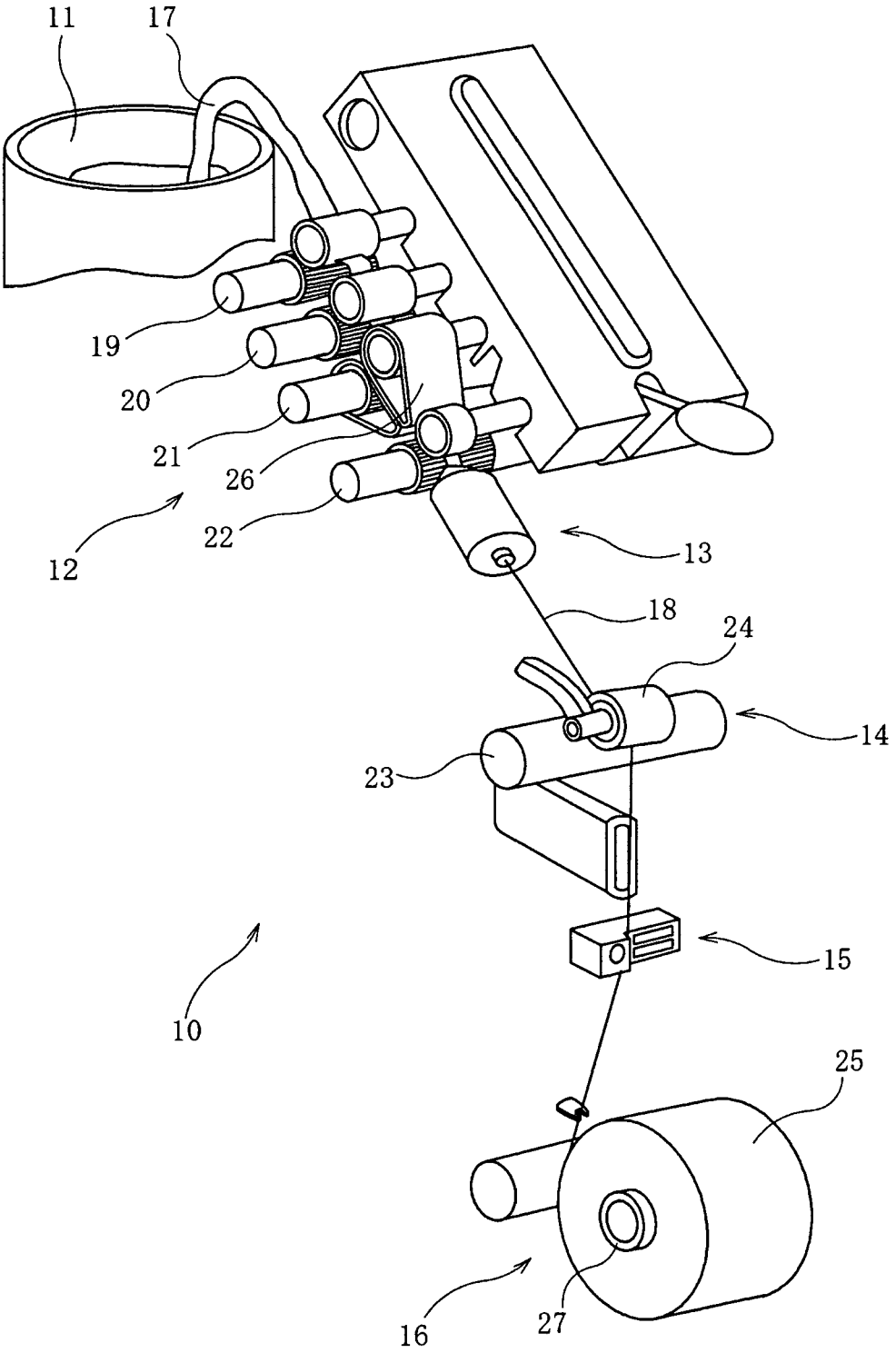


FIG. 02

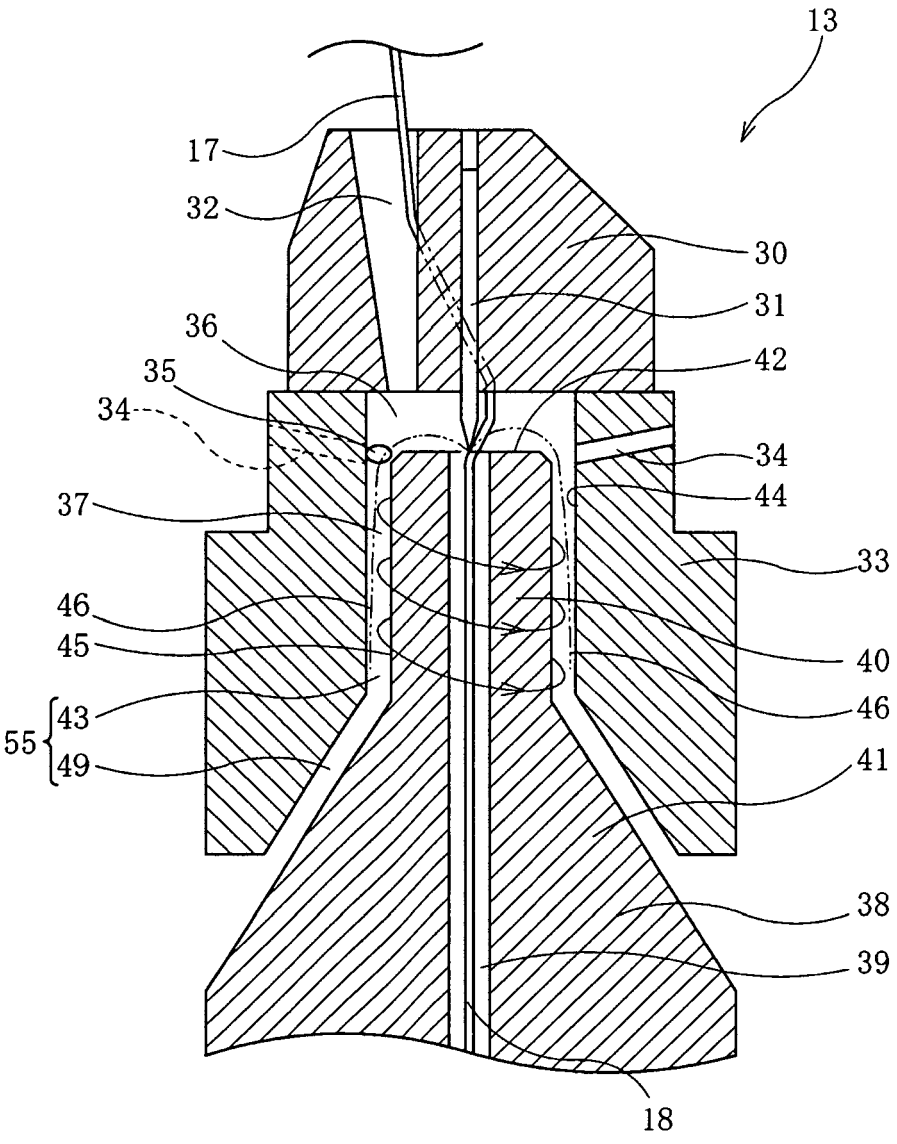


FIG. 03

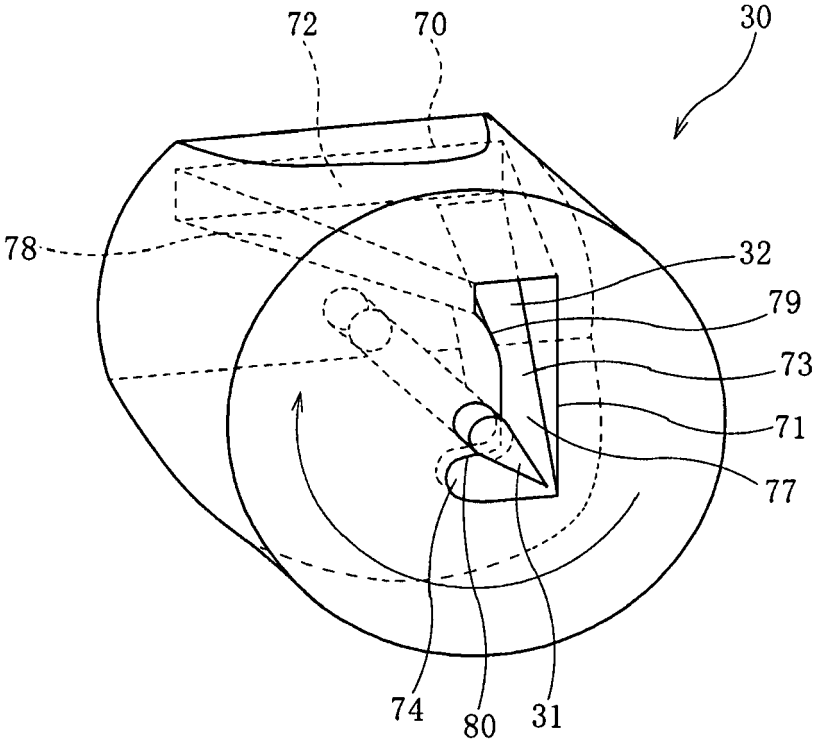


FIG.04

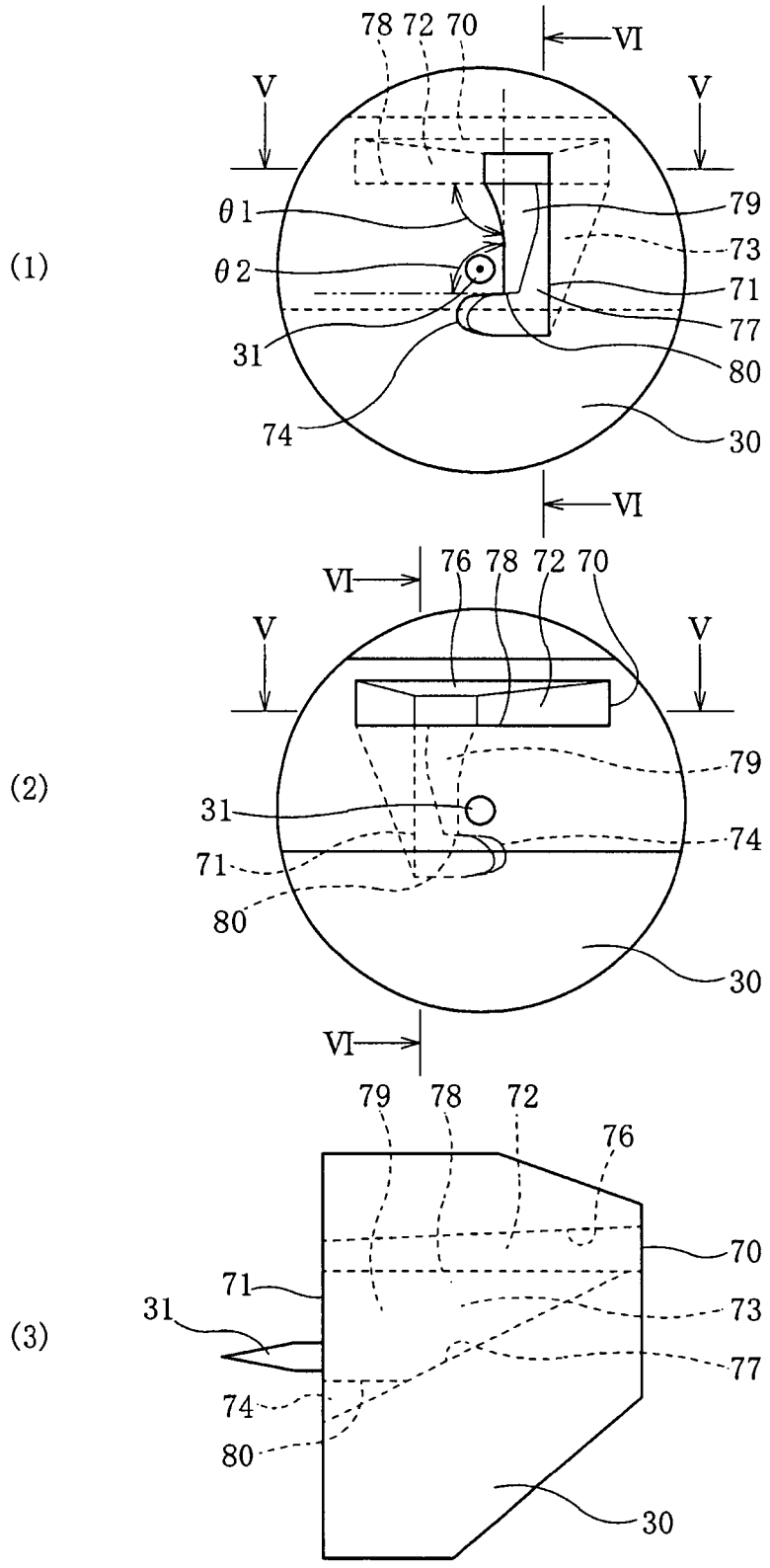

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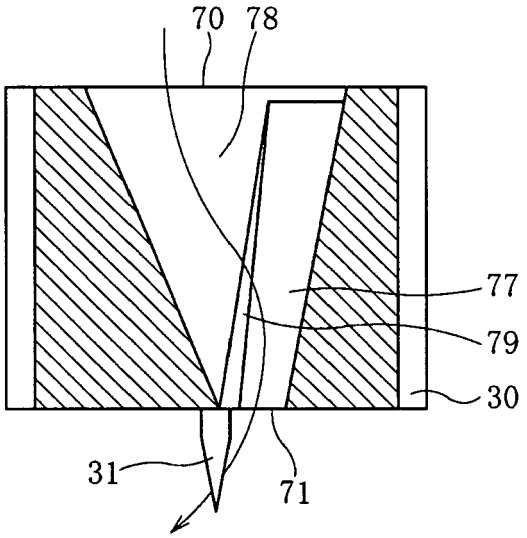
FIG. 05

(1)



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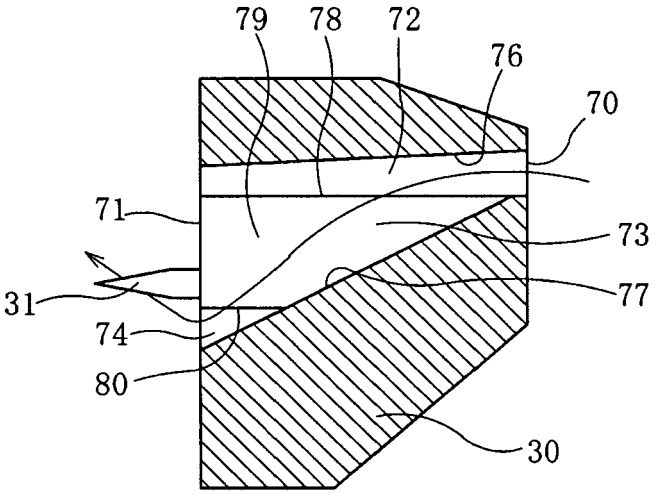

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EUROPEAN SEARCH REPORT

Application Number
EP 08 01 0517

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 431 432 A (RIETER AG MASCHF [CH]) 23 June 2004 (2004-06-23) * paragraphs [0018], [0019]; figures 1,4 *	1	INV. D01H1/115 D01H4/02
X	DE 10 2005 045703 A1 (STAHLECKER GMBH WILHELM [DE]) 22 March 2007 (2007-03-22) * paragraph [0021]; figure 1 *	1	
A	EP 1 518 949 A (MURATA MACHINERY LTD [JP]) 30 March 2005 (2005-03-30) * paragraphs [0041] - [0046]; figures 1-5 *	1	
A	DE 33 25 699 A1 (TOYODA AUTOMATIC LOOM WORKS [JP]; TOYODA CHUO KENKYUSHO KK [JP]) 9 February 1984 (1984-02-09) * page 14, paragraph 1; figure 4 *	1	
A	JP 04 163325 A (MURATA MACHINERY LTD) 8 June 1992 (1992-06-08) * abstract; figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC)
A	EP 0 094 802 A (TOYODA AUTOMATIC LOOM WORKS [JP]; TOYODA CHUO KENKYUSHO KK [JP]) 23 November 1983 (1983-11-23) * abstract; figures 1-6 *	1	D01H
A,D	US 5 528 895 A (DENO KOJI [JP]) 25 June 1996 (1996-06-25) * abstract *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 November 2008	Dreyer, Claude

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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18-11-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1431432 A	23-06-2004	AT 350522 T	15-01-2007
		CN 1508307 A	30-06-2004
		DE 10261011 A1	08-07-2004
		JP 2004197292 A	15-07-2004
		US 2005204720 A1	22-09-2005
DE 102005045703 A1	22-03-2007	EP 1926848 A1	04-06-2008
		WO 2007033717 A1	29-03-2007
		US 2008276594 A1	13-11-2008
EP 1518949 A	30-03-2005	CN 1603481 A	06-04-2005
		JP 2005105430 A	21-04-2005
DE 3325699 A1	09-02-1984	JP 59021724 A	03-02-1984
		US 4621490 A	11-11-1986
JP 4163325 A	08-06-1992	NONE	
EP 0094802 A	23-11-1983	JP 1477343 C	27-01-1989
		JP 58197320 A	17-11-1983
		JP 63020923 B	02-05-1988
		US 4489545 A	25-12-1984
US 5528895 A	25-06-1996	CN 1119225 A	27-03-1996
		DE 4431761 A1	09-03-1995
		IT MI941839 A1	08-03-1995
		JP 2697575 B2	14-01-1998
		JP 7082612 A	28-03-1995

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 7082612 A **[0003]**