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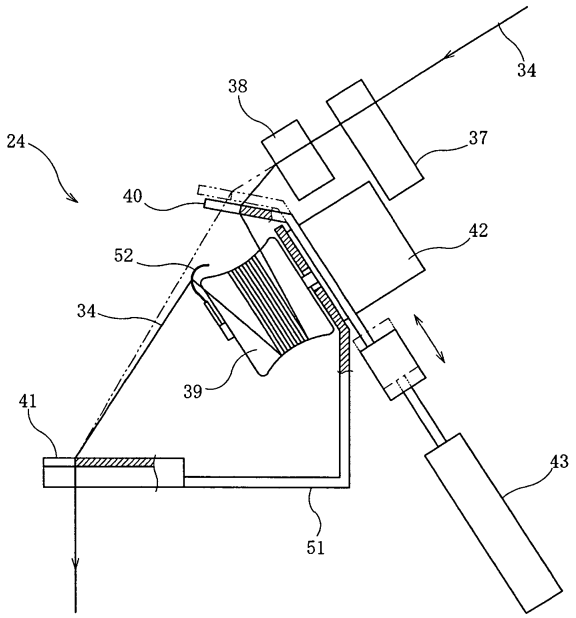
(54) **Slack eliminating device**

(57) The present invention provides a slack eliminating device which improves a life of a yarn hooking member (52) with respect to wearing away caused by traveling of a yarn by changing a position at which a yarn unwound and traveling from a slack eliminating roller (39) makes contact with a yarn hooking member (52). In the present invention, the yarn hooking member (52) is arranged to be rotatable with respect to the slack eliminating roller (39), and which guides the traveling yarn to the downstream side while making contact with the yarn that is unwound from the slack eliminating roller (39), (Fig. 2).

FIG. 2



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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a slack eliminating device, and especially relates to a slack eliminating device in a spinning machine.

BACKGROUND ART

[0002] Conventionally, there has been a spinning machine for spinning a yarn with a spinning device and manufacturing a package by winding the spun yarn with a yarn winding device. This spinning machine includes a slack eliminating device for adjusting a winding tension of a yarn before the yarn spun by the spinning device is wound by the yarn winding device. This slack eliminating device includes a slack eliminating roller, a yarn hooking member, and a downstream guide (for example, refer to Patent document 1). The slack eliminating roller is driven to rotate and accumulates the yarn by winding the yarn around its outer peripheral surface. The yarn hooking member is mounted to be concentric with a rotational axis center of the slack eliminating roller and is rotatable with respect to the slack eliminating roller. The downstream guide is arranged downstream of the slack eliminating roller, and guides the yarn to the winding device. The outer peripheral surface of the slack eliminating roller is formed as concentric circles with approximately the same diameter in its central portion and is formed as a tapered shape with concentric circles whose diameters becomes longer as being closer to both end portions. When unwinding the yarn accumulated on the slack eliminating roller, the yarn hooking member guides the yarn to be unwound evenly from the slack eliminating roller while preventing the yarn from slipping out, and adjusts the yarn winding tension by applying an appropriate resistance by making contact with the yarn.

[Patent document 1] Japanese Unexamined Patent Publication No. 2006-306588

[0003] In the above-described conventional slack eliminating device, since the rotational axis center of the slack eliminating roller coincides with a rotational axis center of the yarn hooking member and an outer peripheral rim of a downstream end portion of the slack eliminating roller is circular, a position at which the yarn traveling by being unwound from the slack eliminating roller makes contact with the yarn hooking member is constant. This position is kept constant even when the yarn hooking member rotates relatively with respect to the slack eliminating roller. For this reason, only a specific portion of the yarn hooking member is worn away by the traveling yarn. As a result, a trouble such as breaking of the yarn hooking member is caused, and this may shorten a life of the yarn hooking member. Furthermore, when the trouble such as breaking of the yarn hooking member due to the wearing away of the yarn hooking member is caused, the spinning machine is required to be stopped in order to replace the yarn hooking member, which also has much effect on a productivity of the package.

SUMMARY OF THE INVENTION

[0004] An object of the present invention is to provide a slack eliminating device in which a life of the yarn hooking member with respect to the wearing away caused by the traveling of yarn is improved by changing the position at which the yarn unwound from the slack eliminating roller makes contact with the yarn hooking member.

[0005] A first aspect of the present invention provides a slack eliminating device which, before a yarn spun by a spinning device is wound by a winding device, adjusts a winding tension of the yarn, includes: a slack eliminating roller which is driven to rotate and to which the yarn is wound around a peripheral surface thereof; an upstream guide which is arranged upstream of the slack eliminating roller and which guides the yarn to the slack eliminating roller; a downstream guide which is arranged downstream of the slack eliminating roller and which guides the yarn to the winding device; a yarn hooking member which is arranged to be rotatable with respect to the slack eliminating roller, and which guides the traveling yarn to the downstream side while making contact with the yarn that is unwound from the slack eliminating roller; and contact position changing means adapted to change a position at which the yarn hooking member makes contact with the yarn.

[0006] In such a configuration, a position at which the yarn hooking member makes contact with the yarn will not be constant and will vary within a predetermined range.

[0007] According to a second aspect of the present invention, the contact position changing means is configured so that, in an outer peripheral rim of a downstream end portion of the slack eliminating roller, a distance from an arbitrary point of a rotational axis center of the yarn hooking member to a point of the peripheral rim is different from a distance from the arbitrary point to another point of the peripheral rim when seen from an axial direction of the slack eliminating roller.

[0008] In such a configuration, when the yarn hooking member rotates relatively with respect to the slack eliminating roller, an intersection point, seen from the axial direction of the slack eliminating roller, of the peripheral rim of the slack eliminating roller and the yarn hooking member will vary.

[0009] According to a third aspect of the present invention, the contact position changing means is configured such that a rotational axis center of the slack eliminating roller is set to coincide with a rotational axis center of the yarn hooking member and that a peripheral rim of a downstream end portion of the slack eliminating roller is formed as an ellipse when seen from an axial direction of the slack eliminating roller.

[0010] In such a configuration, when the yarn hooking member rotates relatively with respect to the slack elim-

inating roller, an intersection point, seen from the axial direction of the slack eliminating roller, of the peripheral rim of the slack eliminating roller and the yarn hooking member will vary.

[0011] According to a fourth aspect of the present invention, the contact position changing means is configured such that a rotational axis center of the slack eliminating roller and a rotational axis center of the yarn hooking member are parallel and also displaced within a predetermined range.

[0012] In such configuration, when the yarn hooking member rotates relatively with respect to the slack eliminating roller, an intersection point, seen from the axial direction of the slack eliminating roller, of the peripheral rim of the slack eliminating roller and the yarn hooking member will vary.

[0013] According to a fifth aspect of the present invention, the contact position changing means is configured by inclining a rotational axis center of the yarn hooking member with respect to a rotational axis center of the slack eliminating roller within a predetermined range.

[0014] In such a configuration, when the yarn hooking member rotates relatively with respect to the slack eliminating roller, a distance between the peripheral rim of the slack eliminating roller and an arbitrary point of the yarn hooking member will vary.

[0015] As described above, according to the first aspect of the present invention, the position at which the yarn hooking member makes contact with the yarn is not fixed and varies within a predetermined range. Therefore, it is possible to prevent only a specific portion of the yarn hooking member from being worn away due to the wearing away caused by the traveling yarn. As a result, the lift of the yarn hooking member can be improved.

[0016] In addition, according to the second aspect of the present invention, when the yarn hooking member rotates relatively with respect to the slack eliminating roller, an intersection point of the peripheral rim of the slack eliminating roller and the yarn hooking member viewed from the axial direction of the slack eliminating roller changes. Therefore, regardless of a positional relationship between the rotational axis center of the slack eliminating roller and the rotational axis center of the yarn hooking member, the position at which the yarn hooking member makes contact with the yarn can be changed.

[0017] According to the third aspect of the invention, when the yarn hooking member rotates relatively with respect to the slack eliminating roller, an intersection point of the peripheral rim of the slack eliminating roller and the yarn hooking member viewed from the axial direction of the slack eliminating roller changes. Therefore, under a state in which the rotational axis center of the slack eliminating roller is coincided with the rotational axis center of the yarn hooking member, the position at which the yarn hooking member makes contact with the yarn can be changed.

[0018] According to the fourth aspect of the present invention, when the yarn hooking member rotates relatively with respect to the slack eliminating roller, an intersection point of the peripheral rim of the slack eliminating roller and the yarn hooking member viewed from the axial direction of the slack eliminating roller changes. Therefore, under a state in which the rotational axis center of the slack eliminating roller is displaced with respect to the rotational center axis of the yarn hooking member, the position at which the yarn hooking member makes contact with the yarn can be changed.

[0019] According to the fifth aspect of the present invention, when the yarn hooking member rotates relatively with respect to the slack eliminating roller, a distance between the peripheral rim of the slack eliminating roller and an arbitrary point of the yarn hooking member changes. Therefore, the position at which the yarn hooking member makes contact with the yarn can be changed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a side view showing a schematic configuration of a spinning machine having a slack eliminating device according to a first embodiment of the present invention.

FIG. 2 is a side view showing a schematic configuration of the slack eliminating device shown in FIG. 1.

FIG. 3 is a front view of a slack eliminating roller shown in FIG. 2.

FIG. 4 is a cross-section view along a IV-IV line shown in FIG. 3.

FIG. 5 is a side view of the slack eliminating roller shown in FIG. 2.

FIG. 6 is a side view of a slack eliminating roller used in a slack eliminating device according to a second embodiment of the present invention.

FIG. 7 is a side view of a slack eliminating roller used in a slack eliminating device according to a third embodiment of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0021] Next, embodiments of the present invention will be described with reference to the drawings.

[0022] Referring to FIG. 1, a spinning machine 20 includes a draft device 21, a spinning device 22, a yarn feed device 23, a yarn clearer 38, a slack eliminating device 24, and a winding device 25 in this order from an upstream side along a yarn feeding direction in which a spun yarn 34 is manufactured from a sliver 27. The spinning machine 20 further includes, between the slack eliminating device 24 and the winding device 25, a yarn joining device 26 provided in a yarn joining cart 48 moving along a plurality of the spinning machines 20. The sliver 27 is stretched by the draft device 21 to be a fiber bundle 33, and the fiber bundle 33 is spun by the spinning device 22 to be a spun yarn 34. The spun yarn 34 is fed by the yarn feed device 23 and is wound by the winding device

25 to form a package 46.

[0023] The draft device 21 is a device for nipping the sliver 27 drawn from a can (not shown in the drawings) by rollers to stretch the sliver 27, and includes four pairs of rollers, i.e., a back roller pair 28, a third roller pair 29, a middle roller pair 31, and a front roller pair 32 in this order from the upstream side of the yarn feeding direction. The respective rollers of the middle roller pair 31 is provided with an apron belt 30.

[0024] The spinning device 22 is a device for manufacturing the spun yarn 34 by supplying a swirling airflow to the fiber bundle 33 fed from the front roller pair 32 of the draft device 21.

[0025] The yarn feed device 23 is a device for feeding the spun yarn 34 manufactured by the spinning device 22 to the winding device 25 arranged on a downstream side of the yarn feeding direction. The yarn feed device 23 includes a delivery roller 35 and a nip roller 36. The nip roller 36 can make contact with and move away from the delivery roller 35. The spun yarn 34 nipped between the delivery roller 35 and the nip roller 36 is fed to the winding device 25 by the delivery roller 35.

[0026] The yarn clearer 38 is a device for detecting a yarn defect of the spun yarn 34 while the spun yarn 34 is being fed to the winding device 25. In accordance with the yarn defect detection information from the yarn clearer 15, a defective portion of the spun yarn 34 is removed and a bad yarn is prevented from being wound to the package 46. When the yarn defect detection information is transmitted from the yarn clearer 38 to a controller (not shown in the drawings), the controller controls a cutter 37 to immediately cut the spun yarn 34 , and stops the draft device 21, the spinning device 22, and the like. Next, the controller controls the yarn joining cart 48 to travel to the front of the spinning machine 20. Then, the controller controls the spinning device 22 and the like to be driven again, controls the yarn joining device 26 of the yarn joining cart 48 to join the yarn ends, and restarts the spinning and winding operations. The yarn joining cart 48 includes a suction pipe 49 which catches a yarn end fed from the spinning device 22 while sucking the yarn end at a position shown by a two-dot chain line in FIG. 1 and guides the caught yarn end to the yarn joining device 26 while rotating around its rotational axis. The yarn joining cart 48 also includes a suction mouth 50 which catches a yarn end in the package 46 while sucking the yarn end at a position shown by a two-dot chain line in FIG. 1 and guides the caught yarn end to the yarn joining device 26 while rotating around its axis.

[0027] The slack eliminating device 24 is a device for adjusting a winding tension of the spun yarn 34 before the spun yarn 34 spun by the spinning device 22 is wound by the yarn winding device 25, and its detail will be described later.

[0028] The winding device 25 is a device for manufacturing the package 46 by winding the spun yarn 34 manufactured by the spinning device 22 around a bobbin. The winding device 25 includes a cradle arm 45, a winding drum 47, and a traverse device (not illustrated in the drawings). The cradle arm 45 is supported in a manner that the cradle arm 45 can swing around an axis 44. The winding drum 47 is driven and rotated while making contact with the peripheral surface of the bobbin or the package 46. The traverse device traverses the spun yarn 34 within a predetermined width. The cradle arm 45 rotatably supports the bobbin to which the spun yarn 34 is wound. When the winding drum 47 is driven to rotate by an electric motor, the package 46 making contact with the winding drum 47 rotates according to the rotation of the winding drum 47, and the spun yarn 34 is wound into the package 46.

[0029] Next, details of the slack eliminating device 24 will be described.

[0030] Referring to FIG. 2, the slack eliminating device 24 includes a slack eliminating roller 39 to which the spun yarn 34 is wound around peripheral surface, an electric motor 42 which is driven to rotate the slack eliminating roller 39, an upstream guide 40 arranged upstream of the slack eliminating roller 39 in the yarn feeding direction, an air cylinder 43 which is driven to advance and recede the upstream guide 40, and a downstream guide 41 arranged downstream of the slack eliminating roller 39, in the yarn feeding direction. The slack eliminating roller 39 is supported by the electrical motor 42. The upstream steam guide 40 is supported by the air cylinder 43. The electrical motor 42, the air cylinder 43, and the downstream guide 41 are supported by the spinning machine 20 via a fixing member such as a bracket 51. The upstream guide 40 guides the spun yarn 34 to the slack eliminating roller 39. The downstream guide 41 guides the spun yarn 34 to the winding device 25. The downstream guide 41 is arranged so that an intersection point of an upper end of the downstream guide 41 and the spun yarn 34 is located approximately on an extended line of the rotational axis center of the slack eliminating roller 39.

[0031] A yarn hooking member 52 is attached to the slack eliminating roller 39 so as to relatively rotate with respect to the slack eliminating roller 39. The yarn hooking member 52 rotates integrally with or independently and concentrically with the slack eliminating roller 39 depending on a condition. The yarn hooking member 52 guides the spun yarn 34 to the downstream guide 41 while making contact with the spun yarn 34 unwound and traveling from the slack eliminating roller 39.

[0032] When the upstream guide 40 is located at an advanced position shown by the two-dot chain line in FIG. 2, a yarn path is formed such that the spun yarn 34 does not engage with the yarn hooking member 52. When the upstream guide 40 is located at a receded position shown by the solid line in FIG. 2, a yarn path formed by the upstream guide 40 and the downstream guide 41 crosses a rotational trajectory surface of the yarn hooking member 52, and the spun yarn 34 engages with the yarn hooking member 52 and is wound around the slack eliminating roller 39. For example, immediately before the

yarn joining operation by the yarn joining device 26, the upstream guide 40 is moved to the advanced position so as to prevent the upstream side yarn end from being pulled into the slack eliminating roller 38 and not being guided to the yarn joining device 26. During the yarn joining operation, the upstream guide 40 is moved to the receded position so as to prevent the spun yarn 34 being spun by the spinning device 22 during the yarn joining operation from being slackened upstream of the yarn joining device 26. During the normal winding operation, the upstream guide 40 is located at the receded position in order to eliminate slackening of the spun yarn 34 and to adjust the winding tension by winding the spun yarn 34 around the slack eliminating roller 39.

[0033] The yarn hooking member 52 rotates integrally with the slack eliminating roller 39 until a predetermined load is applied to the yarn hooking member 52 by the spun yarn 34 which while making contact with the yarn hooking member 52. When the slack eliminating roller 39 is rotated in one direction under a state in which the upstream guide 40 is located at the receded position, the spun yarn 34 and the yarn hooking member 52 engages with each other and the spun yarn 34 is wound around the slack eliminating roller 39 until a predetermined load is applied to the yarn hooking member 52. Then, when a load exceeds the above-mentioned predetermined load, the yarn hooking member 52 rotates independently of the slack eliminating roller 39, and the spun yarn 34 wound and accumulated around the slack eliminating roller 39 is gradually unwound. A predetermined winding tension is applied to the spun yarn 34 by the predetermined load described above. When the yarn hooking member 52 is rotating independently of the slack eliminating roller 39, the spun yarn 34 travels towards the downstream guide 41 while making contact with the yarn hooking member 52. When unwinding the spun yarn 34 wound around the slack eliminating roller 39, the yarn hooking member 52 guides the spun yarn 34 so that the spun yarn 34 is be prevented from slipping out from the slack eliminating roller 39 and the spun yarn 34 is evenly drawn from the slack eliminating roller 39. In addition, the yarn hooking member 52 optimizes the winding tension of the spun yarn 34 by applying an appropriate resistance by making contact with the spun yarn 34.

[0034] Next, details of the slack eliminating roller 39 and the yarn hooking member 52 will be described.

[0035] Referring to FIGS. 3, 4, and 5, the slack eliminating roller 39 includes a roller body 60 in which a concave portion 68 is formed on an end surface on the downstream side, a nut member 61 integrally fixed to the concave portion 68 of the roller body 60, and an adjustment bolt 62 screwed together with the nut member 61. Respective axis centers of the roller body 60, the nut member 61, and the adjustment bolt 62 are arranged to coincide with one another. The adjustment bolt 62 has a cylindrical hole penetrating in the axial direction. Screw parts 75 are formed on an outer peripheral surface of an axis part of the adjustment bolt 62 and on an inner peripheral surface of the nut member 61. The adjustment bolt 62 screws together with the nut member 61 by the screw parts 75.

[0036] The yarn hooking member 52 includes a flyer axis 71 and a flyer 72. The flyer axis 71 is attached so as to relatively rotate with respect to the roller body 60 with a rotational axis center 81 being coincided with a rotational axis center 80 of the roller main body 60. The flyer 72 which is attached to a tip of the flyer axis 71 along a radial direction of the roller body and which is composed of, for example, ceramics. The flyer axis 71 is inserted in the above-mentioned cylindrical hole of the adjustment bolt 62 and is rotatably attached to both of the inner peripheral surface of the nut member 61 and the inner peripheral surface of the adjustment bolt 62 via a bearing 74. The tip of the flyer axis 71 is configured so as to protrude from end surfaces of the adjustment bolt 62 and the roller body 60. The flyer 72 is fixed to the tip of the flyer axis 71. The flyer 72 is configured so as to integrally rotate with the flyer axis 71, and is curved from a peripheral rim 70 of the roller body 60 towards the peripheral surface 64. Therefore, the flyer 72 can hook the spun yarn 34 and can reliably wind the yarn around the peripheral surface 64 of the roller body 60. The flyer axis 71 has a cylindrical portion 73 with a slightly large diameter in a mid portion in its axial direction. An outer peripheral surface of the cylindrical portion 73 can face the inner peripheral surface of the adjustment bolt 62 in the radial direction with a prescribed gap there between.

[0037] A permanent magnet 76 is arranged on the outer peripheral surface of the cylindrical portion 73. A hysteresis member 77 that is a semirigid material is arranged on the inner peripheral surface of the adjustment bolt 62. The permanent magnet 76 is magnetized alternatively in N pole, S pole, N pole, S pole, and so on in a circumferential direction. When the permanent magnet 76 faces the hysteresis member 77, a rotational resistance of the flyer axis 71 with respect to the roller body 60, that is, a rotational resistance of the yarn hooking member 52 with respect to the slack eliminating roller 39 is generated by magnetic coupling of the permanent magnet 76 and the hysteresis member 77. Based on this rotational resistance, the above-described predetermined load is determined. Further, the predetermined load is a boundary on which the yarn hooking member 52 either rotates integrally or independently with respect to the slack eliminating roller 39. When the adjustment bolt 62 is rotated and moved in the axial direction, a facing area of the permanent magnet 76 and the hysteresis member 77 changes and the magnetic coupling of the permanent magnet 76 and the hysteresis member 77 changes. Therefore, a magnitude of the above-mentioned rotational resistance can be adjusted. When the facing area of the permanent magnet 76 and the hysteresis member 77 is large, the magnetic coupling becomes strong and the rotational resistance of the yarn hooking member 52 with respect to the slack eliminating roller 39 increases. When the facing area of the permanent magnet 76 and the hysteresis

member 77 is small, the magnetic coupling becomes weak and the rotational resistance of the yarn hooking member 52 with respect to the slack eliminating roller 39 decreases.

[0038] When it is assumed that a side on which the yarn hooking member 52 is attached is a tip end and that a side on which the electrical motor 42 is attached is a base end, the outer peripheral surface 64 of the roller body 60 is formed to have a taper portion 65, a cylindrical portion 66, and a taper portion 67 from the base end to the tip end. The taper portions 65 and 67 are gently inclined so that the end surface sides have a larger diameter. The cylindrical portion 66 is formed of concentric circles with approximately the same diameter, and has a shape seamlessly continuing to the taper portions 65 and 67 on its both sides. Seen from the axial direction of the slack eliminating roller 39, the peripheral rim 70 of an end portion of the tip side, that is, an end portion of the downstream side of the slack eliminating roller 39, is formed as an ellipse with a long diameter A and a short diameter B as shown in FIG. 3. The roller body 60 is fixed to a motor axis 63 of the electric motor 42 by a fixing screw 69 screwed from a radial direction of the roller body 60.

[0039] The taper portion 65 on the base end side has a function for smoothly moving the wound spun yarn 34 supplied from the upstream side from the large diameter portion to the small diameter portion and regularly winding the spun yarn 34 around a surface of the cylindrical portion 66 in the mid-portion. The taper portion 67 on the tip end side has a function for preventing the wound spun yarn 34 from slipping out at once while being unwound and for ensuring the spun yarn 10 to be smoothly fed out by rewinding the spun yarn 34 from a small diameter portion to a large diameter portion in series. The spun yarn 34 wound around the slack eliminating roller 39 is finally fed out from the roller body 60 while making contact with the peripheral rim 70, and travels while making contact with the flyer 72 of the yarn holing member 52.

[0040] Referring to FIG. 3, the yarn hooking member 52 illustrated by a solid line is located somewhere in the long diameter A when the yarn hooking member 52 relatively rotates with respect to the slack eliminating roller 39. The yarn hooking member 52 illustrated by a two-dot chain line is located somewhere in the short diameter B when the yarn hooking member 52 relatively rotates with respect to the slack eliminating roller 39. A rotational trajectory of the yarn hooking member 52 is a circular shape, and the peripheral rim 70 of the slack eliminating roller 39 is an ellipse shape. When seen from an axial direction of the slack eliminating roller 39 (a direction vertically penetrating the page of FIG. 3), an intersection point of the peripheral rim 70 of the slack eliminating roller 39 and the flyer 72 of the yarn hooking member 52 differs in a case where the yarn hooking member 52 is located at a portion of the long diameter A and a case where the yarn hooking member 52 is located at a portion of the short diameter B. That is, the above-mentioned intersection point varies depending on a rotational position of the yarn hooking member 52 with respect to the slack eliminating roller 39. The spun yarn 34 wound around the slack eliminating roller 39 travels while making contact with the peripheral rim 70 of the roller body 60, travels while making contact with the flyer 72 of the yarn hooking member 52, and is drawn toward the downstream guide 41 at an extended line of the rotational axis center 80 of the slack eliminating roller 39.

[0041] Referring to FIG. 5, a case where the yarn hooking member 52 is located at the portion of the long diameter A is shown by a solid line and a case where the yarn hooking member 52 is located at the portion of the short diameter B is shown by a two-dot chain line. When the yarn hooking member 52 rotates relatively with respect to the slack eliminating roller 39, a position at which the yarn hooking member 52 makes contact with the unwound spun yarn 34 varies within a range D.

[0042] Contact position changing means adapted to change a position at which the yarn hooking member 52 makes contact with the spun yarn 34 is configured such that the rotational axis center 80 of the slack eliminating roller 39 is set to coincide with the rotational axis center 81 of the yarn hooking member 52 and that the peripheral rim 70 of the downstream end portion of the slack eliminating roller 39 is formed as an ellipse when seen from an axial direction of the slack eliminating roller 39.

[0043] As described above, in the slack eliminating device 24 configured as described above, since a position at which the yarn hooking member 52 makes contact with the spun yarn 34 is not fixed and varies within the predetermined range D. Therefore, it is possible to prevent only a specific portion of the yarn hooking member 52 from being worn away due to the wearing away caused by the traveling of the spun yarn 34. As a result, the life of the yarn hooking member 52 can be improved. Accordingly, a frequency of stopping the spinning machine 20 and replacing the yarn hooking member 52 because of a trouble such as breaking of the yarn hooking member 52 is reduced, and a productivity of the package 46 can be improved. In addition, when the yarn hooking member 52 rotates relatively with respect to the slack eliminating roller 39, an intersection point of the peripheral rim 70 of the slack eliminating roller 39 and the yarn hooking member 52 viewed from the axial direction of the slack eliminating roller 39 changes. Therefore, under a state in which the rotational axis center 80 of the slack eliminating roller 39 is coincided with the rotational axis center 81 of the yarn hooking member 52, the position at which the yarn hooking member 52 makes contact with the spun yarn 34 can be changed.

[0044] Referring to FIG. 3, when viewed from the axial direction of the slack eliminating roller 39, the peripheral rim 70 of the slack eliminating roller 39 is configured such that a distance L1 differs from a distance L2. Further, the distance L1 is a distance from an arbitrary point P on the rotational axis center 81 of the yarn hooking member 52 to a point Q on the peripheral rim 70 of the slack elimi-

nating roller 39. The distance L2 is a distance from the arbitrary point P to a different point R on the peripheral rim 70. The arbitrary point P of the rotational axis center 81 of the yarn hooking member 52 can be any point on the rotational axis center 81 shown in FIGS. 4 and 5. According to such configuration, when the yarn hooking member 52 rotates relatively with respect to the slack eliminating roller 39, the intersection point of the peripheral rim 70 of the slack eliminating roller 39 and the yarn hooking member 52 viewed from the axial direction of the slack eliminating roller 39, varies. Therefore, regardless of a positional relationship between the rotational axis center 80 of the slack eliminating roller 39 and the rotational axis center 81 of the yarn hooking member 52, the position at which the yarn hooking member 52 makes contact with the spun yarn 34 can be changed.

[0045] In this case, the contact position changing means adapted to change the position at which the yarn hooking member 52 makes contact with the spun yarn 34 is configured such that the distance L1 from the arbitrary point P of the rotational axis center 81 of the yarn hooking member 52 to the point Q of the peripheral rim 70 is different from the distance L2 from the above mentioned arbitrary point P to another point R of the peripheral rim 70 when seen from the axial direction of the slack eliminating roller 39.

[0046] FIG. 6 is a side view of a slack eliminating roller used for a slack eliminating device according to a second embodiment of the present invention, and a view corresponding to FIG. 5 of the first embodiment. Since a basic configuration is common with the slack eliminating device 24 according to the first embodiment, different points will be mainly described.

[0047] In the slack eliminating device 24 according to the first embodiment, the peripheral rim 70 of the slack eliminating roller 39 is formed as an ellipse. In the slack eliminating device 24 according to the second embodiment, as shown in FIG. 6, when seen from an axial direction of the slack eliminating roller 82, the peripheral rim 70 of a slack eliminating roller 82 is formed to be circular shape in which the rotational axis center 80 passes a center of the rim 70. In addition, in the slack eliminating device 24 according to the first embodiment, the rotational axis center of the slack eliminating roller 39 is set to coincide with the rotational axis center of the yarn hooking member 52. In the slack eliminating device according to the second embodiment, the rotational axis center 80 of the slack eliminating roller 82 and the rotational axis center 81 of the yarn hooking member 52 are parallel and also displaced within a predetermined range. For example, the predetermined range is a range where the yarn hooking member 52 can hook the spun yarn 34 fed from the upstream guide 40 and can relatively rotate without interfering with the peripheral rim 70 of the slack eliminating roller 82.

[0048] Further, the contact position changing means for changing the contact position of the yarn hooking member 52 and the spun yarn 34 is configured by providing the rotational axis center 80 of the slack eliminating roller 82 and the rotational axis center 81 of the yarn hooking member 52 to be parallel and also displaced within a predetermined range.

[0049] In the slack eliminating device configured as described above, the rotational position of the yarn hooking member 52 changes with respect to the slack eliminating roller 82 within a range shown by a solid line and a two-dot chain line in FIG. 6. Accordingly, when the yarn hooking member 52 rotates relatively with respect to the slack eliminating roller 82, the position at which the yarn hooking member 52 makes contact with the spun yarn 34 to be unwound changes within the range D. For this reason, under a state in which the peripheral rim 70 of the slack eliminating roller 82 is in a circular shape, a position at which the yarn hooking member 52 makes contact with the spun yarn 34 can be changed.

[0050] FIG. 7 is a side view of a slack eliminating roller used for a slack eliminating device according to a third embodiment of the present invention, and a view corresponding to FIG. 5 of the first embodiment. Since a basic configuration is common with the slack eliminating device 24 according to the first embodiment, different points will be mainly described.

[0051] In the slack eliminating device 24 according to the first embodiment, the peripheral rim 70 of the slack eliminating roller 39 is formed as an ellipse. In the slack eliminating device according to the third embodiment, as shown in FIG. 7, when seen from the axial direction of the slack eliminating roller 82, the peripheral rim 70 of a slack eliminating roller 83 is formed to be circular shape in which the rotational axis center 80 passes a center of the rim 70. In addition, in the slack eliminating device 24 according to the first embodiment, the rotational axis center of the slack eliminating roller 39 is coincided with the rotational axis center of the yarn hooking member 52. In the slack eliminating device according to the third embodiment, the rotational axis center 81 of the yarn hooking member 52 is arranged so as to incline at an angle of θ, which is a predetermined range with respect to the rotational axis center 80 of the slack eliminating roller 83. Returning to FIG. 4, the nut member 61 and the adjustment bolt 62 are integrally inclined with respect to the roller body 60 in order to incline the yarn hooking member 52. The angle of θ, for example, is in a range where the yarn hooking member 52 can hook the spun yarn 34 fed from the upstream guide 40 and can relatively rotate without interfering with the peripheral rim 70 of the slack eliminating roller 83.

[0052] Further, the contact position changing means for changing the contact position of the yarn hooking member 52 and the spun yarn 34 is configured by inclining the rotational axis center 81 of the yarn hooking member 52 with respect to the rotational axis center 80 of the slack eliminating roller 83 within a predetermined range.

[0053] In the slack eliminating device configured as described above, the rotational position of the yarn hooking member 52 varies with respect to the slack eliminating

roller 83 within a range shown by a solid line and a two-dot chain line in FIG. 7. Accordingly, when the yarn hooking member 52 rotates relatively with respect to the slack eliminating roller 83, a distance between the peripheral rim 70 of the slack eliminating roller 83 and an arbitrary point of the yarn hooking member 52 changes and the position at which the yarn hooking member 52 makes contact with the spun yarn 34 to be unwound changes within the range D. Therefore, the position at which the yarn hooking member 52 makes contact with the spun yarn 34 can be varied.

[0054] Further, in the respective embodiments described above, a rotational resistance is applied to the yarn hooking member by utilizing a magnetic coupling for the slack eliminating roller. However, other configurations may be adopted as long as the yarn hooking member rotates relatively with respect to the roller.

Claims

1. A slack eliminating device which, before a yarn spun by a spinning device (20) is wound by a winding device (25), adjusts a winding tension of the yarn, comprising:

a slack eliminating roller (39) which is driven to rotate and to which the yarn is wound around a peripheral surface thereof;
an upstream guide (40) which is arranged upstream of the slack eliminating roller (39) and which guides the yarn to the slack eliminating roller (39);
a downstream guide (41) which is arranged downstream of the slack eliminating roller (39) and which guides the yarn to the winding device (25);
a yarn hooking member (52) which is arranged to be rotatable with respect to the slack eliminating roller (39), and which guides the traveling yarn to the downstream side while making contact with the yarn that is unwound from the slack eliminating roller (39); and
contact position changing means adapted to change a position at which the yarn hooking member (52) makes contacts with the yarn.

2. The slack eliminating device according to claim 1, wherein the contact position changing means is configured so that, in an outer peripheral rim (70) of a downstream end portion of the slack eliminating roller (39), a distance from an arbitrary point (P) of a rotational axis center (81) of the yarn hooking member (52) to a point (Q) of the peripheral rim (70) is different from a distance from the arbitrary point (P) to another point (R) of the peripheral rim (70) when seen from an axial direction of the slack eliminating roller (39).

3. The slack eliminating device according to claim 1, wherein the contact position changing means is configured such that a rotational axis center (80) of the slack eliminating roller (39) is set to coincide with a rotational axis center (81) of the yarn hooking member (52) and that a peripheral rim (70) of a downstream end portion of the slack eliminating roller (39) is formed as an ellipse when seen from an axial direction of the slack eliminating roller (39).

4. The slack eliminating device according to claim 1, wherein the contact position changing means is configured such that a rotational axis center (80) of the slack eliminating roller (82) and a rotational axis center (81) of the yarn hooking member (52) are parallel and also displaced within a predetermined range.

5. The slack eliminating device according to claim 1, wherein the contact position changing means is configured by inclining a rotational axis center (81) of the yarn hooking member (52) with respect to a rotational axis center (80) of the slack eliminating roller (83) within a predetermined range.

FIG. 1

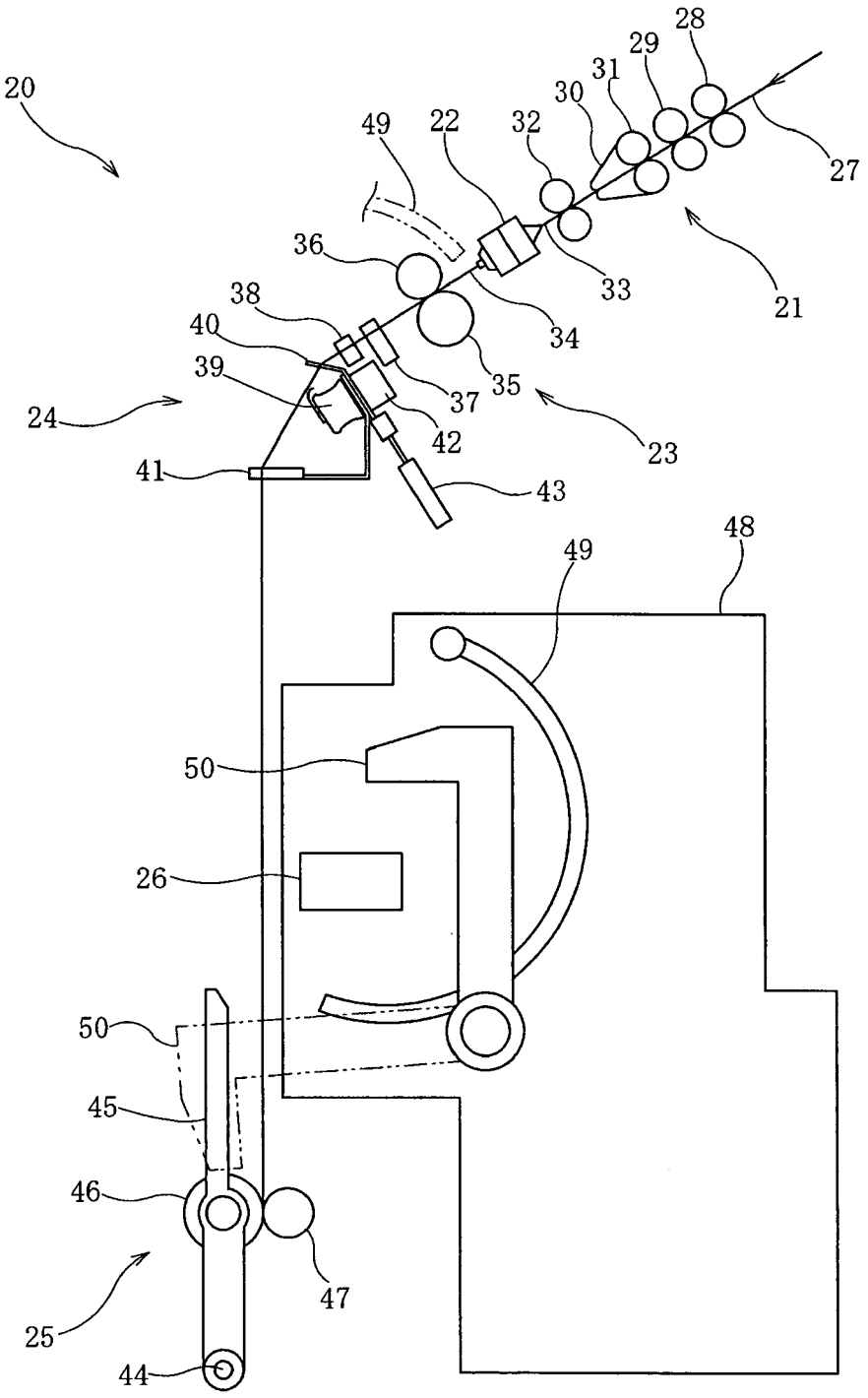
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FIG. 2

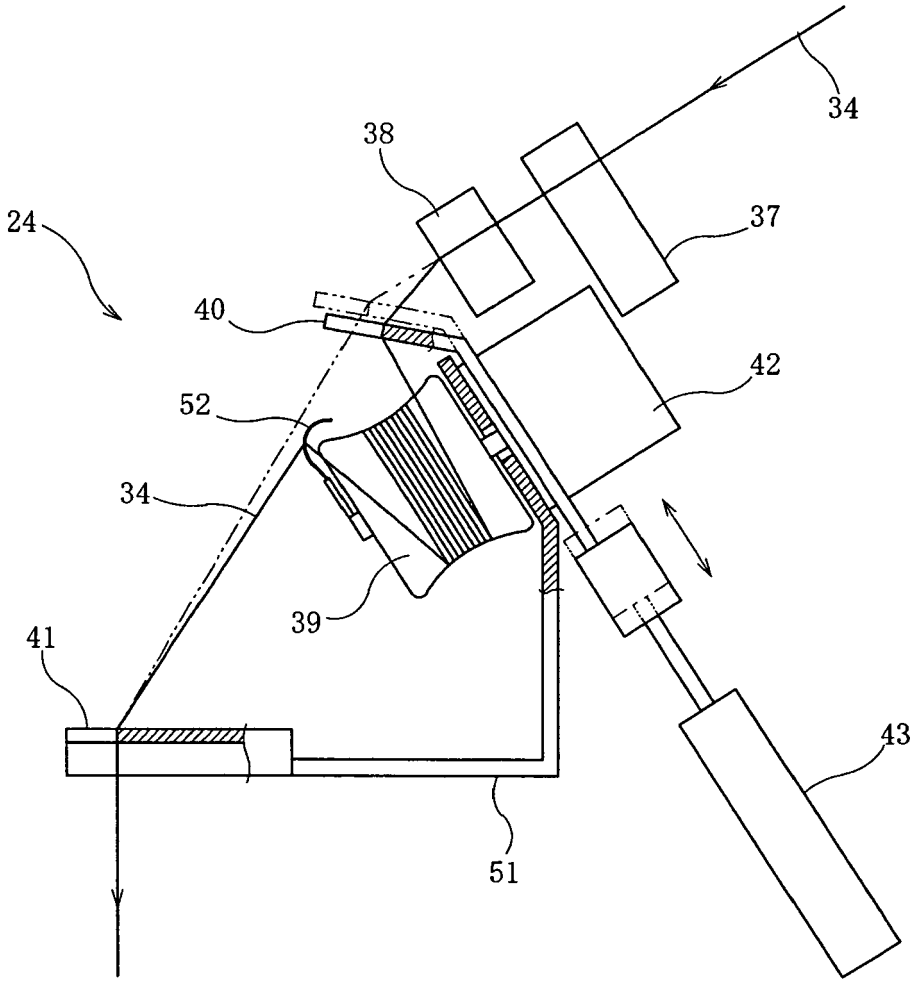


FIG. 3

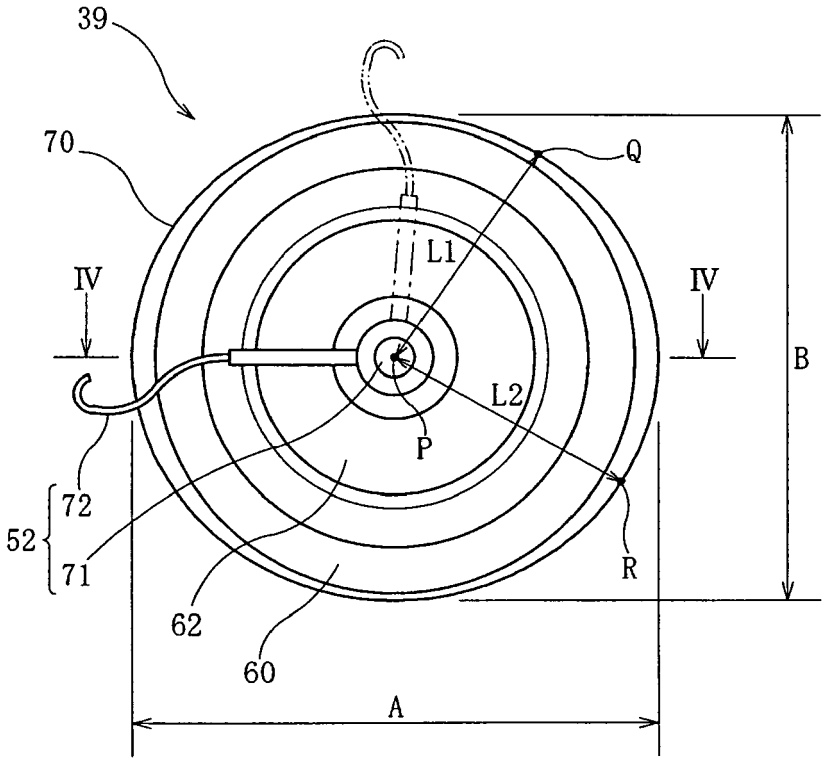


FIG. 4

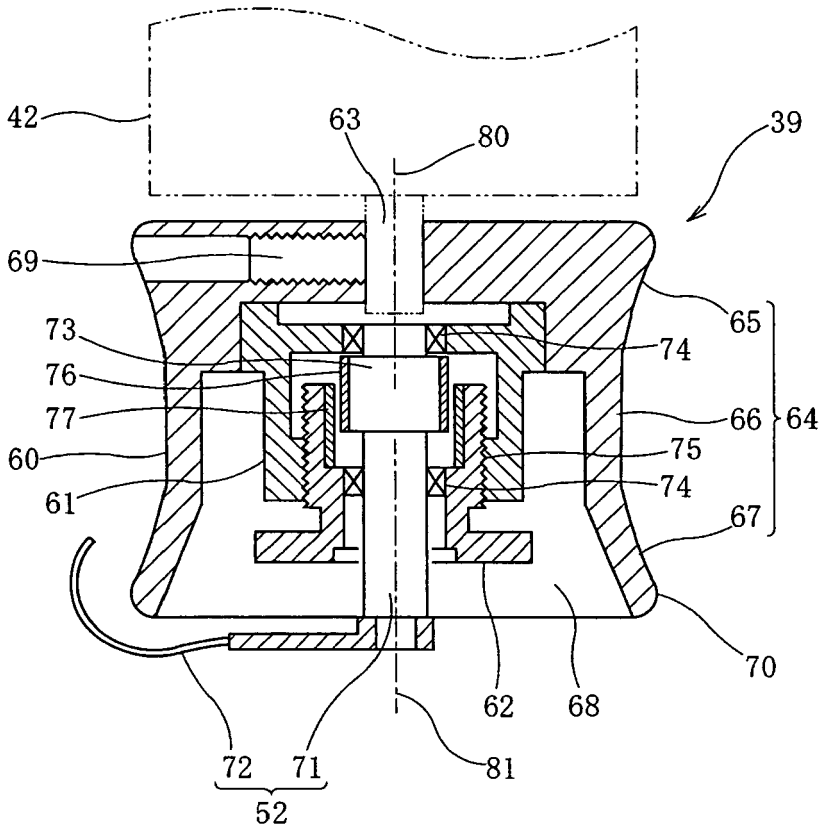


FIG. 5

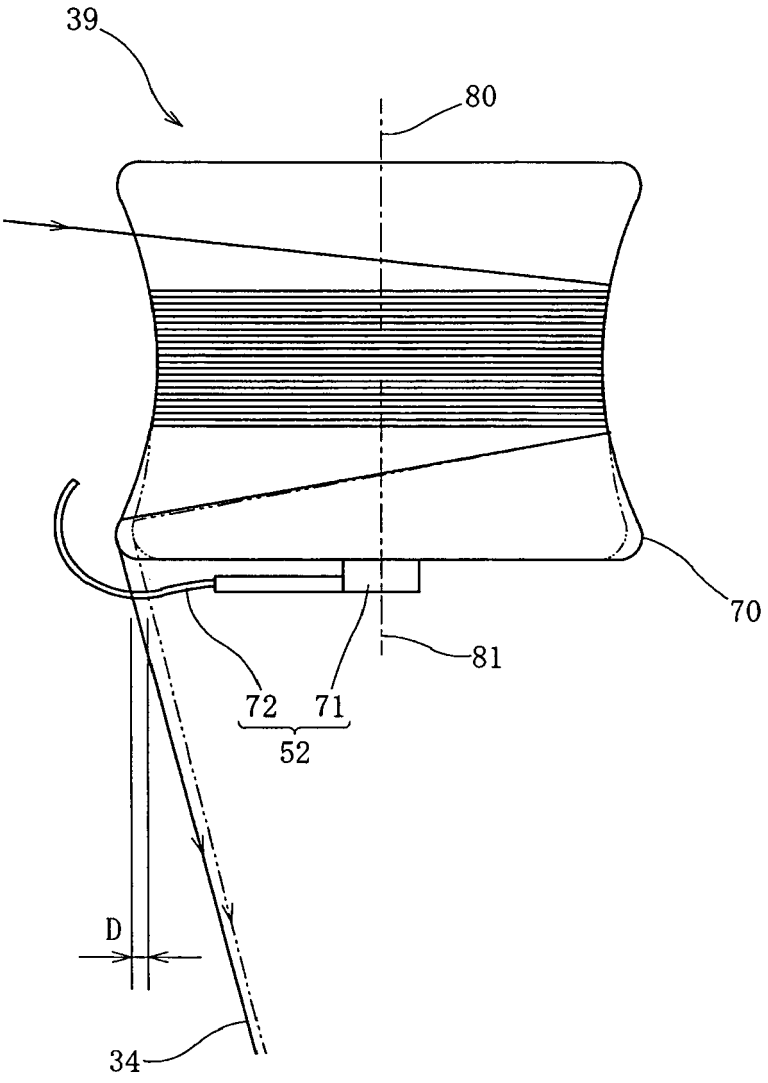


FIG. 6

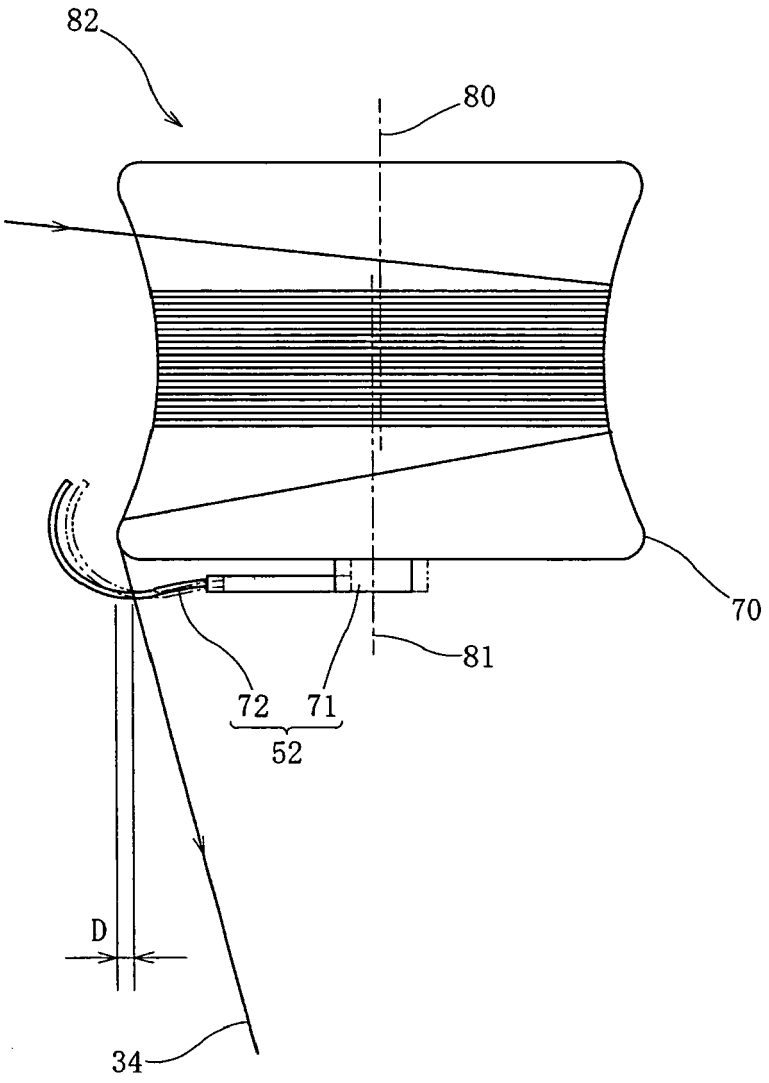
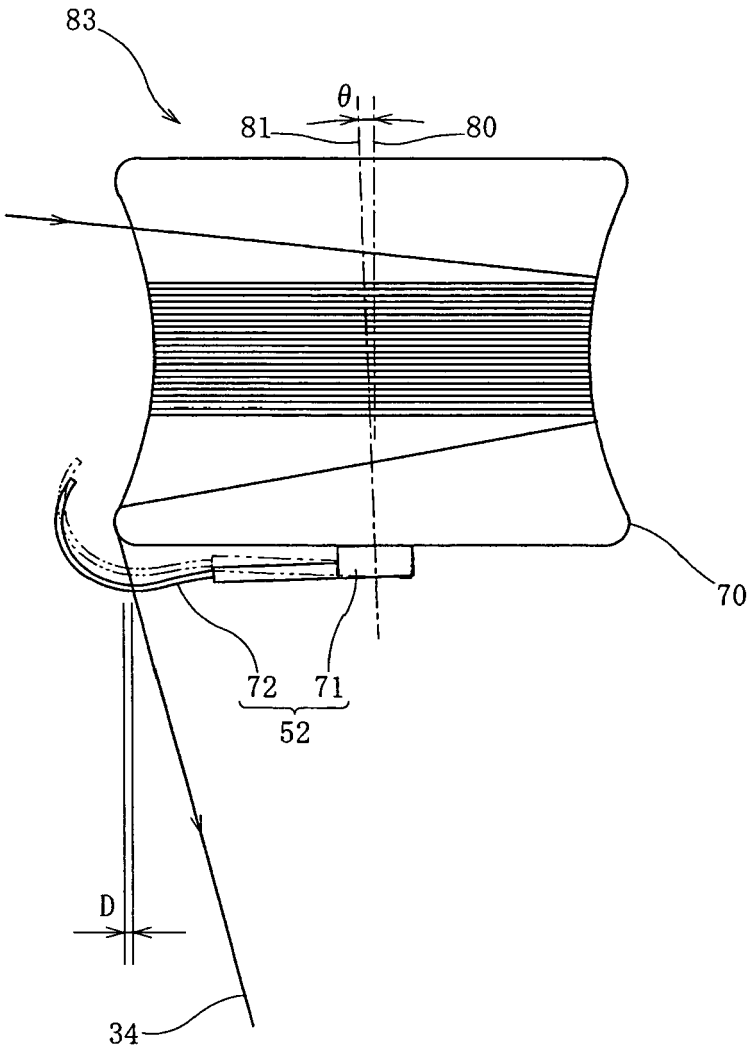


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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