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(54) **A PIECING ARM ASSEMBLY FOR AN AUTOMATIC PIECING APPARATUS AND A METHOD THEREOF**

SPLEISSVORRICHTUNG MIT EINEM ARM FÜR EINE AUTOMATISCHE SPLEISSAPPARATUR UND SPLEISSVERFAHREN

ENSEMBLE DE RATTACHE AVEC BRAS POUR SYSTÈMES DE RATTACHE AUTOMATIQUE ET PROCÉDÉ ASSOCIÉ

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Description**TECHNICAL FIELD**

5 **[0001]** The present invention relates to a piecing arm assembly for an automatic piecing apparatus and a method thereof.

BACKGROUND OF THE DISCLOSURE

10 **[0002]** In textile spinning mills, ring spinning machines are used to produce continuous lengths of yarn. Textile roving materials produced from roving frame machines are usually fed into the ring spinning machines. The roving material is first drafted and twisted and then wound on a package so called cop or yarn cop. During this spinning process, yarn breakage in the said ring spinning machines is a common and frequent problem that requires continuous attention of the work force. In the present day, the yarn breakage remains a major disadvantage in ring spinning machines. Traditionally, large number of workers used to continuously monitor the ring spinning machines throughout the length of the machine frame, which is normally more than 1200 spindles. The broken yarns have to be pieced manually and the yarn spinning sequence has to be restarted after yarn breakage in order to avoid wastage of yarn. This becomes a monotonous task and continuous monitoring of the ring spinning machines drains stamina and health of the workers due to continuous walking along the long ring spinning frames to manually piece the broken yarn ends throughout the day.

20 **[0003]** In view of the above problems, automatic piecing devices are developed as an improvement over the conventional method of manual piecing. The automatic piecing devices involves a robot or a worker in a piecing vehicle or piecing device with built-in drive units and supportive functional units. These automatic piecing devices require additional effort to advance towards the ring spinning machine for piecing operation and to return back after completion of the piecing operation. The conventional automatic piecing devices may practically fail to properly catch and hold the joining ends of the yarn during piecing. This is one of the major drawbacks of the conventional automatic piecing devices that may lead to improper automatic piecing operation.

25 **[0004]** GB 1193305 A discloses a device for repairing yarn breakage on spinning frames and spinning and twisting frames, comprising a broken yarn end catcher and a yarn piecing mechanism adapted to be located between the draft system and a thread guide for guiding thread onto a package from the draft system, said catcher and yarn piecing mechanism being oscillatable with the yarn at right angles to the length of yarn emerging from the draft system of the frame, the broken end yarn catcher being comprised of a plurality of interconnected members, at least two of which members being disposed relative to each other to, define a slot which is tapered or wedge shaped so as to allow free passage of the yarn through the wide part of the slot and to trap the yarn at its narrow part after breakage of the yarn.

30 **[0005]** DE 30 15 839 A1 discloses a piecing device in which, the pressure roller can be arranged via a bearing device on a ball joint which resiliently supports in a spherical bearing of the slide. This bearing device can consist of an intermediate piece and a bearing pin, wherein a compression spring acts on both sides of the slide, the intermediate piece or a clamping element fastened to the bearing pin. The spherical joint results in the aforementioned, spherical movability of the pressure roller, so that the pressure roller is always optimally in contact with the output lower roller without an exact adjustment being necessary.

35 **[0006]** A centering plate is arranged below the pressure roller and has a V-shaped thread guide. The centering plate can be moved relative to the output lower roller via a piston-cylinder unit.

40 **[0007]** DE 37 28 333 A1 employs a linear guide element and the drive is complicated using threaded spindle / screw rod and stepper motor, which is practically not workable for precise positioning of yarn for piecing, using threaded spindle driven by stepper motor.

45 **[0008]** Also, in DE 37 28 333 A1, the movement of the guide element is designed such that it covers the entire traversing region a of the roving and goes beyond it on one side, wherein a cutting element is arranged stationarily on the region of the path of movement beyond the traversing region.

[0009] In JP S5296241, the movement of the lever is achieved by cam & push bar arrangement, by pressing the cradle, against the roller.

50 **[0010]** In JP HO7 278976 A a cutting mechanism is shown that is a complicated construction.

[0011] The present invention is directed to overcome one or more limitations stated above or any other limitation associated with the conventional arts.

SUMMARY OF THE DISCLOSURE

55 **[0012]** One or more shortcomings of the prior art are overcome by a piecing arm assembly according to claim 1 and a method according to claim 10..

[0013] In an embodiment, the at least one arm is pivotably connected to a base unit of the automatic piecing apparatus.

[0014] In an embodiment, the piecing arm assembly comprises an arm plate which is configured to house the at least one roller and the plurality of guide fingers.

[0015] In an embodiment, the movable plate comprises of a guiding surface that co-operates with the guide slot for sliding the tail yarn into the guide slot for piecing.

[0016] In an embodiment, the first actuator is a linear actuator configured with a drive.

[0017] In an embodiment, the at least one arm in the second position makes the at least one roller contact with the delivery drafting roller of the textile spinning machine for piecing the tail yarn and a broken yarn at a position proximal to the nip point of said delivery drafting roller.

[0018] In an embodiment, the piecing arm assembly comprises of a cutter unit that is connected to the movable plate, wherein the cutter unit is connected to a second actuator to snip excess tail yarn after piecing.

[0019] It is to be understood that the aspects and embodiments of the disclosure described above may be used in any combination with each other. Several of the aspects and embodiments may be combined together to form a further embodiment of the disclosure.

[0020] The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

[0021] The novel features and characteristics of the disclosure are set forth in the description. The disclosure itself, however, as well as a preferred mode of use, further advantages thereof, will best be understood by reference to the following description of an illustrative embodiment when read in conjunction with the accompanying drawings. One or more embodiments are now described, by way of example only, with reference to the accompanying drawings wherein like reference numerals represent like elements and in which:

Figure 1 illustrates a schematic view of a textile spinning machine, equipped with a spinning station, in accordance with an embodiment of the present disclosure.

Figure 2 illustrates schematic view of the textile spinning machine and an automatic piecing apparatus, in accordance with an embodiment of the present disclosure.

Figure 3 illustrates a front perspective view of the piecing arm assembly of the automatic piecing apparatus, in accordance with an embodiment of the present disclosure.

Figure 4 illustrates the automatic piecing apparatus in the tail yarn drawing position, in accordance with an embodiment of the present disclosure.

Figure 5 illustrates the piecing arm assembly of the automatic piecing apparatus in the tail yarn piecing position, in accordance with an embodiment of the present invention .

Figures 6a and 6b illustrates rear side view of the piecing arm assembly with a movable plate in accordance with an embodiment of the present invention..

Figure 7 illustrates rear perspective view of the piecing arm assembly of the automatic piecing apparatus, in accordance with an embodiment of the present disclosure.

Figures 8a and 8b illustrates a cutter assembly configured in the piecing arm assembly, in accordance with an embodiment of the present invention .

Figure 9 illustrates the automatic piecing apparatus after completion of the piecing operation, in accordance with an embodiment of the present disclosure.

[0022] The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0023] The foregoing has broadly outlined the features and technical advantages of the present disclosure in order that the detailed description of the disclosure that follows may be better understood. Additional features and advantages of the disclosure will be described hereinafter which form the subject of the claims of the disclosure. It should be appreciated by those

skilled in the art that, the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other mechanism for carrying out the same purposes of the present disclosure. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the scope of the disclosure as set forth in the appended claims. The novel features which are believed to be characteristic of the disclosure,

both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present disclosure.

[0024] The terms "comprises", "comprising", or any other variations thereof, are intended to cover a non-exclusive inclusion, such that an assembly, device or method that comprises a list of components or steps does not include only those components or steps but may include other components or steps not expressly listed or inherent to such setup or device or method. In other words, one or more elements in a system or apparatus preceded by "comprises... a" does not, without more constraints, preclude the existence of other elements or additional elements in the system or apparatus.

[0025] Embodiments of the present disclosure relates in general to textile spinning machines. More particularly, the present disclosure relates to a textile spinning machine configured with an automatic piecing apparatus. The automatic piecing apparatus comprises of a base unit, a support frame, wherein the base unit is provided with an advancing mechanism. The apparatus also includes a piecing arm assembly mounted to the base unit. The base unit may be configured with a first suction pipe to draw a tail yarn from a yarn cop of the textile spinning machine for piecing. The piecing arm assembly comprises of at least one roller to aid in the piecing operation and advancing the pieced yarn downstream after piecing and at least one guide finger to locate the piecing arm assembly with the delivery drafting roller. An arm plate is configured with the piecing arm assembly, wherein the plurality of guide fingers and the at least one roller is mounted on the arm plate. A movable plate is configured with the piecing arm assembly with a guiding surface and a guide slot on the movable plate so as to guide the tail yarn into the guide slot for effectively piecing the broken yarn. A cutter assembly with plurality of cutter elements is mounted on the movable plate to snip the excess yarn that is left after the piecing operation is completed. During the piecing operation the tail yarn is carried up to the engaging position by the piecing arm assembly where the tail yarn is made to come in contact with the broken yarn. The tail yarn and the broken yarn catch each other, thus resulting in a piecing operation. After the piecing operation is completed, the piecing arm assembly may be retracted back to its retracted position and the automatic piecing apparatus moves to the next location.

[0026] Reference will now be made to the exemplary embodiments of the disclosure, as illustrated in the accompanying drawings. Wherever possible, same numerals will be used to refer to the same or like parts. The following paragraphs describe the present disclosure with reference to Figures 1 to 9.

[0027] Figure 1 is an exemplary embodiment of the disclosure which illustrates a perspective view of a textile spinning machine (1). The textile spinning machine (1) comprises of at least one spinning station (2), wherein the at least one spinning station (2) provides a continuous roving (3) for drafting. A drafting unit (4) is fixed to the textile spinning machine (1), wherein the drafting process is carried out by the aid of the delivery drafting rollers (5) configured within the drafting unit (4). The continuous roving (3) that is fed into the drafting unit (4) is drafted and subsequently twisted and then wound on a bobbin so as to form a yarn cop (6). Referring now to figure 2, a tail yarn (12) that is broken away from the continuous roving (3) is attached to the yarn cop (6). In other words, the broken end of the tail yarn (12) is entangled in the yarn cop (6).

[0028] To piece the broken yarn (10) and the tail yarn (12), an automatic piecing apparatus (7) may be employed in the spinning area [best shown in FIG. 2]. The automatic piecing apparatus (7) comprises of a first suction pipe (14) (refer Figure 4). The first suction pipe (14) is used to draw the tail yarn (12) from the yarn cop (6) wherein the tail yarn (12) is attached to the yarn cop (6). The first suction pipe (14) generates a negative pressure due to which a suction force is created. The suction force created in the first suction pipe (14) draws the tail yarn (12) from the yarn cop (6) into the first suction pipe (14). In an embodiment, the automatic piecing apparatus (7) may be located adjacent to the textile spinning machine (1). The automatic piecing apparatus (7) displaces along the textile spinning machine (1) in order to stop at the required yarn cop (6) for piecing the tail yarn (12) with the broken yarn (10).

[0029] Figure 3 illustrates a schematic view of the piecing arm assembly (15) of the automatic piecing apparatus (7). The piecing arm assembly (15) comprises of at least one arm (16), wherein the at least one arm (16) is connected to

the base unit (9) [shown in figure 2]. The at least one arm (16) is capable of pivoting from a first position to a second position during the operation of the automatic piecing apparatus (7). An arm plate (17) is connected to the at least one arm (16) to facilitate mounting of the plurality of guide fingers (19) and at least one roller (25) of the piecing arm assembly (15). The at least one roller (25) is fixed to the piecing arm assembly (15) wherein, the at least one roller (25) is configured to contact with the delivery drafting roller (5) in the second position. The tail yarn (12) contacts the delivery drafting roller (5) at a nip point. The nip point is the location where the delivery drafting rollers are capable of coming in contact with the at least one roller (25). The at least one arm (16) is positioned proximal to the nip point at the second position.

[0030] Further, the piecing arm assembly (15) comprises of the plurality of guide fingers (19) fixed to the arm plate (17). At least one roller (25) is configured on the plurality of guide fingers (19). As the piecing arm assembly (15) traverses from the first position to the second position, the tail yarn (12) held in the suction pipe (14) is positioned on the at least one roller (25). The plurality of guide fingers (19) may be configured to locate the piecing arm assembly properly with the delivery drafting roller (5). The plurality of guide fingers (19) and the at least one roller (25) help in positioning the tail yarn (12) with the delivery drafting roller (5) to carry out the piecing operation.

[0031] The piecing arm assembly (15) comprises of a movable plate (18) mounted on a support member extending from the at least one arm (16). The movable plate (18) is provided with a guide slot (20) configured to displace linearly in a horizontal direction.

[0032] Further, a first actuator (22) is connected to the movable plate (18), to displace the movable plate (18) linearly in a horizontal direction. The guiding surface (21) co-operating with the guide slot (20) allows the tail yarn (12) to slide into the guide slot (20) while the piecing arm assembly (15) moves for piecing. The first actuator (22) may be connected to one side of the movable plate (18) and a second actuator (23) may be connected on the movable plate (18) for actuating a cutter unit (13) (shown in figure 7). The second actuator (23) is configured to actuate the cutter unit (13) to snip the excess yarn after the piecing operation of the tail yarn (12) is completed.

[0033] As the piecing arm assembly (15) displaces from the first position to the second position, the at least one roller (25) comes in contact with the delivery drafting rollers (5) provided on the drafting unit (4) of the textile spinning machine (1). At this position, the tail yarn (12) which is already held in the first suction pipe (14) is carried by the piecing arm assembly (15) towards the delivery drafting rollers (5). The piecing arm assembly (15) reaches the second position and the tail yarn (12) comes in contact with the delivery drafting roller (5). The tail yarn (12) carried by the piecing arm assembly (15) rests on the at least one roller (25), wherein the at least one roller (25) is configured to rotate freely. In an embodiment, the at least one roller (25) comes in contact with the delivery drafting rollers (5), wherein frictional contact between the at least one roller (25) and the delivery drafting rollers (5), drives the at least one roller (25). More particularly, the at least one roller (25) advances the tail yarn (12) towards the delivery drafting rollers (5) such that, the tail yarn (12) and the broken yarn (10) coming out of the delivery drafting rollers (5) catch or contact each other to undergo the piecing operation. The rotation of the roller (25) together with delivery drafting rollers (5) advances the pieced yarn downstream after piecing.

[0034] The automatic piecing apparatus (7) comes to the required position i.e. adjacent to the textile spinning machine (1) when the continuous roving (3) breaks. The automatic piecing apparatus (7) comprises of a base unit (9) and a support frame (8) that supports the base unit (9). Further, the yarn cop (6) is stopped from rotating so that the yarn extending from the yarn cop (6) may be drawn into the first suction pipe (14) to complete the piecing operation.

[0035] The textile spinning machine (1) is further configured with a second suction pipe (11). This second suction pipe (11) is mounted on the textile spinning machine (1) beneath the delivery drafting rollers (5). The broken yarn (10) that is extending from the delivery drafting rollers (5) gets drawn into the second suction pipe (11). The drawing of the broken yarn (10) into the second suction pipe (11) is achieved by a suction force created in the second suction pipe (11) on the textile spinning machine (1).

[0036] Figure 4 illustrates the automatic piecing apparatus (7) positioned adjacent to the textile spinning machine (1) to piece the tail yarn (12) and the broken yarn (10). The piecing arm assembly (15) as disclosed in the figure is in the first position. The first suction pipe (14) is operated in order to draw or suck the tail yarn (12) into the first suction pipe (14). Once the tail yarn (12) is sucked into the first suction pipe (14), the piecing arm assembly (15) of the automatic piecing apparatus (7) pivots to its second position. Due to the displacement or pivoting action of the piecing arm assembly (15) from the first position to the second position, the tail yarn (12) is directed towards the drafting unit (4). Also, movement of the piecing arm assembly (15) aids in carrying out the piecing operation.

[0037] Figure 5 illustrates the tail yarn (12) drawn into the first suction pipe (14), wherein the first suction pipe (14) firmly holds the tail yarn (12). The piecing arm assembly (15) of the automatic piecing apparatus (7) is now displaced to the second position. At this position the tail yarn (12) held by the first suction pipe (14) is carried forward towards the delivery drafting roller (5) of the drafting unit (4). This ensures that the tail yarn (12) comes in contact with the delivery drafting roller (5), wherein, the at least one roller (25) mounted to the piecing arm assembly (15) contacts the delivery drafting roller (5). Due to the frictional contact between the delivery drafting roller (5) and the at least one roller (25) of the piecing arm assembly (15), the tail yarn (12) tends to piece with the broken yarn (10) and advances downstream after piecing.

[0038] Figure 6a illustrates rear side view of the piecing arm assembly (15), wherein the movable plate (18) is at the home position, when the first actuator (22) is in an extended position. The movable plate (18) comprises of a guide slot (20) wherein, the guide slot (20) aids in positioning the tail yarn (12) for piecing as the displacement of the piecing arm assembly (15) takes place from the first position to the second position, to piece the tail yarn (12) with the broken yarn (10). Further, a guiding surface (21) in the form of slope is provisioned on the movable plate (18), wherein guiding surface (21) aids in aligning the tail yarn (12) within the guide slot (20) defined in the movable plate (18). The tail yarn (12) is held by the first suction pipe (14) which comes in contact with the guiding surface (21) of the movable plate (18) when the piecing arm assembly (15) moves to the second position. The guiding surface (21) slides the tail yarn (12) into the guide slot (20) thereby aligning the tail yarn (12) in the required position.

[0039] Figure 6b illustrates the second position of the movable plate (18) when the first actuator (22) is in a retracted position. The tail yarn (12) in the guide slot (20) contacts the delivery drafting roller (5) but may not merge with the broken yarn (10) at the nip point of delivery drafting roller (5) and piecing may not happen. The first actuator (22) is actuated to the retracted position so that the movable plate (18) displaces at a distance 'Y'. The said linear traversing (Y) aids in merging and piecing the tail yarn (12). Thus, the movement of the movable plate (18) prevents the tail yarn (12) and the broken yarn (10) from being misaligned.

[0040] This configuration of the piecing arm assembly (15) aids in positioning of the tail yarn (12) for piecing the tail yarn (12) and the broken yarn (10) together.

[0041] Figure 7 illustrates a schematic view of the piecing arm assembly (15) depicting the cutter unit (13). As the piecing operation comes to an end, the excess tail yarn (12) has to be snipped. As a finishing process, the excess yarn is snipped from the pieced yarn. The cutter unit (13) is configured to snip the excess yarn wherein, the cutter unit (13) comprises of a first fixed cutting element (26) and a second movable cutting element (27). The first fixed cutting element (26) is fixed to the movable plate (18) and the second movable cutting element (27) is pivotably connected to the movable plate (18) at a pivot point (28). A connecting link (24) is used to connect the second movable cutting element (27) with the second actuator (23). The pivot point (28) facilitates a scissor like movement of the second movable cutting element (27). In an embodiment, the displacement required by the second movable cutting element (27) is provided by the second actuator (23).

[0042] In an embodiment, the cutting elements (26, 27) of the cutter unit (13) have a sharp edge to cut the excess yarn.

[0043] Figures 8a and 8b illustrates the home position and the cutting position of the cutter unit (13). During the piecing operation, the cutter unit (13) may be at the home position, wherein the second actuator (23) is at a retracted position. The cutter elements (26, 27) may be defined to have sufficient gap for allowing the tail yarn (12) to be positioned in the guide slot (20). The cutter unit (13) may be actuated based on the requirement to snip the excess yarn left out after the piecing operation. In an embodiment, the second actuator (23) is actuated to displace from the retracted position to an extended position. The displacement of the second actuator (23) results in displacing the connecting link (24) of the cutter unit (13). As the connecting link (24) is directly connected to the second movable cutting element (27), it displaces the second movable cutting element (27). The second movable cutting element (27) is pivotably connected to the movable plate (18), hence the displacement given to the second movable cutting element (27) gets converted into pivoting movement of the second movable cutting element (27). This pivoting movement results in a snipping action created between the cutting elements (26, 27).

[0044] Figure 9 illustrates the automatic piecing apparatus (7) after completion of the piecing operation. The tail yarn (12) extending from the yarn cop (6) has been pieced with the broken yarn (10) extending from the delivery drafting rollers (5). The piecing arm assembly (15) of the automatic piecing apparatus (7) is returned to the first position from the second position. The automatic piecing apparatus (7) is then scheduled for the next piecing operation in a different position wherever the piecing operation is required. The normal operation of textile spinning machine continues with the continuous roving (3) delivering out from the delivery drafting rollers (5) for subsequent twisting and winding in the yarn cop (6).

[0045] In an embodiment the first suction pipe (14) and the second suction pipe (11) may be a tube, pipe, conduit, and the like. The suction force created in the first suction pipe (14) is capable of holding the tail yarn (12) drawn into it until the piecing operation is completed.

[0046] In an embodiment the textile spinning machine (1) may be one of textile ring spinning machine, compact yarn spinning machine, and the like.

[0047] In an embodiment, the guide slot (20) may be of U-shape, C-shape, V shape or any other geometrical shape as required.

[0048] In an embodiment, the first actuator (22) and the second actuator (23) are one of pneumatic devices or hydraulic devices or linear actuators or any type of actuators.

[0049] In an embodiment, the first actuator (22) is a linear actuator with a drive unit.

[0050] In an embodiment, an advancing mechanism is provided for moving the automatic piecing apparatus (7) towards or away from the textile spinning machine (1).

[0051] In an embodiment, the automatic piecing apparatus (7) comprises brake actuating mechanism. The brake

actuating mechanism applies a stopping force to the running spindle of the rotating yarn cop (6).

[0052] In an embodiment, the automatic piecing apparatus (7) provides improved and accurate piecing operation by moving the tail yarn (12) in a linear horizontal direction to align it with the broken yarn (10).

[0053] In an embodiment, the tail yarn (12) and the broken yarn (10) are drawn into the first suction pipe (14) and the second suction pipe (11) respectively to hold the tail yarn (12) and the broken yarn (10) while the piecing operation takes place.

[0054] In an embodiment, the broken yarn (10) is one of delivery fiber, delivery roving and the like.

[0055] The embodiments herein and the various features and advantageous details thereof are explained with reference to the non-limiting embodiments in the description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein may be practiced and to further enable those of skill in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting the scope of the protection, which is namely defined by the claims.

[0056] The foregoing description of the specific embodiments will so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the embodiments as described herein.

[0057] Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

[0058] The use of the expression "at least" or "at least one" suggests the use of one or more elements or ingredients or quantities, as the use may be in the embodiment of the disclosure to achieve one or more of the desired objects or results.

[0059] Any discussion of documents, acts, materials, devices, articles and the like that has been included in this specification is solely for the purpose of providing a context for the disclosure. It is not to be taken as an admission that any or all of these matters form a part of the prior art base or were common general knowledge in the field relevant to the disclosure as it existed anywhere before the priority date of this application.

[0060] The numerical values mentioned for the various physical parameters, dimensions or quantities are only approximations and it is envisaged that the values higher/lower than the numerical values assigned to the parameters, dimensions or quantities fall within the scope of the disclosure, unless there is a statement in the specification specific to the contrary.

[0061] While considerable emphasis has been placed herein on the particular features of this disclosure, it will be appreciated that various modifications can be made, and that many changes can be made in the preferred embodiments without departing from the principles of the disclosure. As long as they are falling within the scope of the claims, these and other modifications in the nature of the disclosure or the preferred embodiments will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the disclosure and not as a limitation.

Referral Numerals:

[0062]

Reference Number	Description
1	Textile spinning machine
2	Spinning station
3	Continuous roving
4	Drafting unit
5	Delivery drafting rollers
6	Yarn cop
7	Automatic piecing apparatus
8	Support frame

(continued)

Reference Number	Description
9	Base unit
10	Broken yarn
11	Second suction pipe
12	Tail yarn
13	Cutter unit
14	First suction pipe
15	Piecing arm assembly
16	Arm
17	Arm plate
18	Movable plate
19	Guide finger
20	Guide Slot
21	Guiding surface
22	First actuator
23	Second actuator
24	Connecting link
25	At least one roller
26	First fixed cutting element
27	Second movable cutting element
28	Pivot point

Claims

1. A piecing arm assembly (15) for an automatic piecing apparatus (7) in a textile ring spinning machine, the piecing arm assembly (15) comprising:

at least one arm (16) configured to displace between a first position and a second position;
a plurality of guide fingers (19) connected to the at least one arm (16), said plurality of guide fingers (19) are configured to locate the piecing arm assembly (15) with respect to a delivery drafting roller (5) of the ring spinning machine;
at least one roller (25) positioned on the plurality of guide fingers (19), said the at least one roller (25) is configured to contact the delivery drafting roller (5) in the second position;
a movable plate (18) defined with a guide slot (20) connected to a support member extending from the at least one arm (16), said guide slot (20) is configured to displace linearly along the axis of the roller (25) to align the tail yarn (12) for piecing;
a first actuator (22) connected to the movable plate (18) for actuating said movable plate (18); and
a cutter unit (13) connected to the movable plate (18), said cutter unit (13) is connected to a second actuator (23) to snip excess tail yarn (12) after piecing.

2. The piecing arm assembly (15) as claimed in claim 1, wherein the at least one arm (16) is pivotably connected to a base unit (9) of the automatic piecing apparatus (7).

3. The piecing arm assembly (15) as claimed in claim 1, comprises an arm plate (17) configured to house the at least one roller (25) and the plurality of guide fingers (19).

4. The piecing arm assembly (15) as claimed in claim 1, wherein the movable plate (18) comprises a guiding surface (21) co-operating with the guide slot (20) for sliding the tail yarn (12) into said guide slot (20) for piecing.
5. The piecing arm assembly (15) as claimed in claim 1, wherein the first actuator (22) is a linear actuator configured with a drive.
6. The piecing arm assembly (15) as claimed in claim 1, wherein the first actuator (22) is a pneumatic actuator.
7. The piecing arm assembly (15) as claimed in claim 1, wherein the at least one arm (16) in the second position makes the at least one roller (25) contact with the delivery drafting roller (5) of a textile spinning machine (1) for piecing the tail yarn (12) and a broken yarn (10) at a position proximal to the nip point of said delivery drafting roller (5).
8. The piecing arm assembly (15) as claimed in claim 1, wherein the second actuator (23) is a pneumatic actuator.
9. The automatic piecing apparatus (7) as claimed in claim 1, comprising a suction unit with a suction pipe (14) to draw the tail yarn (12) from yarn cop (6).
10. A method for piecing a yarn by a piecing arm assembly (15) according to one of the above claims, the method comprising:

displacing at least one arm (16) from a first position to a second position for piecing a tail yarn (12) and a broken yarn (10) at a position proximal to a nip point of a delivery drafting roller (5);
drawing the tail yarn (12) towards the piecing arm assembly (15), such that a plurality of guide fingers (19) connected to the at least one arm (16) locates the piecing arm assembly (15) with respect to the delivery drafting roller (5) and the at least one roller (25) positioned on the plurality of guide fingers (19) contacts with the delivery drafting roller (5);
displacing a guide slot (20) using a first actuator (22) connected to a movable plate (18), on a support member extending from the at least one arm (16) linearly along the axis of the roller (25), to align the tail yarn (12) for piecing;
snipping the excess tail yarn (12) by means of a cutter unit (13) connected to a second actuator (23), after piecing.

Patentansprüche

1. Anspinnarmanordnung (15) für eine automatische Anspinnvorrichtung (7) in einer Textirlingspinnmaschine, wobei die Anspinnarmanordnung (15) Folgendes umfasst:

mindestens einen Arm (16), der konfiguriert ist, um sich zwischen einer ersten Position und einer zweiten Position zu verschieben;
eine Vielzahl von Führungsfingern (19), die mit dem mindestens einen Arm (16) verbunden sind, wobei die Vielzahl von Führungsfingern (19) konfiguriert sind, um die Anspinnarmanordnung (15) in Bezug auf eine Lieferstreckwalze (5) der Ringspinnmaschine zu positionieren;
mindestens eine Walze (25), die auf der Vielzahl von Führungsfingern (19) positioniert ist, wobei die mindestens eine Walze (25) konfiguriert ist, um die Lieferstreckwalze (5) in der zweiten Position zu berühren;
eine bewegliche Platte (18), die mit einem Führungsschlitz (20) definiert ist, der mit einem Stützelement verbunden ist, das sich von dem mindestens einen Arm (16) erstreckt, wobei der Führungsschlitz (20) konfiguriert ist, um sich linear entlang der Achse der Walze (25) zu verschieben, um das Endgarn (12) zum Anspinnen auszurichten;
einen ersten Aktuator (22), der mit der beweglichen Platte (18) verbunden ist, um die bewegliche Platte (18) zu betätigen; und
eine Schneideinheit (13), die mit der beweglichen Platte (18) verbunden ist, wobei die Schneideinheit (13) mit einem zweiten Aktuator (23) verbunden ist, um überschüssiges Endgarn (12) nach dem Anspinnen einzuklemmen.
2. Anspinnarmanordnung (15) nach Anspruch 1, wobei der mindestens eine Arm (16) mit einer Basiseinheit (9) der automatischen Anspinnvorrichtung (7) schwenkbar verbunden ist.
3. Anspinnarmanordnung (15) nach Anspruch 1, die eine Armplatte (17) umfasst, die konfiguriert ist, um die mindestens

eine Walze (25) und die Vielzahl von Führungsfingern (19) aufzunehmen.

4. Anspinnarmanordnung (15) nach Anspruch 1, wobei die bewegliche Platte (18) eine Führungsfläche (21) umfasst, die mit dem Führungsschlitz (20) zusammenwirkt, um das Endgarn (12) zum Anspinnen in den Führungsschlitz (20) zu schieben.
5. Anspinnarmanordnung (15) nach Anspruch 1, wobei der erste Aktuator (22) ein Linearaktuator ist, der mit einem Antrieb konfiguriert ist.
6. Anspinnarmanordnung (15) nach Anspruch 1, wobei der erste Aktuator (22) ein pneumatischer Aktuator ist.
7. Anspinnarmanordnung (15) nach Anspruch 1, wobei der mindestens eine Arm (16) in der zweiten Position die mindestens eine Walze (25) in Kontakt mit der Lieferstreckwalze (5) einer Textilspinnmaschine (1) zum Anspinnen des Endgarns (12) und eines gebrochenen Garns (10) an einer Position nahe dem Klemmpunkt der Lieferstreckwalze (5) bringt.
8. Anspinnarmanordnung (15) nach Anspruch 1, wobei der zweite Aktuator (23) ein pneumatischer Aktuator ist.
9. Automatische Anspinnvorrichtung (7) nach Anspruch 1, umfassend eine Saugereinheit mit einem Saugrohr (14), um das Endgarn (12) von dem Garnkop (6) zu ziehen.
10. Verfahren zum Anspinnen eines Garns durch eine Anspinnarmanordnung (15) nach einem der vorstehenden Ansprüche, wobei das Verfahren Folgendes umfasst:

Verschieben mindestens eines Arms (16) von einer ersten Position zu einer zweiten Position zum Anspinnen eines Endgarns (12) und eines gebrochenen Garns (10) an einer Position nahe einem Klemmpunkt einer Lieferstreckwalze (5);
 Ziehen des Endgarns (12) in Richtung der Anspinnarmanordnung (15), sodass eine Vielzahl von Führungsfingern (19), die mit dem mindestens einen Arm (16) verbunden sind, die Anspinnarmanordnung (15) in Bezug auf die Lieferstreckwalze (5) positioniert und die mindestens eine Walze (25), die auf der Vielzahl von Führungsfingern (19) positioniert ist, die Lieferstreckwalze (5) berührt;
 Verschieben eines Führungsschlitzes (20) unter Verwendung eines ersten Aktuators (22), der mit einer beweglichen Platte (18) verbunden ist, auf einem Stützelement, das sich von dem mindestens einen Arm (16) linear entlang der Achse der Walze (25) erstreckt, um das Endgarn (12) zum Anspinnen auszurichten;
 Einklemmen des überschüssigen Endgarns (12) mittels einer Schneideinheit (13), die mit einem zweiten Aktuator (23) verbunden ist, nach dem Anspinnen.

Revendications

1. Ensemble de rattachage avec bras (15) pour un appareil de rattachage automatique (7) dans un métier à filer à anneaux, l'appareil de rattachage (15) comprenant :
 au moins un bras (16) configuré pour se déplacer entre une première position et une deuxième position ;
 une pluralité de doigts de guidage (19) raccordés à l'au moins un bras (16), ladite pluralité de doigts de guidage (19) étant configurée pour localiser l'appareil de rattachage (15) relativement à un rouleau d'étirage de distribution (5) du métier à filer à anneaux ;
 au moins un rouleau (25) positionné sur la pluralité de doigts de guidage (19), ledit au moins un rouleau (25) étant configuré pour être en contact avec le rouleau d'étirage de distribution (5) dans la deuxième position ;
 une plaque mobile (18) définie avec une fente de guidage (20) raccordée à un élément de support déployé depuis l'au moins un bras (16), ladite fente de guidage (20) étant configurée pour se déplacer de façon linéaire le long de l'axe du rouleau (25) afin d'aligner le fil d'extrémité (12) pour le rattachage ;
 un premier actionneur (22) raccordé à la plaque mobile (18) pour actionner ladite plaque mobile (18) ; et
 une unité de coupe (13) raccordée à la plaque mobile (18), ladite unité de coupe (13) étant raccordée à un deuxième actionneur (23) pour couper l'excédent de fil d'extrémité (12) après le rattachage.
2. Ensemble de rattachage avec bras (15) selon la revendication 1, l'au moins un bras (16) étant raccordé par pivotement à un socle (9) de l'appareil de rattachage automatique (7).

3. Ensemble de rattachage avec bras (15) selon la revendication 1, comprenant une plaque de bras (17) configurée pour contenir l'au moins un rouleau (25) et la pluralité de doigts de guidage (19).
- 5 4. Ensemble de rattachage avec bras (15) selon la revendication 1, la plaque mobile (18) comprenant une surface de guidage (21) coopérant avec la fente de guidage (20) pour coulisser le fil d'extrémité (12) dans la fente de guidage (20) pour le rattachage.
5. Ensemble de rattachage avec bras (15) selon la revendication 1, le premier actionneur (22) étant un actionneur linéaire configuré avec un dispositif d'entraînement.
- 10 6. Ensemble de rattachage avec bras (15) selon la revendication 1, le premier actionneur (22) étant un actionneur pneumatique.
- 15 7. Ensemble de rattachage avec bras (15) selon la revendication 1, l'au moins un bras (16) dans la deuxième position mettant l'au moins un rouleau (25) au contact du rouleau d'étirage de distribution (5) d'un métier à filer de matières textiles (1) pour le rattachage du fil d'extrémité (12) et d'un fil cassé (10) dans une position proche du point de pincement dudit rouleau d'étirage de distribution (5).
- 20 8. Ensemble de rattachage avec bras (15) selon la revendication 1, le deuxième actionneur (23) étant un actionneur pneumatique.
9. Appareil de rattachage automatique (7) selon la revendication 1, comprenant un dispositif d'aspiration avec un tuyau d'aspiration (14) permettant d'extraire le fil d'extrémité (12) de la canette (6).
- 25 10. Procédé de rattachage d'un fil par un ensemble de rattachage avec bras (15) selon une quelconque des revendications ci-dessus, le procédé comprenant :.

le déplacement d'au moins un bras (16) d'une première position à une deuxième position pour rattacher un fil d'extrémité (12) et un fil cassé (10) dans une position proche du point de pincement dudit rouleau d'étirage de distribution (5) ;

l'entraînement du fil d'extrémité (12) vers l'ensemble de rattachage avec bras (15) de sorte qu'une du pluralité de doigts de guidage (19) raccordés à l'au moins un bras (16) localise l'ensemble de rattachage avec bras (15) relativement au rouleau d'étirage de distribution (5), et l'au moins un rouleau (25) positionné sur la pluralité de doigts de guidage (19) entre en contact avec le rouleau d'étirage de distribution (5) ;

le déplacement d'une fente de guidage (20) à l'aide d'un premier actionneur (22) raccordé à une plaque mobile (18) sur un élément de support déployé depuis l'au moins un bras (16) de façon linéaire le long de l'axe du rouleau (25) afin d'aligner le fil d'extrémité (12) pour le rattachage ;

la coupe de l'excédent de fil d'extrémité (12) à l'aide d'une unité de coupe (13) raccordée à un deuxième actionneur (23) après le rattachage.

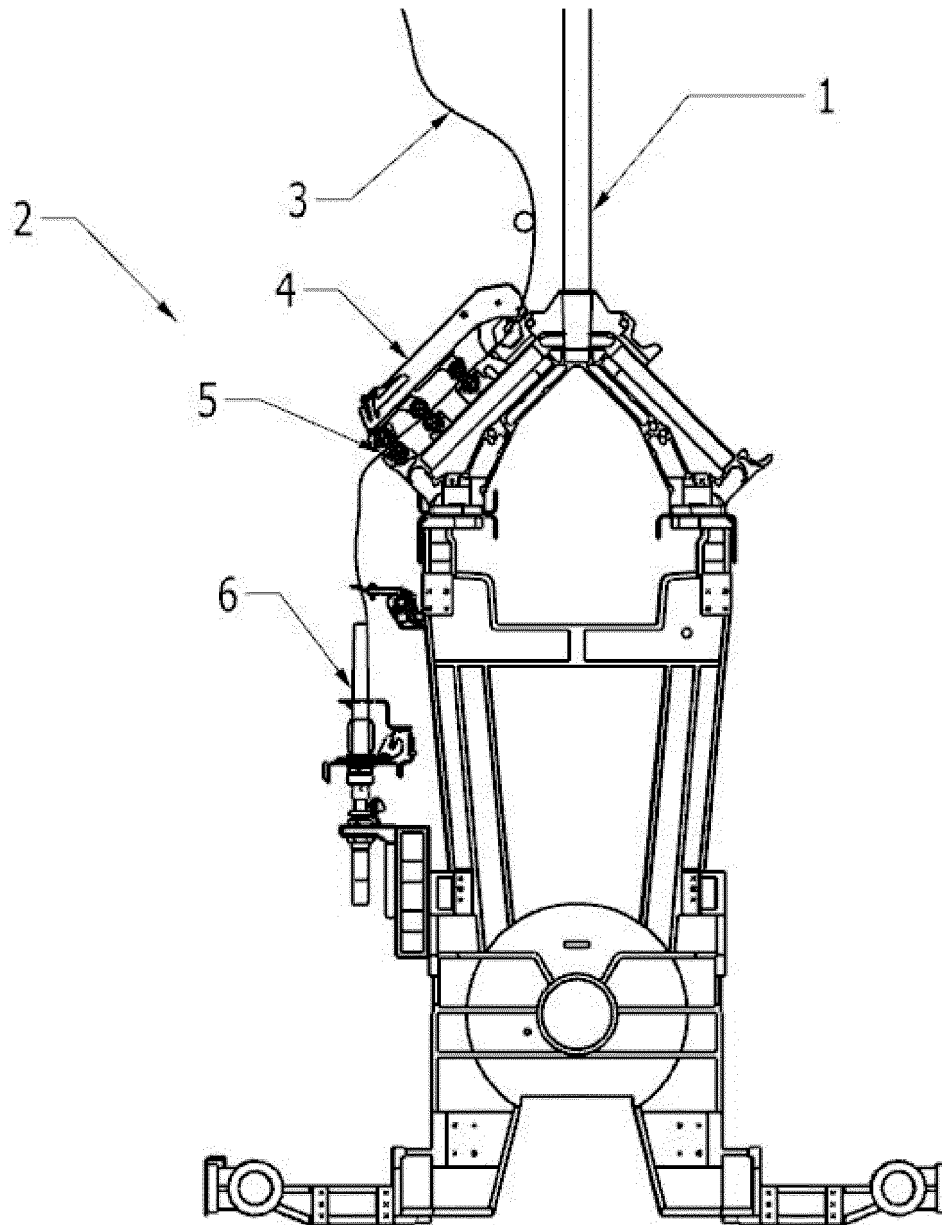


Figure-1

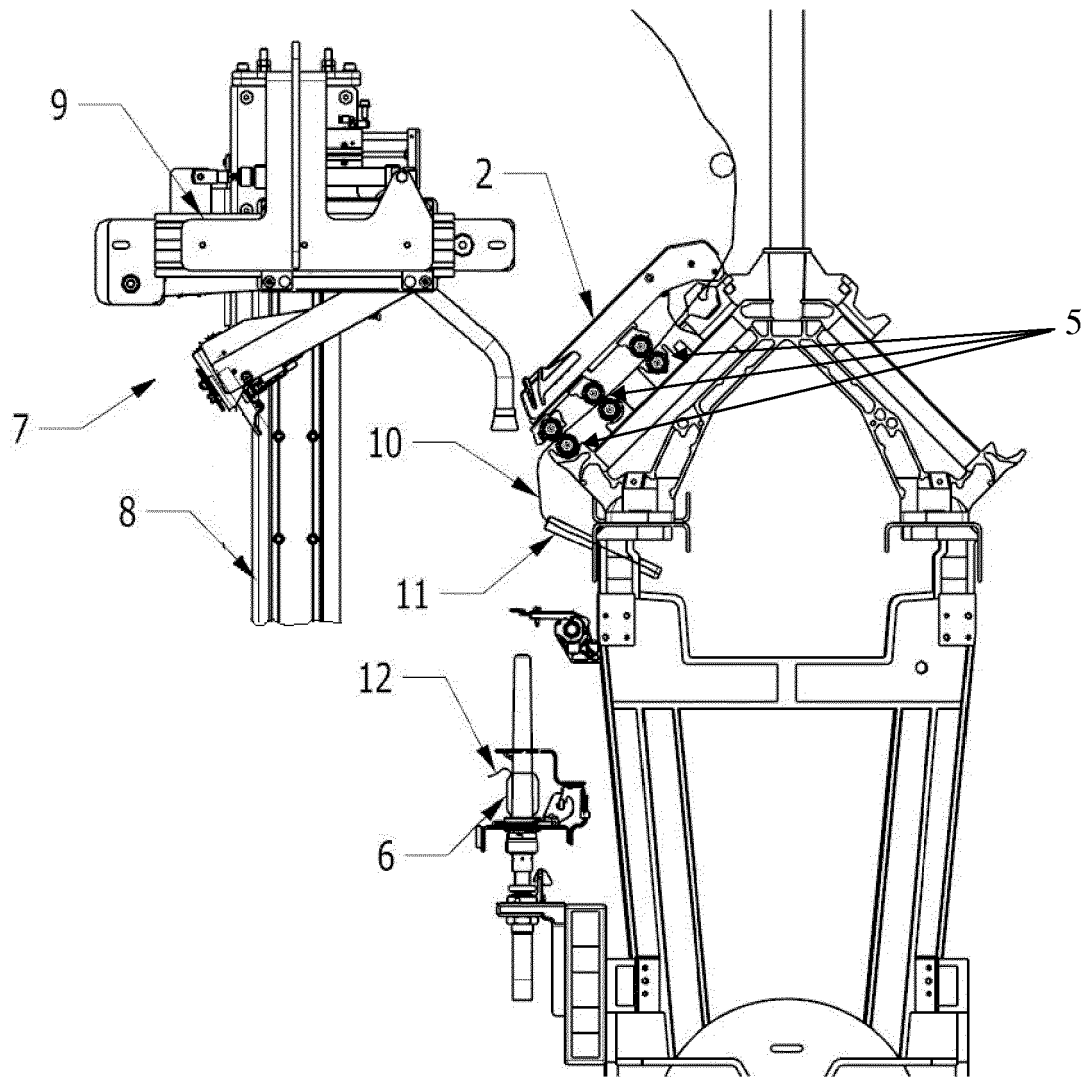


Figure-2

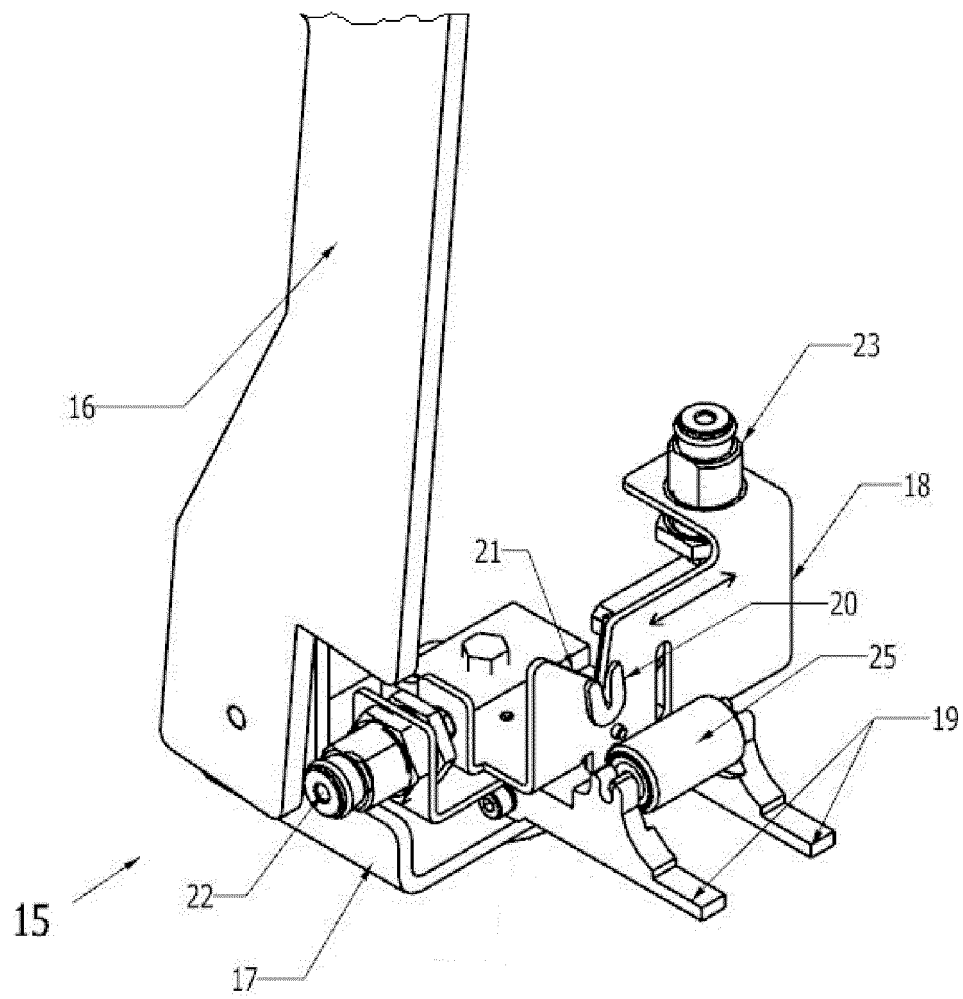


Figure-3

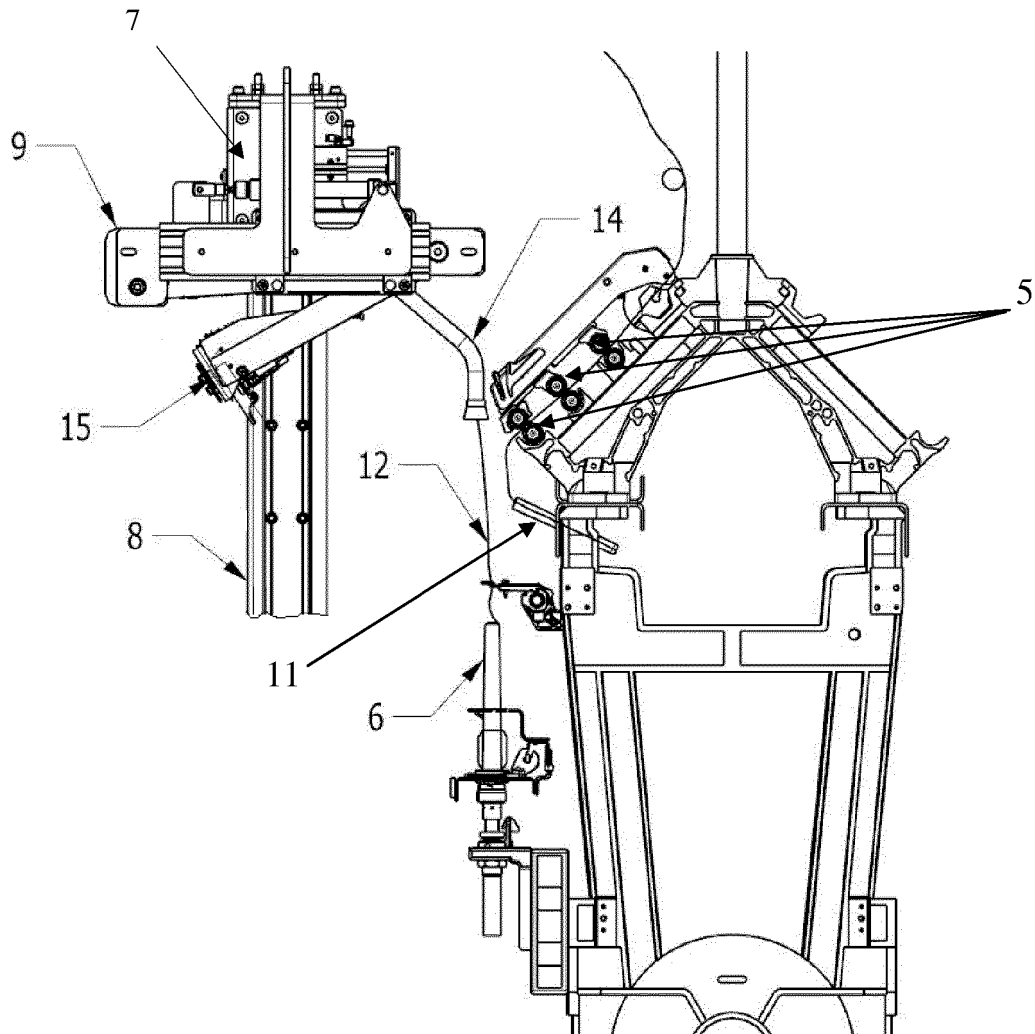


Figure-4

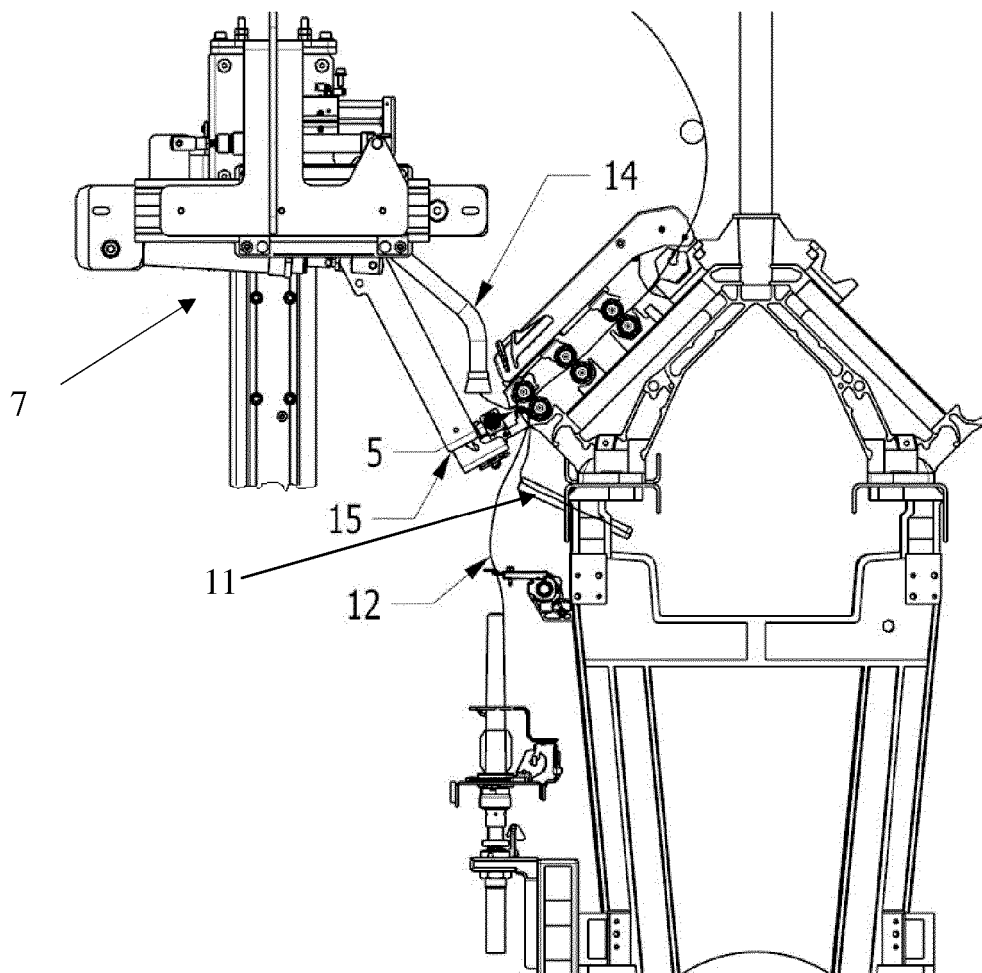


Figure-5

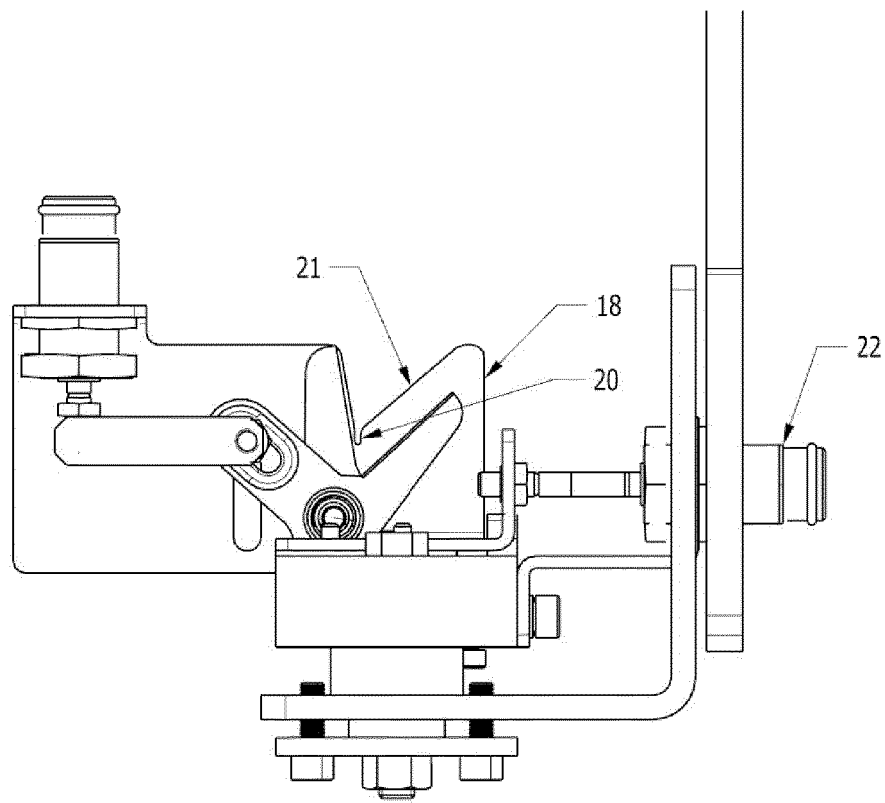


Figure-6a

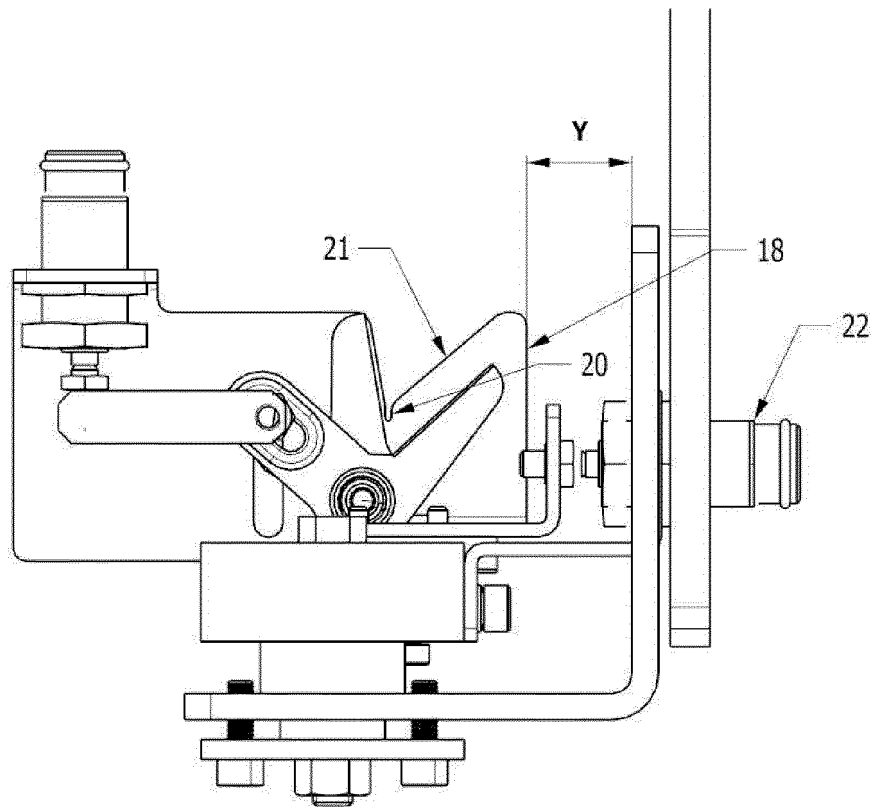


Figure-6b

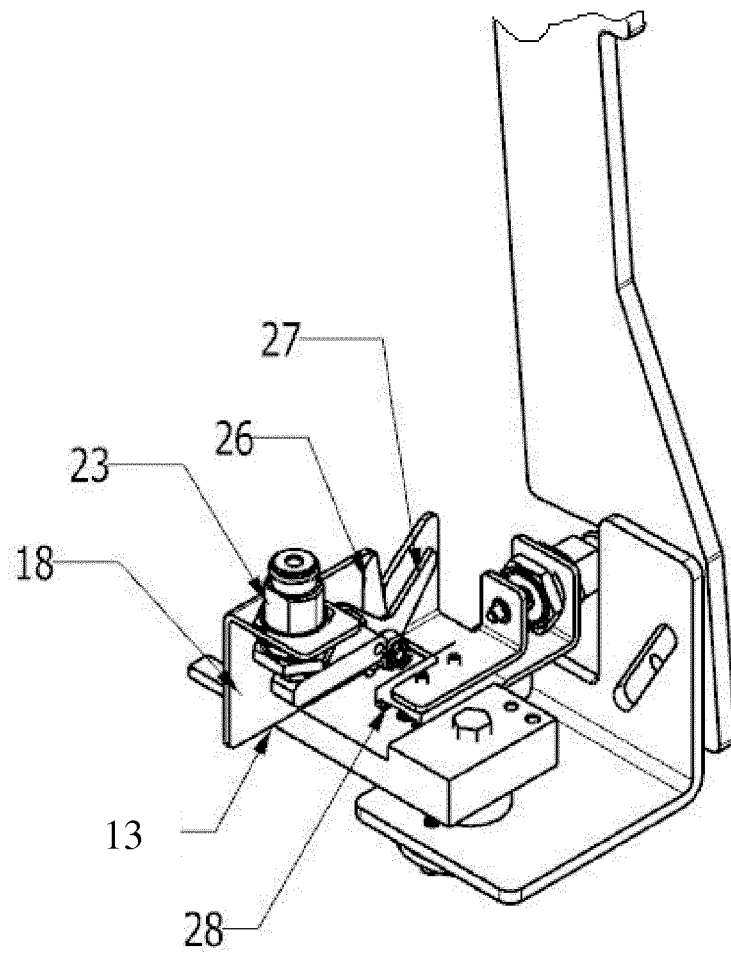


Figure-7

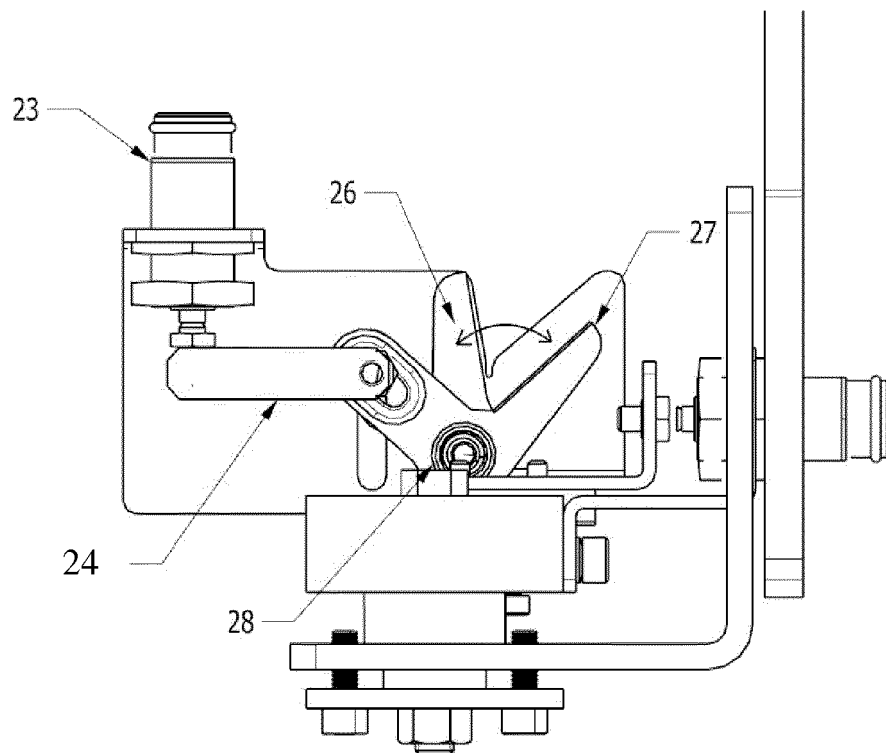


Figure-8a

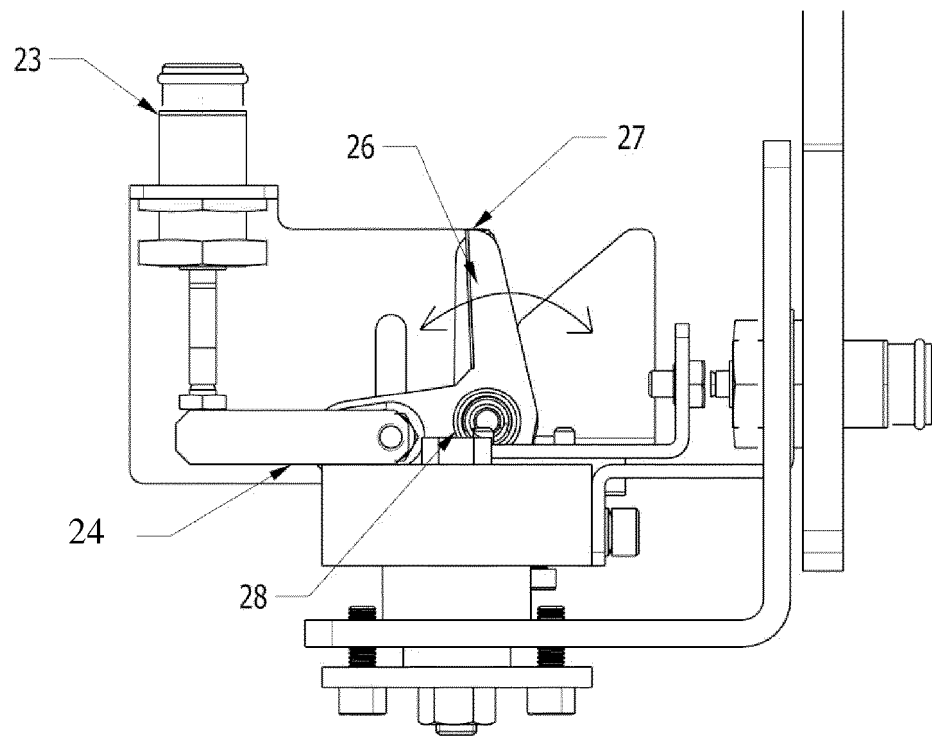


Figure-8b

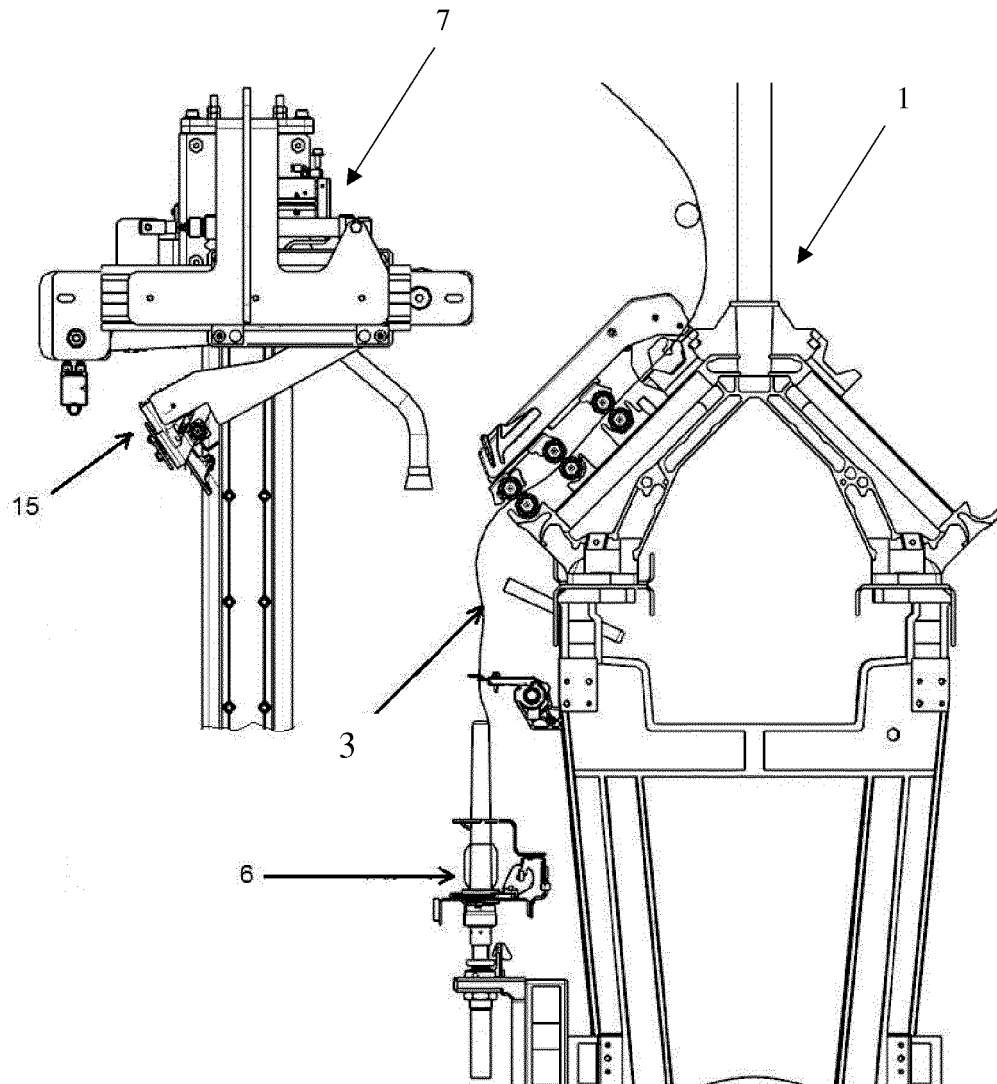


Figure-9

REFERENCES CITED IN THE DESCRIPTION

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