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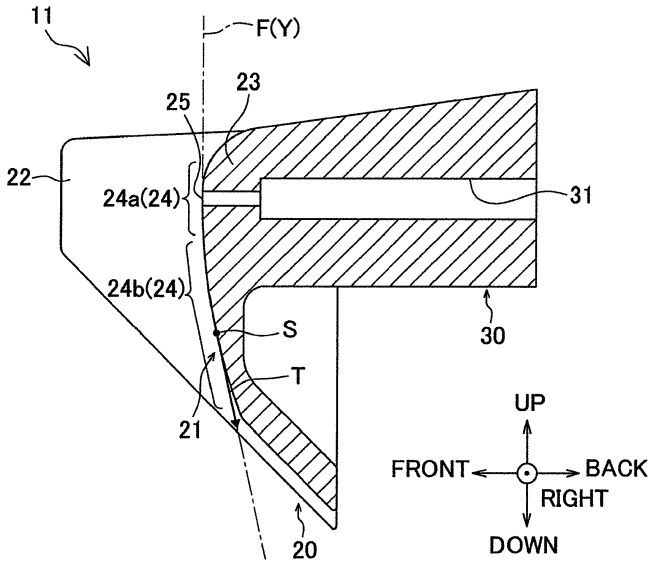
(54) OIL SUPPLY GUIDE AND SPUN YARN TAKE-UP APPARATUS

(57) An amount of oil applied to a yarn is suitably controlled. An oil supply guide 11 for applying oil to a yarn Y spun out from a spinning apparatus includes a guide main body 20 including a passage 21 in which the yarn Y runs, a discharge port 25 from which the oil is discharged toward the passage 21, and a contact surface 24 with which the yarn Y running in the passage 21 makes contact. The contact surface 24 includes a first curved surface 24a in which the discharge port 25 is formed and a second curved surface 24b which is on the downstream in the yarn running direction of the first curved surface 24a. The yarn Y starts to make contact with the contact surface 24 at the periphery of the discharge port 25, and is separated from the contact surface 24 as it runs in a direction of a tangent T of the second curved surface 24b at a predetermined position S.

FIG.3



EP 3 093 378 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an oil supply guide configured to apply oil to a yarn spun out from a spinning apparatus and a spun yarn take-up apparatus including the oil supply guide.

[0002] An oil supply guide configured to apply oil to a yarn spun out from a spinning apparatus is recited in Patent Literature 1 (Japanese Unexamined Patent Publication No. 2007-9342), for example. In the oil supply guide of Patent Literature 1, an oil supply hole is provided above a contact surface with which the yarn makes contact, and oil is applied to the yarn as the yarn runs while being in contact with the contact surface where the oil supplied from the oil supply hole flows (i.e., where the oil adheres to).

SUMMARY OF THE INVENTION

[0003] In the oil supply guide of Patent Literature 1, on the downstream in the yarn running direction of the oil supply guide, the yarn path is bended to pull the yarn toward one side (right side in FIG. 1 of Patent Literature 1) so that the yarn is pressed onto the contact surface. This causes the yarn to be certainly in contact with the contact surface, and the application of the oil to the yarn is facilitated. However, because the yarn path is bended, a part at which the yarn is separated from the contact surface is a corner portion, and hence the oil adhering to the yarn is disadvantageously scraped off from the yarn as the yarn makes contact with the corner portion.

[0004] In addition to the above, if the yarn makes contact with the contact surface before the oil is applied to the yarn, the quality of the yarn may be deteriorated due to the friction with the contact surface. In this regard, when the oil supply hole is provided above the contact surface as in Patent Literature 1, the oil always adheres to the contact surface, and hence the yarn on which no oil is applied does not make contact with the contact surface. However, when the oil supply hole is provided above the contact surface, an amount of the oil tends to be fluctuated during the flow of the oil from the oil supply hole to the contact surface, and hence it is difficult to uniformly apply the oil to the yarn.

[0005] An object of the present invention is therefore to suitably control an amount of oil applied to a yarn, in an oil supply guide configured to apply oil to a yarn spun out from a spinning apparatus and a spun yarn take-up apparatus including the oil supply guide.

[0006] To achieve the objective above, the present invention recites an oil supply guide for applying oil to a yarn spun out from a spinning apparatus, including a guide main body including a passage in which the yarn run, a discharge port from which the oil is discharged toward the passage, and a contact surface with which the yarn running in the passage makes contact, the contact surface including a first curved surface in which the discharge port is formed and a second curved surface on the downstream in a yarn running direction of the first curved surface, and the yarn starting to make contact with the contact surface at a periphery of the discharge port and being separated from the contact surface as the yarn runs in a direction of a tangent of the second curved surface at a predetermined position.

[0007] In the oil supply guide of the present invention, the yarn starts to make contact with the contact surface at the periphery of the oil discharge port formed in the first curved surface. The oil discharged from the discharge port is therefore immediately applied to the yarn, and hence fluctuation in the amount of the applied oil is restrained. In addition to the above, because the yarn runs along the tangent of the second curved surface at the predetermined position when the yarn is separated from the contact surface, the oil is not scraped off by a corner portion. As such, according to the present invention, fluctuation in the amount of the applied oil is restrained and unintentional scrape-off of the applied oil is restrained, with the result that the amount of the oil applied to the yarn is suitably controllable.

[0008] The present invention is preferably arranged such that the contact surface is entirely a curved surface from the first curved surface to the second curved surface.

[0009] When a part of the contact surface is flat, the yarn tends to float from the flat portion at a central part of the flat portion, and the force of pressing the yarn onto the contact surface is weak at this part. For this reason, the oil may not be properly applied from the contact surface to the yarn. In this regard, when the entirety of the contact surface is a curved surface as above, the yarn is allowed to easily maintain the state of being in close contact with the contact surface, and hence the oil is suitably applied.

[0010] In addition to the above, the present invention recites a spun yarn take-up apparatus including: the oil supply guide above; and a cooling cylinder which is provided on the upstream in the yarn running direction of the oil supply guide and includes an internal space in which the yarn runs and to which cooling wind is supplied, the oil supply guide being provided so that the discharge port is distanced by 20mm or shorter from an extension of a central axis of the cooling cylinder in a direction in which the discharge port opens.

[0011] When the yarn is cooled by using the cooling cylinder, the yarn is preferably arranged to run at the central axis of the cooling cylinder as much as possible, to cause the cooling wind to be uniformly supplied in the circumferential direction. In this regard, as described above, the discharge port is arranged to be distanced by 20mm or shorter in the opening direction of the discharge port from the extension of the central axis of the cooling cylinder. With this arrangement, the yarn path from the spinning apparatus to the oil supply guide via the cooling cylinder extends more or less along the central axis of

the cooling cylinder, with the result that the yarn is favorably cooled by the cooling cylinder.

[0012] In regard to the above, preferably, an angle between the extension and the tangent of the second curved surface at the predetermined position is 13 degrees or larger and 16 degrees or smaller.

[0013] When the angle above is small, the yarn is less firmly pressed onto the contact surface. In the meanwhile, when the angle is too large, the yarn is excessively pressed onto the contact surface, with the result that the oil adhering to the yarn may be scraped off. For this reason, when the angle is not smaller than 13 degrees and not larger than 16 degrees, the yarn is suitably pressed onto the contact surface and the state of suitable application of the oil on the yarn is maintained.

[0014] According to the present invention, fluctuation in the amount of the applied oil is restrained and unintentional scrape-off of the applied oil is restrained, with the result that the amount of the oil applied to the yarn is suitably controllable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 schematically shows a spun yarn take-up apparatus including an oil supply guide.

FIG. 2 is a front elevation of the oil supply guide.

FIG. 3 is a cross section taken at the III-III line in FIG. 2.

FIG. 4 is a schematic view for explaining the disposition of the oil supply guide.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(Spun Yarn Take-Up Apparatus)

[0016] The following will describe an embodiment of the present invention. FIG. 1 schematically shows a spun yarn take-up apparatus including an oil supply guide. The spun yarn take-up apparatus 1 takes up synthetic-resin yarns Y spun out from a spinning apparatus 2 and each formed of filaments F and forms packages P by winding the yarns Y onto bobbins B, respectively. The upward, downward, frontward, backward, leftward, and rightward directions shown in FIG. 1 will be used as the upward, downward, frontward, backward, leftward, and rightward directions of the spun yarn take-up apparatus 1.

[0017] The spun yarn take-up apparatus 1 includes members such as a cooling unit 3, an oil supply unit 4, a drawing unit 5, take-up rollers 6 and 7, an interlacing device 8, and a winding device 9. In the spinning apparatus 2, to begin with, polymer supplied from a polymer supplier (not illustrated) formed of a gear pump or the like is pushed out downward through spinnerets 2a lined up in the left-right direction, and yarns Y formed of filaments F are spun out while being side by side in a direction away from the viewer of FIG. 1.

[0018] The yarns Y spun out from the spinnerets 2a of the spinning apparatus 2 run on a yarn path which is along the cooling unit 3, the oil supply unit 4, the drawing unit 5, the take-up roller 6, the interlacing device 8, and the take-up roller 7, while being side by side in the direction away from the viewer of FIG. 1. The yarns Y are distributed in the front-back direction from the take-up roller 7, and are then wound onto the respective bobbins B at the winding device 9.

[0019] The cooling unit 3 is provided with cylindrical cooling cylinders 10. Each cooling cylinder 10 is provided below the spinnerets 2a of the spinning apparatus 2. The yarns Y spun out from the spinnerets 2a of the spinning apparatus 2 run downward in an internal space 10a of each cooling cylinder 10, along the axial direction of the cooling cylinder 10. Around the internal space 10a, a flow control section 10b is formed. Cooling wind supplied from an unillustrated compressed air supplier flows into the internal space 10a, under the control of the flow control section 10b. The flow control section 10b predominantly controls the cooling wind so that the flow rate of the cooling wind flowing into the internal space 10a is substantially uniform in the circumferential direction of the cooling cylinder 10.

[0020] The oil supply unit 4 includes oil supply guides 11 which are provided below the respective cooling cylinders 10. The oil supply guide 11 groups filaments F spun out from the spinnerets 2a into a single yarn Y, and applies oil to the yarn Y (the filaments F). This oil supply guide 11 will be detailed later.

[0021] The drawing unit 5 is provided below the oil supply unit 4. The drawing unit 5 includes a heat retaining box 12 and heating rollers (not illustrated) housed in the heat retaining box 12. By the heating rollers, the drawing unit 5 draws the yarns Y while heating them.

[0022] The yarns Y drawn by the drawing unit 5 are sent to the winding device 9 by the take-up rollers 6 and 7. Between the take-up rollers 6 and 7, the interlacing device 8 is provided to interlace the filaments constituting one yarn Y.

[0023] The winding device 9 includes members such as a base 13, a turret 14, two bobbin holders 15, a supporting frame 16, a contact roller 17, and a traverse unit 18. The winding device 9 rotates the bobbin holder 15 so as to simultaneously wind the yarns Y supplied from the take-up roller 7 onto the bobbins B, and eventually form packages P.

[0024] To the base 13, the disc-shaped turret 14 is attached. The turret 14 is rotationally driven by an unillustrated motor. By the turret 14, two long bobbin holders 15 are cantilevered to extend in the front-back direction. To each bobbin holder 15, the cylindrical bobbins B are attached to be lined up along the axial direction of the bobbin holder 15. As the turret 14 rotates, the two bobbin holders 15 are switchable between an upper winding position and a lower retracted position.

[0025] The supporting frame 16 is a long frame-shaped member extending in the front-back direction. This sup-

porting frame 16 is fixedly attached to the base 13. At a lower part of the supporting frame 16, a roller supporting member 19 which is long in the front-back direction is attached to be movable in the up-down direction relative to the supporting frame 16. The roller supporting member 19 supports the contact roller 17 which extends along the axial direction of the bobbin holder 15 to be rotatable. This contact roller 17 makes contact with a package P in the process of formation. As a predetermined contact pressure is applied to the package P, the shape of the package P is adjusted.

[0026] The traverse unit 18 includes traverse guides 18a which are lined up in the front-back direction. The traverse guides 18a are driven by an unillustrated motor, so as to reciprocate in the front-back direction. As the traverse guides 18a reciprocate with the yarns Y being threaded thereon, the yarns Y are wound onto the corresponding bobbins B while being traversed about the fulcrum guides 18b in the front-back direction.

(Oil Supply Guide)

[0027] FIG. 2 is an front elevation of the oil supply guide 11 whereas FIG. 3 is a cross section taken at the III-III line in FIG. 2. The oil supply guide 11 is configured to apply oil to a yarn Y which are spun out from the spinning apparatus 2 and are each formed of filaments F. The oil supply guide 11 is provided with a guide main body 20 having a passage 21 in which the yarn Y runs and an oil supplier 30 which is integrated with the guide main body 20 and supplies oil to the guide main body 20. The guide main body 20 and the oil supplier 30 are made of a ceramics material such as alumina and zirconia.

[0028] As shown in FIG. 2, the guide main body 20 includes two side walls 22 opposing each other and a connecting portion 23 connecting the bottom portions of these side walls 22 with each other. Between the two side walls 22, the passage 21 in which the yarn Y runs downward is formed. The two side walls 22 have inclined surfaces 22a which are inwardly inclined toward the bottom (i.e., backward). The passage 21 is therefore narrowed toward the connecting portion 23. Furthermore, the inclined surfaces 22a are inwardly inclined in the downward direction, and hence the passage 21 is narrowed downward. With this arrangement, scattered filaments F having reached the oil supply guide 11 are gradually grouped into a single yarn Y while running on the passage 21.

[0029] In the front surface of the connecting portion 23, a contact surface 24 with which the yarn Y running in the passage 21 makes contact is formed at a central part in the up-down direction. As shown in FIG. 3, this contact surface 24 includes a first curved surface 24a in which the discharge port 25 is formed and a second curved surface 24b which is formed on the downstream in the yarn running direction of the first curved surface 24a. Each of the first curved surface 24a and the second curved surface 24b is a curved surface bulging frontward. In the present embodiment, the first curved surface 24a and the second curved surface 24b are formed in an integrated manner, and the entire contact surface 24 from the first curved surface 24a to the second curved surface 24b is a curved surface.

[0030] In the first curved surface 24a, the discharge port 25 which is open to the passage 21 is formed across the substantially entire width of the passage 21. This discharge port 25 communicates with an oil supply hole 31 which is formed in the connecting portion 23 and the oil supplier 30 and horizontally extends in the front-back direction. This oil supply hole 31 is connected with an unillustrated oil supply device. Oil supplied from the oil supply device is discharged from the discharge port 25 to the passage 21 via the oil supply hole 31.

[0031] The discharge port 25 is formed at a position where the yarn Y mostly starts to make contact with the contact surface 24 (first curved surface 24a). To put it differently, the yarn path is arranged so that the yarn Y starts to make contact with the contact surface 24 at the periphery of the discharge port 25. Furthermore, the yarn path is arranged so that the yarn Y is separated from the contact surface 24 at the second curved surface 24b. To be more specific, the yarn Y is separated from the contact surface 24 as they run along a tangent T at a predetermined position S of the second curved surface 24b.

[0032] FIG. 4 is a schematic view for explaining the disposition of the oil supply guide 11. The oil supply guide 11 is provided below the cooling cylinder 10. In a strict sense, to firmly press the yarn Y onto the contact surface 24 and favorably apply the oil, the position of the front end portion of the contact surface 24 (the position of the discharge port 25 in the present embodiment) is preferably slightly frontward of an extension of the central axis A of the cooling cylinder 10. However, when the front end portion is too far away from the extension of the central axis A of the cooling cylinder 10, the yarn Y running in the internal space 10a of the cooling cylinder 10 is significantly deviated from the central axis A, with the result that it becomes difficult to uniformly supply the cooling wind to the yarn Y in the circumferential direction.

[0033] For this reason, in the present embodiment, the discharge port 25 is provided such that the discharge port 25 is frontward of the extension of the central axis A of the cooling cylinder 10 and the distance L between the extension and the discharge port 25 in the opening direction (front-back direction) (i.e., the distance L from the extension when viewed in the direction in which the spinnerets 2a are lined up) is 20mm or shorter. As the distance in the up-down direction between the spinnerets 2a and the discharge port 25 is about 600 to 1600mm, the ratio of the distance L to this distance is about 0.033 (=20/600) or lower. Furthermore, in the present embodiment, an angle θ formed between the extension of the central axis A of the cooling cylinder 10 and the tangent T of the contact surface 24 at the predetermined position S is arranged not to be smaller than 13 degrees and not to be larger than 16 degrees.

(Effects)

[0034] In the oil supply guide 11 of the present embodiment, because the yarn Y starts to make contact with the contact surface 24 at the periphery of the oil discharge port 25 formed in the first curved surface 24a, the oil discharged from the discharge port 25 is immediately applied to the yarn Y, and the oil application is not influenced by the flow of the oil on the oil supply guide 11 and variations in the state of oil accumulation. On this account, fluctuation in the amount of the applied oil is restrained. In addition to the above, because the yarn Y runs along the tangent T of the second curved surface 24b at the predetermined position S when the yarn Y is separated from the contact surface 24, the oil is not scraped off by a corner portion. As such, in the oil supply guide 11 of the present embodiment, fluctuation in the amount of the applied oil is restrained and unintentional scrape-off of the applied oil is restrained, with the result that the amount of the oil applied to the yarn Y is suitably controllable.

[0035] When the drawing unit 5 for heating the yarn Y is provided as in the spun yarn take-up apparatus 1 of the present embodiment, oil with a small water content, i.e., high-viscosity oil (e.g., oil with the viscosity of about $10mm^2/s$ or higher and $200mm^2/s$ or lower) may be used to improve the heating efficiency of the drawing unit 5. When such high-viscosity oil is used, provided that an oil supply hole is provided above a contact surface as in Patent Literature 1, an oil amount significantly fluctuates in a process of oil flow from the oil supply hole to the contact surface because of constant changes in the state of flowing and in the state of accumulation from the oil supply hole to the position to make contact with the yarn Y, with the result that uniform application of the oil is difficult. In this regard, in the oil supply guide 11 of the present embodiment, the oil is uniformly applied because fluctuation in the oil amount is less likely to occur as the oil discharged from the discharge port 25 is immediately applied to the yarn Y.

[0036] In addition to the above, in the present embodiment, the yarn Y (filaments F) starts to make contact with the contact surface 24 at the first curved surface 24a where the passage 21 is wide. For this reason, the filaments F are likely to be scattered at the position of making contact with the contact surface 24, and hence the oil is suitably applied to the filaments F.

[0037] When a part of the contact surface 24 is flat, the yarn Y tends to float from the flat portion at a central part of the flat portion, and the force of pressing the yarn Y onto the contact surface is weak at this part. For this reason, the oil may not be properly applied from the contact surface 24 to the yarn Y. In this regard, when the entirety of the contact surface 24 is a curved surface as in the oil supply guide 11 of the present embodiment, the yarn Y is allowed to easily maintain the state of being in close contact with the contact surface 24, and hence the oil is suitably applied.

[0038] In addition to the above, when the yarn Y is cooled by using the cooling cylinder 10, the yarn Y is preferably arranged to run at the central axis A of the cooling cylinder 10 as much as possible, to cause the cooling wind to be uniformly supplied in the circumferential direction. In this regard, in the present embodiment, the discharge port 25 is arranged to be distanced by 20mm or shorter in the opening direction of the discharge port 25 from the extension of the central axis A of the cooling cylinder 10. With this arrangement, the yarn path from the spinning apparatus 2 to the oil supply guide 11 via the cooling cylinder 10 extends more or less along the central axis A of the cooling cylinder 10, with the result that the yarn Y is favorably cooled by the cooling cylinder 10.

[0039] In addition to the above, when the angle θ (see FIG. 4) between the extension of the central axis A of the cooling cylinder 10 and the tangent T of the contact surface 24 at the predetermined position S is small, the yarn Y is less firmly pressed onto the contact surface 24. In the meanwhile, when the angle θ is too large, the yarn Y is excessively pressed onto the contact surface 24, with the result that the oil adhering to the yarn Y may be scraped off. For this reason, when the angle θ is not smaller than 13 degrees and not larger than 16 degrees, the yarn Y is suitably pressed onto the contact surface 24 and the state of suitable application of the oil on the yarn Y is maintained.

[0040] In addition to the above, when the curvature radius of the second curved surface 24b is short, i.e., less than 20mm, the contact length between the yarn Y and the oil supply guide 11 with a suitable yarn bending angle is short, i.e., equal to or shorter than 4.5mm. As such, the contact length is not sufficient for the application of the oil. On the contrary, when the curvature radius is too long, i.e., longer than 40mm, the contact length between the yarn Y and the oil supply guide 11 with a suitable yarn bending angle is equal to or longer than 11mm. As the yarn contact length is excessively long, the contact resistance is increased and the yarn Y is significantly damaged by the contact with the oil supply guide 11. In consideration of the above, when the curvature radius of the second curved surface 24b is arranged to be not shorter than 20mm and not longer than 40mm, the oil is suitably applied to the yarn Y, and at the same time the yarn Y is not damaged by the contact with the oil supply guide 11.

[Other Embodiments]

[0041] The present invention is not limited to the embodiment above and elements of the embodiment above can be suitably combined or changed within the scope of the present invention.

[0042] For example, while in the embodiment above the entirety of the contact surface 24 from the first curved surface 24a to the second curved surface 24b is a curved surface, a flat surface may exist between the first curved

surface 24a and the second curved surface 24b.

[0043] Furthermore, to suitably retain the oil on the contact surface 24 and favorably apply the oil to the yarn Y, an uneven portion such as a groove for retaining the oil may be formed in the contact surface 24.

[0044] While the present embodiment describes the device in which filaments F spun out from a single spinneret 2a are grouped into a single yarn Y, filaments F spun out from a single spinneret 2a may be grouped into plural yarns Y. In such a case, because the oil supply guide 11 must be provided for each yarn Y, plural oil supply guides 11 are provided to correspond to a single spinneret 2a.

Claims

1. An oil supply guide for applying oil to a yarn spun out from a spinning apparatus, comprising
a guide main body including a passage in which the yarn runs, a discharge port from which the oil is discharged toward the passage, and a contact surface with which the yarn running in the passage make contact,
the contact surface including a first curved surface in which the discharge port is formed and a second curved surface on the downstream in a yarn running direction of the first curved surface, and
the yarn starting to make contact with the contact surface at a periphery of the discharge port and being separated from the contact surface as the yarn runs in a direction of a tangent of the second curved surface at a predetermined position.

2. The oil supply guide according to claim 1, wherein, the contact surface is entirely a curved surface from the first curved surface to the second curved surface.

3. The oil supply guide according to claim 1 or 2, wherein, a curvature radius of the second curved surface is not shorter than 20mm and not longer than 40mm.

4. A spun yarn take-up apparatus comprising: the oil supply guide of any one of claims 1 to 3; and
a cooling cylinder which is provided on the upstream in the yarn running direction of the oil supply guide and includes an internal space in which the yarn runs and to which cooling wind is supplied,
the oil supply guide being provided so that the discharge port is distanced by 20mm or shorter from an extension of a central axis of the cooling cylinder in a direction in which the discharge port opens.

5. The spun yarn take-up apparatus according to claim 4, wherein, an angle between the extension and the tangent of the second curved surface at the predetermined position is 13 degrees or larger and 16 degrees or smaller.

FIG.1

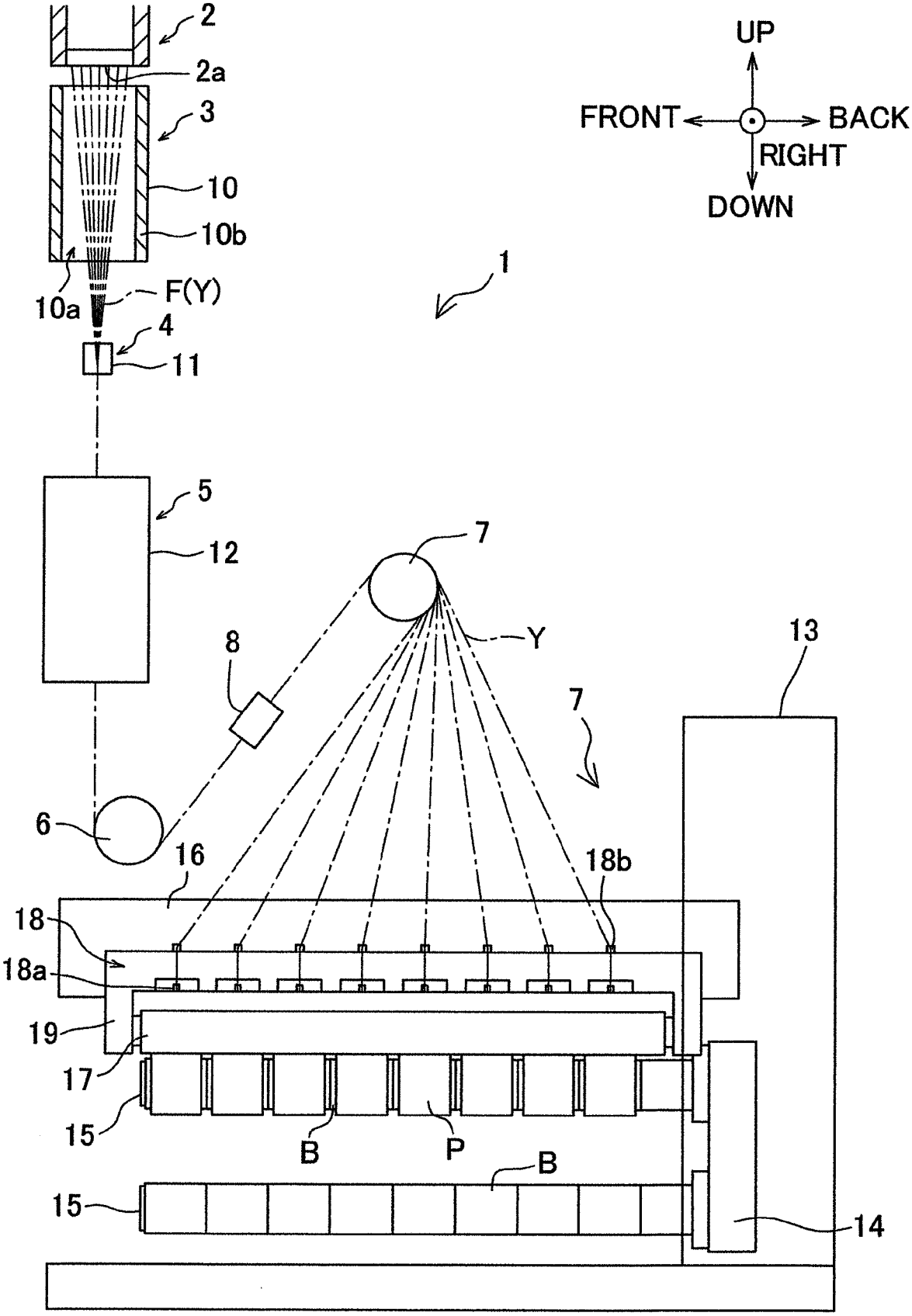

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FIG.2

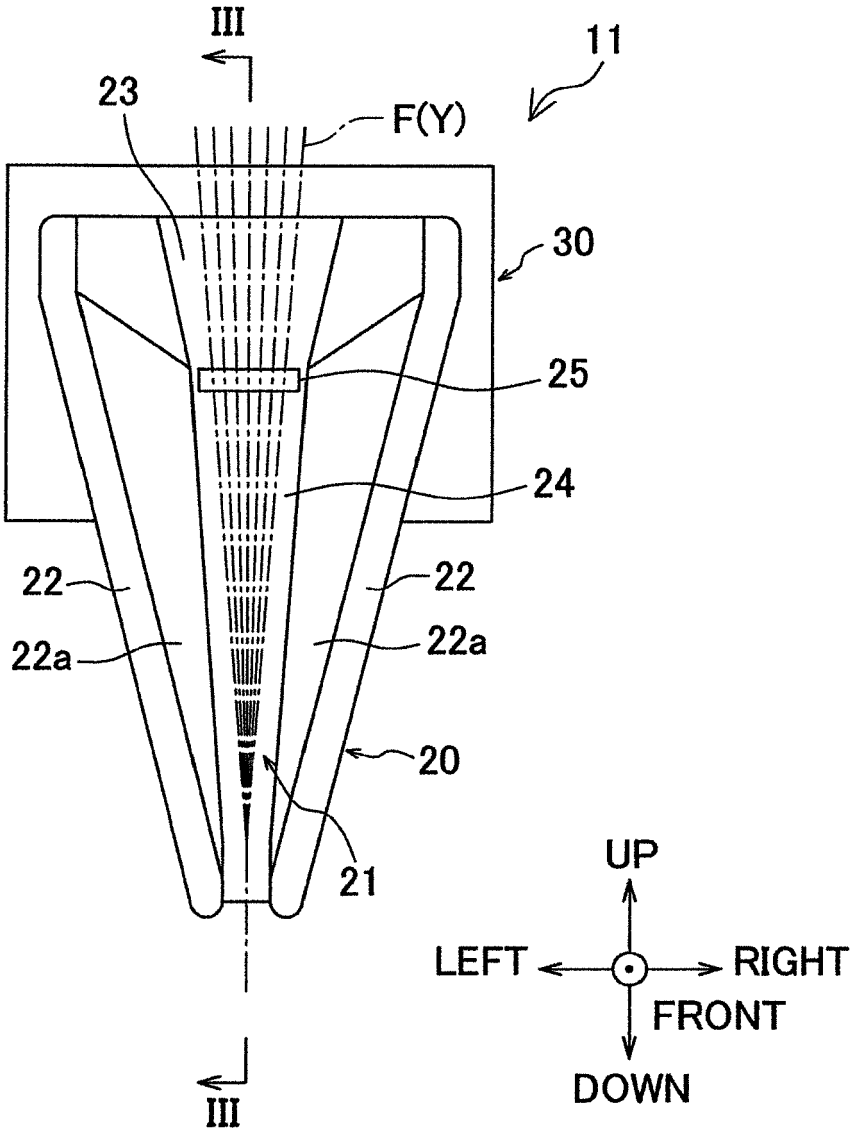
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FIG.3

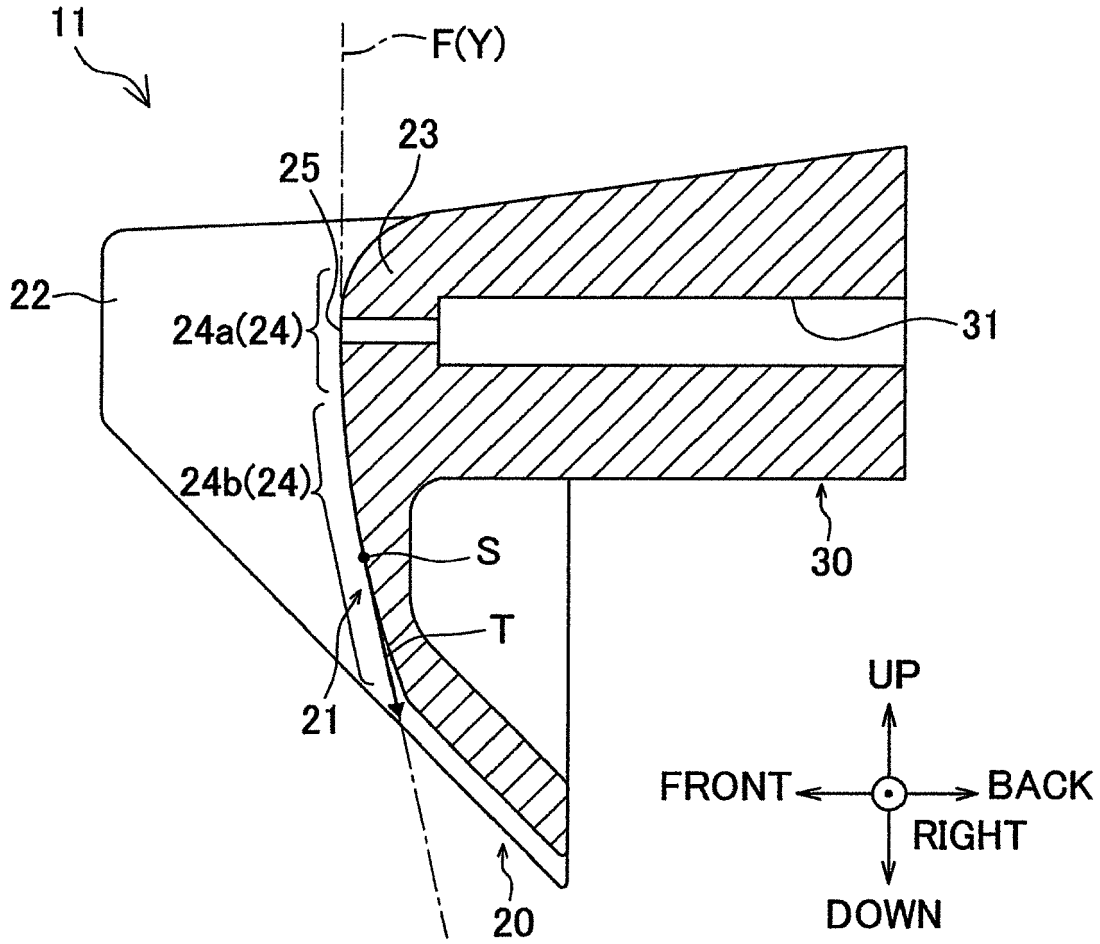
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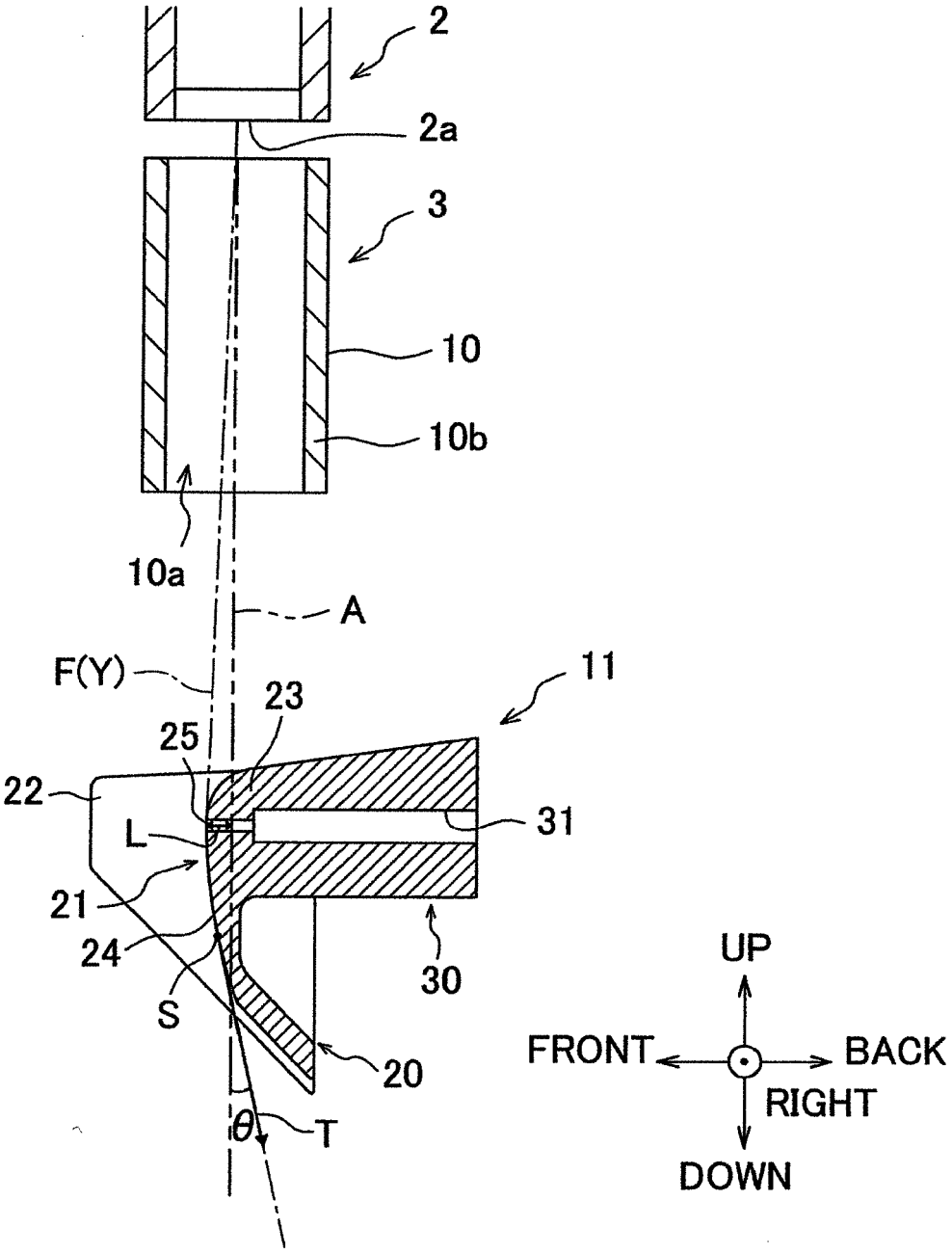
FIG.4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EUROPEAN SEARCH REPORT

Application Number
EP 16 16 7885

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	CN 203 583 032 U (JIANGSU CHALLEN FIBER S & T CO LTD) 7 May 2014 (2014-05-07) * paragraph [0014]; figure 1 * -----	1-5	INV. D01D5/096
Y	DE 10 2012 024853 A1 (OERLIKON TEXTILE GMBH & CO KG [DE]) 26 June 2014 (2014-06-26) * paragraphs [0008], [0011], [0023], [0024], [0029], [0030]; figure 1 * -----	1-5	

TECHNICAL FIELDS SEARCHED (IPC)

D01D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 September 2016	Van Beurden-Hopkins

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 16 7885

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
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19-09-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 203583032 U	07-05-2014	NONE	
DE 102012024853 A1	26-06-2014	NONE	

EPO FORM P0459

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

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Patent documents cited in the description

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