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(54) **GUIDE ELEMENT FOR A RING SPINNING MACHINE AND WORKSTATION, EQUIPPED THEREWITH, OF A RING SPINNING MACHINE**

(57) The invention relates to a guide element (22) for a strand-like fiber structure (1) for a ring spinning machine, having a guide slot (2), the guide slot having an inlet opening (3) with an inlet region (4) adjoining the inlet opening and narrowing in a funnel-shaped manner starting from the inlet opening, the guide slot having a transition region (5) connected to the inlet region (4) on an end of the inlet region that is remote from the inlet opening, the guide slot having an end region (6) which is arranged on an end of the transition region (5) facing away from the inlet region (4) and delimits the guide slot in a direction facing away from the inlet opening. The invention is characterized in that the guide slot has at least one change in direction in the transition region (5). A ring spinning machine having a corresponding guide element is also proposed.

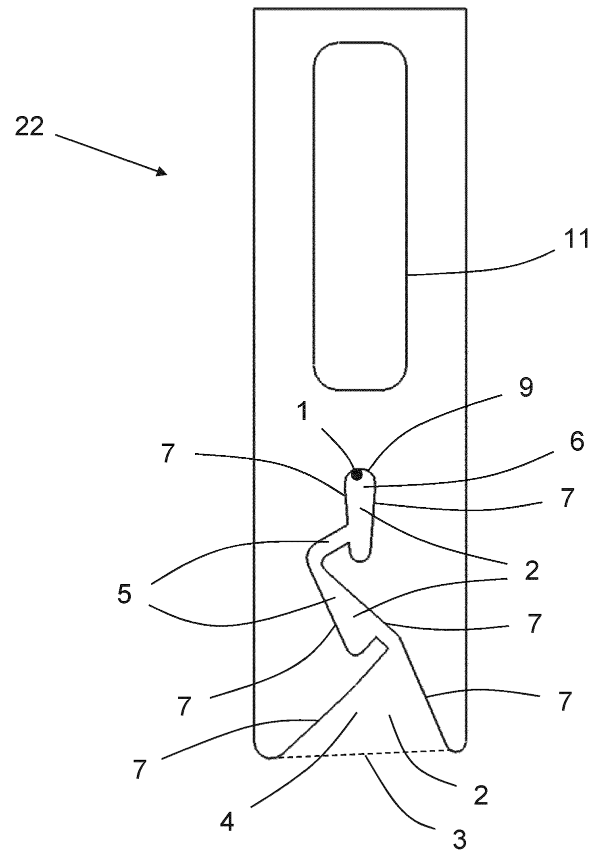

Fig. 1

EP 4 023 799 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a guide element for a strand-like fiber structure for a ring spinning machine.
[0002] The invention also relates to a ring spinning machine having at least one workstation for producing a yarn, the workstation having a guide element for guiding a strand-like fiber structure extending between a drafting system and a yarn winding unit of the workstation.

TECHNOLOGICAL BACKGROUND

[0003] Guide elements for guiding a moving fiber strand (for example in the form of what is known as pre-yarn or roving or a yarn) are used in a wide variety of designs in spinning and winding machines. A guide element of the type in question, which is configured to be used at a workstation of a ring spinning machine, is usually arranged between a drafting system and a ring rail and a spindle rail of the workstation and is usually releasably connected to a support of the workstation via a screw or other fastening means. In this case, the guide element has the task of guiding the fiber structure between the drafting system and the spindle rail and preventing a rotation introduced by the circular path of a ring traveler moving along a spinning ring that is arranged on the ring rail into the fiber structure from propagating via the guide element into the region of the drafting system.
[0004] A known embodiment of a guide element for a workstation of a ring spinning machine is formed by a coiled wire with an eyelet designed as a spinning channel, in the region of which eyelet a yarn is formed from the fiber composite coming from the drafting system. The fiber composite is an elongate fiber structure with individual fibers, some of which extend in parallel and which are twisted to form a yarn in the region of the eyelet.
[0005] Both the fiber composite coming from the drafting system and the yarn are referred to as a fiber structure in the context of the invention.
[0006] A free end of the coiled wire is releasably attached to a support arm of the workstation. If a yarn break occurs at the workstation, a fiber structure spun into yarn usually separates between the drafting system and the spindle rail, which means that it has to be re-spun either manually by an operator or using an operating robot. For this purpose, the free end of the fiber composite coming from the drafting system can be connected to the already spun yarn from the spindle rail or to a free end of an auxiliary yarn.
[0007] A disadvantage of the known guide element is that the operator or the operating robot must be guided around the wound wire from the front in the region of the spinning channel of the guide element (when looking at the workstation of the ring spinning machine) when a separate yarn is newly pieced, so that the operator or the operating robot can introduce an already spun yarn into the eyelet designed as a spinning channel. Accordingly, handling with the twisted wire as a guide element is very impractical. In addition, if the yarn breaks, there is a risk that the broken yarn will be wound around the wire as a result of the rotation and that an operator will have to loosen this winding manually.
[0008] Another embodiment of a guide element for a workstation of a ring spinning machine is known from EP 3 521 490 A1, the guide element being formed from a main body having an attachment region and a guide region. The guide region has a guide slot acting as a spinning channel with an inlet opening, the guide slot being formed by a ceramic, movably mounted guide insert which is glued into the main body.
[0009] The relatively high costs of such a guide element are disadvantageous. In addition, there is the complex manufacturing process and problems with yarn handling due to the movable guide insert, which has to be moved between two positions counter to a counterforce.

REPRESENTATION OF THE INVENTION

[0010] The object of the present invention is therefore to provide a guide element for a ring spinning machine which is improved over the prior art and a workstation, equipped therewith, of a ring spinning machine.
[0011] The object is achieved by a guide element for a ring spinning machine and a ring spinning machine (or one or more workstations of such a ring spinning machine) having the features of the independent claims.
[0012] The guide slot of the guide element according to the invention is designed as a continuous slot from an inlet opening to an end region. While the inlet region adjoining the inlet opening is used to insert a strand-like fiber structure during a piecing process at a workstation of a ring spinning machine, the end region is used to guide the fiber structure during the spinning process. In particular, in the end region there is a transition from an untwisted or only slightly twisted fiber composite coming from a drafting system at the workstation to a twisted yarn. As is customary in ring spinning machines, the rotation is generated by a ring traveler located in the region of a cop, the rotation continuing into the end region of the guide element.
[0013] In order to allow reliable and simple insertion of the fiber structure into the guide slot both manually and by

means of a piecing robot during a piecing process at the workstation, the inlet region is funnel-shaped, i.e. the clear width of the guide slot is reduced, preferably continuously, starting from the inlet opening to the transition from the inlet region to the transition region.

[0014] In order to prevent the fiber structure from exiting the guide slot again during the piecing process or during the subsequent spinning process, according to the invention the guide slot now has at least one change in direction in the transition region.

[0015] The guide slot is therefore not completely straight between the inlet region and the end region. Rather, the side walls delimiting the guide slot laterally have at least one, preferably several, bends or branches, so that the fiber structure is deflected laterally one or more times when it is inserted into the guide slot after passing the inlet region and in a plan view of the guide element. The change in direction ultimately has the effect that a yarn that extends in the end region of the guide slot during the spinning process is reliably held in the guide slot, since the change in direction makes it more difficult for the yarn to exit the end region via the transition region and finally via the inlet opening out of the guide slot. In particular, it is advantageous if the guide slot has a first change in direction in the transition region and a second change in direction at the transition between the transition region and the end region, both changes of direction branching off in different directions in a top view of the guide element in relation to the clockwise direction.

[0016] The entire guide slot preferably extends in a common plane. It is also advantageous if the side walls delimiting the guide slot each delimit a portion of the guide element which also lies in one plane. The guide slot is therefore designed in particular as a free space in a flat portion of the guide element.

[0017] It is also advantageous if the guide element has two side walls delimiting the inlet region and spanning an angle (α), the value of which is between 50° and 90°, preferably between 60° and 80°. While the guide slot should be relatively narrow in the transition region, it is advantageous if the inlet opening has a relatively large clear width. The above-mentioned angular range has proven to be advantageous here, since both requirements can be met with a tolerable overall size of the guide element. Otherwise, for certain applications the required installation space would be too large and/or the material requirements too high. The side walls delimiting the inlet region preferably each extend in a straight line. It is also advantageous if the two side walls delimiting the inlet region transition at different angles into the adjoining side walls which laterally delimit or define the transition region. In this case, the fiber structure already undergoes a first change in direction when it is moved from the inlet opening into the transition region.

[0018] It is particularly advantageous if the guide element has, in the transition region, two side walls spanning an angle (β), which side walls are adjacent to one another and delimit the guide slot, the angle (β) having a value between 30° and 150°, preferably between 60° and 120°. Said side walls thus form a bend in a plan view of the guide element, the bend, i.e. the transition between the side walls, being designed as a sharp edge or rounded, the latter being preferred in order to smoothly guide the fiber structure when it is moved from the inlet opening to the end region.

[0019] It is also advantageous if one of the side walls is adjacent to a side wall in the end region, the one side wall in the transition region forming an angle (γ) with the side wall in the end region, the value of which angle is between 60° and 150°, preferably between 80° and 130°. In this case, too, there is a transition, likewise in particular rounded, between the two side walls, with the side walls following the transition preferably being at least partially straight.

[0020] It is advantageous if the clear width of the guide slot in the transition region widens at least once and then narrows once. In particular, it is advantageous if the clear width of the guide slot initially widens and then decreases, preferably continuously, following the inlet region. The clear width preferably decreases continuously up to the (first) change in direction in the transition region. This also creates a funnel shape in the transition region, which ensures smooth insertion of the fiber structure from the inlet region to the end region.

[0021] It is also advantageous if the guide slot has, in the transition region, a clear width, the value of which varies between 0.5 mm and 7.0 mm, preferably between 0.7 mm and 5.0 mm, in the course of the transition region. In particular, it is advantageous if the clear width, starting from the end of the inlet region that is remote from the inlet opening, initially increases to the maximum value and then decreases to the minimum value, this value preferably remaining constant after the reduction up to the end region. In a direction from the end region to the inlet region, a bottleneck is created which the fiber structure would have to overcome in order to exit the guide slot. This effectively prevents the fiber structure from accidentally exiting the guide slot.

[0022] There are also advantages if the inlet region has, in the region of the inlet opening, a clear width, the value of which is between 5 mm and 20 mm, preferably between 12 mm and 17 mm. This range ensures that a piecing robot can reliably insert the fiber structure into the guide slot during piecing. Manual insertion of the fiber structure is also possible without any problems. If the value were chosen to be greater than the specified maximum value, this would increase the manufacturing costs of the guide element, since the material requirement would then increase due to the larger overall size of the guide element.

[0023] It is also advantageous if the clear width of the guide slot from the inlet opening to the end of the inlet region that is remote from the inlet opening is reduced to a value between 0.5 mm and 3.0 mm, preferably between 0.7 mm and 1.5 mm. The specified range ensures that the fiber structure can be moved into the end region without undesired friction occurring between the side walls delimiting the guide slot and the fiber structure. In the case of a ring spinning machine, the fiber structure to be inserted into the guide element is not yet a yarn stabilized by complete twisting. Therefore, there would be a risk that the only slightly twisted fiber structure would be locally disintegrated (disturbance of the fiber arrangement, creation of gaps between the individual fibers previously packed together in a densified manner) and thus weakened by friction during insertion. Possible consequences would be an unwanted irregularity in the yarn produced as well as the danger of a yarn break when the spinning process is restarted. At the same time, the clear width in the region of said end of the inlet region is small enough to prevent the fiber structure from accidentally exiting the guide slot during spinning at the workstation of a ring spinning machine or to minimize the corresponding risk of occurrence. It has been found that with a range between 0.7 mm and 1.5 mm a reliable operation for most of the yarn types usually produced on ring spinning machines can be obtained.

[0024] It is also advantageous if the end region has a circular arcuate wall portion on a side facing away from the inlet opening in a plan view of the guide element. Said wall portion serves to continuously guide the fiber structure during the spinning operation. Said circular arc shape has proven itself, since the fiber structure also generally has a substantially circular cross section, so that low-friction guidance of the fiber structure in the end region is ensured.

[0025] It has been found that particularly good results can be achieved if the circular arcuate wall portion in a plan view of the guide element has a radius (Rc) of between 1.5 and 2.5 mm, preferably between 1.75 mm and 2.0 mm, at least in sections. The ring spinning process is not a completely stationary process. The direction in which the fiber strand runs away from the guide element in the direction of the spindle changes continuously and depends on the current position of the moving ring traveler, the height of the moving ring rail and/or spindle rail, the rotational speed of the spindle and the stability of the yarn balloons that form. It has been found that a ring spinning operation with only a few disturbances and at the same time leading to a yarn of good quality can be achieved if a circular arcuate wall portion with such dimensions is used. This allows the fiber strand to align itself thermodynamically optimally at different points along the circular arcuate wall portion, depending on the current spinning state. By allowing a certain degree of freedom to the fiber strand regarding its positioning within the guide element, on the one hand unwanted fluctuations in the longitudinal forces within the fiber strand can be reduced and on the other hand local stress concentration in the fiber strand in the contact area with the guide element can be largely avoided. If a smaller radius were selected, such thermodynamic self-optimization of the fiber stand cannot take place due to the geometric constraints imposed by the guide element. With a larger radius, on the other hand, it has been found that the guidance of the fiber strand, which is actually the main task of the guide element, is no longer sufficient to produce a good twist and consequently the quality of the produced yarn decreases. With larger radii, there is also a risk of chaotic, very dynamic movements of the fiber strand in the guide element and the fiber strand escaping from the guide element.

[0026] It is also advantageous if the end region of the guide slot is designed to be drop-shaped in a plan view of the guide element. The drop shape is formed by the circular arcuate wall portion and two side walls of the guide element which are spaced apart from one another and which adjoin said wall portion. The distance between the two side walls decreases starting from the circular arcuate wall portion in the direction of the inlet opening, thus producing the above-mentioned drop shape. In particular, it is advantageous if the transition region opens into the drop-shaped end region in the region of one of the two spaced-apart side walls. The end region can also have a circular arc shape on the side thereof that is remote from the circular arcuate wall portion. A drop-shaped form is particularly advantageous if the larger arc (the blunt end) of the drop has a circular arcuate wall portion in a plan view of the guide element which has a radius (Rc) of between 1.5 and 2.5 mm, preferably between 1.75 mm and 2.0 mm as described before. Such a drop shape allows the fiber strand to align itself in a thermodynamically optimized way as described above and at the same time to be stabilized in case of highly dynamic chaotic movements caused by disturbances. The stabilization effect is achieved by the fact that a chaotically moving fiber strand at some point will move towards the pointed end of the drop shape where the tapering side walls restrict its movement more and more leading to the fiber strand becoming confined and decelerated (calmed) by the geometrical constrains. As soon as the kinetic energy drops below a certain level, the fiber strand will return (driven by the longitudinal force in it) to the blunt end of the drop shape and normal spinning under optimal thermodynamic conditions can continue.

[0027] It is also advantageous if the transition region has at least one retaining portion for the fiber structure on opposite sides of the guide slot. The retaining portions are formed by wall portions, the course of which deviates from a straight line in a plan view of the guide element. In particular, the retaining portions bring about the above-mentioned change in direction of the guide slot. If the fiber structure guided in the end region is subjected to a force in the direction of the inlet opening, the retaining portions act as a spatial obstacle past which the fiber structure must be guided counter to a frictional force caused by the retaining portions. The retaining portions thus minimize the risk that the fiber structure can be moved out of the guide slot during the spinning operation.

[0028] Furthermore, it is advantageous if at least one of the retaining portions is formed by a hook-shaped bulge. The bulge is formed here by a portion of the guide element which intersects an imaginary connecting line that extends from a center of the inlet opening to the end of the guide slot opposite the inlet opening. If the fiber structure were to move from the end region in the direction of the inlet opening, it would have to pass the bulges before it unintentionally leaves the guide slot.

[0029] It is particularly advantageous if the retaining portions are arranged one behind the other in a direction extending from the inlet opening toward the end region. This creates two retaining portions which the fiber structure would have to overcome by overcoming friction between the retaining portion and the fiber structure before it can exit the guide slot. The risk of the fiber structure leaving the guide slot during the spinning operation is thus further reduced by the arrangement of two retaining portions.

[0030] Furthermore, it is advantageous if the guide element is at least entirely or partially designed as a stamped part, preferably made of metal, or formed from a wire. If the guide element is in the form of a stamped part, it is advantageous if it has a thickness of between 0.6 mm and 1.5 mm at least in portions. In particular, it is advantageous if the thickness of the stamped part is greater than the smallest clear width of the guide slot. Entanglement of individual guide elements during production thereof can thus be prevented in a simple manner. In particular, it is also advantageous if the fiber guide element consists of a hardened metal.

[0031] It is advantageous if the guide element has a recess which is not connected to the guide slot, the recess serving to attach the guide element to a support of a workstation of a ring spinning machine. The guide element basically comprises a main body in which the guide slot is made (for example by drilling and/or milling). Furthermore, the above-mentioned recess should be present in order to be able to attach the guide element to a support of the workstation. The recess can be closed or open to the outside. In particular, the recess is used for receiving a screw or for the passage of a screw, by means of which screw the guide element can be connected to the support. A closed recess can be advantageous in particular for embodiments made of stamped and hardened metal, since this can reliably prevent undesired deformation (twisting) of the guide element during a hardening process.

[0032] It is particularly advantageous if the guide element comprises a yarn catcher which is arranged outside the guide slot. The yarn catcher is designed as a portion protruding or cantilevered from the remaining part of the guide element, on which portion a yarn end winds up after a yarn break due to its own rotation. In this case, the end of the yarn is located at a predetermined point on the yarn guide and can easily be picked up by a robot or an operator at the workstation and the fiber composite coming from the drafting system is superimposed thereon during a piecing process.

[0033] The ring spinning machine according to the invention is characterized in that it has a workstation with a guide element, the guide element being designed according to the previous and/or following description, where the features described as optional can be implemented individually or in any combination, as far as this is technically possible. Furthermore, the workstation naturally includes further components or elements that are necessary in a ring spinning machine to produce a yarn from a fiber composite.

BRIEF EXPLANATIONS OF THE DRAWINGS

[0034] Further advantages of the invention are described in the following embodiments, in which, schematically:

Fig. 1	is a plan view of a guide element according to the invention;
Fig. 2	shows the guide element according to Fig. 1, additional dimensions and angles being identified;
Fig. 3	shows an alternative embodiment of a guide element according to the invention;
Fig. 4	shows the guide element shown in Fig. 3, attached to a support of a workstation of a ring spinning machine;
Fig. 5	shows selected elements of a workstation of a ring spinning machine;
Fig. 6a, 6b	show selected portions of further embodiments of a guide element according to the invention;
Fig. 7a	shows selected portions of a further embodiment of a guide element according to the invention;
Fig. 7b	shows a last embodiment of a guide element according to the invention;
Fig. 8	shows a portion of the guide element according to Fig. 1, an additional dimension being identified; and
Fig. 9a/b	each show a portion of a guide element according to Fig. 1 with a fiber strand during ring spinning.

EMBODIMENTS OF THE INVENTION

[0035] **Fig. 1 and** 2 each show the same plan view of the same guide element 22 according to the invention, which guide element is used to guide a strand-like fiber structure 1 during a spinning process at a workstation 23 of a ring spinning machine.

[0036] In general, in connection with the present invention and also with regard to the general description, it should be made clear that the top view is the view according to Fig. 1, i.e. viewing a plane in which the entirety or most of the guide slot 2 described below is located.

[0037] The guide element 22 comprises a guide slot 2 for the fiber structure 1, which begins in the regions of an inlet opening 3. Adjoining the inlet opening 3 is a funnel-shaped inlet region 4, which transitions into a transition region 5 on a side of the inlet region 4 that is remote from the inlet opening 3. The inlet opening 3 is shown in **Fig.** 1 by a dashed line, which, however, does not represent a physical structure of the guide element 22, but serves only to better identify the inlet opening 3.

[0038] On the side of the transition region 5 opposite the inlet opening 3, the guide slot 2 merges into a drop-shaped end region 6 which, on the side thereof opposite the inlet opening 3, represents an end of the guide slot 2. In the embodiment shown, the guide element 22 has a wall portion 9 in the form of a circular arc in the region of said end. This wall portion transitions into side walls 7 on both sides, which extend up to the inlet opening 3.

[0039] The inlet region 4 with its inlet opening 3 thus forms the guide slot 2 together with the transition region 5 and the end region 6.

[0040] Furthermore, the guide element 22 in the example shown has an outwardly closed recess 11, which is used, for example, for the passage of a screw 17, by means of which the guide element 22 can be attached to a support 12, shown in more detail in **Fig. 4,** of the workstation 23 of a ring spinning machine. As can be seen from **Fig. 7b**, which shows an alternative embodiment of the guide element 22, the recess 11 can also be open on one side.

[0041] Regardless of the exact shape of the guide slot 2, according to the invention the guide slot 2 now has a change in direction in the transition region 5. This change in direction is indicated in **Fig. 2** by the dotted line which extends through the guide slot 2. As this line shows, a fiber structure 1, which is introduced into the guide slot 2 via the inlet opening 3, is deflected several times laterally (i.e. in the plane of the drawing) by the change in direction before it lands in the end region 6 of the guide slot 2.

[0042] In particular during the spinning operation, during which the fiber structure 1 is in the end region 6 and is guided there, the change in direction minimizes the risk that the fiber structure 1 can leave the guide slot 2 due to an externally acting force. This force arises during the spinning operation due to the guiding of the fiber structure 1 in the region of a ring traveler unit 20 of the workstation 23, as is shown by way of example in **Fig 5**. The ring traveler unit 20 per se is known in ring spinning machines and is therefore not described further.

[0043] In particular, the changes in direction shown in **Fig. 2** by the dotted line are produced by retaining portions 10. The retaining portions 10 are implemented by a specific shape of the side walls 7, which also have one or more changes in direction in the transition region 5.

[0044] This creates a guide slot 2, the clear width 8 of which initially decreases due to the funnel-shaped inlet region 4 starting from the inlet opening 3 and increases again after the first retaining portion 10, which marks the beginning of the transition region 5. In the transition region 5, the clear width 8 decreases again and then increases again in the end region 6.

[0045] The end region 6 preferably has a circular arcuate wall portion 9 in the region thereof that is remote from the inlet opening 3 and that forms the end of the guide slot 2 in the direction mentioned, the end portion being drop-shaped in particular in the plan view shown.

[0046] The inlet region 4 is preferably defined by two side walls 7 delimiting the inlet region 4, which span an angle α (indicated in **Fig. 2**), the range of the angle α having a value mentioned in the general description.

[0047] The clear width 8 is also identified in **Fig. 2**; this should also have a value according to the general description, and the value in a first portion of the transition region 5 following the inlet region 4, starting from an initial value, initially increases and then gradually decreases again. In a second portion of the transition region 5, which finally opens into the end region 6, the clear width 8 is preferably constant.

[0048] Further angular ranges can also be seen in **Fig. 2**. In particular, two adjacent side walls 7 of the guide element 22 span an angle β, the advantageous range of values of this angle being mentioned in the general description. A second angle γ is formed by a side wall 7 delimiting the transition region 5 and a side wall delimiting the end region 6, the advantageous range of values thereof also already being mentioned in the general description.

[0049] **Fig. 3** shows a further embodiment of the guide element 22 according to the invention, the shape of the guide slot 2 corresponding to the shape shown in **Fig. 1 and 2.** In addition to the first embodiment, the guide element 22 has lateral chamfers 16 which increase the stability of the guide element 22.

[0050] In addition, a thread catcher 13 is shown in **Fig. 3**, which protrudes laterally from the guide element 22 and around which a yarn end wraps due to its own rotation if a yarn break occurs during the spinning operation.

[0051] **Fig. 4** shows the guide element 22 shown in **Fig. 3** together with a support 12 which can be connected via an attachment portion 18 to a corresponding holding structure of the workstation 23 of a ring spinning machine. In the example shown, the guide element 22 is attached to the support 12 by means of a screw 17 which passes through the recess 11 shown in **Fig. 3** and which ensures fixing of the guide element 22 on the support 12 via a nut or a thread in the support 12.

[0052] **Fig. 5** shows the combination shown in **Fig. 4** of the support 12 and the guide element 22 between a pair of output rollers 14 of a drafting system of a workstation 23 of a ring spinning machine and the yarn spinning unit 15 thereof, which has, inter alia, a bearing (not shown), for a cop 19 and a ring traveler unit 20, by means of which the twist is introduced into the fiber structure 1 coming from the drafting system, so that in the region of the guide element 22 a yarn is produced with a twist, which yarn is finally wound onto the cop 19 by rotating said cop.

[0053] The holding structure to which the support 12 is attached is not shown for reasons of clarity. The principle of ring spinning is also not discussed in more detail at this point, since this is well known from the prior art. What is shown, however, is a swivel pin 21 about which the support 12 can be pivoted together with the guide element 22. A corresponding pivoting can take place manually or by means of a piecing robot in order to pivot the guide element 22 from the dashed position to the position shown by solid lines and thus to move the guide element 22 against the fiber structure 1 in order to insert the fiber structure 1 into the guide slot 2.

[0054] Finally, further forms of conceivable guide slots 2 are shown in **Fig. 6a**, **6b** and **7a**, the guide element 22 in each case being shown only in portions. The guide element 22 shown in **Fig. 7b** also has an alternative shape of the guide slot 2, in which in particular the end region 6 is formed by two regions (both provided with the reference number 6) which are opposite with respect to the transition region 5.

[0055] In the embodiments according to **Fig. 6a to 7b**, the guide slot 2 in each case has an inlet opening 3, an adjoining inlet region 4, a transition region 5 adjoining the inlet region 4 and an end region 6 that completes the guide slot 2. The transition region 5 also has at least one change in direction according to the invention.

[0056] Fig. 8 schematically shows a section of the guide element 22 of Fig. 1. The drop-shaped end region 6 has a circular arcuate wall portion 6 which has in the plan view as shown a radius (Rc) of between 1.75 mm and 2.0 mm. During spinning operation, This allows a fiber strand (not shown in Fig. 8) to align itself thermodynamically optimally at different points along the circular arcuate wall portion 9, as shown in Fig. 9a.

[0057] In Fig. 9 a typical path of motion (represented by the arrow with the broken line) of a fiber strand 1 relatively to the walls that delimitate the end region of the guide slot 6 during ring spinning using a variation of a guide element 22 according to the present invention is schematically shown. In this variation the end region of the guide slot 6 has a circular arcuate wall portion 9 having a radius (see. Fig. 8) about 1.75 mm. This causes the fiber strand 1 during the ring spinning process to move along the circular arcuate wall portion 9. This is because the fiber strand automatically aligns itself optimally in terms of energy due to thermodynamic principles. It has been shown that the fiber strand in many cases performs a kind of periodic movement roughly in the form of the large Latin letter D, as schematically illustrated. This periodic movement is only minor and results in a quasi-stationary guidance of the fiber strand. If such a quasi-stationary spinning process is disturbed, e.g. due to a thick spot in the supplied roving, the suddenly occurring different conditions can lead to a destabilization of this guidance. In many cases this effects a chaotic and highly dynamic movement of the fiber strand 1 away from the circular arcuate wall portion 9, as indicated in Fig. 9b by the arrow with the broken line.

[0058] If the dynamics are too high, the fiber strand 1 may move further away from the circular arcuate wall portion 6 towards the pointed end of the drop shaped end region of the guide slot 6. In such a case due to the drop-like shape of this variation of a guide element 22 according to the invention, the fiber strand 1 will be confined and decelerated by the tapering side walls 7 restrict its movement more and more. Hence the fiber strand 1 becomes increasingly confined and decelerated (calmed) by the geometrical constrains given by the tapering side walls 7. In other words the increasing constriction of the fiber strand 1 by the side walls 7 causes a stabilization of the fiber strand 1, which finally returns to the circular arcuate wall portion 9 at the blunt side of the drop-like form. The present invention is not limited to the embodiments shown and described. Modifications within the scope of the claims are possible as well as any combination of the described features, even if they are shown and described in different parts of the description or the claims or in different embodiments, provided that there is no contradiction to the teaching of the independent claims.

LIST OF REFERENCE SIGNS

[0059]

1	Strand-like fiber structure	22	Guide element
2	Guide slot	23	Workstation of a ring spinning machine
3	Inlet opening of the guide slot		
4	Inlet region of the guide slot	24	Yarn
5	Transition region of the guide slot	α	Angle between two wall portions delimiting the inlet region
6	End region of the guide slot	β	Angle between wall portions adjacent to one another in the transition region
7	Side wall		
8	Clear width of the guide slot	γ	Angle between a side wall in the

(continued)

9	Circular arcuate wall portion		transition region and a side wall in the end region
10	Retaining portion	Rc	Radius
11	Recess		
12	Support		
13	Thread catcher		
14	Output roller pair of a drafting system		
15	Yarn winding unit		
16	Chamfer		
17	Screw		
18	Attachment portion of the support		
19	Cop		
20	Ring traveler unit		
21	Swivel pin		

Claims

1. Guide element (22) for a strand-like fiber structure (1) for a ring spinning machine, having a guide slot (2),

- the guide slot (2) having an inlet opening (3) with an inlet region (4) adjoining the inlet opening (3) and narrowing in a funnel-shaped manner starting from the inlet opening (3),
- the guide slot (2) having a transition region (5) connected to the inlet region (4) on an end of the inlet region (4) that is remote from the inlet opening (3),
- the guide slot (2) having an end region (6) which is arranged on an end of the transition region (5) facing away from the inlet region (4) and delimits the guide slot (2) in a direction facing away from the inlet opening (3),

characterized in that the guide slot (2) has at least one change in direction in the transition region (5).

2. Guide element (22) according to the preceding claim, **characterized in that** the guide element (22) has two side walls delimiting the inlet region (4) and spanning an angle (α), the value of which is between 50° and 90°, preferably between 60° and 80°.

3. Guide element (22) according to either of the preceding claims, **characterized in that** the guide element (22) has, in the transition region (5), two side walls spanning an angle (β), which side walls are adjacent to one another and delimit the guide slot (2), the angle (β) having a value between 30° and 150°, preferably between 60° and 120°.

4. Guide element (22) according to any of the preceding claims, **characterized in that** one of the side walls is adjacent to a side wall in the end region (6), the one side wall in the transition region (5) forming an angle (γ) with the side wall in the end region (6), the value of which angle is between 60° and 150°, preferably between 80° and 130°.

5. Guide element (22) according to any of the preceding claims, **characterized in that** the clear width of the guide slot in the transition region (5) widens at least once and then narrows once.

6. Guide element (22) according to any of the preceding claims, **characterized in that** the guide slot (2) has, in the transition region (5), a clear width, the value of which varies between 0.5 mm and 7.0 mm, preferably between 0.7 mm and 5.0 mm, in the course of the transition region (5).

7. Guide element (22) according to any of the preceding claims, **characterized in that** the inlet region (4) has, in the region of the inlet opening (3), a clear width, the value of which is between 5 mm and 20 mm, preferably between 12 mm and 17 mm.

8. Guide element (22) according to the preceding claim, **characterized in that** the clear width of the guide slot from the inlet opening (3) to the end of the inlet region (4) that is remote from the inlet opening (3) is reduced to a value between 0.5 mm and 3.0 mm, preferably between 0.7 mm and 1.5 mm.

9. Guide element (22) according to any of the preceding claims, **characterized in that** the end region (6) has an arcuate wall portion (9) on a side that is remote from the inlet opening (3).

10. Guide element (22) according to any of the preceding claims, **characterized in that** the end region (6) of the guide slot (2) is drop-shaped.

11. Guide element (22) according to any of the preceding claims, **characterized in that** the transition region (5) has, on opposite sides of the guide slot (2), at least one retaining portion (10) in each case for the fiber structure (1).

12. Guide element (22) according to the preceding claim, **characterized in that** at least one of the retaining portions (10) is formed by a hook-shaped bulge.

13. Guide element (22) according to either claim 11 or claim 12, **characterized in that** the retaining portions (10) are arranged one behind the other in a direction extending from the inlet opening (3) toward the end region.

14. Guide element (22) according to any of the preceding claims, **characterized in that** the guide element (22) has a recess (11) which is not connected to the guide slot (2), the recess (11) being used to attach the guide element (22) to a support of a workstation (23) of a ring spinning machine.

15. Ring spinning machine having at least one workstation (23) for producing a yarn (24), the workstation (23) having a guide element (22) for guiding a strand-like fiber structure (1) extending between a drafting system and a yarn winding unit of the workstation (23),
characterized in that the guide element (22) is designed according to one or more of the preceding claims.

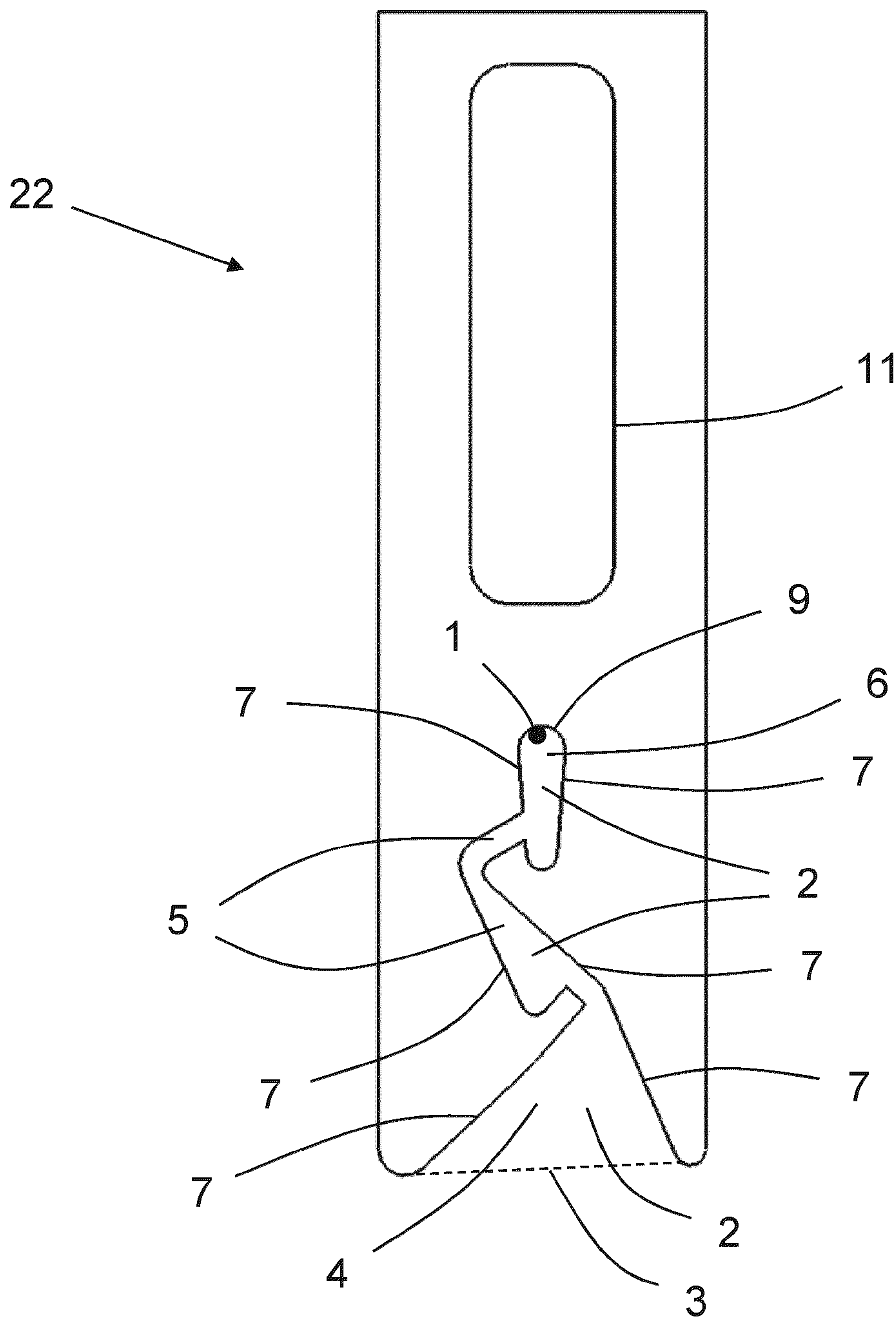

Fig. 1

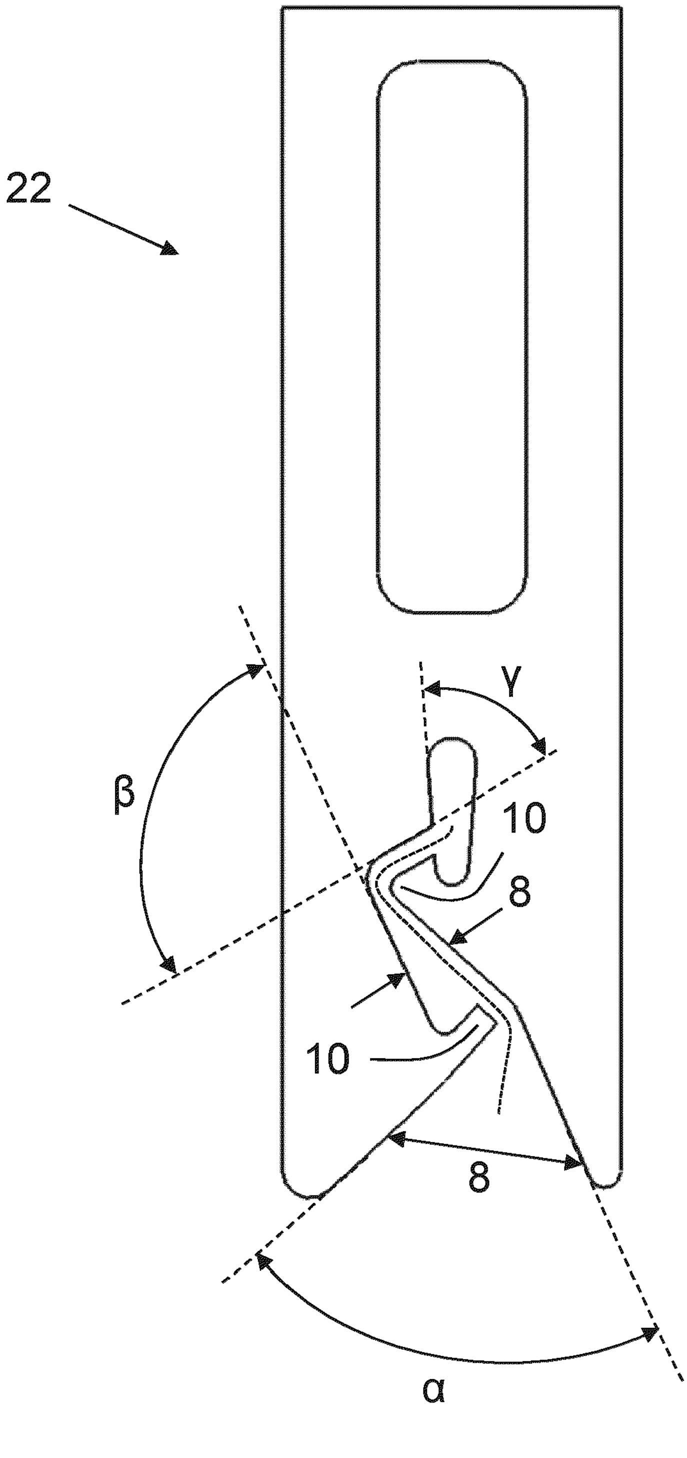

Fig. 2

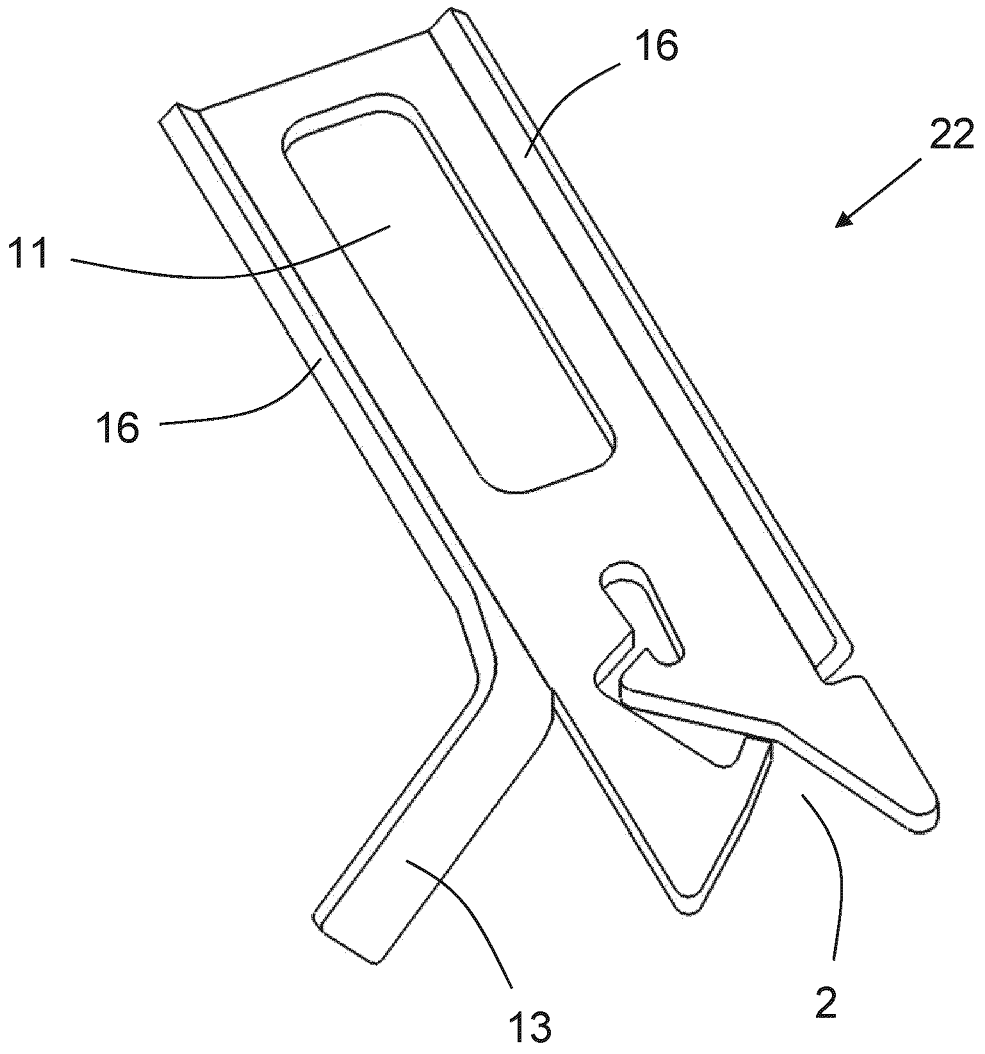

Fig. 3

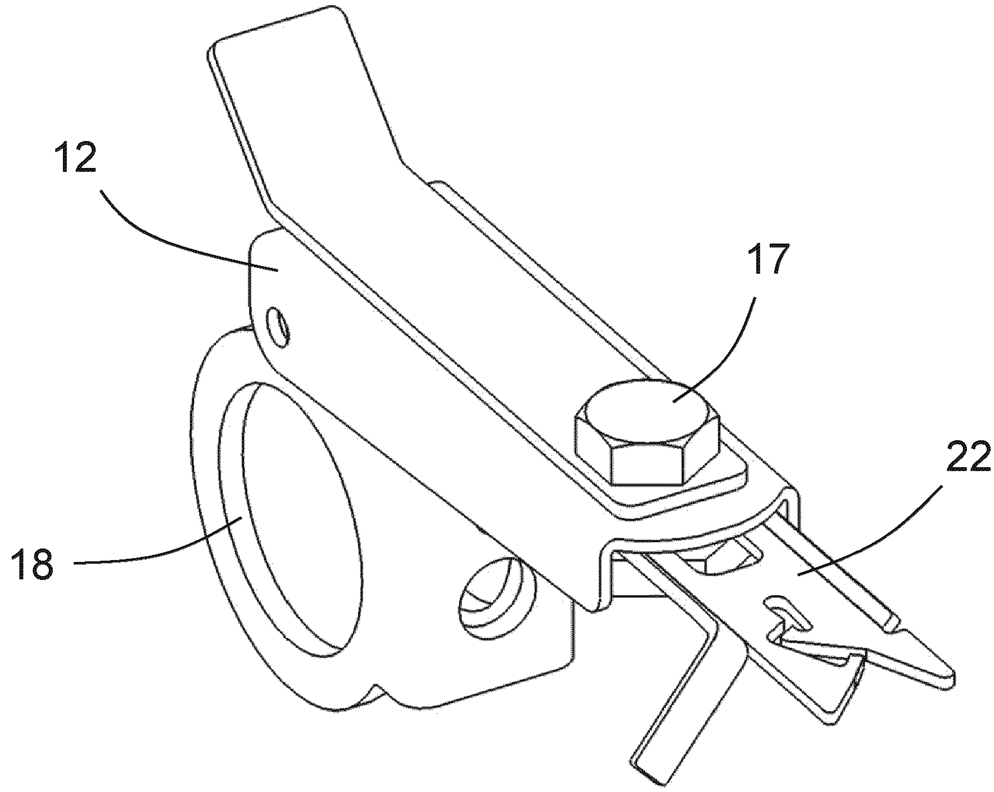

Fig. 4

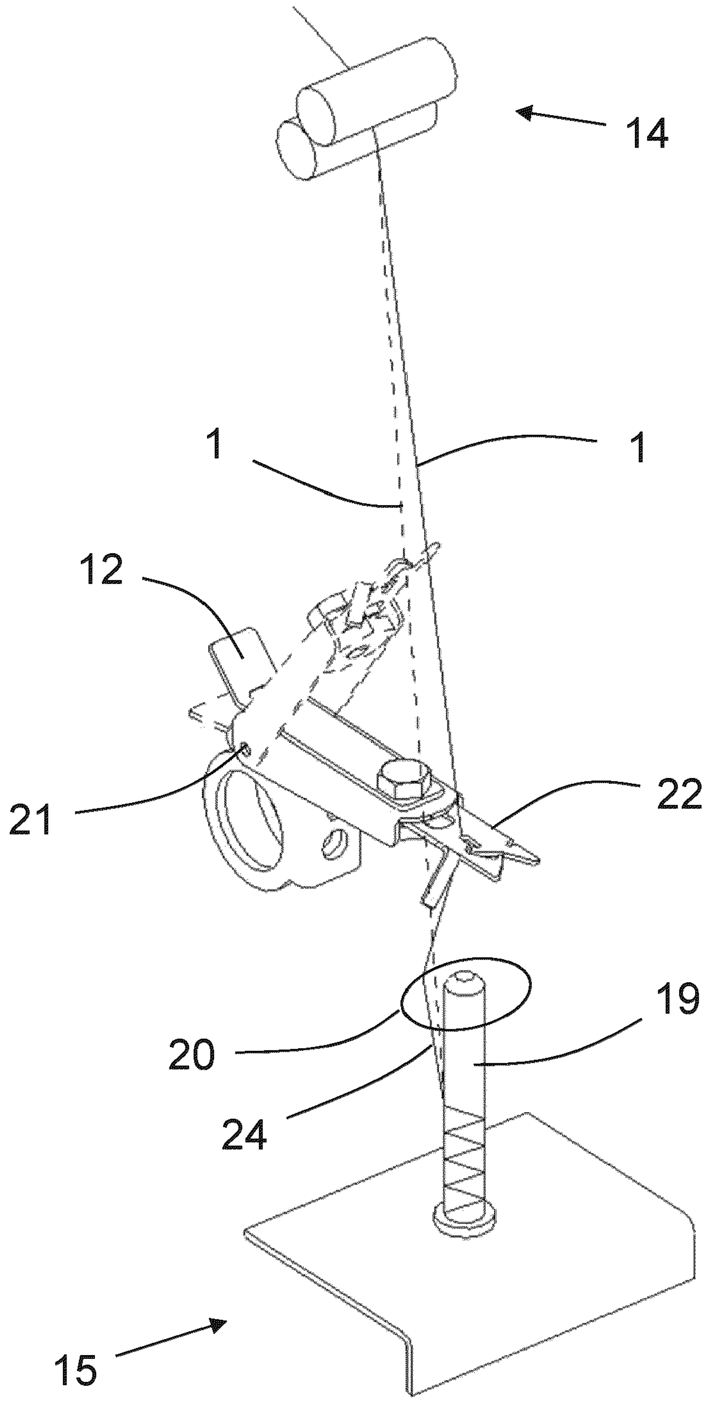

Fig. 5

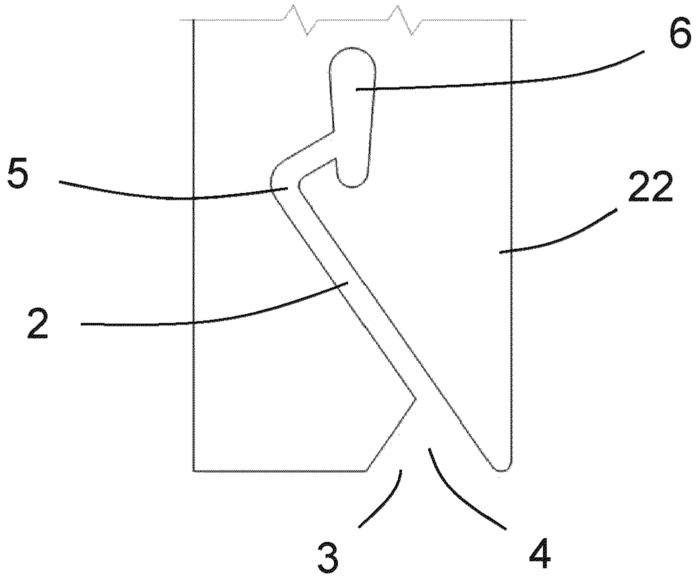

Fig. 6a

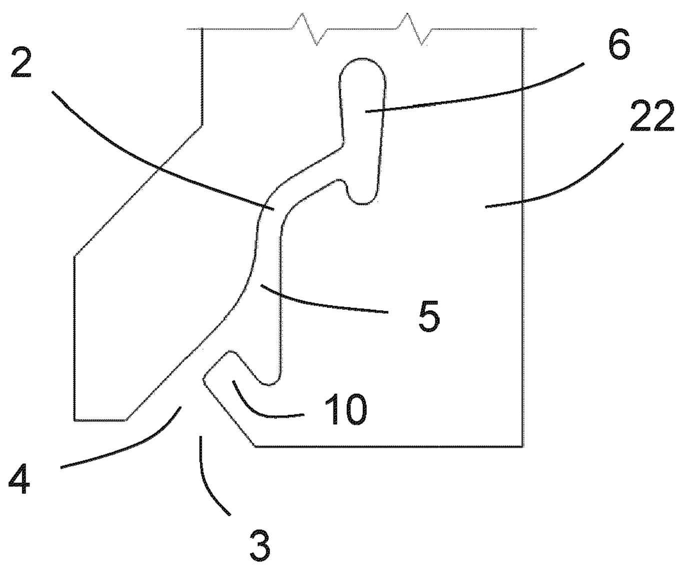

Fig. 6b

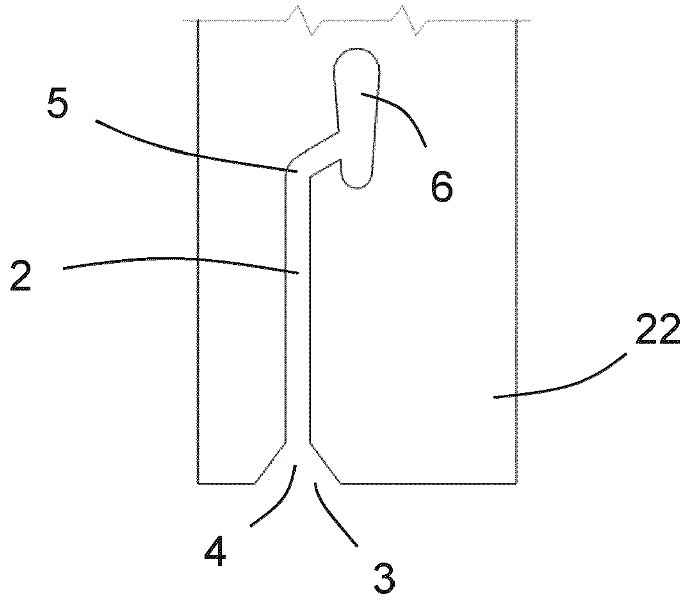

Fig. 7a

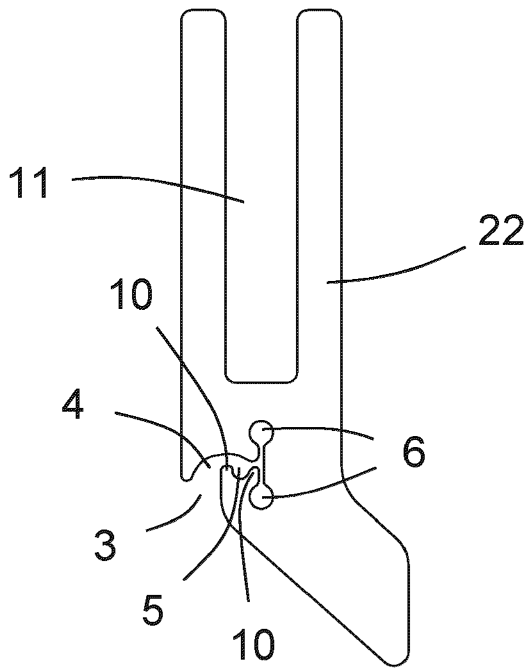

Fig. 7b

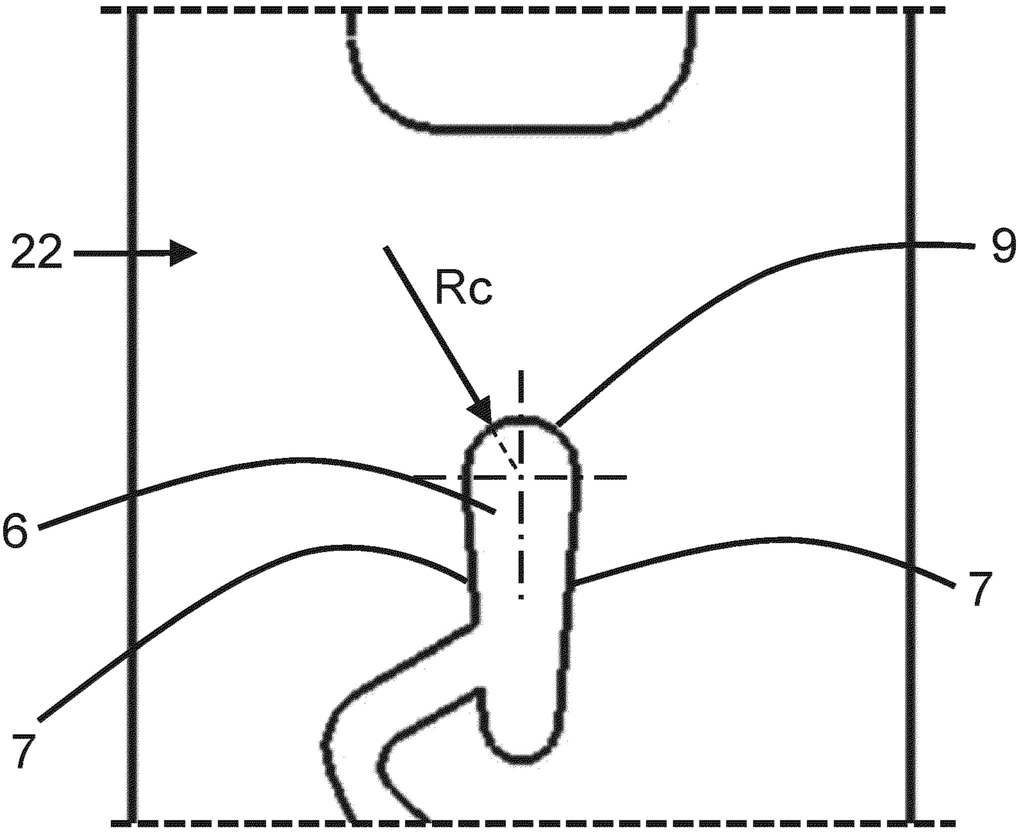

Fig. 8

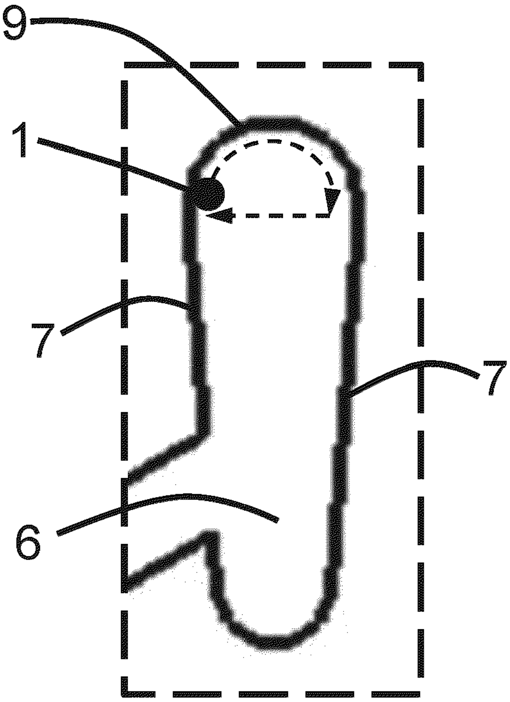

Fig.9a

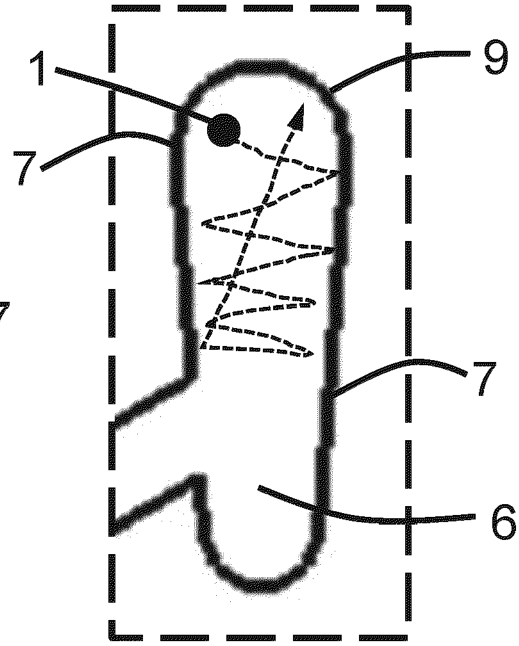

Fig.9b

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 4473

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	GB 07367 A A.D. 1911 (TYTLER JOHN ERNEST; BOWKER WILLIAM HENRY) 25 March 1912 (1912-03-25) * page 2, line 41 - page 3, line 21 * * page 3, line 44 - page 4, line 25; figure 9 *	1-3,5,9, 11,15	INV. D01H13/04 B65H57/04
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X	CN 203 903 656 U (QINGDAO HONGDA TEXTILE MACH CO) 29 October 2014 (2014-10-29) * paragraph [0021] - paragraph [0026]; figure 2 *	1-3,9,15	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	20 May 2022	Pollet, Didier

CATEGORY OF CITED DOCUMENTS

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20-05-2022

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

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