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(71) Applicant: **Maschinenfabrik Rieter AG**
8406 Winterthur (CH)

(72) Inventors:
- **MORAVEC, Milan**
  56201 Ústí nad Orlicí, Hylváty (CZ)
- **BROZEK, Tomas**
  56201 Ústí nad Orlicí (CZ)
- **ZARECKY, Radek**
  56002 Ceska Trebova (CZ)

(54) YARN GUIDE FOR A SPINNING UNIT OF A RING SPINNING MACHINE, A RING SPINNING MACHINE AND A METHOD FOR THREADING YARN INTO THE YARN GUIDE

(57) The invention relates to a yarn guide (102) for a spinning unit of a ring spinning machine, which comprises a supporting arm (10), which is at its front end provided with a front guide (3) with a guide hole (33), which in the top view has a closed shape, whereby a horizontal threading groove (34) to the guide hole (33) passes in the direction (X) of the yarn being threaded into the guide hole (33) from the outer side of the guide (3), to which extends a sliding pin (35) of the front guide (3) of yarn arranged on the outer side of the front guide (3), the sliding pin (35) being inclined in the direction (X) of the yarn being threaded into the guide hole (33). The invention also relates to a ring spinning machine as well as to a method for threading yarn into the yarn guide.

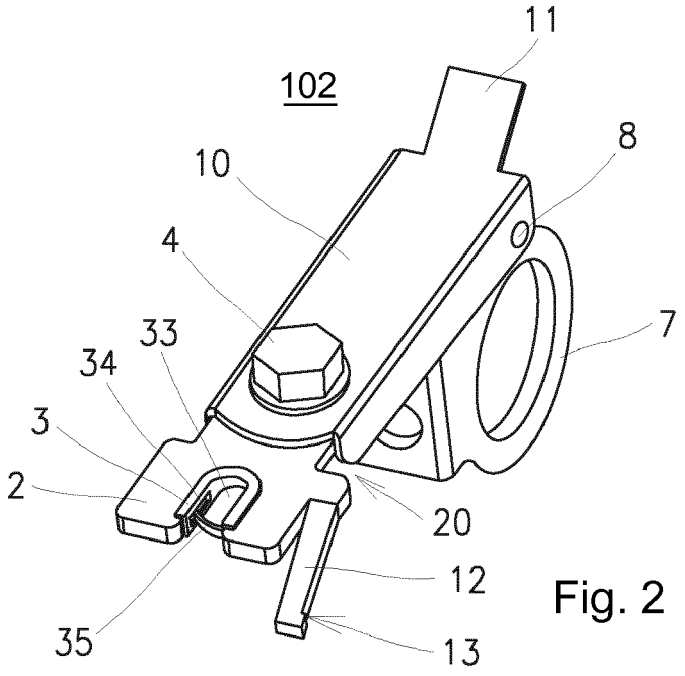

Fig. 2

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Description

Field of the invention

[0001] The invention relates to a yarn guide for a spinning unit of a ring spinning machine.

[0002] The invention also relates to a ring spinning machine comprising a row of spinning units arranged next to each other with a balloon limiter and a drafting device, whereby a yarn guide is arranged at each spinning unit in the area between the balloon limiter and the drafting device.

[0003] In addition, the invention relates to a method for threading yarn into the yarn guide arranged at the spinning unit of a ring spinning machine between the balloon limiter and the drafting device, the method consisting of steps of guiding a yarn end by a service robot from the end of a bobbin to the drafting device and threading the yarn into the yarn guide during this step of guiding the yarn.

Description of related art

[0004] Ring spinning machines comprise a row of spinning units arranged next to each other, each of which comprises a roving drafting device. From the drafting device the processed roving is carried to a twisting device, from which the produced yarn is withdrawn and wound in a winding device on a tube, which is slid on a rotatable spindle. By winding the yarn on the tube, a bobbin or cop is formed.

[0005] During the operation of the spinning unit and during yarn production the manufacturing process may be interrupted, e.g., due to a yarn break, when the motion of a traveller on a ring on a ring bench is terminated and the end of the ruptured yarn is wound on the bobbin. Consequently, yarn is also pulled out of a yarn guide and a balloon limiter. After such an interruption of yarn production it is necessary to resume the manufacturing process at the spinning unit in question by means of a series of manual or machine-operated service operations. In doing this, it is necessary to find the end of the yarn being wound on the cop, unwind the yarn end from it, thread it first into the traveller on the ring, then into the balloon limiter and the guide eyelet of yarn, and finally bring the yarn end between the end rollers of a roving drafting device in such a manner that during the spinning resumption, the yarn end is joined to the end of the roving and the process of yarn production and winding yarn is resumed. When replacing a wound cop with an empty tube, or when searching for the yarn end on the cop package, it is necessary to remove the tube/cop from the spindle, place the empty tube or the cop package on the spindle and perform the above-described procedure to resume spinning with the yarn being threaded into the individual nodes. For ease of use and for spatial reasons, to enable these operations, it is sometimes necessary to create enough space for handling above the cop, within which a yarn guide is mounted upwardly tiltably on the frame of the spinning machine.

[0006] Current ring spinning machines are predominantly operated manually, mainly due to the relative complexity of the operations performed when threading yarn at the spinning unit. Substitution of these activities by a service robot is, in principle, possible but poses high demands on service mechanisms and the time required to carry out these activities.

[0007] In current ring spinning machines, the yarn guide at the spinning unit is basically formed by a shaped wire of a circular cross-section, which is by one of its ends mounted tiltably on the frame of the spinning machine and at its other end is shaped into a helix which in a top view forms a circumferentially enclosed guide eyelet, whereby the end portion of this wire extends further in front of the guide eyelet, where it forms a bent arm with a hook to capture in case of need the end of the broken yarn before winding the broken yarn end onto the guiding surfaces of the guide eyelet. Therefore, when threading the yarn into the guide device - eyelet, the operator or the service robot has to perform a series of successive spatial motions with the yarn being threaded, which is rather time-consuming. Recently, there has been an ever-increasing pressure put by the users of the ring spinning machines on the use of automatic service devices, whereby it is required that the automatic operations at the spinning unit are performed in the shortest possible time with the highest possible reliability. For that purpose, it is necessary to adapt not only the service robot itself, but also some parts of the workstation. One of these nodes, which can be adjusted to improve the feasibility of automatic service of the spinning unit, is a yarn guide at the spinning unit, which is provided with a front yarn guide.

[0008] DE 1 244 630 B describes a double yarn guide which is used for guiding yarn at a workstation of a plying machine, where two guides comprising an open guide groove are used. The guides are turned to each other by 180° and are positioned relative to each other in both the horizontal and vertical planes, in order to ensure their yarn guiding function and to facilitate the yarn to be threaded in after a break into the guide device. This arrangement partially simplifies the threading of the yarn end into the guide, yet the operator or service robot has to carry out several successive complicated spatial motions as the yarn is threaded into the guide, which extends the operating time and reduces the reliability of the process. The yarn guide arranged in this manner does not even guarantee the uniform effect of the guiding surfaces on the running yarn, which is reflected in the quality of the yarn to be wound and the quality of the yarn package.

[0009] DE 102 20 302 A1 describes the use of a yarn guide at a workstation of a plying machine, provided in the form of an eyelet with a pair of opposing arms extending to a threading gap, the end tips of which are arranged above each other, overlapping each other, so that in a top view they close the circular guiding portion of the

guide, leaving an oblique gap for the passage of the yarn into the guide eyelet. The eyelet is encased in a protective cover, through which the yarn must be inserted before being threaded into the guide, which prolongs the time needed for the service operations and increases the complexity of handling the yarn.

Brief summary of the invention

[0010] The goal of the invention is therefore to eliminate or at least reduce the disadvantages of the background art, especially to allow an easy and reliable threading of the yarn into a reliable yarn guide.

[0011] The aim of the invention is achieved by a yarn guide at a spinning unit of a ring spinning unit, whose principle consists in that it comprises a supporting arm which is at its front end provided with a front guide with a guide hole having a closed shape in a top view, whereby a horizontal threading groove passes in the direction of threading the yarn into the guide hole from the outer side of the guide. Arranged on the outer side of the front guide is a sliding pin of the front yarn guide, the sliding pin being inclined in the direction of the yarn being threaded into the guide hole.

[0012] Preferably, the front guide is detachably mounted on the supporting arm.

[0013] Preferably, the front guide is mounted on a holder and the holder is detachably mounted on the supporting arm.

[0014] Preferably, the holder of the front guide is provided with a fixing element adapted to be detachably connected to the supporting arm.

[0015] Preferably, the supporting arm is at its rear end provided with a control arm.

[0016] Preferably, the holder is provided with a downwardly inclined arm, which is at its lower end provided with a restraining hook.

[0017] Preferably, the holder of the guide is made of steel or plastic or a fibre composite or aluminium or a combination thereof.

[0018] Preferably, the front guide of the yarn is made of technical ceramics.

[0019] Preferably, the supporting arm is at its front end provided with a vertical restraining arm, which is at its free end provided with a restraining hook.

[0020] Preferably, the supporting arm is mounted tiltably on a holder.

[0021] Preferably, the guide hole has a closed circular shape in a plan view.

[0022] The principle of a ring spinning machine consists in that it comprises a row of spinning units arranged next to each other with a balloon limiter and a drafting device, whereby the yarn guide according to at least one of claims 1 to 11 is arranged at each spinning unit in the area between the balloon limiter and the drafting device.

[0023] The principle of a method for threading yarn into a yarn guide consists in that threading the yarn through a labyrinth formed by the sliding pin and the threading groove, which connects the outer side of the front guide to the guide hole, into the guide hole.

[0024] The advantage of this solution is the fact that yarn is threaded quickly and reliably into the yarn guide when spinning is resumed or when spinning is started, which reduces the time needed for the service operations of a workstation and increases the efficiency of the machine. Since the hardness and resistance of the material of the yarn guide according to the invention is considerably higher than the hardness and resistance of the yarn guides made of twisted wire which are currently used at the same time on the ring machines used by twisted steel wire wires, another advantage is increasing the lifetime and also contributing to a more stable quality of the yarn produced, even in the case of a lower twist of the yarn. This is facilitated by a circularly closed shape of the profile of the guide hole of the front guide in a plan view, which is better situated in comparison with the background art.

Brief description of the drawings

[0025] The invention is schematically represented in the drawing, wherein it is shown by

- **Fig. 1** an example of an arrangement of a part of a spinning unit;
- **Fig. 2** an embodiment of an inventive yarn guide;
- **Fig. 3** a second embodiment of the inventive yarn guide;
- **Fig. 4** an arrangement of a holder of the inventive yarn guide;
- **Fig. 4a** a plan view of an exemplary embodiment of the front guide; and
- **Fig. 4b** a front view of an exemplary embodiment of the front guide.

Detailed Description of the invention

[0026] The invention will be described with reference to an exemplary embodiment of a yarn guide at a spinning unit of a ring spinning machine producing yarn, whereby the machine comprises a row of identical spinning units arranged next to each other. The arrangement of the spinning unit of a ring spinning machine is basically well-known and therefore it will only be described hereinafter in a simplified manner for the purposes of this invention. Those parts, elements or nodes of the spinning unit that are of significance to the present invention will be described in greater detail.

[0027] Fig. 1 shows an example of an arrangement of a part of a spinning unit. The spinning unit of a ring spinning machine comprises an unillustrated supply package, from which a roving is fed to a drafting device 1 in the direction of the arrow A. A twisting and winding device 101 of yarn is arranged downstream of the drafting device 1 in the direction of the roving motion. Between the drafting device 1 and the yarn twisting and winding device 101, where roving is gradually transformed into yarn, the

yarn passes at first through a yarn guide 102 and then through a balloon limiter 103, which is shown only systematically in a dashed line, as far as to a traveller 110, which circulates on a flange 111 of a ring 112 on a ring bench 113 around a bobbin 114 or a cop, which is a tube with a yarn package. After passing through the traveller 110, the yarn produced is wound onto the tube which is slid onto a rotating spindle (not shown) to form the bobbin 114. The yarn package on the bobbin is formed by a gradual vertical reciprocating motion of the ring bench 113 in the direction of the arrow B.

[0028] The yarn guide 102 comprises a holder 7, which is attached to a structure, e.g., to a frame of the ring spinning machine above the level of the yarn winding device in the area of the spinning unit. In the shown embodiment, the holder 7 is provided in the form of an eyelet, which is slid on an unillustrated pin at the workstation and fastened thereto. In an unillustrated exemplary embodiment, the holder 7 is formed on the principle of a clamping joint of two opposing clamping portions interconnected by connecting means (bolts, eccentric connections, etc.), whereby the clamping portions are arranged on the opposite side of the supporting pin at the spinning unit and are pulled towards each other by the connecting means, thereby clamping the supporting pin, and the holder 7 is thus fastened at the spinning unit.

[0029] Fig. 2 shows a first embodiment of a yarn guide 102 according to the invention in more detail. In the illustrated embodiment, a front guide 3 is mounted in a guide holder 2, which is mounted at the front end of a supporting arm 10. The guide holder 2 is at its rear end provided with a fixing element 20, by which it is attached to the front end of the supporting arm 10 by means of a fastening bolt 4. The front guide 3 is mounted in the holder 2, for example, by sliding into a continuous groove in the holder 2, or by gluing, etc. Not illustrated, but still in the framework of this invention, the front guide 3 could be directly detachably mounted on the supporting arm 10.

[0030] A supporting arm 10 is mounted tiltably upwardly on the holder 7. In the shown exemplary embodiment, the supporting arm 10 is mounted by its end near the holder 7, hereinafter only "the rear end", rotatably (tiltable upwardly) on a pin 8 which is mounted on the holder 7. At this rear end, the supporting arm 10 is provided with a control arm 11 directed upwards, which controls the tilting of the supporting arm 10, especially through the robot service. When tilted downwards, the supporting arm 10 abuts by its own weight and, if appropriate, by the force action of an unillustrated spring, upon an unillustrated backstop with which the holder 7 is provided, by which means the supporting arm 10 is held in the working position.

[0031] The supporting arm 10 is made of a suitable material, e.g., bent steel sheet, or it is made of a molding plastic part or plastic splatter, etc. The guide holder 2 is made of a suitable material, for example, it is formed by a steel sheet cut, molding plastic part or plastic splatter, or it is made of fiber, e.g. carbon fiber, or an aluminum composite, or a combination of at least two materials. The front yarn guide 3 is also made of a suitable material, for example, of technical ceramics.

[0032] Furthermore, in the embodiment of Fig. 1 and 2, the holder 2 is at its lateral side provided with a downwardly oriented restraining arm 12, consisting of, for example, a bent narrowed portion, whereby at the lower end of the restraining arm 12 is arranged a restraining hook 13. The restraining hook 13 is designed to wind a broken yarn end in case of need instead of winding the broken yarn end around a wall of the front guide 3, thereby avoiding the necessity of complicated removal of the wound yarn from the front guide 3.

[0033] In the embodiment of the inventive yarn guide 102 according to Fig. 3, the restraining arm 12 is arranged vertically between the front end of the supporting arm 10 and the guide holder 2, which is at its free end provided with the restraining hook 13.

[0034] In an embodiment not shown in the Figures it would be possible to position the guide hole 33, threading groove 34 and the sliding pin 35 not in line with the supporting arm 10, but arrange it at a certain angle to the left or to the right. As an angle a value between 10° and 100° could be chosen, which still allows a robot to introduce a yarn into the guide hole 33, but this measure would avoid that yarn leaves unintentionally the guide hole 33, when the yarn guide 102 is moved upward.

[0035] In the illustrated embodiment of Fig. 4, the fixing element 20 of the guide holder 2 is configured as a pair of flat parallel arms 200 with a gap 201 between them, whereby the parallel arms 200 are adapted to abut the surface of the front end of the supporting arm 10, which is here provided with a through hole situated in the area the gap 201 between the parallel arms 200 of the fixing element 20 in the position of the fixing element 20 near the supporting arm 10. The fastening bolt 4 passes through the through hole in the supporting arm 10, the fastening bolt 4 being provided at the other end with a nut so that by tightening the bolt 4 and the nut, the parallel arms 200 of the fixing element 20 are pressed against the supporting arm 10 and the guide holder 2 is fastened to the supporting arm 10. In the exemplary embodiment, the attachment of the holder 2 to the supporting arm 10 is realized by other suitable means, e.g., by means of a clip coupling or by means of a sliding flexible latch, etc.

[0036] Furthermore, Fig. 4a shows a plan view of an exemplary embodiment of a front guide. The front guide 3 mounted at the front end of the supporting arm 10 comprises a circular guide wall 330, which is in a plan view circumferentially enclosed and which defines a guide hole 33 of the front yarn guide 3. In its front portion, opposite the direction X of yarn insertion into the guide hole 33, the front guide 3 is provided with a horizontal linear threading groove 34, which in the direction X of yarn insertion extends from the front side of the front guide 3 as far as into the circular guide wall 330 of the guide hole 33. Into the threading groove 34 extends a sliding pin 35 with a tip 350 and a front sliding wall 351 sloping in the

direction X of yarn insertion into the guide hole 33 towards the threading groove 34. The threading groove 34 and the sliding pin 35 thus form a labyrinthine threading groove 34 of yarn, allowing the yarn to be guided from the front side of the front yarn guide 3 into the guide hole 33 of the front guide 3 easily and reliably by simply being laid transversely across the sloping sliding wall 351 of the sliding pin 35, which is accompanied by a slight tightening of the yarn across this wall 351. At the same time, thanks to the labyrinthine groove 34, yarn is prevented from moving outwardly from the guide hole 33, hence the above-described term "circumferentially closed circular guide wall 330" defining the guide hole 33 of the front yarn guide 3. Fig. 4b shows a front view, in which the threading groove 34 and the sliding pin 35 arranged therein can be seen.

[0037] In the illustrated embodiment, the front yarn guide 3 comprises a guide hole 33 of yarn defined in the rear portion by the body of the front guide 3 and in the front portion defined by the inner wall 352 of the sliding pin 35, whose front sliding wall 351 is inclined with respect to the X direction of the yarn insertion into the guide hole 33, whereby the inner wall 352 is part of the guide wall 330 of the guide hole 33, and in a plan view encloses the guide wall 330 of the guide hole 33 because the tip 350 of the sliding pin 35 is disposed in the threaded groove 34 in the opposite wall of the guide 3 and thus contributes to the formation of the labyrinthine groove 34.

[0038] The invention is applied at the spinning unit of a ring spinning machine both during the yarn production, when the yarn is reliably guided through a guide hole 33, and during the service operations of the spinning unit after a yarn break or during the start-up of the spinning process, allowing easy and simple yarn insertion into the guide hole 33 without performing complicated spatial manipulations with the yarn end.

[0039] During yarn insertion into the guide hole 33 after yarn breakage, a series of service steps following one another is performed to resume spinning. First, the bobbin spindle stops rotating and the broken yarn end is detected on the bobbin 114 package, whereby the bobbin 114 is ejected from the spindle or remains thereon in order to search for the yarn end. Before ejecting the bobbin 114 from the spindle, it is necessary to form a through hole for it, which is performed by tilting the yarn guide 102 upwards in the direction of the arrow Y, e.g., by the pressure exerted by a suitable means of the service robot on the control arm 11 at the rear end of the supporting arm 10, or in the case of manual operation by exerting pressure from the bottom on the front portion of the yarn guide 102, etc. After finding the yarn end and unwinding the required yarn length to a yarn container, the bobbin 114 is slid on the spindle and the yarn guide 102 is tilted back to the working position, which is substantially in the horizontal direction. Subsequently, the yarn guide is first inserted into a traveller 110, next it is threaded through a balloon limiter 103, then through the guide hole 33 of the yarn guide 3 and finally it is inserted between the end rollers of the roving drafting device 1 in such a manner that this yarn end gets into contact with the roving end clamped by the end rollers of the drafting device 1 while winding yarn on the bobbin is being started.

[0040] The operation of yarn insertion into the guide hole 33 of the front guide 3 of yarn starts with the yarn being laid (stretched) transversely across the inclined front sliding wall 351 of the sliding pin 35, on which the yarn itself subsequently slips to the side towards the groove 34 and then passes through the labyrinthine threading groove 34, bends over the tip 350 of the sliding pin 35 and through the labyrinthine threading groove 34 passes to the guide hole 33, because the yarn is slightly tightened during threading. After being inserted into the guide hole 33, the yarn is brought between the unillustrated end rollers of the drafting device 1 so that during the resumption of spinning the yarn end can be joined to the roving end. Subsequently, the spinning-in process is started, which afterwards changes into the yarn spinning process.

[0041] The advantage of this solution is the fact that yarn is threaded quickly and reliably into the yarn guide when spinning is resumed or when spinning is started, which reduces the time needed for the service operations of a workstation and increases the efficiency of the machine. Since the hardness and resistance of the material of the yarn guide according to the invention is considerably higher than the hardness and resistance of the yarn guides made of twisted wire which are currently used at the same time on the ring machines used by twisted steel wire wires. Another advantage is that the lifetime is increasing and also contributing to a more stable quality of the yarn produced, even in the case of a lower twist of the yarn. This is facilitated by a circularly closed shape of the profile of the guide hole of the front guide in a plan view, which is better situated in comparison with the background art.

Reference numbers

[0042]

1	Drafting device
10	Supporting arm
11	Control arm
12	Restraining arm
13	Restraining hook
101	Twisting and winding device
102	Yarn guide
103	Balloon limiter
110	Traveller
111	Flange
112	Ring
113	Ring bench
114	Bobbin
2	Holder
20	Fixing element
200	Parallel arms

201 Gap
3 Guide
33 Guide hole
330 Circular guide wall
34 Threading groove
35 Sliding pin
350 Tip
351 Sliding wall of guide 3
352 Inner wall of sliding pin
4 Bolt
7 Holder
8 Pin

A Direction (of roving motion)
B Direction (up and down of ring bench 113)
X Direction (yarn insertion into front guide 3)
Y Direction (tilting the yarn guide 102 upwards)

Claims

1. A yarn guide (102) for a spinning unit of a ring spinning machine, **characterized in that**

- the yarn guide (102) comprises a supporting arm (10), which is at its front end provided with a front guide (3) comprising a guide hole (33), which has a closed shape in a plan view,
- wherein a horizontal threading groove (34) extends from the outer side of the front guide (3) to the guide hole (33) in the direction (X) of threading the yarn into the guide hole (33),
- wherein into the horizontal threading groove (34) extends a sliding pin (35) of the front guide (3) arranged on the outer side of the front guide (3) and wherein the sliding pin (35) is inclined in the direction (X) of threading the yarn into the guide hole (33).

2. The yarn guide (102) according to claim 1, **characterized in that** the front guide (3) is detachably mounted on the supporting arm (10).

3. The yarn guide (102) according to claim 1, **characterized in that** the front guide (3) is mounted on a holder (2) and the holder (2) is detachably mounted on the supporting arm (10).

4. The yarn guide (102) according to claim 3, **characterized in that** the holder (2) of the front guide (3) is provided with a fixing element (20) adapted to be detachably connected to the supporting arm (10).

5. The yarn guide (102) according to any of claims 1 to 4, **characterized in that** the supporting arm (10) is at its rear end provided with a control arm (11).

6. The yarn guide (102) according to any of claims 3 to 5, **characterized in that** the holder (2) is provided with a downwardly inclined arm (12), which is at its lower end provided with a restraining hook (13).

7. The yarn guide (102) according to any of claims 3 to 6, **characterized in that** the holder (2) of the guide is made of steel or plastic or a fibre composite or aluminium or a combination thereof.

8. The yarn guide (102) according to any of claims 1 to 8, **characterized in that** the front guide (3) of the yarn is made of technical ceramics.

9. The yarn guide (102) according to any of claims 1 or 2, **characterized in that** the supporting arm (10) is at its front end provided with a vertical restraining arm (12), which is at its free end provided with a restraining hook (13).

10. The yarn guide (102) according to any of claims 1 to 9, **characterized in that** the supporting arm (10) is mounted tiltably on a holder (7).

11. The yarn guide (102) according to any of claims 1 to 10, **characterized in that** the guide hole (33) has a closed circular shape in a plan view.

12. A ring spinning machine containing a row of spinning units arranged next to each other, each spinning unit comprises a balloon limiter (103) and a drafting device (1), whereby the yarn guide (102) according to any of claims 1 to 11 is arranged at each spinning unit in the area between the balloon limiter (103) and the drafting device (1).

13. The ring spinning machine according to the preceding claim, **characterized in that** the supporting arm (10) is mounted tiltably on the holder (7), which is mounted on the frame of the spinning machine.

14. The ring spinning machine according to claim 12 or 13, **characterized in that** the ring spinning machine comprises a service robot, which is equipped with means capable of raising the yarn guide (102) by actuating the control arm (11).

15. A method of threading yarn into the yarn guide (102) according to any of claims 1 to 11 arranged at a spinning unit of a ring spinning machine between the balloon limiter (103) and the drafting device (1), comprising the steps of

- guiding the yarn end from the bobbin to the drafting device (1) by the service robot and
- threading the yarn into the yarn guide (102) during the step of guiding the yarn,

characterized in

• threading the yarn through the labyrinth formed by the sliding pin (35) and the threading groove (34), which connects the outer side of the front guide (3) to the guide hole (33), into the guide hole (33).

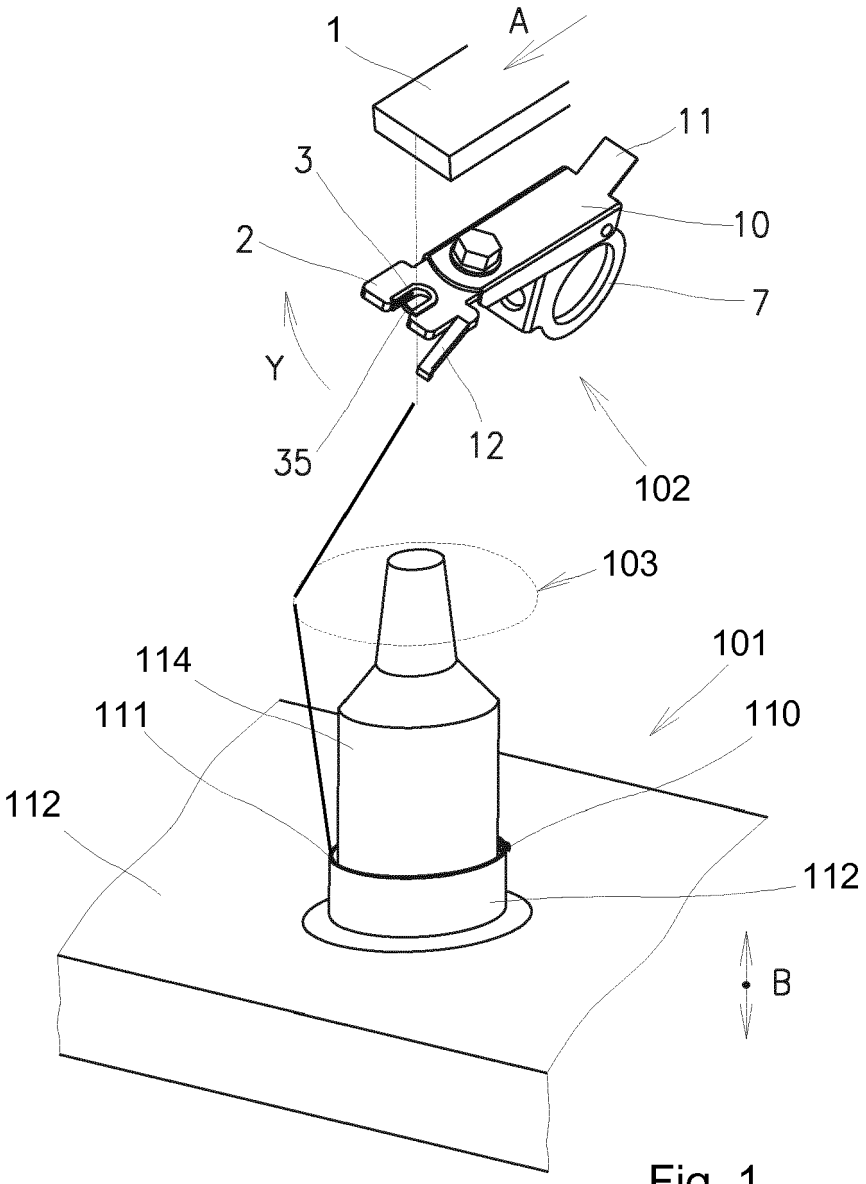
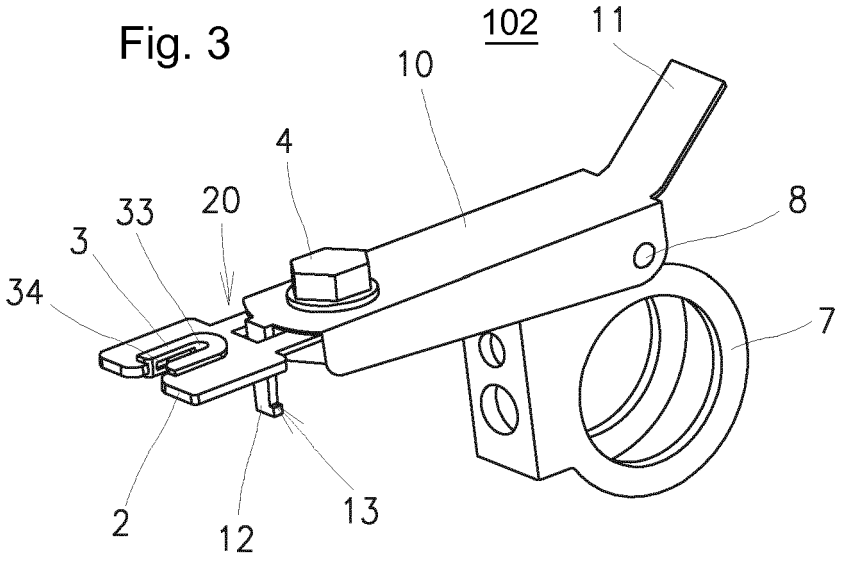


Fig. 1

Fig. 3



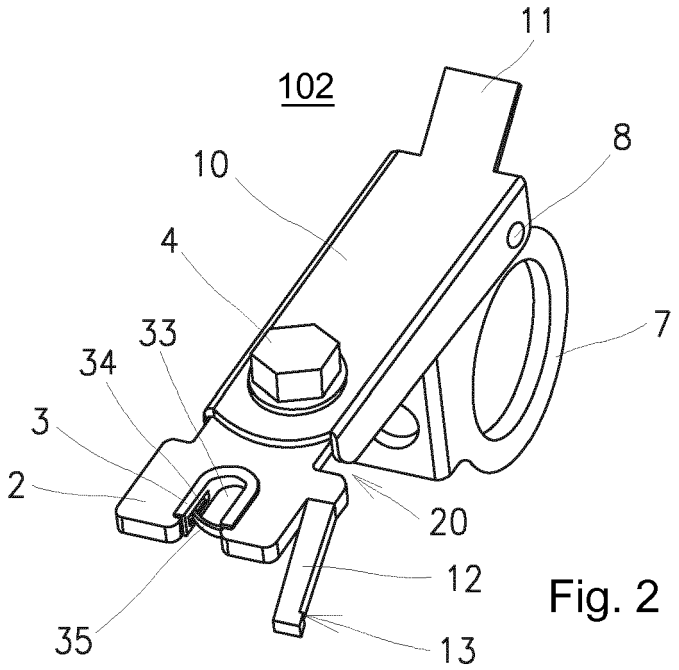


Fig. 2

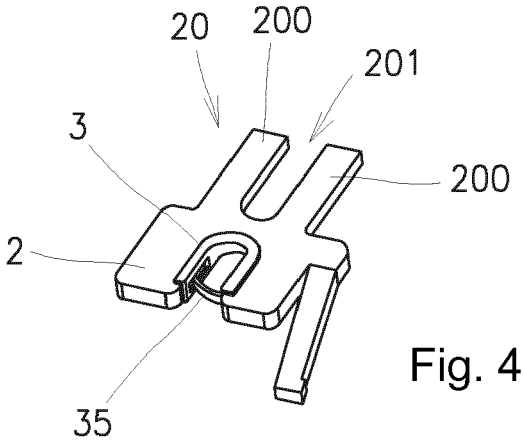


Fig. 4

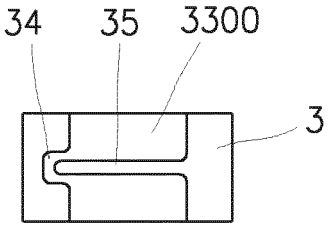


Fig. 4b

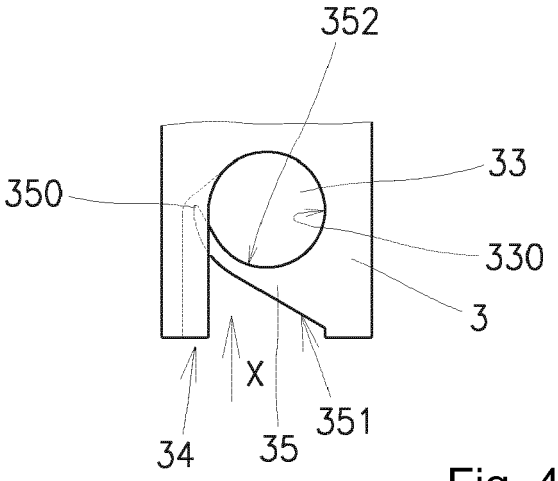


Fig. 4a

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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 2789

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 Y	CN 206 615 868 U (TONG XIANBO) 7 November 2017 (2017-11-07) * paragraph [0001] * * paragraph [0012] - paragraph [0015] * * paragraph [0022] * * paragraph [0025] * * figures 1,2 *	1,2,8, 11,15 3,4,6,7, 9,10,12, 13	INV. D01H13/04 B65H57/00 B65H57/06
X Y	FR 410 599 A (DANIEL BLESI [IT]; AUGUST GRAF [IT]) 24 May 1910 (1910-05-24) * the whole document *	1 6	
Y,D	DE 12 44 630 B (SAURER ALLMA GES MIT BESCHRAEN) 13 July 1967 (1967-07-13) * column 6, line 13 - line 30 * * figures 4-8 *	3,4,7	
Y	EP 0 864 676 A2 (ZINSER TEXTILMASCHINEN GMBH [DE]) 16 September 1998 (1998-09-16) * abstract; figure 1 *	10,12,13	
Y	US 3 719 036 A (PREISSER G) 6 March 1973 (1973-03-06) * abstract * * column 7, line 11 - line 16 * * figure 10 *	6,9	TECHNICAL FIELDS SEARCHED (IPC) D01H B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 June 2019	Humbert, Thomas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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