



(11)

**EP 3 447 015 A1**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**27.02.2019 Bulletin 2019/09**

(51) Int Cl.:  
**B65H 51/22 (2006.01)**

(21) Application number: **18190233.9**

(22) Date of filing: **22.08.2018**

(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**  
Designated Validation States:  
**KH MA MD TN**

(71) Applicant: **Murata Machinery, Ltd.**  
**Kyoto-shi,**  
**Kyoto 601-8326 (JP)**

(72) Inventor: **SHIGA, Masakazu**  
**Kyoto, 612-8686 (JP)**

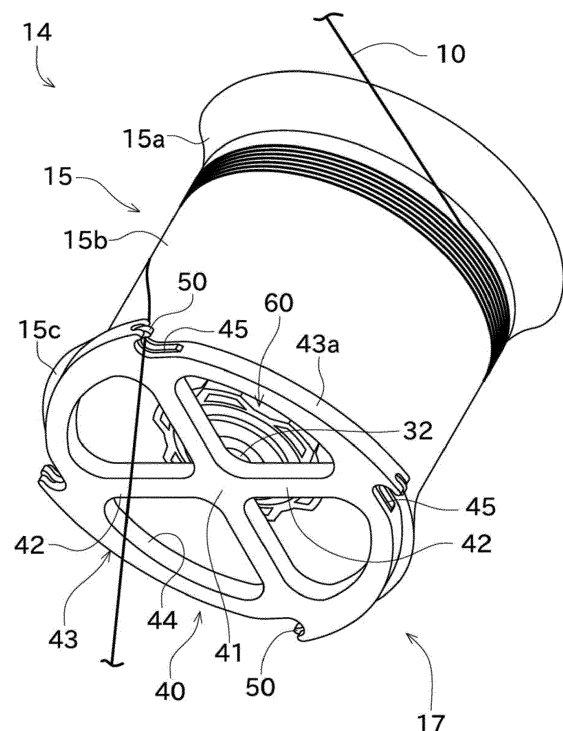
(74) Representative: **Weickmann & Weickmann**  
**PartmbB**  
**Postfach 860 820**  
**81635 München (DE)**

(30) Priority: **25.08.2017 JP 2017162347**

(54) **YARN GUIDE, YARN ACCUMULATING DEVICE, AND YARN WINDING MACHINE**

(57) A yarn guide (17) includes a central part (41), a yarn hooking member (50), and a connecting member (42). The central part is positioned at a rotation center. The yarn hooking member is positioned on a radially outer side of the central part, and is operative in hooking a spun yarn (10) and guiding the hooked spun yarn. The connecting member is formed so as to extend from the central part in the radially outward direction, and connects the central part and the yarn hooking member directly or via another member. The yarn guide further includes an assisting member (43) that includes an arc-shaped or linear portion connected to an end portion of the radially outer side of the connecting member, and assists in yarn guiding performed by the yarn hooking member, or includes a plurality of the yarn hooking members and a plurality of the connecting members.

**FIG.4**



## Description

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

**[0001]** The present invention relates to a yarn guide capable of hooking a yarn and guiding the yarn.

#### 2. Description of the Related Art

**[0002]** Conventionally, there is known a yarn winding machine that winds a yarn and that includes a yarn accumulating device that temporarily accumulates the yarn. Such a yarn accumulating device includes a yarn accumulating roller on which the yarn is accumulated and a yarn guide that hooks and guides the yarn to the yarn accumulating roller.

**[0003]** A yarn storing device disclosed in Japanese Patent Application Laid-Open No. S59-138563 (Patent Document 1) includes a storing roller and a yarn guide arranged on one side in an axial direction of the storing roller. The yarn guide includes a yarn returning ring and a yarn returning apparatus arranged on a radially outer side of the yarn returning ring. Because the yarn returning ring is a ring-shaped member, and is arranged so as to enclose a disc-shaped end plate, the entire yarn guide is formed in a disc shape.

**[0004]** A yarn feeding device disclosed in Japanese Patent Application Laid-Open No. S63-502360 (Patent Document 2) includes a yarn accumulating drum and a yarn guiding section arranged on one side in an axial direction of the yarn accumulating drum. In Patent Document 2, as an example of the yarn guiding section, a configuration that includes a ring and a tooth or a pin arranged on a radially inner side of the ring is disclosed. In Patent Document 2, as another example of the yarn guiding section, a configuration that includes a circular disc and a tooth or a pin arranged on a radially outer side of the disc is disclosed.

**[0005]** Because the disc-shaped yarn guide member explained in Patent Documents 1 and 2 tends to be heavy, there is room for improvement. Because the yarn is passed through the inner side of the ring in the yarn guiding section that includes the ring explained in Patent Document 2, the yarn that passes over the radially outer side of the ring cannot be guided. Because the yarn guide member includes a part that contacts the yarn, wearing of the yarn guide member occurs easily. Hence, prolonging the operating life of the yarn guide member is desirable.

### SUMMARY OF THE INVENTION

**[0006]** One object of the present invention is to provide a yarn guide capable of guiding a yarn that comes near from a radially outer side thereof, and that is light in weight and has a longer operating life. This object is achieved

according to the invention by a yarn guide according to claim 1, a yarn accumulating device according to claim 11 or a yarn winding machine according to claim 16.

**[0007]** According to one aspect of the present invention, a yarn guide for a yarn accumulating device is provided. The yarn guide includes a central part; a yarn hooking member; and a connecting member. The central part is positioned at a rotation center. The yarn hooking member is positioned on an outer side of the central part, and hooks a yarn and guides the yarn. The connecting member extends outward from the central part, and connects the central part and the yarn hooking member directly or via another member. The yarn guide further includes an assisting member that includes an arc-shaped portion or a linear portion connected to an end portion of an outer side of the connecting member and that assists in yarn guiding performed by the yarn hooking member, or includes a plurality of the yarn hooking members and a plurality of the connecting members.

**[0008]** With this configuration, because a space is formed outside the central part when seen in the direction of the rotating shaft, the yarn guide can be made lighter than the disc-shaped yarn guide without a hole formed in the disc. Moreover, because the assisting member or the plurality of the yarn hooking members are provided, wearing of the yarn hooking member can be reduced, thereby prolonging operating life of the yarn guide member.

**[0009]** It is preferable that the above yarn guide includes equal to or greater than two but equal to or less than sixteen yarn hooking members.

**[0010]** With this configuration, the operating life of the yarn guide can be prolonged, and the yarn guide can be made light in weight.

**[0011]** In the above yarn guide, it is preferable that the yarn hooking member contains a material having higher wear resistance than that of the central part.

**[0012]** With this configuration, because the yarn hooking member is less likely to be worn out, the operating life of the yarn guide can be prolonged further.

**[0013]** In the above yarn guide, it is preferable that the assisting member is formed as to entirely encircle the central part.

**[0014]** With this configuration, because it is less likely that the yarn contacts the rod-shaped connecting member, the yarn can be prevented from getting entangled.

**[0015]** In the above yarn guide, it is preferable that at least a part of each of the central part, the connecting member, and the assisting member are positioned on a same plane.

**[0016]** With this configuration, because the yarn guide can be formed in a simple shape, the yarn guide can be easily manufactured.

**[0017]** In the above yarn guide, it is preferable that the connecting member is rod-shaped. With this configuration, the yarn guide can be made light in weight.

**[0018]** In the above yarn guide, the connecting member and the assisting member are constituted by a disk

member in which holes are formed. With this configuration, a lightweight yarn guide can be easily manufactured.

**[0019]** In the above yarn guide, it is preferable that the yarn hooking member is hook-shaped.

**[0020]** With this configuration, the yarn engaged in the yarn hooking member can be made less likely to be disengaged from the yarn hooking member.

**[0021]** According to another aspect of the present invention, a yarn accumulating device that includes the yarn guide; and a yarn accumulating roller is provided. The yarn accumulating roller is arranged on one side in an axial direction that passes through the rotation center of the yarn guide, and accumulates the yarn.

**[0022]** With this configuration, because the yarn guide is light in weight and has a longer operating life, the yarn accumulating device can be made light in weight, and the operating life thereof can be prolonged.

**[0023]** In the above yarn accumulating device, it is preferable that the yarn accumulating device has a configuration explained below. The yarn accumulating device includes an adjusting mechanism that adjusts resistance required to cause the yarn guide to rotate with respect to the yarn accumulating roller. The adjusting mechanism includes an operating member provided to be operated to adjust magnitude of the resistance. The operating member is arranged in a space that is formed on a radially inner side of an outer peripheral surface of the yarn accumulating roller.

**[0024]** With this configuration, instead of removing the yarn guide from the yarn accumulating roller, the operating member can be operated via an open part such as a through hole that is formed in the yarn guide. Therefore, the operation to adjust the resistance can be easily performed.

**[0025]** In the above yarn accumulating device, it is preferable that when an end portion on a side on which the yarn guide is arranged is seen in the axial direction, at least a part of the assisting member is positioned farther on the outer side than an end portion of a radially outer side of the yarn accumulating roller.

**[0026]** With this configuration, because the yarn can easily contact the assisting member at the time of yarn hooking, the success rate of the yarn hooking can be improved.

**[0027]** In the above yarn accumulating device, it is preferable that when the end portion on the side on which the yarn guide is arranged is seen in the axial direction, at least a part of the yarn hooking member is positioned farther on an inner side than the end portion of the radially outer side of the yarn accumulating roller.

**[0028]** With this configuration, the yarn engaged in the yarn hooking member can be made less likely to be disengaged from the yarn hooking member.

**[0029]** In the above yarn accumulating device, it is preferable that at least a part of the yarn hooking member is positioned between two end portions of the yarn accumulating roller in the axial direction, and is positioned farther on the outer side than the end portion of the ra-

dially outer side of the yarn accumulating roller.

**[0030]** With this configuration, at the time of the yarn hooking, the yarn hooked in the yarn hooking member can be reliably guided to the yarn accumulating roller.

**[0031]** According to still another aspect of the present invention, a yarn winding machine that includes the yarn accumulating device; a yarn supplying section; and a winding device is provided. The yarn supplying section is arranged upstream of the yarn accumulating device in a yarn traveling direction and supplies the yarn. The winding device is arranged downstream of the yarn accumulating device in the yarn traveling direction and winds the yarn.

**[0032]** With this configuration, in the yarn winding machine, the yarn accumulating device can be made light in weight, and the operating life thereof can be prolonged. As a result, the time during which the yarn winding machine needs to be stopped to perform maintenance of the yarn accumulating device can be shortened, and the operational efficiency of the yarn winding machine can be improved.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0033]**

FIG. 1 is a front view showing a configuration of a spinning frame according to an embodiment of the present invention.

FIG. 2 is a side view of a spinning unit.

FIG. 3 is a cross-sectional view of a yarn accumulating device taken along a plane passing through a rotation center.

FIG. 4 is a perspective view of the yarn accumulating device.

FIG. 5 is a diagram showing a view of a side of the yarn accumulating device on which a yarn guide is arranged when seen in the axial direction.

FIG. 6 is a cross-sectional view of a yarn accumulating device according to a first modification taken along a plane passing through the rotation center.

FIG. 7A is a schematic diagram showing a view of a yarn guide according a second modification when seen in the axial direction.

FIG. 7B is a schematic diagram showing a view of a yarn guide according a third modification when seen in the axial direction.

FIG. 8A is a schematic diagram showing a view of a yarn guide according a fourth modification when seen in the axial direction.

FIG. 8B is a schematic diagram showing a view of a yarn guide according a fifth modification when seen in the axial direction.

FIG. 9 is a schematic diagram showing a view of a yarn guide according a sixth modification when seen in the axial direction.

FIG. 10 is a schematic diagram showing a view of a yarn guide according a seventh modification when

seen in the axial direction.

## DETAILED DESCRIPTION

**[0034]** Exemplary embodiments of a spinning frame (yarn winding machine) according to the present invention are explained below with reference to the accompanying drawings. A spinning frame 1 shown in FIG. 1 includes a plurality of spinning units 2 arranged side-by-side, a yarn joining cart 3, a motor box 4, and a machine-frame controlling device 90.

**[0035]** The machine-frame controlling device 90 centrally controls various structural components of the spinning frame 1, and includes a monitor 91 and one or more input keys 92. By performing an appropriate operation by using the input keys 92, an operator can make settings on a specific spinning unit 2 or all spinning units 2, and can display on the monitor 91 the settings, the status, and the like of a specific spinning unit 2 or all spinning units 2.

**[0036]** As shown in FIG. 2, each spinning unit 2 includes, sequentially from the upstream to the downstream, a drafting device 7, an air spinning device (yarn supplying section) 9, a yarn accumulating device 14, and a winding device 96. Note that, in the present description, terms "upstream" and "downstream" refer to upstream and downstream in a traveling direction of a sliver 6, a fiber bundle 8, and a spun yarn (yarn) 10 at the time of spinning. The spinning unit 2 spins the fiber bundle 8 supplied from the drafting device 7 by the air spinning device 9 to form the spun yarn 10. The spun yarn 10 is wound by the winding device 96 to form a package 28.

**[0037]** By transporting the sliver 6 to the downstream side by sandwiching the sliver 6 between a plurality of drafting rollers (bottom rollers) and a plurality of opposing rollers (top rollers), and rotating the drafting rollers in a drafting direction, the drafting device 7 draws (drafts) the sliver 6 so that the sliver 6 has a predetermined fiber amount (or thickness) thereby forming the fiber bundle 8. The drafting device 7 includes, sequentially from the upstream, four drafting rollers, namely, a back roller 21, a third roller 22, a middle roller 24, and a front roller 25. An apron belt 23 made of rubber is wound around the middle roller 24. Each of the drafting rollers is driven to rotate at a predetermined rotational speed. The drafting device 7 includes the opposing rollers each opposing the drafting rollers.

**[0038]** In a plurality of the spinning units 2, a common driving source can be provided for the drafting rollers, or a separate driving source can be provided for each of the spinning units 2. The four drafting rollers can be respectively driven by a separate driving section, or at least two drafting rollers can be driven by a same driving section.

**[0039]** The air spinning device 9 includes a spinning chamber, a fiber guiding section, a swirling air current generating nozzle, and a hollow guiding shaft. The fiber guiding section guides the fiber bundle 8 supplied from

the drafting device 7 into the spinning chamber. The swirling air current generating nozzle is arranged surrounding a path on which the fiber bundle 8 travels. By injecting air from the swirling air current generating nozzle, a swirling air current is generated in the spinning chamber. By causing fiber ends of a plurality of fibers that constitute the fiber bundle 8 to be reversed and whirled by the action of the swirling air current, the spun yarn 10 is generated. The hollow guiding shaft guides the spun yarn 10 from the spinning chamber to the outside of the air spinning device 9.

**[0040]** A yarn quality measuring device 12 and a spinning sensor 13 are arranged downstream of the air spinning device 9. The spun yarn 10 spun by the air spinning device 9 passes through the yarn quality measuring device 12 and the spinning sensor 13.

**[0041]** The yarn quality measuring device 12 monitors the thickness of the traveling spun yarn 10 by using a not-shown optical sensor. Upon detecting a defect in the spun yarn 10 (a part of the spun yarn 10 with an abnormal thickness and the like), the yarn quality measuring device 12 transmits to a not-shown unit controller a yarn defect detection signal. The sensor of the yarn quality measuring device 12 for monitoring the thickness of the spun yarn 10 is not limited to the optical sensor, and can be, for example, an electrostatic capacitance sensor. The yarn quality measuring device 12 can detect as a yarn defect, a foreign substance that is contained in the spun yarn 10, or can detect the presence or absence of the spun yarn 10 instead of or in addition to the quality of the spun yarn 10.

**[0042]** The spinning sensor 13 is arranged immediately downstream of the yarn quality measuring device 12. The spinning sensor 13 can detect a tension of the spun yarn 10 present between the air spinning device 9 and the yarn accumulating device 14. The spinning sensor 13 transmits a detection signal indicative of the detected tension to the unit controller. By monitoring the tension detected by the spinning sensor 13, the unit controller detects an abnormal portion of the spun yarn 10 such as a weak yarn. The spinning sensor 13 can be omitted.

**[0043]** The yarn accumulating device 14 is arranged downstream of the yarn quality measuring device 12 and the spinning sensor 13. As shown in FIG. 2, the yarn accumulating device 14 includes a yarn accumulating roller 15, a yarn guide 17, and a motor 16.

**[0044]** The yarn guide 17 can hook the spun yarn 10. At the time of starting and restarting winding of the package 28, the spun yarn 10 is not wound on the yarn accumulating roller 15. In such a state, by rotating while hooking the spun yarn 10, the yarn guide 17 guides the spun yarn 10 to the yarn accumulating roller 15 (performs yarn hooking). Accordingly, the spun yarn 10 can be wound on the yarn accumulating roller 15.

**[0045]** The yarn accumulating roller 15 can temporarily accumulate a certain amount of the spun yarn 10 by winding the spun yarn 10 on an outer peripheral surface thereof. By rotating the yarn accumulating roller 15 at a pre-

determined rotational speed in a state in which the spun yarn 10 is wound around the outer peripheral surface of the yarn accumulating roller 15, the spun yarn 10 can be withdrawn from the air spinning device 9 at a predetermined speed and transported to the downstream side. Because the spun yarn 10 can be temporarily accumulated on the outer peripheral surface of the yarn accumulating roller 15, the yarn accumulating device 14 can function as a buffer. Accordingly, defects in which the spinning speed of the air spinning device 9 and the winding speed (a speed at which the spun yarn 10 is wound onto the package 28) do not match for some reason (for example, slack and the like in the spun yarn 10) can be eliminated. A delivery roller and a nip roller can be arranged between the air spinning device 9 and the yarn accumulating device 14, and the spun yarn 10 can be withdrawn from the air spinning device 9 by using such pair of rollers.

**[0046]** A yarn guide member 18 and the winding device 96 are arranged downstream of the yarn accumulating device 14. A waxing device can be arranged between the yarn guide member 18 and the winding device 96, and wax can be applied to the spun yarn 10.

**[0047]** The winding device 96 includes a cradle arm 97, a winding drum 98, a traverse guide 99, and a not-shown winding drum driving motor. The cradle arm 97 rotatably supports a bobbin on which the spun yarn 10 is wound. By conveying a driving force of the winding drum driving motor, the winding drum 98 rotates while being in contact with an outer peripheral surface of the bobbin or the package 28. The traverse guide 99 can guide the spun yarn 10. In the winding device 96, the winding drum 98 is driven by the winding drum driving motor while causing the traverse guide 99 to perform a reciprocating movement by a not-shown driving section. Accordingly, by rotating the package 28 that is in contact with the winding drum 98, the winding device 96 winds the spun yarn 10 while traversing the spun yarn 10 to form the package 28.

**[0048]** As shown in FIGS. 1 and 2, the yarn joining cart 3 includes a yarn joining device 93, a suction pipe 94, and a suction mouth 95. When a yarn breakage or a yarn cut occurs in a certain spinning unit 2, the yarn joining cart 3 travels on a not-shown rail and stops at or near that spinning unit 2. The suction pipe 94 pivots upward around a shaft thereof, catches the spun yarn 10 supplied from the air spinning device 9, and guides the spun yarn 10 to the yarn joining device 93 by pivoting downward around the shaft. The suction mouth 95 pivots downward around a shaft thereof, catches the spun yarn 10 from the package 28, and guides the spun yarn 10 to the yarn joining device 93 by pivoting upward around the shaft. The yarn joining device 93 joins the guided spun yarns 10. Accordingly, the winding device 96 can resume the winding of the spun yarn 10.

**[0049]** A detailed configuration of the yarn accumulating device 14 is explained below with reference to FIGS. 3 and 4.

**[0050]** The yarn accumulating roller 15 is a roller member in which at least the outer peripheral surface thereof is made of a wear resistant material, and is fixed to a motor shaft 31 of the motor 16. Assuming that a side on which the yarn guide 17 is arranged is a tip end, and a side on which the motor 16 is arranged is a base end, the outer peripheral surface of the yarn accumulating roller 15 includes, sequentially from the base end to the tip end, a base end side taper part 15a, a middle roller part 15b, and a tip end side taper part 15c.

**[0051]** The middle roller part 15b is slightly narrower at the tip end side, and is formed in a continuous manner without any level difference between the base end side taper part 15a and the tip end side taper part 15c. The shape of the middle roller part 15b is not limited to such a shape, and, for example, the diameter of the middle roller part 15b can be constant from the base end side to the tip end side.

**[0052]** The base end side taper part 15a and the tip end side taper part 15c are moderately tapered such that respective end surface sides have a larger diameter. The base end side taper part 15a allows the supplied spun yarn 10 to move smoothly from a larger diameter portion thereof toward a smaller diameter portion thereof to reach the middle roller part 15b, thereby causing the spun yarn 10 to be orderly wound on the surface of the middle roller part 15b. The tip end side taper part 15c prevents the occurrence of a sloughing phenomenon in which the spun yarn 10 wound on the middle roller part 15b slips out of the yarn accumulating roller 15 at once. However, the tip end side taper part 15c can be omitted.

**[0053]** The yarn guide 17 is arranged at the tip end side of the yarn accumulating roller 15. As shown in FIG. 3, the yarn guide 17 is fixed to an end portion of a tip end side of a rotating shaft 32. The rotating shaft 32 is rotatably fixed to the yarn accumulating roller 15. The central axis of the rotating shaft 32 is the same as that of the motor shaft 31.

**[0054]** As shown in FIG. 3, an adjusting mechanism 60 is arranged on an inner side of the yarn accumulating roller 15. Specifically, the adjusting mechanism 60 is arranged in a space inside the outer peripheral surface (specifically, inside the middle roller part 15b and the tip end side taper part 15c) of the yarn accumulating roller 15 in the radial direction thereof. The adjusting mechanism 60 includes a base part 61, an adjusting bolt (operating member) 62, a magnetic hysteresis member 63, a magnet-mounting part 68, and a permanent magnet 69.

**[0055]** The base part 61 is fixed to the yarn accumulating roller 15 and rotates integrally with the yarn accumulating roller 15. The base part 61 includes a ring portion 61a that is formed on a radially outer side of the rotating shaft 32. A female thread is formed on an inner wall surface of the ring portion 61a.

**[0056]** The adjusting bolt 62 includes a cylindrical portion 62a that is arranged on the radially outer side of the rotating shaft 32 and positioned on the radially inner side of the base part 61. A male thread is formed on an outer

peripheral surface of the cylindrical portion 62a. The male thread of the cylindrical portion 62a is engaged with the female thread of the base part 61. The adjusting bolt 62 includes on a tip end portion thereof a head portion having a larger diameter than that of the cylindrical portion 62a. By manually grasping and turning the head portion of the adjusting bolt 62, the operator can move the adjusting bolt 62 with respect to the base part 61. The magnetic hysteresis member 63 is arranged on an inner peripheral surface of the cylindrical portion 62a.

**[0057]** The magnet-mounting part 68 is connected to a base end side of the rotating shaft 32. The magnet-mounting part 68 rotates integrally with the yarn guide 17. An outer diameter of the magnet-mounting part 68 is smaller than an inner diameter of the cylindrical portion 62a of the adjusting bolt 62. The magnet-mounting part 68 can be positioned on the radially inner side of the cylindrical portion 62a. The permanent magnet 69 is mounted on an outer peripheral surface of the magnet-mounting part 68.

**[0058]** In this manner, the magnetic hysteresis member 63 that integrally rotates with the yarn accumulating roller 15 and the permanent magnet 69 that integrally rotates with the yarn guide 17 are arranged opposing each other. With such a configuration, when the yarn guide 17 is rotated with respect to the yarn accumulating roller 15, resistance is generated. In other words, unless a force larger than the generated resistance is applied, the yarn guide 17 cannot be rotated with respect to the yarn accumulating roller 15.

**[0059]** Therefore, when a force that pulls the spun yarn 10 that is engaged in the yarn guide 17 toward the downstream is applied in a state in which the spun yarn 10 is wound around the yarn accumulating roller 15, a force that rotates the yarn guide 17 so that the spun yarn 10 is unwound from the tip end side of the yarn accumulating roller 15 is applied to the yarn guide 17. Accordingly, if the yarn tension on the downstream of the yarn accumulating device 14 (the yarn tension between the yarn accumulating device 14 and the winding device 96) is high enough to overcome the resistance, the yarn guide 17 rotates independently of the yarn accumulating roller 15, thereby the spun yarn 10 is gradually unwound from the tip end side of the yarn accumulating roller 15 via the yarn guide 17.

**[0060]** On the other hand, if the yarn tension on the downstream of the yarn accumulating device 14 is not high enough to overcome the resistance, the yarn guide 17 rotates integrally with the yarn accumulating roller 15. In such a case, the yarn guide 17 operates so as to prevent the spun yarn 10 from being unwound from the tip end side of the rotating yarn accumulating roller 15.

**[0061]** In this manner, when the yarn tension on the downstream side increases, the yarn accumulating device 14 unwinds the spun yarn 10, and when the yarn tension decreases (when slacking is likely to occur in the spun yarn 10), the yarn accumulating device 14 operates so as to stop the unwinding of the spun yarn 10. Accord-

ingly, the yarn accumulating device 14 can remove the slacking of the spun yarn 10 and apply appropriate tension to the spun yarn 10.

**[0062]** By turning the adjusting bolt 62 to change the position of the adjusting bolt 62 (magnetic hysteresis member 63) in the axial direction thereof, the area in which the magnetic hysteresis member 63 and the permanent magnet 69 are facing one another can be changed, resulting in change in magnitude of the resistance. With the configuration explained above, the resistance explained above can be adjusted by using the adjusting mechanism 60.

**[0063]** The detailed shape and configuration of the yarn guide 17 is further explained below with reference to FIG. 5.

**[0064]** As shown in FIGS. 3 to 5, the yarn guide 17 includes a rotating member 40 and a yarn hooking member 50. The rotating member 40 is connected to the rotating shaft 32 and rotates integrally with the rotating shaft 32 in the direction shown with a bold arrow in FIG. 5. The yarn hooking member 50 is arranged on a radially outer side end portion of the rotating member 40. The yarn hooking member 50 guides the spun yarn 10 in a state of being in contact with the spun yarn 10. The rotating member 40 and the yarn hooking member 50 are explained in detail below.

**[0065]** As shown in FIGS. 4 and 5, the rotating member 40 includes a central part 41, a connecting member 42, and an assisting member 43. A through hole 44 is formed in the rotating member 40. The shape of the through hole 44 is not limited to a substantially triangular shape shown in the figures. The rotating member 40 is made of resin and manufactured by using, for example, a mold. The entire rotating member 40 has the same thickness, and, when seen in a direction perpendicular to the axial direction (for example, FIG. 3), appears linear without any curve and the like. In other words, a part of each structural component that constitutes the rotating member 40 (for example, a surface of one side in the axial direction) is positioned on the same plane.

**[0066]** The central part 41 is a portion positioned at a rotation center around which the yarn guide 17 rotates. Accordingly, the rotating shaft 32 is connected to the base end side of the central part 41.

**[0067]** The connecting member 42 is a rod-shaped member that extends from the central part 41 in the radially outward direction. In the present embodiment, four connecting members 42 are formed. All connecting members 42 have the same shape and are arranged at an equal interval (90 degrees). Accordingly, when seen in the axial direction, the connecting member 42 appears to have the same shape (four-fold symmetry) if rotated by 90 degrees, and naturally, appears to have the same shape even if rotated by 180 degrees (point symmetry).

**[0068]** The assisting member 43 is connected to the connecting members 42 on the radially outer side of the rotating member 40. The assisting member 43 includes four arc-shaped (elongated curved) portions each of that

connects the two adjacent connecting members 42. Accordingly, the assisting member 43 is ring-shaped, and encircles the central part 41 and the connecting members 42 over the entire periphery (360 degrees). Accordingly, when the spun yarn 10 comes near from the radially outer side of the rotating member 40, the spun yarn 10 contacts the assisting member 43 or the yarn hooking member 50 before contacting the central part 41 and the connecting members 42.

**[0069]** When seen in the axial direction (that is, in FIG. 5), an outer peripheral surface 43a of the assisting member 43 has a portion positioned on the radially outer side and a portion positioned on the radially inner side with respect to the position of the tip end side end surface of the yarn accumulating roller 15 (tip end side taper part 15c). In other words, each of the four arcs of the assisting member 43 have a different center, and the positions of all four centers also differ from that of the rotation center of the rotating member 40. Because a part of the assisting member 43 is positioned farther on the radially outer side than the end surface of the yarn accumulating roller 15, the assisting member 43 can more easily contact the spun yarn 10 at the time of yarn hooking than the yarn accumulating roller 15. Therefore, the success rate of the yarn hooking can be improved.

**[0070]** Particularly, in the present embodiment, the diameter of the assisting member 43 gradually becomes smaller towards the upstream side in the rotating direction, and the portion having the smaller diameter connects to the yarn hooking member 50. In other words, when the spun yarn 10 contacts the outer peripheral surface 43a, the spun yarn 10 comes near the upstream side in the rotating direction following the rotation of the rotating member 40, thereby the spun yarn 10 can be smoothly moved to the yarn hooking member 50.

**[0071]** The center of an arc-shaped inner peripheral surface of the assisting member 43 is the same as the rotation center of the rotating member 40. Accordingly, the thickness of the assisting member 43 in the radial direction is not constant, and as the position of the outer peripheral surface 43a shifts in the radially outward direction, the thickness of the assisting member 43 increases.

**[0072]** The through hole 44 is formed by being enclosed with two adjacent connecting members 42 and the assisting member 43. In the present embodiment, because four connecting members 42 are provided, four through holes 44 are formed. Because the connecting members 42 and the assisting member 43 are elongate, a relatively larger through hole 44 is formed. Accordingly, the rotating member 40 can be made sufficiently light in weight. Furthermore, the operator can operate the adjusting mechanism 60 (specifically, the adjusting bolt 62) via the through holes (open portion) 44. Accordingly, the resistance can be adjusted without removing the yarn guide 17.

**[0073]** A mounting groove 45 is provided for mounting the yarn hooking member 50 to the rotating member 40.

The mounting groove 45 is formed at a position at which the connecting member 42 and the assisting member 43 are connected. Accordingly, in the present embodiment, the same number as that of the connecting members 42, that is, four mounting grooves 45 are provided. The mounting groove 45 is a mounting groove that is formed in a shape that corresponds to the shape of the yarn hooking member 50 (later-explained in detail).

**[0074]** The yarn hooking member 50 is mounted into the mounting groove 45 of the rotating member 40. The yarn hooking member 50 rotates integrally with the rotating member 40. The yarn hooking member 50 is a part that contacts and guides the spun yarn 10 at the time of the yarn hooking and the yarn winding. The yarn hooking member 50 is made of a material having higher wear resistance (specifically, ceramic) than the rotating member 40 (particularly, the central part 41). It is preferable that the number of the yarn hooking members 50 is equal to or greater than two but equal to or less than sixteen, it is more preferable that this number is equal to or greater than two but equal to or less than six, and it is most preferable that this number is four as explained in the present embodiment. All the four yarn hooking members 50 have the same configuration. As shown in FIG. 5, the yarn hooking member 50 is substantially U-shaped (hook-shaped), and includes a fixed portion 51, an extending portion 52, and a retaining portion 53.

**[0075]** The fixed portion 51 is a linear portion and is arranged such that a longitudinal direction thereof substantially matches the peripheral direction of the assisting member 43. The fixed portion 51 is an innermost portion of the yarn hooking member 50 in the radial direction of the rotating member 40. The fixed portion 51 is inserted in the mounting groove 45 and is fixed in the mounting groove 45 by using adhesive. The fixed portion 51 includes, along the entire longitudinal direction, a portion that is inserted into the mounting groove 45 and a portion that is exposed outside the rotating member 40. An inclined surface 51a is formed at one end portion (a downstream end portion in the rotation direction) of the fixed portion 51. Therefore, the spun yarn 10 guided along the outer peripheral surface 43a is smoothly inserted into the yarn hooking member 50. Because the fixed portion 51 is longer than the retaining portion 53, the yarn hooking member 50 can be fixed in a stable state into the mounting groove 45.

**[0076]** The extending portion 52 is a portion that extends from the other end portion (an upstream side end portion in the rotation direction) of the fixed portion 51 in the radially outward direction of the rotating member 40. Like the fixed portion 51, the extending portion 52, too, includes along the entire longitudinal direction a portion that is fixed by being inserted into the mounting groove 45 and a portion that is exposed outside the rotating member 40. A surface on one side (a surface on the downstream side in the rotation direction) of the extending portion 52 is curved (arc-shaped), and can guide the spun yarn 10 without applying excessive force on the

spun yarn 10. In a state in which the yarn guide 17 is rotating, the spun yarn 10 does not always need to be contacting the extending portion 52, and the spun yarn 10 may be guided by the yarn guide 17 while moving between the extending portion 52 and the inclined surface 51a (or near the inclined surface 51a (includes a part of the assisting member 43)).

**[0077]** The retaining portion 53 is a linear portion connected to the outer side of the extending portion 52 in the radial direction of the rotating member 40. The retaining portion 53 is arranged substantially parallel to the fixed portion 51. Only one end portion (an upstream side end portion in the rotation direction) of the retaining portion 53 is fixed by being inserted into the mounting groove 45. The other end portion (a downstream side end portion in the rotation direction) of the retaining portion 53 includes a portion that extends in the radially inward direction. With such a configuration, the spun yarn 10 guided by the yarn hooking member 50 can be made less likely to be disengaged from the yarn hooking member 50.

**[0078]** When seen in the axial direction (that is, in FIG. 5), the yarn hooking member 50 has a part positioned on the radially outer side (a part of the extending portion 52 and the retaining portion 53) and a part positioned on the radially inner side (a part of the extending portion 52 and the fixed portion 51) with respect to the position of the tip end side end surface of the yarn accumulating roller 15 (tip end side taper part 15c). Because the yarn hooking member 50 includes a part that is positioned on the radially outer side, it is easier for the yarn hooking member 50 to contact the spun yarn 10 at the time of the yarn hooking than the yarn accumulating roller 15. Therefore, the success rate of the yarn hooking can be improved.

**[0079]** In the present embodiment, the yarn hooking member 50 is fixed to the rotating member 40 by using adhesive. The yarn hooking member 50 can be removed from the rotating member 40 by melting the adhesive by using heat and the like. In this manner, because the yarn hooking member 50 can be removed from the rotating member 40, the yarn hooking member 50 can be replaced.

**[0080]** In the present embodiment, because the yarn guide 17 includes a plurality of the yarn hooking members 50, and the load applied on each of the yarn hooking members 50 is distributed, the operating life of the yarn guide 17 can be prolonged. Furthermore, because the assisting member 43 is included in the yarn guide 17, the entangling of the spun yarn 10 in the connecting member 42 is less likely to occur. Accordingly, because of such a configuration, too, the operating life of the yarn guide 17 can be prolonged.

**[0081]** Next, modifications of the embodiment explained above will be explained. In the explanation of the present modification, structural elements having the same or similar configuration as those explained in the embodiment explained above are indicated by the same reference numerals and explanation thereof may be omitted. A first modification will be explained with reference

to FIG. 6.

**[0082]** In the embodiment explained above, the rotating member 40 appears linear when seen in the direction perpendicular to the axial direction. However, in the first modification, a fringe portion of the rotating member 40 is bent toward the base end side of the yarn accumulating device 14. Specifically, a part of the rotating member 40 in the radially outer direction (both end portions) is positioned between the both end portions of the yarn accumulating roller 15 in the axial direction and is positioned on the radially outer side of the yarn accumulating roller 15. The yarn hooking member 50 is arranged on both end portions of the rotating member 40 in the radially outer direction. The yarn hooking member 50, too, is positioned between the both ends of the yarn accumulating roller 15 in the axial direction and is positioned on the radially outer side of the yarn accumulating roller 15. In other words, both end portions of the rotating member 40 in the radially outer direction and the yarn hooking members 50 are arranged at a position away from the plane on which the central part 41 and the connecting members 42 are positioned. Alternatively, the yarn hooking member 50 can be longer than that shown in FIG. 6, and can be arranged such that the tip end portions of the yarn hooking members 50 are positioned farther on an upstream side of the tip end side taper part 15c. The tip end portion of the yarn hooking member 50 that is positioned farther on the upstream side of the tip end side taper part 15c can be linear or curved in shape. In other words, the tip end portion of the yarn hooking member 50 can have, for example, a three-dimensional shape that is bent in different directions at a plurality of positions.

**[0083]** With such a configuration, at the time of the yarn hooking, the spun yarn 10 that is hooked on the yarn hooking member 50 can be reliably guided to the yarn accumulating roller 15.

**[0084]** Next, a second modification and a third modification will be explained with reference to FIGS. 7A and 7B. In the embodiment explained above, the assisting member 43 is arc-shaped; however, the assisting member 43 according to the present modifications can be polygonal in shape. The assisting member 43 can be triangular as shown in FIG. 7A, rectangular as shown in FIG. 7B, or polygonal having five or more sides. In such a configuration, the assisting member 43 is not arc-shaped but linear in shape. In a case where the assisting member 43 is polygonal, as shown in FIGS. 7A and 7B, the yarn hooking member 50 is attached to each vertex and the connecting member 42 is formed so as to extend toward the respective vertex. Even in the second and the third modifications, because the yarn guide 17 includes the assisting member 43 and the plurality of the yarn hooking members 50, the operating life of the yarn guide 17 can be prolonged similar to the embodiments explained above. Because the through hole 44 is formed in the yarn guide 17 (because a space is formed on the radially outer side of the central part 41), the yarn guide 17 can be made light in weight.



**[0085]** Next, a fourth modification and a fifth modification will be explained with reference to FIGS. 8A and 8B. The yarn guide 17 explained in the above embodiments includes the assisting member 43; however, as long as the yarn guide 17 includes a plurality of the connecting members 42 and a plurality of the yarn hooking members 50, the assisting member 43 can be omitted. The yarn guide 17 can include two connecting members 42 and two yarn hooking members 50 as shown in FIG. 8A, can include three connecting members 42 and three yarn hooking members 50 as shown in FIG. 8B, or can include four or more connecting members 42 and four or more yarn hooking members 50. Even in the fourth and fifth modifications, because the yarn guide 17 includes the plurality of the yarn hooking members 50, the operating life of the yarn guide 17 can be prolonged. Because a space is formed on the radially outer side of the central part 41 in the yarn guide 17, the yarn guide 17 can be made light in weight. Because the assisting member 43 is omitted in the fourth and fifth modifications, an open portion (notch) is formed between the adjacent connecting members 42 in the peripheral direction. Accordingly, the operator can operate the adjusting mechanism 60 (in detail, the adjusting bolt 62) via the open portion.

**[0086]** Next, a sixth modification will be explained with reference to FIG. 9. In the embodiments explained above, the yarn guide 17 includes the plurality of the connecting members 42; however, as long as the yarn guide 17 includes the assisting member 43, as shown in FIG. 9, the yarn guide 17 can include only one connecting member 42 and one yarn hooking member 50. In such a configuration, because the center of gravity of the yarn guide 17 deviates from the rotation center, a weight 81 can be arranged across the rotation center on the opposite side of the yarn hooking member 50. Even in the sixth modification, because the yarn guide 17 includes the assisting member 43, the operating life of the yarn guide 17 can be prolonged. Because the through hole 44 is formed in the yarn guide 17, the yarn guide 17 can be made light in weight.

**[0087]** Next, a seventh modification will be explained with reference to FIG. 10. In the embodiments explained above, the assisting member 43 encircles the central part 41 in 360 degrees; however, the assisting member 43 can encircle a part of the central part 41. As shown in FIG. 10, the assisting member 43 can be arranged at a fixed interval (90 degrees interval). Even in the seventh modification, because the yarn guide 17 includes the assisting member 43 and a plurality of the yarn hooking members 50, the operating life of the yarn guide 17 can be prolonged like in the embodiments explained above. Because the through hole 44 is formed in the yarn guide 17, the yarn guide 17 can be made light in weight.

**[0088]** According to an aspect of the present invention, the yarn guide 17 for the yarn accumulating device 14 having the following configuration is provided. That is, the yarn guide 17 includes the central part 41, the yarn hooking member 50, and the connecting member 42. The

central part 41 is positioned at the rotation center. The yarn hooking member 50 is positioned on the radially outer side of the central part 41, and is operative in hooking the spun yarn 10 and guiding the hooked spun yarn 10. The connecting member 42 is formed so as to extend from the central part 41 in the radially outward direction, and connects the central part 41 and the yarn hooking member 50 directly or via another member. The yarn guide 17 includes an arc-shaped or a linear portion connected to the end portion of the radially outer side of the connecting member 42. The yarn guide 17 further includes the assisting member 43 that assists in the guiding of the spun yarn 10 performed by the yarn hooking member 50, or the plurality of the yarn hooking members 50 and the plurality of the connecting members 42.

**[0089]** Accordingly, because the space is formed on the radially outer side of the central part 41 when seen in the direction of the rotating shaft, the yarn guide 17 can be made lighter than the disc-shaped yarn guide 17. Because the yarn guide 17 includes the assisting member 43 or the plurality of the yarn hooking members 50, wearing of the yarn hooking members 50 can be reduced, thereby making it possible to prolong the operating life of the yarn guide 17.

**[0090]** The yarn guide 17 according to the present embodiment includes equal to or greater than two but equal to or less than sixteen yarn hooking members 50.

**[0091]** Accordingly, the operating life of the yarn guide 17 can be prolonged and the yarn guide 17 can be made light in weight.

**[0092]** In the yarn guide 17 according to the present embodiment, the yarn hooking member 50 contains a material having higher wear resistance than that of the central part 41.

**[0093]** Accordingly, because the yarn hooking member 50 becomes less likely to be worn out, the operating life of the yarn guide 17 can be further prolonged.

**[0094]** In the yarn guide 17 according to the present embodiment, the assisting member 43 is formed so as to entirely encircle the central part 41.

**[0095]** Accordingly, because it is less likely that the spun yarn 10 contacts with the rod-shaped connecting member 42, the spun yarn 10 can be prevented from getting entangled.

**[0096]** In the yarn guide 17 according to the present embodiment, at least a part of each of the central part 41, the connecting member 42, and the assisting member 43 are positioned on the same plane.

**[0097]** Accordingly, because the yarn guide 17 can be formed in a simple shape, the yarn guide 17 can be easily manufactured.

**[0098]** In the yarn guide 17 according to the present embodiment, it is preferable that the connecting member 42 is rod-shaped. Accordingly, the yarn guide 17 can be made light in weight.

**[0099]** In the yarn guide 17 according to the present embodiment, the connecting member 42 and the assisting member 43 are constituted by a disc with a hole

formed therein. Accordingly, a lightweight yarn guide 17 can be easily manufactured.

**[0100]** In the yarn guide 17 according to the present embodiment, the yarn hooking member 50 is hook-shaped.

**[0101]** Accordingly, the spun yarn 10 engaged in the yarn hooking member 50 can be made less likely to be disengaged from the yarn hooking member 50.

**[0102]** The yarn accumulating device 14 according to the present embodiment includes the adjusting mechanism 60 that adjusts the resistance required for causing the yarn guide 17 to rotate with respect to the yarn accumulating roller 15. The adjusting mechanism 60 includes the adjusting bolt 62 provided for an operation to adjust the magnitude of the resistance. The adjusting bolt 62 is arranged in a space that is formed on the radially inner side of the outer peripheral surface of the yarn accumulating roller 15.

**[0103]** Accordingly, the adjusting bolt 62 can be operated via the open part such as the through hole 44 and the notch that is formed in the yarn guide 17, without removing the yarn guide 17 from the yarn accumulating roller 15. Therefore, the operation to adjust the resistance can be performed efficiently.

**[0104]** In the yarn accumulating device 14 according to the present embodiment, when the end portion on a side on which the yarn guide 17 is arranged is seen in the axial direction, at least a part of the assisting member 43 is positioned farther on the outer side than an end portion of the radially outer side of the yarn accumulating roller 15.

**[0105]** Accordingly, because the spun yarn 10 can easily contact the assisting member 43 at the time of the yarn hooking, the success rate of the yarn hooking can be improved.

**[0106]** In the yarn accumulating device 14 according to the present embodiment, when the end portion on the side on which the yarn guide 17 is arranged is seen in the axial direction, at least a part of the yarn hooking member 50 is positioned farther on the inner side than the end portion of the radially outer side of the yarn accumulating roller 15.

**[0107]** Accordingly, the spun yarn 10 engaged in the yarn hooking member 50 can be made less likely to be disengaged from the yarn hooking member 50.

**[0108]** In the yarn accumulating device 14 according to the present embodiment, at least a part of the yarn hooking member 50 is positioned between the both end portions of the yarn accumulating roller 15 in the axial direction, and is positioned farther on the outer side than the end portion of the radially outer side of the yarn accumulating roller 15.

**[0109]** Accordingly, the spun yarn 10 hooked on the yarn hooking member 50 can be reliably guided to the yarn accumulating roller 15 at the time of the yarn hooking.

**[0110]** Exemplary embodiments and modifications (hereinafter simply referred to as "the above embodi-

ments") of the present invention are explained above. The configurations explained above, however, can be modified as explained below.

**[0111]** In the above embodiments, a layout is such that the package 28 is formed below the air spinning device 9; however, a layout in which the package 28 is formed above the air spinning device 9 can be used.

**[0112]** In the above embodiments, the rotating member 40 is made of resin; however, the rotating member 40 can be made of metal (for example, lightweight metal such as aluminum). The rotating member 40 according to the above embodiments is solid; however, the rotating member 40 can be hollow inside. Two plates that constitute one side and the other side of the axial direction that passes through the rotation center of the rotating member 40 can be provided, and these two plates can be connected by a beam member having a truss structure. Alternatively, the rotating member 40 can be constituted by two plates and an intermediate layer that is arranged between the two plates and is made by using a material that is different from that of the plates.

**[0113]** In the above embodiments, the yarn hooking member 50 is arranged on a line that extends from the connecting member 42; however, as long as the connecting member 42 and the yarn hooking member 50 are connected directly or via another member (as long as the connecting member 42 and the yarn hooking member 50 rotate integrally), the yarn hooking member 50 can be arranged at a different position. For example, in FIG. 5, the connecting member 42 can be formed so as to extend towards a portion between the yarn hooking members 50 that are arranged side-by-side in the peripheral direction. In such a configuration, the yarn hooking member 50 is connected to the connecting member 42 via the assisting member 43.

**[0114]** In the above embodiments, the yarn hooking member 50 is made of ceramic; however, as long as the yarn hooking member 50 contains a material that has higher wear resistance than that of the central part 41, a material other than ceramic can be used for the yarn hooking member 50. For example, the yarn hooking member 50 can be made of metal and coated with hard chrome, diamond-like carbon, and the like. The yarn hooking member 50 can be made of metal or resin. In the above embodiments, the yarn hooking member 50 is detachable from the rotating member 40; however, the yarn hooking member 50 can be formed integrally with the rotating member 40 and can be non-detachable.

**[0115]** In the above embodiments, only the yarn accumulating roller 15 among the yarn accumulating roller 15 and the yarn guide 17 is driven by the motor 16; however, the yarn accumulating roller 15 and the yarn guide 17 can be individually driven by separate motors.

**[0116]** In the above embodiments, the adjusting mechanism 60 is arranged in the yarn accumulating device 14; however, the adjusting mechanism 60 can be omitted.

**[0117]** In the above embodiments, a space is formed

between the yarn guide 17 and an internal space of the yarn accumulating roller 15. Therefore, by grasping a center of the yarn guide 17, the operator can easily attach / detach the yarn guide 17 to / from the yarn accumulating roller 15, and remove the yarn accumulating device 14 from the spinning unit 2. Moreover, by arranging the motor 16 in the internal space of the yarn accumulating roller 15, the motor 16, too, can be removed from the tip end side taper part 15c after the yarn guide 17 is removed.

**[0118]** In the yarn guide 17, the connecting member 42 and the assisting member 43 can be constituted by a disc with a hole formed therein. Accordingly, a lightweight yarn guide 17 can be easily manufactured.

**[0119]** The scope of application of the present invention is not limited to the spinning frame, and can be applied to other spinning machines. The present invention can also be applied to other yarn winding machines (such as automatic winders, and open end spinning machines) as long as the configuration thereof includes a yarn accumulating device. Other than yarn winding machines, the present invention can also be applied to looms that include a yarn accumulating device.

**[0120]** The drawings used in the explanation of the above embodiments can be schematic diagrams, and each configuration can have a different shape than the shape shown in the drawings. For example, the fixed portion 51 of the yarn hooking member 50 can be longer or shorter than that shown in FIG. 5. When the fixed portion 51 is longer, in addition to having a substantially linear portion shown in FIG. 5, the fixed portion 51 can also include a part that is curved along the assisting member 43. Alternatively, the fixed portion 51 can be arranged so as to be further inclined toward the outer periphery of the tip end side taper part 15c than that shown in FIG. 5. The position of a first end portion (an end portion on the inclined surface 51a side in FIG. 5) of the yarn hooking member 50 can be nearer the central part 41 of the yarn guide 17 than that of a second end portion (an end portion on the extending portion 52 side) thereof. In such a configuration, when the yarn accumulating device 14 is seen from the tip end side taper part 15c side, the extending portion 52 can be arranged farther on the outer side than the tip end side taper part 15c. Alternatively, the fixed portion 51 that is shown as substantially linear in FIG. 5 can include a concave part that is formed facing toward the outer periphery.

**[0121]** In the above explanation, the meaning of "a plurality of" also includes "a predetermined number of".

**[0122]** Disclosed is a yarn guide (17) which includes a central part (41), a yarn hooking member (50), and a connecting member (42). The central part is positioned at a rotation center. The yarn hooking member is positioned on a radially outer side of the central part, and is operative in hooking a spun yarn (10) and guiding the hooked spun yarn. The connecting member is formed so as to extend from the central part in the radially outward direction, and connects the central part and the yarn hooking member directly or via another member. The

yarn guide further includes an assisting member (43) that includes an arc-shaped or linear portion connected to an end portion of the radially outer side of the connecting member, and assists in yarn guiding performed by the yarn hooking member, or includes a plurality of the yarn hooking members and a plurality of the connecting members.

**[0123]** Further disclosed are the following items:

1. A yarn guide (17) for a yarn accumulating device (14) comprising:

a central part (41) that is positioned at a rotation center;

at least one yarn hooking member (50) that is positioned on an outer periphery of the yarn guide (17), and that is adapted to hook a yarn (10) and to guide the yarn (10); and

at least one connecting member (42) that extends outward from the central part (41), wherein said yarn hooking member (50) is connected to the central part (41) via said connecting member (42),

characterized in that

the yarn guide (17) further includes an assisting member (43) that includes an arc-shaped portion or a linear portion connected to an end portion of an outer side of the connecting member (42) and preferably extends in a circumferential direction of the yarn guide (17), and that is adapted to assist in yarn guiding performed by the yarn hooking member (50).

2. The yarn guide according to item 1, wherein said yarn hooking member (50) is connected to the central part (41) via said assisting member (43).

3. The yarn guide according to item 1 or 2, comprising a plurality of said yarn hooking members (50) which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17), or/and comprising a plurality of said connecting members (42) which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17) or/and comprising a plurality of said assisting members (43) which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17).

4. A yarn guide (17) for a yarn accumulating device (14) comprising:

a central part (41) that is positioned at a rotation center;

at least one yarn hooking member (50) that is

positioned on an outer side of the central part (41), and that is adapted to hook a yarn (10) and to guide the yarn (10); and  
at least one connecting member (42) that extends outward from the central part (41), wherein said yarn hooking member (50) is connected to the central part (41) via said connecting member (42),

characterized in that

the yarn guide (17) includes a plurality of said yarn hooking members (50) and a plurality of said connecting members (42), which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17).

5. The yarn guide, wherein each of said connecting members (50) has a respective yarn hooking member (50) which is connected to an end portion of an outer side of the respective connecting member (42).

6. The yarn guide (17) according to any of items 1 to 5, that includes equal to or greater than two but equal to or less than sixteen yarn hooking members (50).

7. The yarn guide (17) according to any of items 1 to 6, wherein the yarn hooking member (50) contains a material having higher wear resistance than that of the central part (41).

8. The yarn guide (17) according to any one of items 1 to 7, wherein the assisting member (43) is formed as to entirely encircle the central part (41).

9. The yarn guide (17) according to any one of items 1 to 8, wherein at least a part of each of the central part (41), the connecting member (42), and the assisting member (43) are positioned on a same plane.

10. The yarn guide (17) according to any one of items 1 to 9, wherein the connecting member (42) is rod-shaped or the yarn hooking member (50) is hook-shaped.

11. The yarn guide (17) according to any one of items 1 to 9, wherein the connecting member (42) and the assisting member (43) are constituted by a disk member in which holes are formed.

12. A yarn accumulating device (14) comprising:

the yarn guide (17) according to any one of items 1 to 11; and  
a yarn accumulating roller (15) that is arranged on one side in an axial direction that passes

through the rotation center of the yarn guide (17), and that is adapted to accumulate the yarn (10).

13. The yarn accumulating device (14) according to item 12 comprising:

an adjusting mechanism (60) adapted to adjust resistance required to cause the yarn guide (17) to rotate with respect to the yarn accumulating roller (15), wherein  
the adjusting mechanism (60) includes an operating member (62) provided to be operated to adjust magnitude of the resistance, wherein the operating member (62) is arranged in a space that is formed on a radially inner side of an outer peripheral surface of the yarn accumulating roller (15).

14. The yarn accumulating device (14) according to item 12 or 13, wherein, when an end portion on a side on which the yarn guide (17) is arranged is seen in the axial direction, at least a part of the assisting member (43) is positioned further on the outer side than an end portion of a radially outer side of the yarn accumulating roller (15).

15. The yarn accumulating device (14) according to any one of items 12 to 14, wherein, when the end portion on the side on which the yarn guide (17) is arranged is seen in the axial direction, at least a part of the yarn hooking member (50) is positioned further on an inner side than the end portion of the radially outer side of the yarn accumulating roller (15).

16. The yarn accumulating device (14) according to any one of items 12 to 15, wherein, at least a part of the yarn hooking member (50) is positioned between two end portions of the yarn accumulating roller (15) in the axial direction, and is positioned further on the outer side than the end portion of the radially outer side of the yarn accumulating roller (15).

17. A yarn winding machine comprising:

the yarn accumulating device (14) according to any one of items 12 to 16;  
a yarn supplying section (9) that is arranged upstream of the yarn accumulating device (14) in a yarn traveling direction, and that is adapted to supply the yarn (10); and  
a winding device (96) that is arranged downstream of the yarn accumulating device (14) in the yarn traveling direction, and that is adapted to wind the yarn (10).

**Claims**

1. A yarn guide (17) for a yarn accumulating device (14) comprising:

a central part (41) that is positioned at a rotation center;  
 at least one yarn hooking member (50) that is positioned on an outer periphery of the yarn guide (17), and that is adapted to hook a yarn (10) and to guide the yarn (10); and  
 at least one connecting member (42) that extends outward from the central part (41), wherein said yarn hooking member (50) is connected to the central part (41) via said connecting member (42),

**characterized in that**

the yarn guide (17) further includes an assisting member (43) that includes an arc-shaped portion or a linear portion connected to an end portion of an outer side of the connecting member (42) and preferably extends in a circumferential direction of the yarn guide (17), and that is adapted to assist in yarn guiding performed by the yarn hooking member (50),

**or characterized in that**

the yarn guide (17) includes a plurality of said yarn hooking members (50) and a plurality of said connecting members (42), which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17).

2. The yarn guide (17) according to claim 1, wherein said yarn hooking member (50) is connected to the central part (41) via said assisting member (43).
3. The yarn guide (17) according to claim 1 or 2, comprising a plurality of said yarn hooking members (50) which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17), or/and comprising a plurality of said connecting members (42) which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17) or/and comprising a plurality of said assisting members (43) which preferably are located displaced with respect to each other in a circumferential direction of the yarn guide (17).
4. The yarn guide (17) according to claim 1, wherein each of said connecting members (42) has a respective yarn hooking member (50) which is connected to an end portion of an outer side of the respective

connecting member (42).

5. The yarn guide (17) as claimed in any of Claims 1 to 4, that includes equal to or greater than two but equal to or less than sixteen yarn hooking members (50).
6. The yarn guide (17) as claimed in any of Claims 1 to 5, wherein the yarn hooking member (50) contains a material having higher wear resistance than that of the central part (41).
7. The yarn guide (17) as claimed in any one of Claims 1 to 6, wherein the assisting member (43) is formed as to entirely encircle the central part (41).
8. The yarn guide (17) as claimed in any one of Claims 1 to 7, wherein at least a part of each of the central part (41), the connecting member (42), and the assisting member (43) are positioned on a same plane.
9. The yarn guide (17) as claimed in any one of Claims 1 to 8, wherein the connecting member (42) is rod-shaped or/and wherein the yarn hooking member (50) is hook-shaped.
10. The yarn guide (17) as claimed in any one of Claims 1 to 9, wherein the connecting member (42) and the assisting member (43) are constituted by a disk member in which holes are formed.
11. A yarn accumulating device (14) comprising:  
 the yarn guide (17) as claimed in any one of Claims 1 to 10; and  
 a yarn accumulating roller (15) that is arranged on one side in an axial direction that passes through the rotation center of the yarn guide (17), and that is adapted to accumulate the yarn (10).
12. The yarn accumulating device (14) as claimed in Claim 11 comprising:  
 an adjusting mechanism (60) adapted to adjust resistance required to cause the yarn guide (17) to rotate with respect to the yarn accumulating roller (15), wherein  
 the adjusting mechanism (60) includes an operating member (62) provided to be operated to adjust magnitude of the resistance, wherein  
 the operating member (62) is arranged in a space that is formed on a radially inner side of an outer peripheral surface of the yarn accumulating roller (15).
13. The yarn accumulating device (14) as claimed in

Claim 11 or 12, wherein, when an end portion on a side on which the yarn guide (17) is arranged is seen in the axial direction, at least a part of the assisting member (43) is positioned further on the outer side than an end portion of a radially outer side of the yarn accumulating roller (15). 5

14. The yarn accumulating device (14) as claimed in any one of Claims 11 to 13, wherein, when the end portion on the side on which the yarn guide (17) is arranged is seen in the axial direction, at least a part of the yarn hooking member (50) is positioned further on an inner side than the end portion of the radially outer side of the yarn accumulating roller (15). 10 15

15. The yarn accumulating device (14) as claimed in any one of Claims 11 to 14, wherein, at least a part of the yarn hooking member (50) is positioned between two end portions of the yarn accumulating roller (15) in the axial direction, and is positioned further on the outer side than the end portion of the radially outer side of the yarn accumulating roller (15). 20

16. A yarn winding machine comprising: 25  
the yarn accumulating device (14) as claimed in any one of Claims 11 to 15;  
a yarn supplying section (9) that is arranged upstream of the yarn accumulating device (14) in a yarn traveling direction, and that is adapted to supply the yarn (10); and 30  
a winding device (96) that is arranged downstream of the yarn accumulating device (14) in the yarn traveling direction, and that is adapted to wind the yarn (10). 35

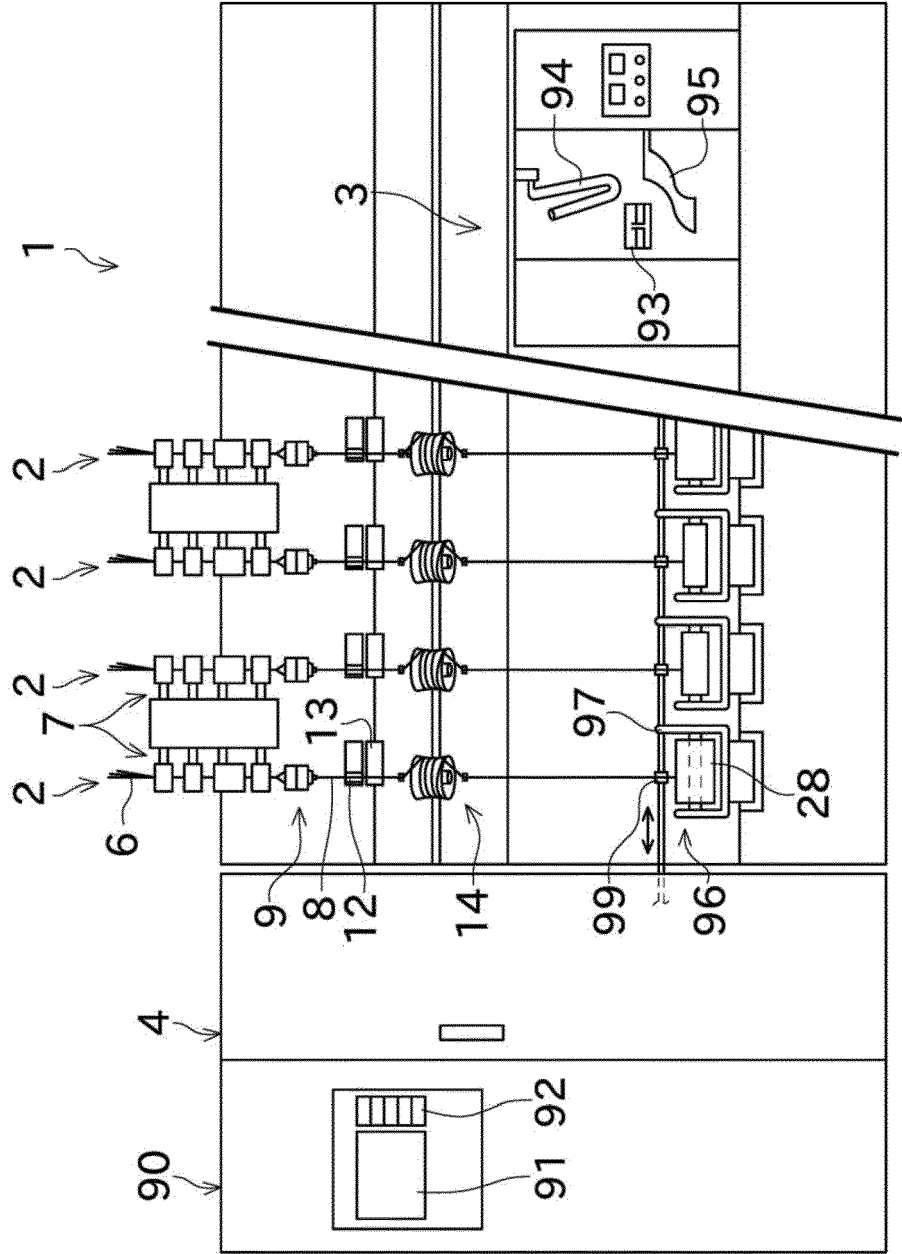
40

45

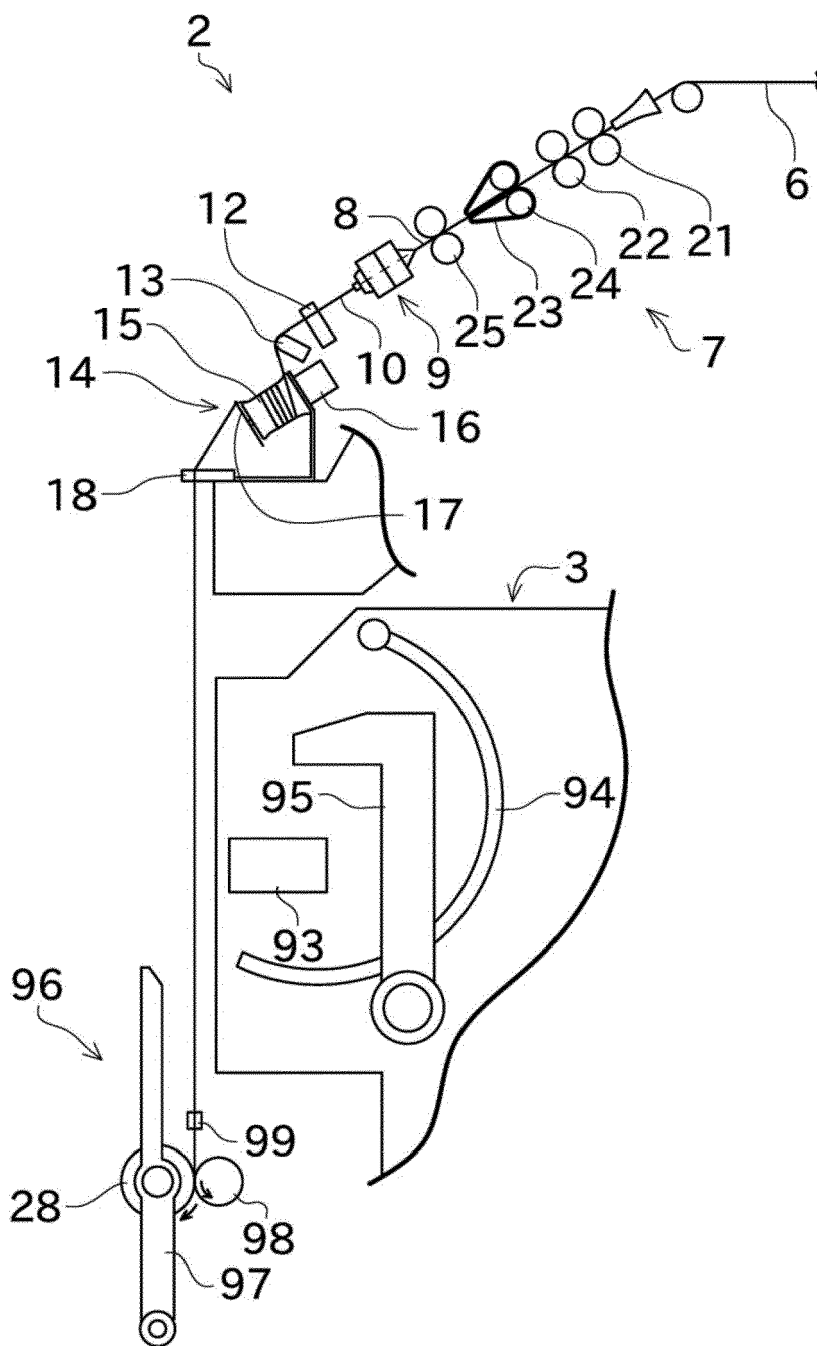
50

55

FIG.1

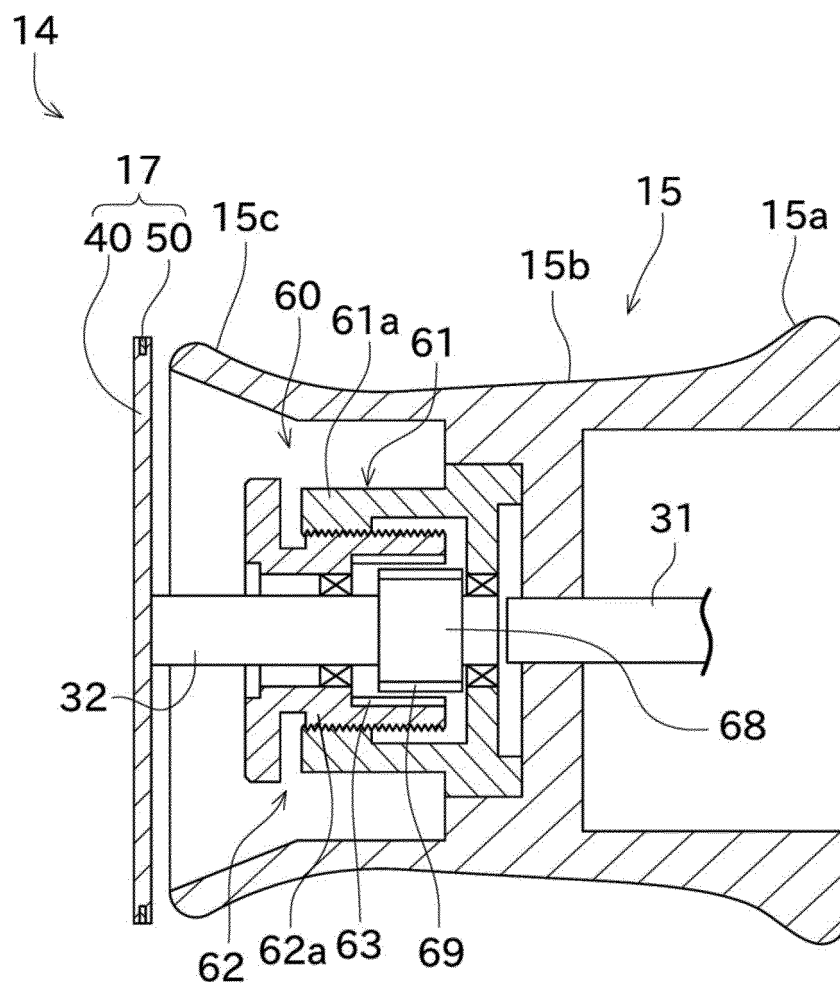


**FIG.2**

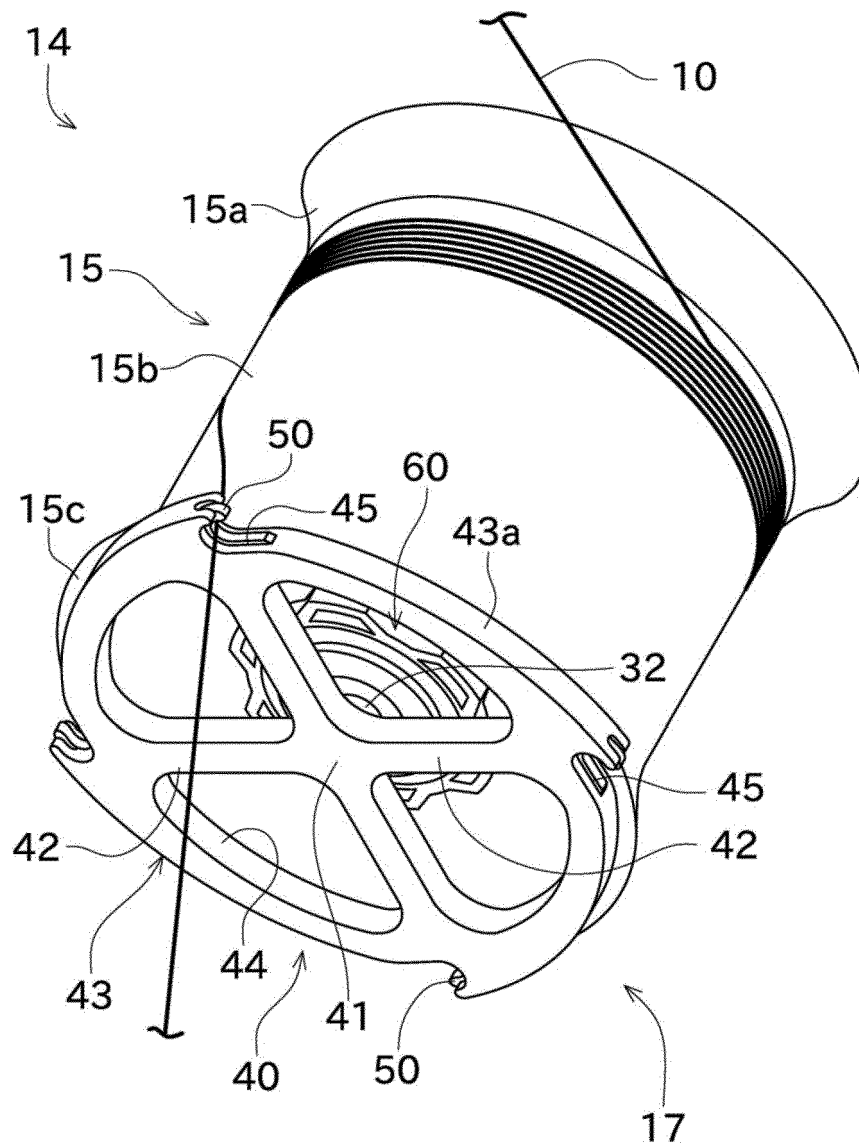




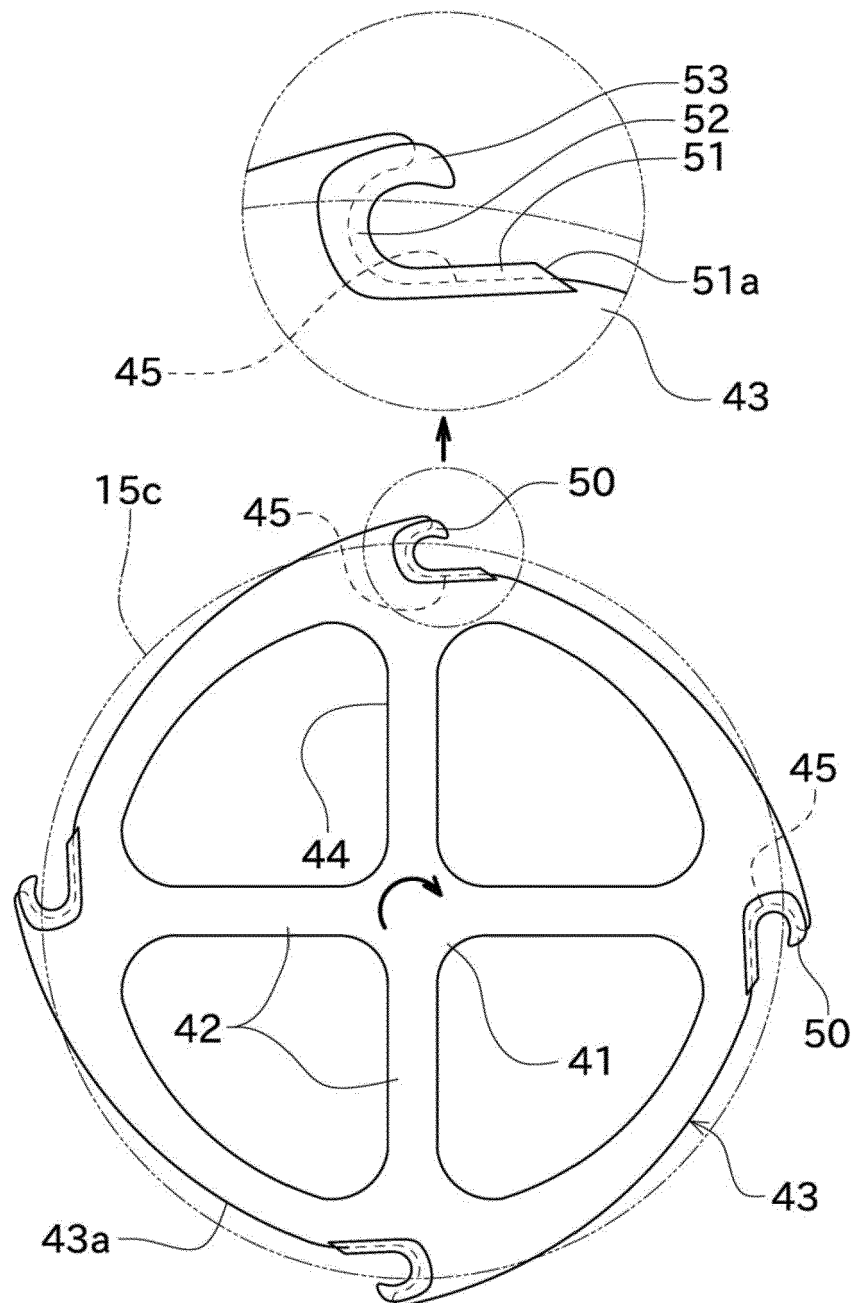
**FIG.3**



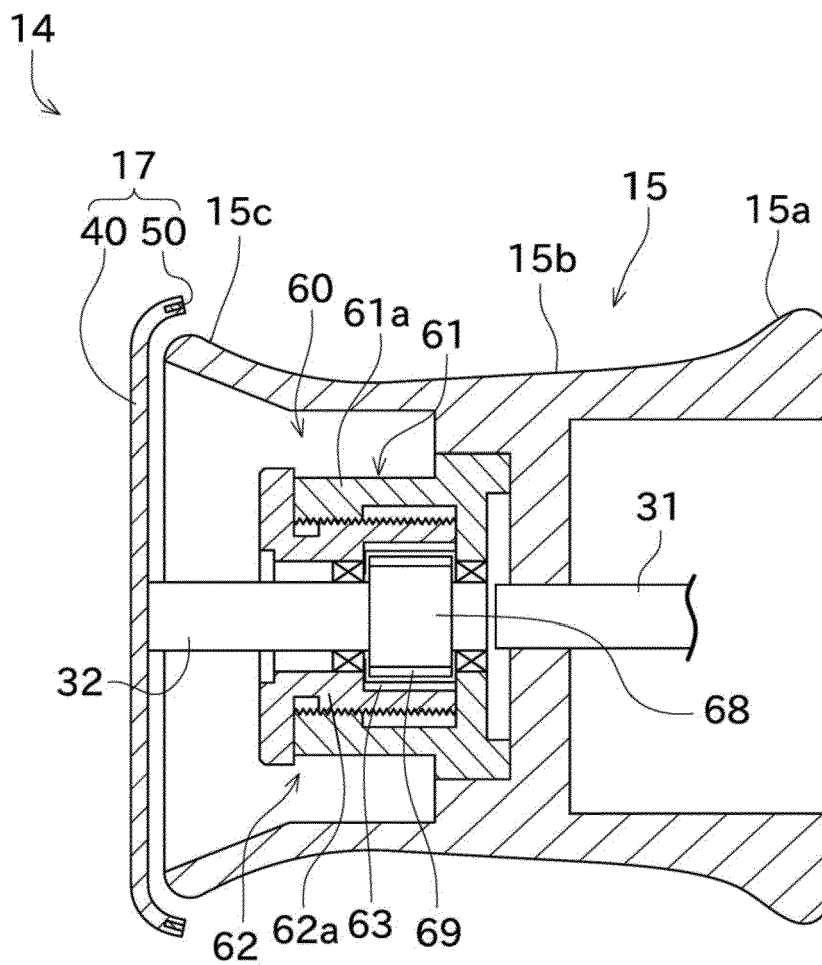
**FIG.4**



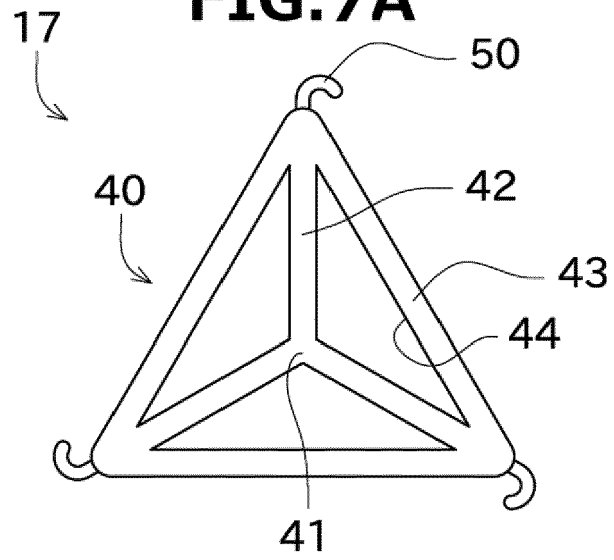
**FIG.5**



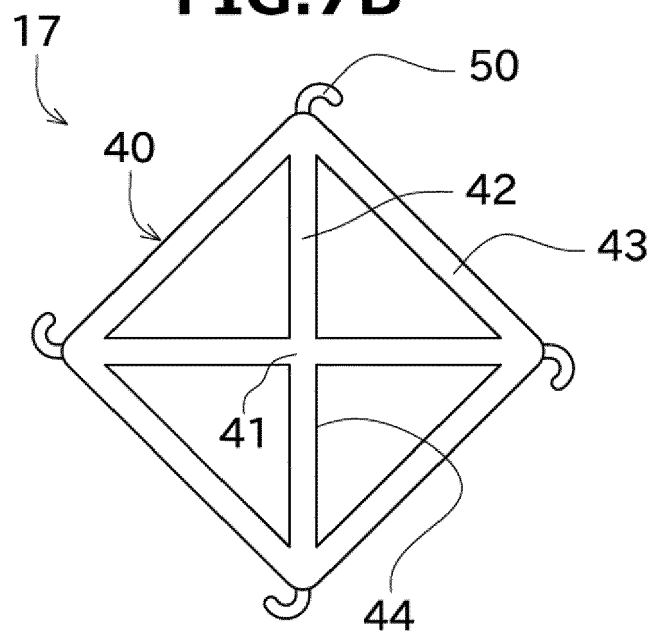
**FIG.6**



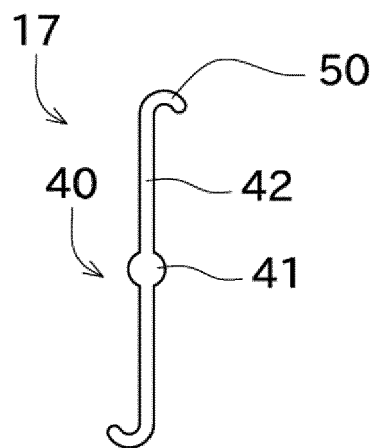
**FIG.7A**



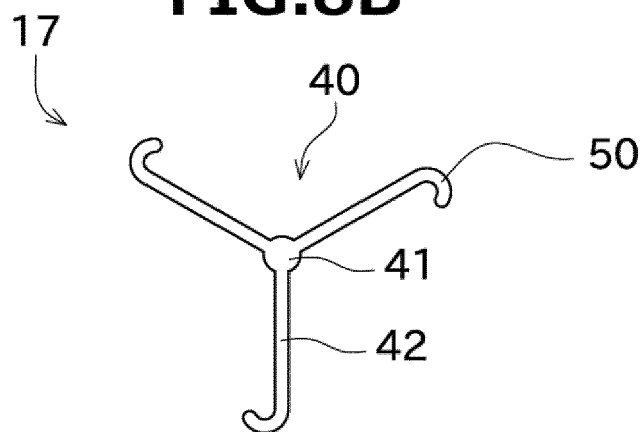
**FIG.7B**



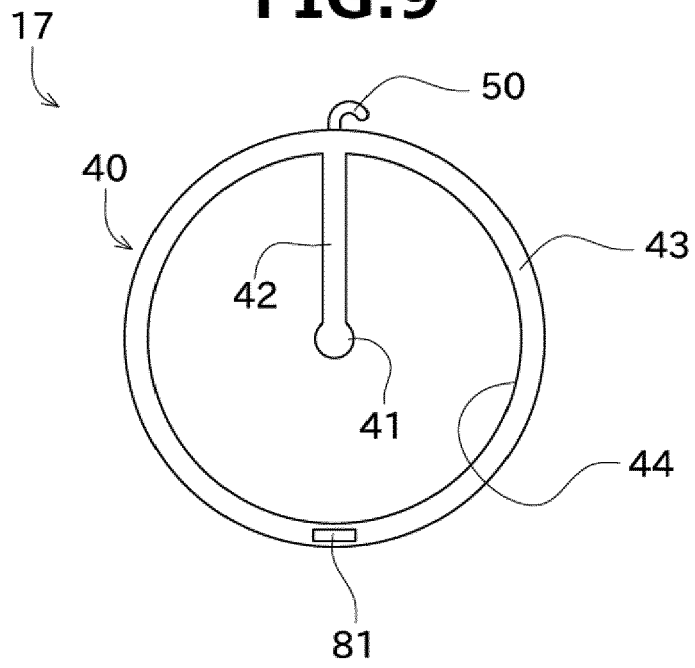
**FIG.8A**



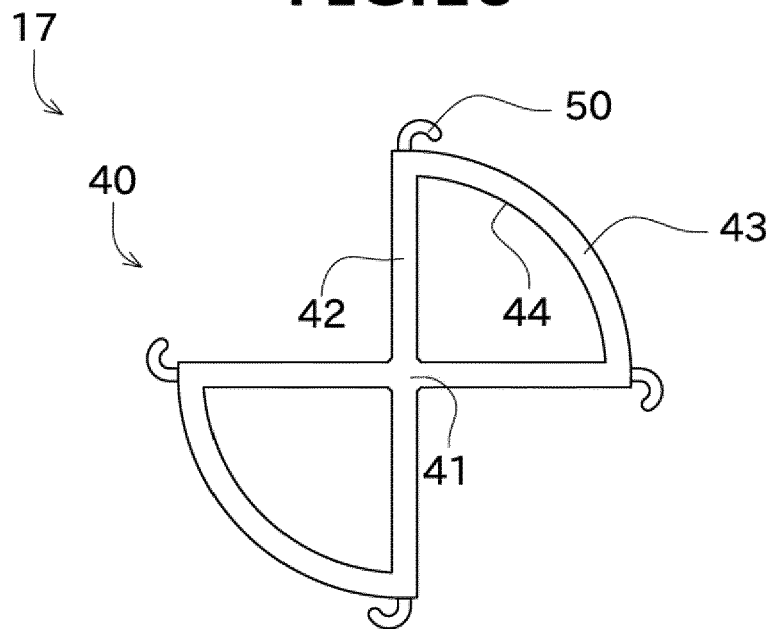
**FIG.8B**



**FIG.9**



**FIG.10**





## EUROPEAN SEARCH REPORT

 Application Number  
 EP 18 19 0233

5

10

15

20

25

30

35

40

45

50

55

2

EPO FORM 1503 03.82 (P04C01)

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 2 889 250 A1 (RIETER CZ S R O [CZ]) 1 July 2015 (2015-07-01)  * paragraphs [0015] - [0018]; figures 1-3 *	1,4,6,9, 11,13, 15,16	INV. B65H51/22
X,D	JP S59 138563 A (SCHUBERT & SALZER MASCHINEN) 9 August 1984 (1984-08-09) * abstract * & EP 0 108 195 A1 (SCHUBERT & SALZER MASCHINEN [DE]) 16 May 1984 (1984-05-16) * page 14, line 9 - page 15, line 13; figures 1-3 *	1-16	
X	EP 0 226 930 A1 (IRO AB [SE]) 1 July 1987 (1987-07-01) * figures 3,5 *	1,3-5, 7-9,11	
X	US 3 915 403 A (KING HERBERT R) 28 October 1975 (1975-10-28)  * figures 1-3 *	1-3,5, 7-9,11, 13	TECHNICAL FIELDS SEARCHED (IPC)  B65H D01H D04B D03D
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>11 January 2019</b>	Examiner <b>Pussemier, Bart</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 19 0233

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-01-2019

10

15

20

25

30

35

40

45

50

55

ORM P0459

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2889250 A1	01-07-2015	CN 104787616 A	22-07-2015
		CZ 304712 B6	03-09-2014
		EP 2889250 A1	01-07-2015
		JP 2015120598 A	02-07-2015
		US 2015175381 A1	25-06-2015
-----			
JP S59138563 A	09-08-1984	CS 8306264 A2	16-09-1988
		DE 3238376 A1	26-04-1984
		EP 0108195 A1	16-05-1984
		GB 2128213 A	26-04-1984
		HK 30187 A	24-04-1987
		IN 161751 B	30-01-1988
		JP H0413272 B2	09-03-1992
		JP S59138563 A	09-08-1984
		MY 8700359 A	31-12-1987
		SE 454876 B	06-06-1988
-----			
EP 0226930 A1	01-07-1987	DE 3670104 D1	10-05-1990
		EP 0226930 A1	01-07-1987
		JP H0759779 B2	28-06-1995
		JP S63502360 A	08-09-1988
		KR 930010353 B1	16-10-1993
		US 4832270 A	23-05-1989
		WO 8703625 A1	18-06-1987
-----			
US 3915403 A	28-10-1975	NONE	
-----			

**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- JP S59138563 B [0003]
- JP S63502360 B [0004]