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(72) Inventors:
• **SRINIVASAN, Rajasekaran**
641020 Coimbatore, Tamil Nadu (IN)
• **JEGANATHAN, Pasupathy**
641020 Coimbatore, Tamil Nadu (IN)
• **ARULANANDAM THILIP, Kumar**
641020 Coimbatore, Tamil Nadu (IN)

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(74) Representative: **Goddard, Heinz J.**
Boehmert & Boehmert
Anwaltpartnerschaft mbB
Pettenkoferstrasse 22
80336 München (DE)

(71) Applicant: **Lakshmi Machine Works Ltd.**
Coimbatore 641 020 Tamil Nadu (IN)

(54) **YARN INSERTING ARRANGEMENT FOR A RING SPINNING MACHINE**

(57) The present invention provides a yarn inserting arrangement (2) for a ring spinning machine and a method thereof. The yarn inserting arrangement (2) comprises a suction tube (8) for receiving a lifted end of a broken yarn (10) from a cop (9), a gripping arm (3) for pulling the broken yarn (10) between the suction tube (8) and the cop (9), and a rocker arm (4) for pulling the broken yarn

(10) after the gripping arm (3) moves downwards to a position proximal to a ring position of a ring rail (11) to allow the broken yarn (10) hooked in the gripping arm (3) and the rocker arm (4) to be substantially tangential to the ring of the ring rail (11) for insertion of the broken yarn (10) into a rotatable traveler (12) positioned in the ring of the ring rail (11).

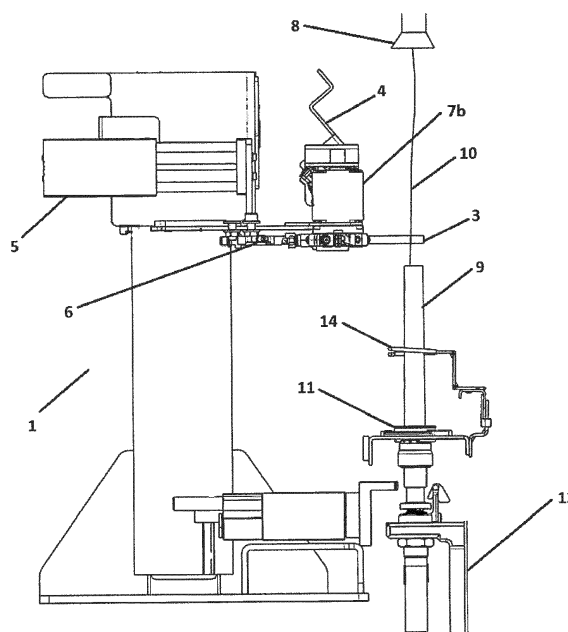


Figure 2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to textile ring spinning machines. Particularly, the present invention relates to an automatic piecing arrangement for broken yarn ends in textile ring spinning machines. More particularly, the invention deals with an improved yarn inserting arrangement for an automatic piecing device of textile ring spinning machines.

BACKGROUND OF THE INVENTION

[0002] In textile spinning mills, yarn breakage in ring spinning machines is a frequent problem that requires continuous attention of the work force/labours. Yarn breakage now-a-days remains a major disadvantage in ring spinning machines which has forced huge number of workers/manual labours to continuously monitor the ring spinning machines at both the sides throughout the length of the machine frame, which is normally more than 1600 spindles. The broken yarns have to be pieced manually, and the yarn spinning sequence has to be restarted then and there after yarn breakage in order to avoid wastage of yarn. The stamina and health of the workers also gets affected due to continuous walking along the long ring spinning frames to manually piece the broken yarn ends throughout the day.

[0003] Automatic piecing devices are provided as an improvement towards the conventional method of manual piecing. The automatic piecing devices involve a robot or worker in a piecing vehicle or piecing device which has in-built drive units, sensing units, and support units which are normally required for automatic piecing arrangements. Such automatic piecing devices are required to be advanced towards the ring spinning machine for piecing operation, and for returning back after completing the piecing operation. The existing piecing arrangements are not successful since the piecing unit does not have any automatic means for successfully inserting the yarn to be pieced into a ring traveler of the ring spinning machine.

[0004] There is therefore a need in the art to provide a yarn inserting arrangement capable of overcoming deficiencies of the conventional techniques and providing an improved automatic piecing device for ring spinning machines.

OBJECTS OF THE INVENTION

[0005] It is an object of the present invention to provide an improved automatic piecing device for ring spinning machines.

[0006] It is another object of the present invention to provide a novel and improved yarn inserting arrangement for automatic piecing device of the ring spinning machines.

[0007] It is another object of the present invention to provide a yarn inserting arrangement for the ring spinning machine capable of automatically inserting broken yarn to be pieced into a ring traveler of the ring spinning machine.

[0008] It is still another object of the present invention to reduce wastage of yarn by piecing the broken yarn with yarn delivered from drafting zone of the ring spinning machine.

[0009] It is yet another object of the present invention to accurately insert yarn into the traveler for automatic piecing in ring spinning machines.

SUMMARY OF THE INVENTION

[0010] An aspect of the present invention relates to a yarn inserting arrangement for a ring spinning machine. The yarn inserting arrangement includes a suction tube adapted to receive a lifted end of a broken yarn from a cop, the suction tube being positioned above the cop, a gripping arm adapted to pull the broken yarn in between the suction tube and the cop, and a rocker arm adapted to pull the broken yarn after the gripping arm moves downwards to a position proximal to a ring position of a ring rail to allow the broken yarn hooked in the gripping arm and the rocker arm to be substantially tangential to the ring of ring rail for insertion of the broken yarn into a rotatable traveler positioned in the ring of ring rail.

[0011] According to an embodiment of the present invention, the gripping arm includes a retractable needle member for fixedly gripping the broken yarn.

[0012] According to an embodiment of the present invention, the gripping arm is adapted to oscillate substantially horizontally by an actuating means.

[0013] According to an embodiment of the present invention, the rocker arm is adapted to oscillate substantially vertically by an actuating means. According to another embodiment of the present invention, the rocker arm is adapted to oscillate substantially horizontally by another actuating means. According to another embodiment of the present invention, any or a combination of the gripping arm and the rocker arm are adapted to oscillate substantially vertically or substantially horizontally by at least an actuating means.

[0014] According to an embodiment of the present invention, the actuating means is any of the pneumatic, hydraulic or electric.

[0015] According to an embodiment of the present invention, the traveler is adapted to rotate by means of a blowing means to allow insertion of the broken yarn inside the traveler. According to an embodiment of the present invention, the blowing means includes an air nozzle pointed towards the ring on the ring rail so as to blow air to rotate the traveler during yarn inserting.

[0016] According to an embodiment of the present invention, in the position in which the gripping arm reaches the proximal position of the ring rail, the broken yarn forms a V-shape between the suction tube, the gripping arm

and a balloon control ring surrounding the cop.

[0017] According to an embodiment of the present invention, the broken yarn forms a V-shape between the balloon control ring, the rocker arm and the gripping arm, after the broken yarn present in between the balloon control ring and the gripping arm is pulled by the rocker arm.

[0018] According to an embodiment of the present invention, the gripping arm and the rocker arm are moved towards the ring of ring rail through an actuating means for insertion of the broken yarn into the rotatable traveler. According to an embodiment of the present invention, the broken yarn is released from the gripping arm and the rocker arm after the yarn is inserted inside the traveler.

[0019] Another aspect of the present invention relates to a method of piecing broken yarn in a ring spinning machine. The method involves lifting an end of a broken yarn from a cop to a suction tube positioned above the cop, pulling, by a gripping arm, the broken yarn in between the suction tube and the cop, and pulling, by a rocker arm, the broken yarn after the gripping arm moves downwards to a position proximal to a ring position of a ring rail of the ring spinning machine.

[0020] According to an embodiment of the present invention, the rocker arm pulls the broken yarn in between the balloon control ring and gripping arm to allow the broken yarn hooked in the gripping arm and the rocker arm to be substantially tangential to the ring of the ring rail in between the rocker arm and the gripping arm for insertion of the broken yarn into a rotatable traveler positioned in the ring of ring rail.

[0021] According to an embodiment of the present invention, the method further includes a step of piecing the broken yarn with yarn/fibre being delivered from a drafting zone of the ring spinning machine.

[0022] According to an embodiment of the present invention, any or a combination of the gripping arm and the rocker arm are adapted to oscillate vertically or horizontally with the help of at least one actuating means, the at least one actuating means being any of pneumatic, hydraulic or electric.

[0023] According to an embodiment of the present invention, the traveler is adapted to rotate by means of a blowing means to allow insertion of the broken yarn inside the traveler.

[0024] Another aspect of the present invention relates to a yarn inserting arrangement for an automatic piecing unit of a ring spinning machine including a suction tube adapted to receive a lifted end of a broken yarn from a cop, the suction tube being positioned above the cop, a gripping arm adapted to pull the broken yarn in between the suction tube and the cop, and a rocker arm adapted to pull the broken yarn after the gripping arm moves downwards to a position proximal to a ring position of a ring rail, to allow the broken yarn hooked in the gripping arm and the rocker arm to be substantially tangential to the ring of the ring rail, for insertion of the broken yarn into a rotatable traveler positioned in the ring of the ring

rail.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0025] The accompanying drawings are included to provide a further understanding of the present disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present disclosure and, together with the description, serve to explain the principles of the present disclosure.

[0026] In the figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label with a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

Figure 1 illustrates an exemplary isometric view representation of a yarn inserting arrangement of an automatic piecing unit for a ring spinning machine, in accordance with an embodiment of the present invention;

Figure 2 illustrates an exemplary side view representation of the yarn inserting arrangement along with spindle and cop of the ring spinning machine in accordance with an embodiment of the present invention;

Figures 3A through 3D illustrate an exemplary representation of sequence of inserting of yarn into a traveler positioned in a ring of a ring rail of the ring spinning machine, in accordance with an embodiment of the present invention;

Figure 4 illustrates an exemplary side view representation of the yarn inserting arrangement of the ring spinning machine after successful insertion of the yarn into the traveler, in accordance with an embodiment of the present invention; and

Figure 5 illustrates an exemplary flowchart representation of a method of piecing broken yarn in the ring spinning machine in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0027] As used in the description herein and throughout the claims that follow, the meaning of "a," "an," and "the" includes plural reference unless the context clearly dictates otherwise. Also, as used in the description herein, the meaning of "in" includes "in" and "on" unless the

context clearly dictates otherwise.

[0028] Exemplary embodiments will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments are shown. This disclosure may however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. These embodiments are provided so that this disclosure will be thorough and complete and will fully convey the scope of the disclosure to those of ordinary skill in the art. Moreover, all statements herein reciting embodiments of the disclosure, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in the future.

[0029] According to the present invention, an automatic piecing unit is provided to assist yarn piecing operation during yarn breakage incidents in ring spinning machines (also referred to as "textile ring spinning machines" hereinafter). Before initiating yarn piecing, broken yarn end from a cop is lifted upwards by blowing means. The lifted yarn end is held inside a suction tube of the piecing unit positioned above the cop. The yarn end held by the suction tube is to be inserted inside a ring traveler positioned in a ring of the textile ring spinning machine before piecing the yarn end with delivery yarn from the drafting zone. There are no means in existing arrangements to successfully insert the yarn end automatically inside the traveler.

[0030] In the present invention, the automatic piecing unit is provided with a yarn inserting arrangement having a rocker arm and a gripping arm placed in a common base. The rocker and gripping arms insert the yarn end into the traveler through actuating means, such as but not limited to, a hydraulic or pneumatic or electric actuator or the like. After inserting the yarn end into the traveler, the yarn held in the suction tube is pieced with delivery yarn from the drafting zone.

[0031] Figure 1 illustrates an exemplary isometric view representation of a yarn inserting arrangement (2) of an automatic piecing unit (1) for a ring spinning machine, in accordance with an embodiment of the present invention.

[0032] The yarn inserting arrangement (2) of the automatic piecing unit (1) includes a gripping arm (3), a rocker arm (4), actuating means (5) for moving a set of components of the yarn inserting arrangement (2) forward and backward, a gripper horizontal actuating means (6) and rocker vertical and horizontal actuating means (7a, 7b). The components of the yarn inserting arrangement (2) are mounted in a common platform of the automatic piecing unit (1).

[0033] Referring to Figure 2, where an exemplary side view representation of the yarn inserting arrangement (2) along with spindle and cop of the ring spinning machine is shown. The yarn inserting arrangement (2) may be moved towards the cop (9) of the ring spinning machine through the actuating means (5). When the yarn inserting

arrangement (2) is at its home position, the rocker arm (4) is also at its home position. The gripping arm (3) is connected to the gripper horizontal actuating means (6) for enabling horizontal movement of the gripping arm (3) after reaching the position above the cop (9).

[0034] According to an embodiment of the present invention, end of the broken yarn (10) is lifted from the cop (9) and is held inside a suction tube (8) positioned above the cop (9). The suction tube (8) may move upwards near drafting zone of the textile ring spinning machine such that broken yarn (10) is passed into a lappet hook (not shown). Then the gripping arm (3) may move towards the position above the cop (9) and perform horizontal oscillatory movement through actuating means (6) to hook and pull the yarn (10) through hook like arrangement provided at front portion of the gripping arm (3).

[0035] Referring to Figure 3A, upon actuation by the gripper horizontal actuating means (6), the gripping arm (3) performs the horizontal oscillatory motion to pull the broken yarn (10) below the lappet hook position/above the cop (9) position. The broken yarn (10) is dragged by a hook like arrangement provided at front portion of the gripping arm (3). The gripping arm (3) is provided with a retractable needle member (15) at its front portion. The needle member (15) opens and closes by actuating means (not shown). After pulling the broken yarn (10) inside the hook like arrangement of the gripping arm (3), the needle member (15) closes and grips the broken yarn (10) such that the broken yarn (10) is now unable to come out of the hook like arrangement. Thereafter, the gripping arm (3) along with yarn inserting arrangement (2) starts moving downwards.

[0036] As shown in Figure 3B, while moving downwards, the gripping arm (3) holds the broken yarn (10) such that the pulled broken yarn (10) moves downstream and reaches the proximal position of the ring rail (11) thereby forming V-shape yarn between the suction tube (8), the gripping arm (3) and a Balloon Control ring (14) surrounding the cop (9).

[0037] According to an embodiment of the present invention, vertical movement of the rocker arm (4) is actuated by a rotary/linear actuating means (7a). The rocker arm (4) performs vertical oscillatory movement from top to bottom thereby pulling down the broken yarn (10) present in between the Balloon control ring (14) surrounding the cop (9) and the gripping arm (3).

[0038] According to an embodiment of the present invention, horizontal movement of the rocker arm (4) may be actuated by another rotary/linear actuating means (7b). The rocker arm (4) performs horizontal oscillatory movement thereby again pulling sideways the broken yarn (10) present in between the Balloon control ring (14) surrounding the cop (9) and the gripping arm (3). This forms another V-shape yarn between the balloon control ring (14), the rocker arm (4) and the gripping arm (3). The actuating means (7a, 7b) may be selected from any or a combination of a pneumatic actuator, a hydraulic actuator, electric actuator and an actuating means having

any other kind of pressure developing means.

[0039] According to an embodiment of the present invention, as shown in Figure 3C, the yarn inserting arrangement (2) as a unit is moved forward towards the ring of the ring rail (11) through actuating means (5). The broken yarn (10) hooked in the gripping arm (3) and the rocker arm (4) is tangential to a ring of the ring rail (11) in between the rocker arm (4) and the gripping arm (3) and is ready for insertion into the traveler (12) positioned in the ring.

[0040] According to an embodiment of the present invention, the traveler (12) may reach front portion of the ring through a blowing means (16) mounted in the piecing unit. The blowing means (16) comprises an air nozzle pointed towards the ring so as to blow air from air source. The blowing means (16) blows air towards the ring so that the traveler (12) rotates clockwise around the ring. While rotating clockwise, the broken yarn (10) which is tangential to the ring between the rocker arm (4) and the gripping arm (3) is automatically inserted inside the traveler (12).

[0041] Referring to Figure 3D, the yarn inserting arrangement (2) as a unit is retracted backwards. Thus, the rocker arm (4) and the gripping arm (3) are moved to their respective home positions. The needle member (15) of the gripping arm (3) is retracted by the actuating means (not shown), and the yarn is released from the gripping arm (3) and from the rocker arm (4).

[0042] Figure 4 illustrates an exemplary side view representation of the yarn inserting arrangement (2) of the ring spinning machine after successful insertion of the yarn into the traveler, in accordance with an embodiment of the present invention. The broken yarn (10) is inserted into the traveler (12) and is ready for subsequent piecing operation with the yarn/fibre being delivered from drafting zone of the ring spinning machine (13). Thus, the broken yarn (10) is successfully inserted inside the traveler (12), and thereafter, the broken yarn (10) held in the suction tube (8) is pieced with the delivery yarn from the drafting zone through piecing arrangement.

[0043] Figure 5 illustrates an exemplary flowchart representation of a method of piecing broken yarn (9) in the ring spinning machine in accordance with an embodiment of the present invention. The method of piecing broken yarn (10) in a ring spinning machine includes at step (502), lifting an end of a broken yarn (10) from a cop (9) to a suction tube (8) positioned above the cop (9). The suction tube (8) may move upwards near drafting zone of the ring spinning machine such that broken yarn (10) is passed into a lappet hook (not shown).

[0044] According to an embodiment of the present invention, the method further includes at step (504), pulling, by a gripping arm, the broken yarn in between the suction tube and the cop, and at step (506), pulling, by a rocker arm, the broken yarn after the gripping arm moves downwards to a position proximal to a ring position of a ring rail of the ring spinning machine. In an embodiment, the gripping arm (3) may move towards the position above

the cop (9) and perform horizontal oscillatory movement through actuating means (6) to hook and pull the yarn (10) through hook like arrangement provided at front portion of the gripping arm (3). Thereafter, the gripping arm (3) starts moving downwards. When the gripping arm (3) reaches a proximal position of the ring of ring rail (11), vertical and horizontal movement of the rocker arm (4) is actuated by rotary/linear actuating means (7a, 7b) to pull the broken yarn (10) present in between the balloon control ring (14) surrounding the cop (9) and the gripping arm (3).

[0045] According to an embodiment of the present invention, the rocker arm (4) pulls the broken yarn (10) in between the balloon control ring (14) surrounding the cop (9) and the gripping arm (3) to allow the broken yarn (10) hooked in the gripping arm (3) and the rocker arm (4) to be tangential to the ring of the ring rail (11) in between the rocker arm (4) and the gripping arm (3) for insertion of the broken yarn (10) into a rotatable traveler (12) positioned in the ring of the ring rail (11).

[0046] According to an embodiment of the present invention, the method further includes a step of piecing the broken yarn (10) with yarn being delivered from a drafting zone of the ring spinning machine (13).

[0047] Various modifications to these embodiments are apparent to those skilled in the art from the description and drawings herein. The principles associated with the various embodiment defined herein may be applied to other embodiments. Therefore, the description is not intended to be limited to the embodiments shown along with the accompanying drawings but is to be provided broadest scope consistent with the principles and novel and inventive features describe/disclosed or suggested herein. Any modifications, equivalent substitutions, improvements etc. within the principle of the present invention shall all be included in the scope of protection of the present invention.

Claims

1. A yarn inserting arrangement (2) for a ring spinning machine comprising:

a suction tube (8) adapted to receive a lifted end of a broken yarn (10) from a cop (9), the suction tube (8) being positioned above the cop (10);
a gripping arm (3) adapted to pull the broken yarn (10) in between the suction tube (8) and the cop (9); and
a rocker arm (4) adapted to pull the broken yarn (10) after the gripping arm (3) moves downwards to a position proximal to a ring position of a ring rail (11), to allow the broken yarn (10) hooked in the gripping arm (3) and the rocker arm (4) to be substantially tangential to the ring of the ring rail (11), for insertion of the broken yarn (10) into a rotatable traveler (12) positioned in the ring of

- the ring rail (11).
2. The yarn inserting arrangement (2) as claimed in claim 1, wherein the gripping arm (3) comprises a retractable needle member (15) for fixedly gripping the broken yarn (10). 5
 3. The yarn inserting arrangement (2) as claimed in claim 1, wherein the gripping arm (3) is adapted to oscillate substantially horizontally by an actuating means (6). 10
 4. The yarn inserting arrangement (2) as claimed in claim 1, wherein the rocker arm (4) is adapted to oscillate substantially vertically by an actuating means (7a). 15
 5. The yarn inserting arrangement (2) as claimed in claim 1, wherein the rocker arm (4) is adapted to oscillate substantially horizontally by an actuating means (7b). 20
 6. The yarn inserting arrangement (2) as claimed in claim 1, wherein any or a combination of the gripping arm (3) and the rocker arm (4) are adapted to oscillate vertically or horizontally by at least an actuating means. 25
 7. The yarn inserting arrangement (2) as claimed in claim 6, wherein the actuating means is any of the pneumatic, hydraulic or electric. 30
 8. The yarn inserting arrangement (2) as claimed in claim 1, wherein the traveler (12) is adapted to rotate by means of a blowing means to allow insertion of the broken yarn (10) inside the traveler (12). 35
 9. The yarn inserting arrangement (2) as claimed in claim 8, wherein the blowing means comprises an air nozzle pointed towards the ring on the ring rail (11) so as to blow air to rotate the traveler (12) during yarn inserting. 40
 10. The yarn inserting arrangement (2) as claimed in claim 1, wherein in the position in which the gripping arm (3) with pulled yarn reaches downwards proximal to the ring of the ring rail (11), the broken yarn (10) forms a V-shape between the suction tube (8), the gripping arm (3) and a Balloon Control ring (14) surrounding the cop (9). 45
 11. The yarn inserting arrangement (2) as claimed in claim 1, wherein the rocker arm (4) pulls the broken yarn (10) present in between a balloon control ring (14) surrounding the cop (9) and the gripping arm (3). 50
 12. The yarn inserting arrangement (2) as claimed in claim 11, wherein the broken yarn (10) forms a V-shape between the Balloon control ring (14), the rocker arm (4) and the gripping arm (3).
 13. The yarn inserting arrangement (2) as claimed in claim 1, wherein the gripping arm (3) and the rocker arm (4) are moved towards the ring of ring rail (11) through an actuating means (5) for insertion of the broken yarn (10) into the rotatable traveler (12).
 14. The yarn inserting arrangement (2) as claimed in claim 1, wherein the broken yarn (10) is released from the gripping arm (3) and the rocker arm (4) after the yarn is inserted inside the traveler (12).
 15. A method of piecing broken yarn (10) in a ring spinning machine, the method comprising the steps of:
 - lifting an end of a broken yarn (10) from a cop (9) to a suction tube (8) positioned above the cop (10);
 - pulling, by a gripping arm (3), the broken yarn (10) in between the suction tube (8) and the cop (9); and
 - pulling, by a rocker arm (4), the broken yarn (10) after the gripping arm (3) moves downwards to a position proximal to a ring position of a ring rail (11); and
 - allowing the broken yarn (10) hooked in the gripping arm (3) and the rocker arm (4) to be substantially tangential to the ring of the ring rail (11), for insertion of the broken yarn (10) into a rotatable traveler (12) positioned in the ring of the ring rail (11).
 16. The method as claimed in claim 15, further comprising a step of piecing the broken yarn (10) with yarn/fibre being delivered from the drafting zone.
 17. The method as claimed in claim 15, wherein any or a combination of the gripping arm (3) and the rocker arm (4) are adapted to oscillate vertically or horizontally by at least an actuating means (6, 7a, 7b).
 18. The method as claimed in claim 15, wherein the traveler (12) is adapted to rotate by means of a blowing means to allow insertion of the broken yarn (10) inside the traveler (12).
 19. A yarn inserting arrangement for an automatic piecing unit of a ring spinning machine comprising:
 - a suction tube (8) adapted to receive a lifted end of a broken yarn (10) from a cop (9), the suction tube (8) being positioned above the cop (10);
 - a gripping arm (3) adapted to pull the broken yarn (10) in between the suction tube (8) and the cop (9); and
 - a rocker arm (4) adapted to pull the broken yarn

(10) after the gripping arm (3) moves downwards to a position proximal to a ring position of a ring rail (11), to allow the broken yarn (10) hooked in the gripping arm (3) and the rocker arm (4) to be substantially tangential to the ring of the ring rail (11), for insertion of the broken yarn (10) into a rotatable traveler (12) positioned in the ring of the ring rail (11).

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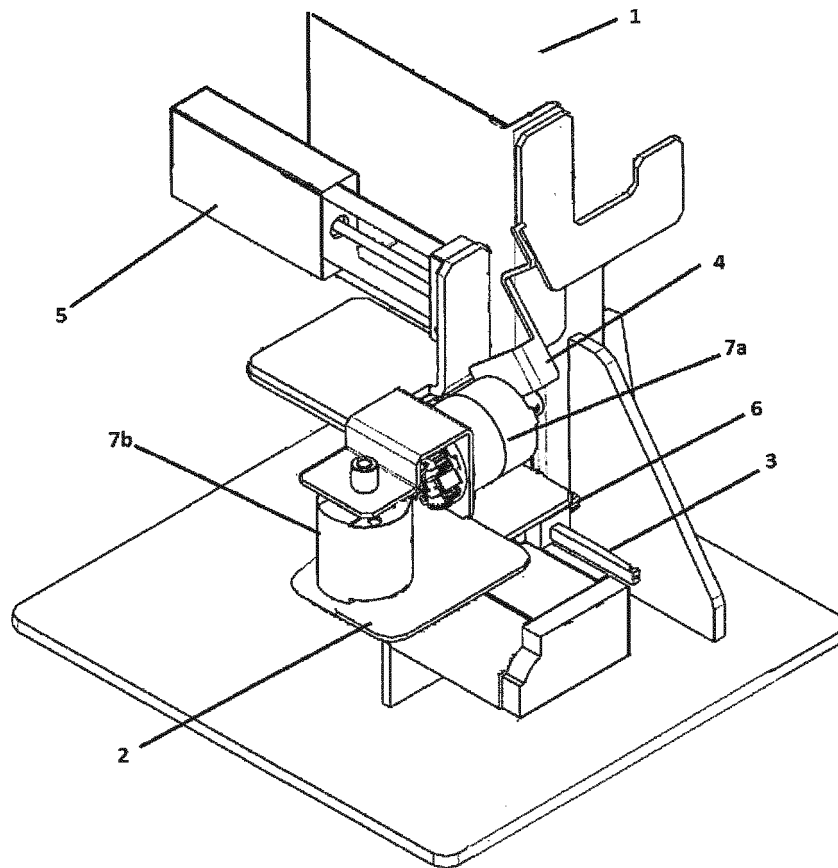


Figure 1

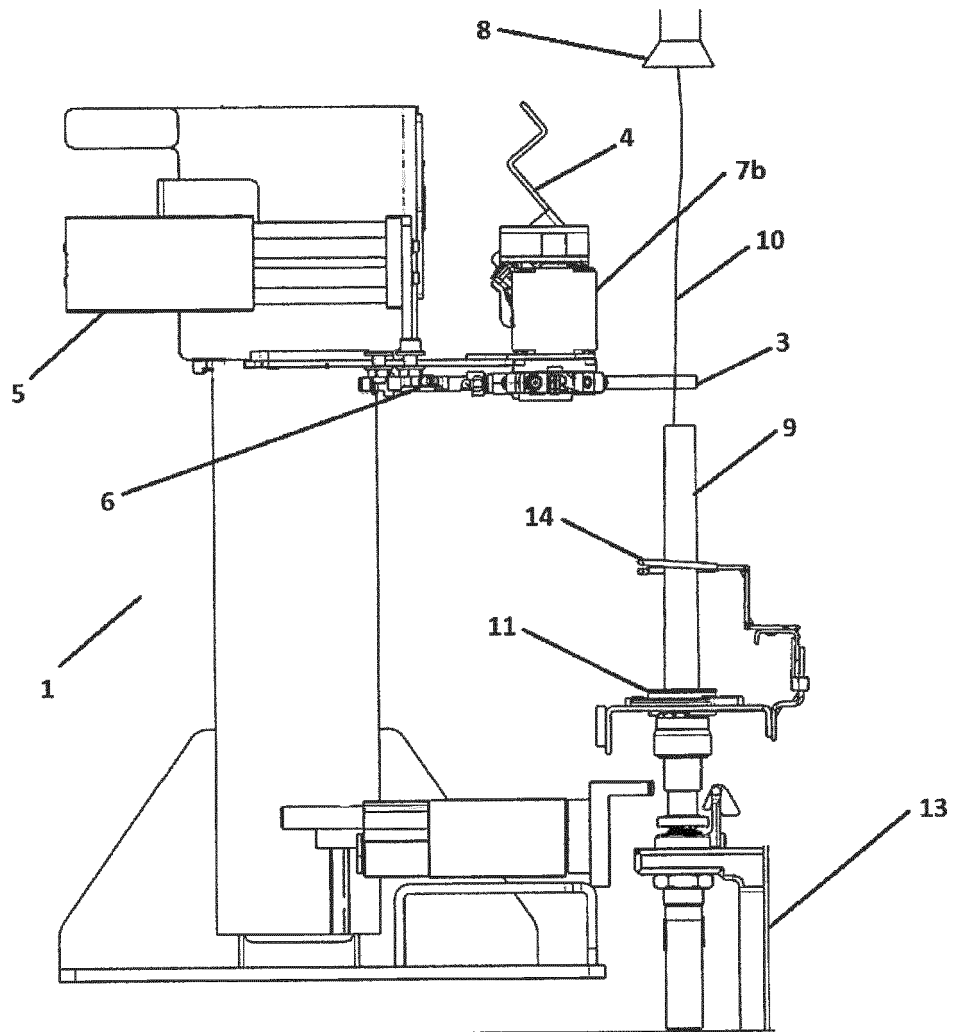


Figure 2

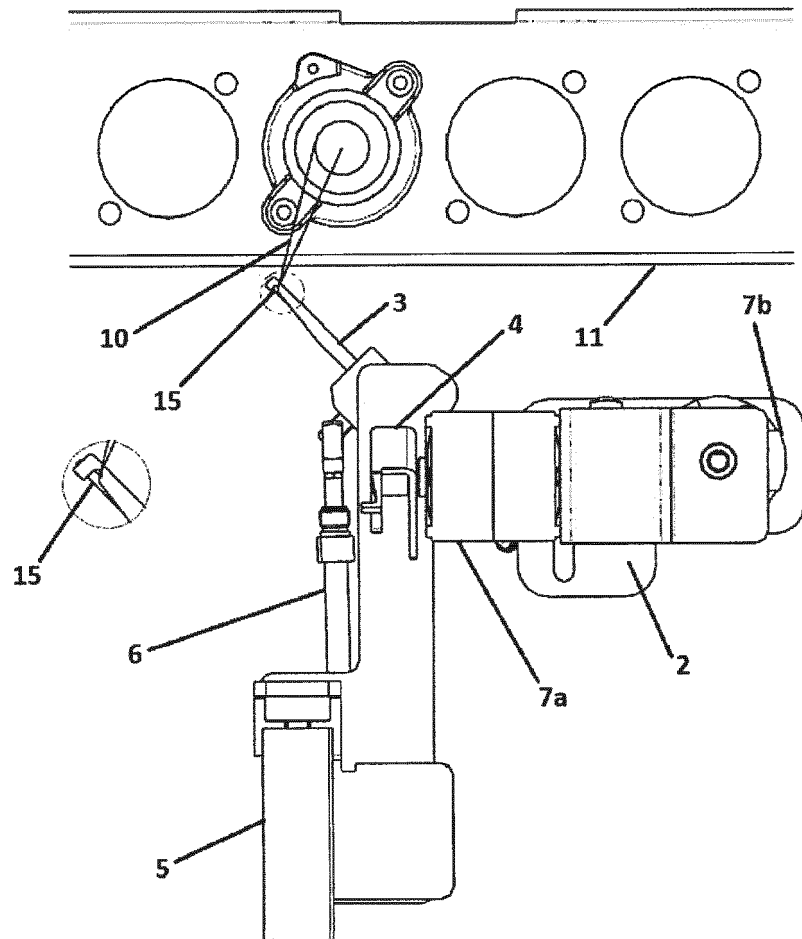


Figure 3A

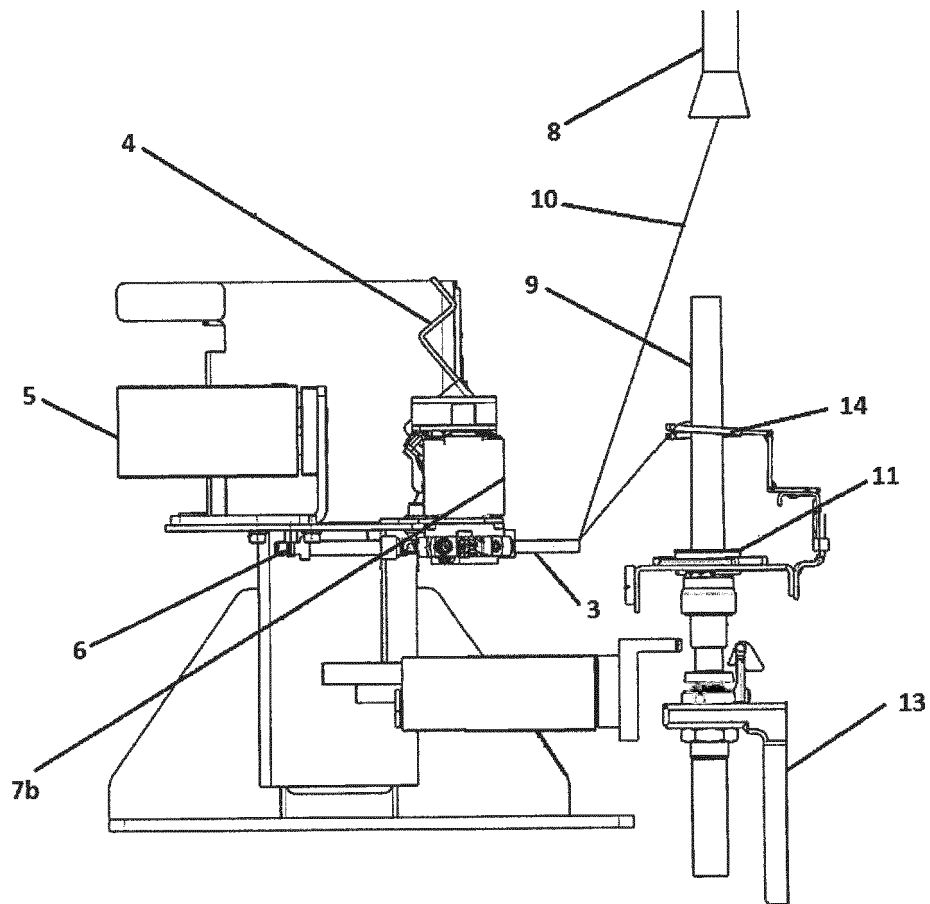


Figure 3B

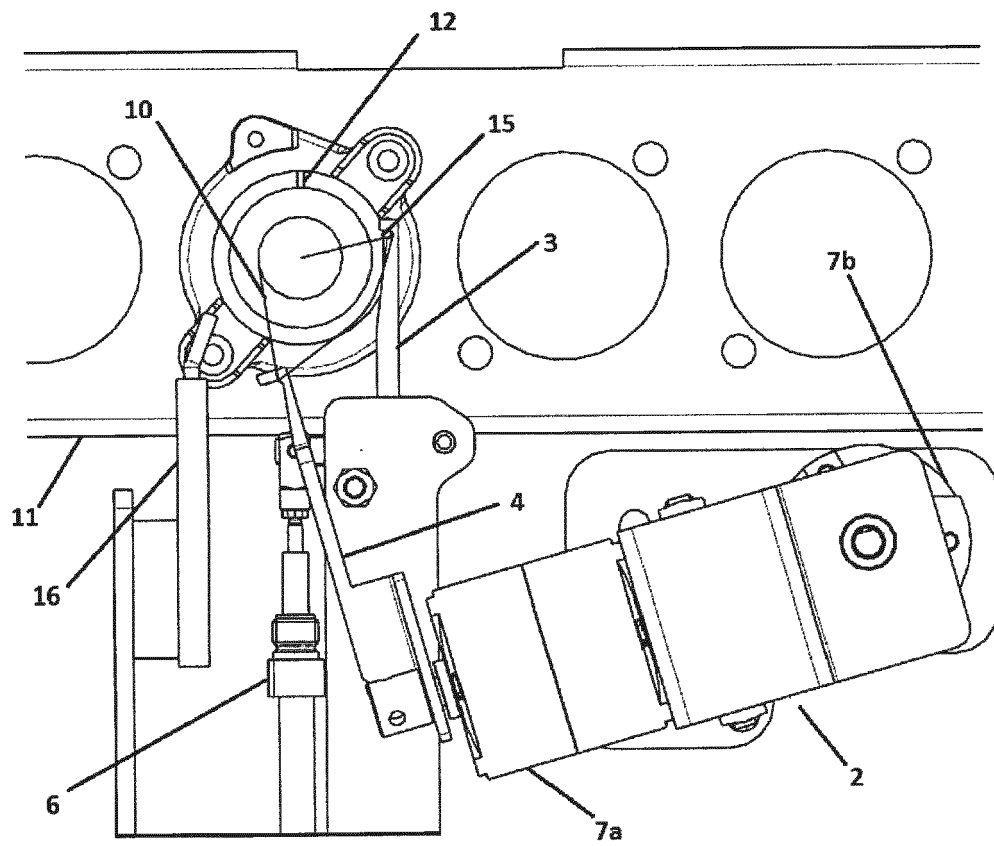


Figure 3C

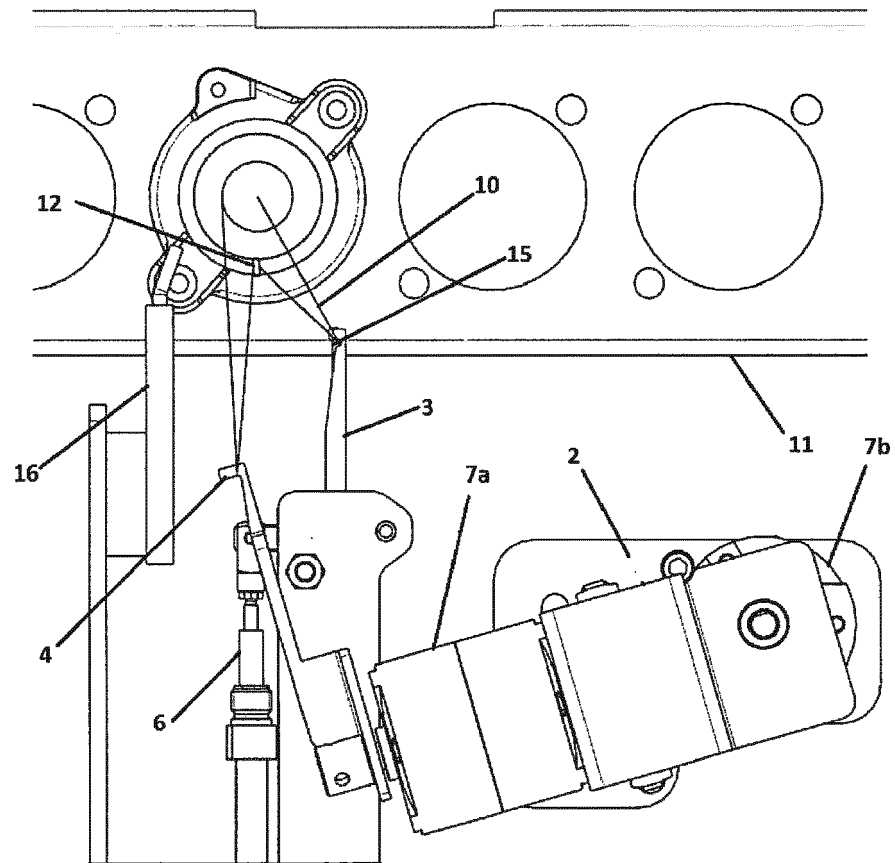


Figure 3D

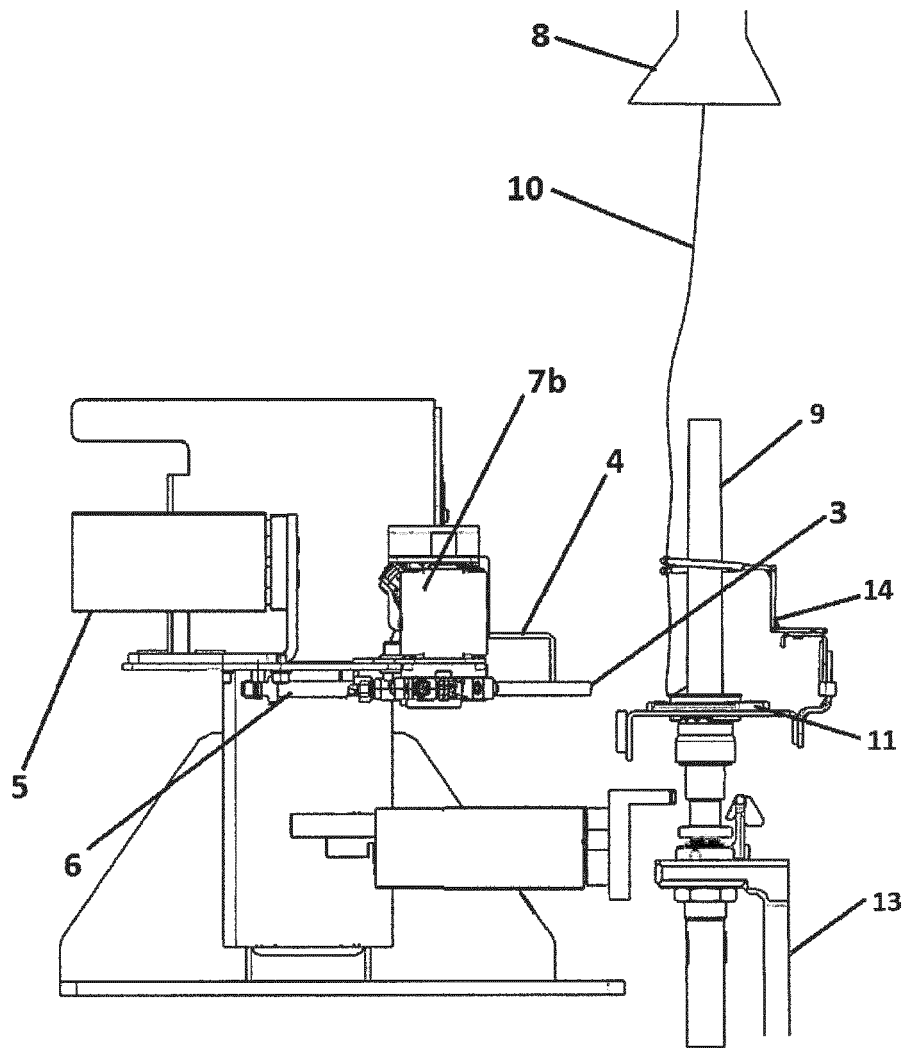


Figure 4

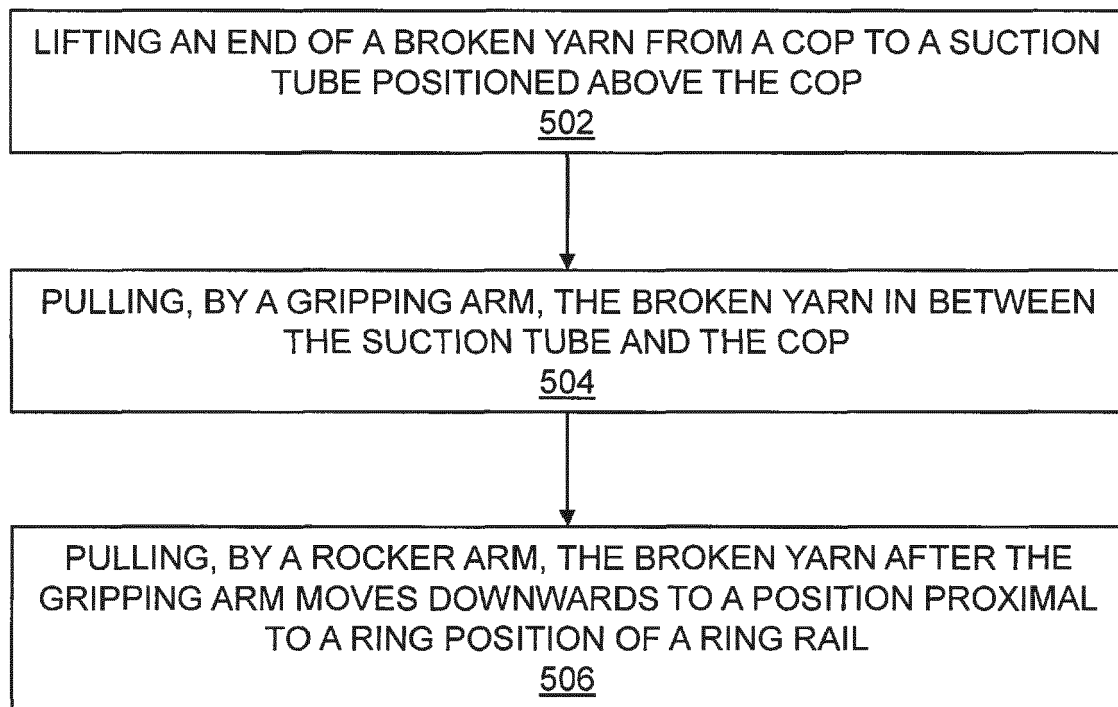


Figure 5



EUROPEAN SEARCH REPORT

Application Number
EP 19 17 0803

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			D01H B65H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 September 2019	Examiner Hausding, Jan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

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

EP 19 17 0803

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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