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(54) **METHOD AND DEVICE OF THREADING A YARN END INTO A RING TRAVELLER**

(57) The invention relates to a method of threading a yarn (7) end into a traveller (4) on a ring (3) with a flange (30) at a spinning station of a ring spinning machine, in which the yarn end is sucked into a vacuum tube (A), by which the yarn end is guided into a position with respect to a bobbin and subsequently an oblique threading section (N) of the yarn end is created, which is placed at the flange (30) of the ring (3), this oblique threading section (N) of the yarn end being inclined at an angle (α) with respect to the horizontal plane, whereby the traveller (4)

is set into motion by compressed air and is put onto the yarn end and the yarn end is threaded into the traveller (4) in the area of the threading section (N). The oblique threading section (N) of the yarn end is formed and positioned at the flange (30) of the ring (3) by at least one vertically situated positioning means (921, 922, 923). The invention also relates to a device for threading yarn (7) into a traveller (4) on a ring (3) with a flange (30) at a spinning station of a ring spinning machine.

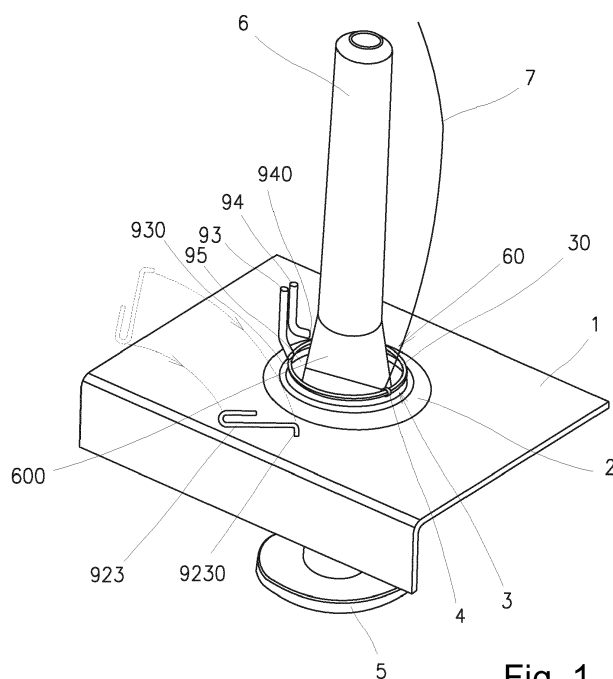


Fig. 1

Description

Field of the invention

[0001] The invention relates to a method of threading a yarn end into a traveller on a ring with a flange at a spinning station of a ring spinning machine according to the preamble of the independent method claim. The invention also relates to a device for threading a yarn end into a traveller on a ring with a flange at a spinning station of a ring spinning machine according to the preamble of the independent device claim.

Description of related art

[0002] When a yarn break occurs on ring spinning machines, yarn is wound on a bobbin. To resume spinning, it is necessary to detect a yarn end, unwind the required yarn length and guide the yarn to its working path. This involves not only threading the yarn into a yarn guide above the bobbin, but also, more importantly, threading the yarn into a traveller, which is displaceably mounted on a flange of a ring.

[0003] In view of the great complexity of this operation, virtually no service devices for threading yarn into the traveller are used nowadays. Yet there are several solutions for the automatic or automated operation of threading yarn into the traveller.

[0004] CH 515 172 discloses an automatic device for threading yarn into a traveller of a ring spinning machine which comprises a means for finding a yarn end on a bobbin and a handling lever for guiding yarn to a defined position relative to a ring flange. The means finds the yarn end and sucks it into a suction duct such that the yarn is tensioned between the bobbin and the suction duct, which subsequently moves to the ring, whereby the yarn passes vertically downwards between the bobbin and the suction duct. Tilted towards the ring is a guide arm, which captures the yarn tightened substantially vertically downwards between the bobbin and the suction duct, presses the yarn against the ring flange and withdraws the yarn over the edge of the ring flange as far as a ring bench which the guide arm abuts. The device is further provided with an air nozzle which is slightly inclined and directed downwards against the bobbin. With this air nozzle, compressed air is blown against the bobbin, and consequently the traveller on the ring flange is set into motion in the direction of the air flow, intersecting in its motion the path of the yarn tightened over the ring flange. In the traveller-threading operation, the traveller basically hits the yarn, whereupon the yarn is threaded into the traveller. The disadvantage of this arrangement is the relatively high load of the yarn when being tensioned by the handling arm to a position substantially vertical from the package to the ring bench. Another drawback is the substantially vertical direction of the yarn tightened over the ring flange from the package to the ring bench, which means that the traveller may be

bounced off the yarn instead of being put onto the yarn, which may result in an unsuccessful attempt to thread the yarn into the traveller. In addition, due to the relatively large distance of the air nozzle from the bobbin, increased energy is required for setting the traveller into motion by the compressed air from the nozzle in this position.

[0005] US 3 882 664 describes an automatic device for threading yarn into a traveller of a ring spinning machine which comprises a device for finding a yarn end on a bobbin and a handling lever for guiding the yarn into a defined position relative to a ring flange. The device finds the yarn end on the bobbin and sucks it into a suction duct such that the yarn is tensioned between the bobbin and the handling means, the yarn end being free in a sucking device of the handling means. The handling means moves downwards towards the ring, whereby the yarn passes vertically downwards between the bobbin and the sucking device of the handling means. A guide lever is tilted towards the ring, captures the yarn tightened substantially vertically downwards between the bobbin and the suction device of the handling means, presses the yarn against the ring flange and withdraws the yarn over the edge of the ring flange as far as to a ring bench, which the guide lever abuts. Above the handling lever is arranged a capturing tooth, which captures the yarn when the handling lever is tilted down in the area between the inner wall of the ring and the package on the bobbin and which deflects the yarn slightly obliquely from the vertical direction between the bobbin and the suction device of the handling means. The handling means is further provided with an air nozzle, which is directed slightly obliquely downwards against the bobbin and in the direction in which the yarn is slightly deflected by the capture tooth from the vertical path between the handling lever and the bobbin. The mouth of the air nozzle is arranged at the level of the inlet opening of the suction duct of the handling means. With this air nozzle, compressed air is blown against the bobbin, whereby the traveller on the ring flange is set into motion in the direction of the air flow from the air nozzle, intersecting the path of the yarn tensioned over the ring flange between the handling lever and the capture tooth. In the traveller-threading operation, the traveller basically hits the yarn, whereupon the yarn is threaded into the traveller. The disadvantage of this arrangement is the relatively high load of the yarn when being tensioned by the handling lever to a position substantially vertical from the package to the ring bench. Another disadvantage is the substantially vertical direction of the yarn tightened over the ring flange from the package to the ring bench, which results in the traveller being bounced off the yarn instead of being put onto the yarn, the outcome of which is an unsuccessful attempt to thread the yarn into the traveller. Moreover, due to the relatively large distance of the air nozzle from the bobbin, increased energy is required for setting the traveller into motion by the compressed air from the nozzle in this position.

[0006] EP 0 391 110 discloses a method and a device

for threading yarn into a traveller of a ring machine, which comprises a vacuum yarn handling device. The vacuum yarn handling device holds the free end of yarn extending from a bobbin and moves laterally to the bobbin. Between this device and the bobbin, a slider is pushed with its side to the bobbin above a ring flange with the traveller. The vacuum handling device moves above the slider to the other side of the bobbin and is lowered below the level of the ring flange with the traveller, thereby wrapping the yarn around the slider. Consequently, the yarn now moves from the package on the bobbin sideways through the slider to the vacuum yarn handling device. After that, the vacuum yarn handling device moves forwards towards the plane of the bobbin, so the yarn is now arranged in an inclination downwards past the lower edge of the ring flange with the traveller, surrounding a small part of the ring circumference. Subsequently, with two streams of compressed air directed to both sides of the bobbin, the traveller is guided to a defined position on the ring flange on the opposite side of positioning nozzles, and a mechanical handling means of the traveller moves just above the upper surface of the ring flange. The mechanical handling means of the traveller has a flat rotary portion in the shape of an annulus corresponding to the plan view of the flange of the ring and has a cut-out for sliding around the bobbin. A vertical, upwardly oriented pin is arranged on this flat rotary portion. With the 'cut-out' in its flat portion, the mechanical handling means of the traveller slides over the ring flange, the traveller being positioned in the fully rear position in which the cut-out of the flat portion of the mechanical handling means of the traveller is situated. By rotating this flat portion about the axis of the ring, the end of the flat circular portion is inserted between the traveller and the ring flange, and by further rotation, the vertical pin is brought into contact with the traveller, which by further rotation of the flat portion of the mechanical handling means is pushed away into the region of the ring flange with the sloping yarn, and, as a result of further rotation of the flat portion, the traveller is put on the yarn and captures it. Thus, the yarn is threaded into the traveller. Subsequently, the mechanical handling means of the traveller turns back so that the flat portion of the handling means is fully ejected from the traveller, which remains captured on the yarn. Then the mechanical handling means of the traveller moves away from the bobbin, passes through a break in its flat portion, and the vacuum handling device continues to manipulate the yarn end, for example, towards the yarn guide above the bobbin, etc. The disadvantage of this arrangement is the fact that handling the yarn in space, especially handling the traveller, is extremely difficult, as it requires at first the air positioning for capturing the yarn by the flat mechanical handling means and the subsequent mechanical motion of the traveller to the yarn and back, which puts high demands on the accuracy, reliability and speed of the whole operation.

[0007] To sum up, in general the disadvantage of the background art is the fact that there are numerous ob-

stacles to practical use of the automatic or automated process of yarn handling at a spinning station of a ring spinning machine, especially the small space for yarn handling at the spinning station, where the spacing between the individual units is merely 70 or 75 mm. Another disadvantage is the fact that handling fine yarn, which is typically manufactured on ring spinning machines, also requires the so-called gentle handling in terms of peak voltages, smoothness of motion, tensioning, friction and bending of the yarn, etc. All in all, the existing devices and methods are slow, complicated and difficult, which limits the efficiency of their use in practice.

Brief summary of the invention

[0008] The aim of the invention is therefore to eliminate or at least reduce the drawbacks of the background art, especially to allow fast and reliable threading of yarn into a traveller on a ring flange of a ring spinning machine.

[0009] The aim of the invention is solved by a method of threading a yarn end into a traveller on a ring with a flange at a spinning station of a ring spinning machine according to the preamble of the independent method claim, wherein the oblique threading section of the yarn end is created and positioned at the flange of the ring by at least one vertically situated positioning element.

[0010] The principle of the invention for threading a yarn end into a traveller on a ring with a flange at a spinning station of a ring spinning machine consists in that positioning means of the yarn end are provided with at least one positioning element situated vertically for being wrapped by the yarn end in the horizontal direction and for creating an oblique threading section of the yarn end, whereby the positioning means of the yarn end and/or the vacuum tube are displaceable towards the ring to a position in which the oblique threading section of the yarn end is situated near the ring flange and at least one drive air nozzle directed in the direction of the oblique threading section of the yarn end is associated with the space between the package and the inner surface of the ring.

[0011] The invention enables to perform reliable and fast automatic threading of yarn into a traveller on a flange of a ring at a spinning station of a ring spinning machine with reproducible good results and with minimum requirements for space and build-up area, whereby the solution according to the invention can be used even for spinning stations being spaced from each other 75 mm and less. The invention can be implemented by means of a device with minimum weight, which consistently exhibits a high working speed, reliability and long service life. The invention allows the use of mechatronic elements, employing mechanical, electronic and pneumatic means in the form of miniaturized automatic components, such as lock pneumatic cylinders, pneumatically operated rotators and sensors.

[0012] Preferably, the oblique threading section of the yarn end is formed between a vertically situated capturing pin of the positioning element and the vacuum tube by

putting the positioning element from the top over the yarn end, which is stretched between the bobbin and the vacuum tube, and by moving the vacuum tube or the positioning element and the vacuum tube so that the oblique threading section of the yarn end moves towards the flange of the ring and the ring traveler subsequently slips over the yarn end.

[0013] In another preferred embodiment, the oblique threading section of the yarn end is formed by wrapping the yarn end between the bobbin and the vacuum tube around a pair of vertically situated spaced-apart positioning elements, and in the concurrent motion of both positioning elements so that the oblique threading section of the yarn end moves towards the flange of the ring and the ring traveler is subsequently put onto the yarn end. The positioning elements can turn around one vertical axis so that the oblique threading section of the yarn end between the bobbin and the vacuum tube is formed.

[0014] Preferably, the oblique threading section in the position adjacent to the flange of the ring before slipping over by ring traveler passes just below the flange of the ring in the region of the transition between a cylindrical portion of the ring to the flange. Advantageously, turning of the positioning elements around the vertical axis is performed by compressed air or by an electromotor with a controllable torque.

[0015] Preferably, the positioning of the ring traveller is done by compressed air on the flange of the ring before threading the yarn end into the ring traveller in the direction opposite the direction of the ring traveller motion during threading of the yarn end into the ring traveller.

[0016] Preferably, intentional stopping of the ring traveller on the flange is done by compressed air and/or by a mechanical stopper.

[0017] Preferably, positioning elements are positioned on a working arm, which moves between the vertical and horizontal position by a holder, whereby the holder moves horizontally reversibly linearly on a carrier and the carrier is vertically slidable on a linear guide.

[0018] The aim is as well solved by a device for threading a yarn end into a ring traveller on a ring having a flange at a spinning station of a ring spinning machine according to the preamble of the independent device claim, which is characterized in that

- the positioning means are provided with at least one vertical positioning element for wrapping the yarn end in the horizontal direction and for forming an oblique threading section of the yarn end, whereby the positioning means of the yarn end and/or the vacuum tube are displaceable towards the ring to a position in which the oblique threading section of the yarn end is situated at the flange of the ring, and
- the at least one drive air nozzle directed in the direction of the oblique threading section of the yarn end is assigned to the space between the package and the inner surface of the ring.

[0019] Preferably, the positioning element is provided with a capturing pin, which is situated vertically in the position positioned towards the path of the yarn end between a bobbin and the vacuum tube, whereby the positioning element and/or the vacuum tube are reversibly displaceable towards the flange of the ring.

[0020] Preferably, the positioning elements comprise a pair of spaced-apart positioning pins for forming the oblique threading section of the yarn end, the positioning pins are in the position positioned towards the path of the yarn end between a bobbin and the vacuum tube situated vertically, whereby the path of the yarn end between the bobbin and the vacuum tube passes between the vertically positioned positioning pins and these positioning pins are mounted on a common rotatable means, which is in this vertical position reversibly rotatable about a vertical axis and is reversibly slidable towards the ring.

[0021] Advantageously, the common rotatable means of the positioning elements is composed of a movable part of a rotatable pneumatic cylinder or of an electromotor with a controllable torque.

[0022] Advantageously, the positioning pins have a pair of oppositely inclined conical surfaces (hyperboloid), whereby the line connecting the smallest diameters of both positioning elements is oblique with respect to the horizontal plane of the flange of the ring in the position of the positioning elements adjacent to the ring.

[0023] Advantageously, adjacent to the air nozzle is mounted an auxiliary air nozzle, which is directed to the space between the package and the inner surface of the ring in the opposite direction of the drive air nozzle.

[0024] Advantageously, the positioning elements for positioning the yarn end are tiltable from a top position to a bottom position near the path of the yarn end between the package and the vacuum tube.

[0025] Advantageously, the common rotatable means of the positioning elements is mounted on a positioning device, which is mounted on a working arm, which is arranged reversibly tiltable between the vertical and horizontal position on a holder, the holder being mounted reversibly horizontally slidably on a carrier, which is mounted vertically slidably on the linear guide.

Brief description of the drawings

[0026] The invention is schematically represented in the drawings, wherein

Fig. 1 shows an arrangement of a spinning station during yarn production;

Fig. 1a shows an arrangement of the spinning station after the yarn end has been sucked in by the vacuum tube and after the tilting of the positioning element;

Fig. 1b shows a process step for forming the oblique yarn guiding section;

Fig. 2 represents a process step after moving the oblique yarn guiding section to the ring flange;

- Fig. 3** shows a process step after putting the traveller onto the yarn following moving the oblique yarn guiding section towards the ring flange;
- Fig. 4** is a diagram of the device with a pair of positioning elements in initial position, showing only the ring and the traveller, not the ring bench;
- Fig. 5** is a diagram of the device with the pair of positioning elements being tilted on the yarn, showing only the ring and the traveller, not the ring bench;
- Fig. 6** is a diagram of the device with the pair of positioning elements after the positioning elements have been turned slightly to form the oblique yarn guiding section, showing only the ring and the traveller, not the ring bench;
- Fig. 7** is a plan view of the arrangement of the pair of positioning elements with the oblique yarn guiding section at the ring flange;
- Fig. 8** is a diagram of mutual orientation of the ring and the pair of positioning elements;
- Fig. 9** is a diagram of the arrangement of the pair of positioning elements;
- Fig. 10** is a diagram of the device with the pair of positioning elements with the oblique yarn guiding section having moved to the ring flange, whereby only the ring and the traveller are shown, not the ring bench;
- Fig. 11** is a diagram of the device with the pair of positioning elements with the oblique yarn guiding section having moved to the ring before the traveller is put onto the oblique yarn guiding section, whereby only the ring and the traveller are shown, not the ring bench;
- Fig. 12** is a diagram of the device with the pair of positioning elements with the oblique yarn guiding section having moved to the ring after the traveller has been put onto the oblique yarn guiding section and after the positioning elements have moved slightly away from the ring, whereby only the ring and the traveller are shown, not the ring bench;
- Fig. 13** is a diagram of the device with the pair of positioning elements with the oblique yarn guiding section in the position having moved to the ring after the traveller has been put onto the oblique yarn guiding section and after the positioning elements have moved away from the ring before the working arm is tilted over to vertical position as in Fig. 5, whereby only the ring and the traveller are shown, not the ring bench; and
- Fig. 14** is a plan view of the arrangement of the pair of positioning elements with the oblique yarn guiding section situated at the ring and with a pair of drive air nozzles, whereby only the ring and the traveller are shown, not the ring bench.

Detailed Description of the invention

[0027] The invention will be described with reference to an exemplary embodiment of a ring spinning machine, which comprises a row of spinning stations arranged next to each other. The embodiment illustrated and described here corresponds to an arrangement of a yarn manufacturing machine with the so-called Z twist, i.e. a clockwise twist. However, it is evident that the invention can be used also on yarn manufacturing machines with an S-twist, i.e. a twist in an anticlockwise direction, where the use of the present invention is essentially mirrored in relation to the embodiment shown and described herein.

[0028] The row of spinning stations is associated, as is shown in Figs. 1 to 3, with a common ring bench 1, which is mounted displaceably on the frame of the machine and is movable up and down. A ring 3 is attached to the ring bench 1 by means of a holder 2 and a traveller 4 is movably mounted on a flange 30 of a ring. A rotatable drive spindle 5 passes through the middle of the ring 3. The rotatable drive spindle 5 is arranged in the axial vertical axis of the ring 3. On the rotatable drive spindle 5 is placed a tube 6, on which a package 60 of yarn is formed by spinning in a well-known manner, resulting in the formation of a cop, i.e., a tube 6 with a package 60. The drive spindle 5 is rotatably driven, e.g., by an unillustrated belt drive associated with the lower end of the drive spindle 5. During spinning, the traveller 4 runs round the bobbin on the flange 30 of the ring 3, since it is carried by the yarn, which is wound on the tube 6. Arranged above the bobbin are an unillustrated balloon limiter, an unillustrated guide of yarn and an unillustrated drafting device of roving, from which yarn is formed by drafting and twisting and is wound on the tube 6 into the bobbin.

[0029] For performing the method according to the invention, the ring spinning machine is provided with a service means of the spinning station, e.g. with a service robot arranged displaceably along the row of spinning stations.

[0030] In the embodiment according to Figs. 1 to 3, which show the basic principle diagram, one of these service means is a vacuum tube A, which is spatially displaceable, and so its suction mouth A0 is able to assume required static positions relative to the spinning station and is also able to move along the required paths, as will be described in greater detail hereinafter. Another of these service means is a positioning element 923 for positioning of the yarn end 7 relative to the ring 3 and its flange 30 when threading the yarn end 7 into the traveller 4. The positioning element 923 is spatially displaceable, so that it is able to assume required static positions relative to the spinning station and, if appropriate, to move along the required paths, as will be described in greater detail hereinafter. The positioning element 923 is provided with a capturing pin 9230, which is situated vertically in the working position of the positioning element 923. In the work position the positioning element 923 is tilted down above the yarn end 7 tensioned between the bobbin and the vacuum tube A towards the area before the ring

3. Another service means is a drive air nozzle 93, which is connected to a source of compressed air and is displaceable in the space between its idle position in which it is situated spaced from the ring 3, and its working position, in which it is situated with its outlet orifice 930 at a level above the flange 30 of the ring 3 in the area of the flange 30 of the ring 3 and the gap between the inner wall of the ring 3 and the outer circumference of the package 60 on the bobbin. At the same time, the outlet orifice 930 of the drive air nozzle 93 is directed to a gap 95 between the inner wall of the ring 3 and the outer circumference of the package 60 on the bobbin, substantially tangentially to the bobbin in the direction of the motion of the traveller 4 when threading the yarn end 7, as will be described in greater detail hereinafter. In the embodiment in Figs. 2 and 3, the drive air nozzle 93 is associated with an auxiliary air nozzle 94, which is in principle positioned in the same manner as the drive air nozzle 93 except that the outlet orifice 940 of this auxiliary air nozzle 94 is directed to the gap 95 between the inner wall of the ring 3 and the outer circumference of the package 60 on the bobbin, but in the direction tangentially to the bobbin opposite to the direction of the outlet orifice 930 of the drive air nozzle 93.

[0031] In an embodiment of the invention shown in Figs. 4 to 11, the service robot comprises the vacuum tube A, which is spatially displaceable, and so its suction mouth A0 can assume required static positions relative to the spinning station and is also able to move along the required paths. For example, the vacuum tube A is adapted to assume a position with its mouth A0 against the conical portion 600 of the package 60, see Fig. 4, whereby due to the yarn end 7 being sucked into the vacuum tube A the yarn end 7 is tensioned but not to such an extent that a break of the yarn end 7 would occur. The service robot further comprises a vertical linear guide 8, on which is vertically displaceably mounted a carrier 9 of the mechanism of preparing the yarn end 7 for threading into the traveller 3. A holder 90 of a working arm 91 is mounted on the carrier 9 reversibly displaceably in the horizontal direction towards the ring 3 and away from the ring 3. The working arm 91 is mounted by one of its ends on the holder 90 and is reversibly tiltable between its vertical position (Fig. 4) and horizontal position (Figs. 5 and 6).

[0032] The working arm 91 is provided at its other free end provided with a positioning means 92 of the yarn end 7, which is fitted with two positioning elements 921, 922, which consist of spaced apart conical mandrels with a pair of oppositely inclined conical surfaces forming a groove for guiding the yarn end 7. The positioning elements 921, 922 are in the horizontal position of the working arm 91 situated vertically, whereby in the horizontal position of the working arm 91, the positioning means 92 is reversibly rotatable about its vertical axis R, preferably by 180°. In the horizontal position of the working arm 91, the positioning means 92 of the yarn end 7 is positioned such that the path of the yarn end 7 tensioned between

the conical portion 600 of the package 60 and the vacuum tube A in the position opposite the conical portion 600 of the package 6 passes between vertically situated positioning elements 921, 922, as shown in Fig. 5. In addition, the positioning elements 921, 922 in this horizontal position of the working arm 91 are situated in such a manner that the connecting line between the smallest diameters 9210, 9220 of their conical surfaces forms with the plane of the flange 30 of the ring 3, i.e. with the horizontal direction, angle α which means that this connecting line between the smallest diameters 9210, 9220 is oblique with respect to the horizontal plane of the flange 30 of the ring 3. In layman's terms, one of the positioning elements 921, 922 is longer and the other shorter.

[0033] Due to the working arm 91 being mounted extendably on the holder 90, the positioning means 92 is in the horizontal position of the working arm 91 displaceable between the basic position spaced from the ring 3, see Fig. 5, and the working position of the ring 3, see Figs. 7, 10 to 12 and 14. In this working position, the smallest diameter 9210 of the conical surface of the shorter positioning element 921 is situated slightly above the level of the lower edge 300 of the flange 30 of the ring 3 (distance Z1 in Fig. 8), whereby the smallest diameter 9220 of the conical surface of the longer positioning element 922 is situated slightly below the level of the lower edge 300 of the flange 30 of the ring 3 (distance Z2 in Fig. 8). The mutual distance Y of the positioning elements 921, 922 corresponds to the radius of the ring 3, so that the positioning elements 921, 922 can be brought to the working position at the flange 30 of the ring 3 so closely that the connecting line between the smallest diameters 9210, 9220 of the positioning elements 921, 922 passes in a plan view just below the flange 30 of the ring 3, ideally in the transition region between the cylindrical portion of the ring 3 into the flange 30 of the ring 3.

[0034] Preferably, the drive of the rotation of the positioning means 92 about its vertical axis is formed by a rotatable pneumatic cylinder, i.e. by a rotator, the movable portion of which is rigidly connected to the positioning means 921, 922. The force with which such a rotatable pneumatic cylinder, i.e. rotator, acts on the yarn end 7 during its rotating motion is smaller than the actual yarn strength, and therefore the rotatable pneumatic cylinder acts as a pneumatic spring, thereby ensuring safe handling the yarn end 7 without breakage risk. In another exemplary embodiment, the force with which the rotatable pneumatic cylinder, i.e. rotator, acts on the yarn end 7 during its rotating motion is set rigidly by reducing the compressed air, or it is set manually or electronically depending on the fineness of the yarn being produced currently at a respective machine. In another exemplary embodiment, the drive of the rotation of the positioning means 92 is controlled also with regard to the speed of its motion.

[0035] In an unillustrated embodiment, the drive of the rotation of the positioning means 92 about its vertical axis is composed of an electric motor with a controllable

torque for setting the level of tension of the yarn end 7, wherein the positioning means 921, 922 are coupled to the movable portion of the electric motor.

[0036] The positioning elements 921, 922 are preferably made of a resistant (hard) material (stainless steel, ceramics, etc.) or they have a special surface finish to improve the resistance (elox, hard chrome, etc.) and so they are not damaged and their service life is not shortened due to the action of the yarn.

[0037] To avoid conflict between the individual mechanisms, the vacuum tube A and the carrier 9 with the holder 90, the working arm 91, the positioning means 92 etc. are arranged in a plan view next to each other.

[0038] A drive air nozzle 93 is disposed on the front side of the positioning means 92 of the yarn end 7, which is in the working position of the positioning means 92 of the yarn end 7 at the ring 3 situated by its outlet orifice 930 at a level above the flange 30 of the ring 3 in the area between the inner wall of the ring 3 and the outer circumference of the package 60 on the bobbin. The outlet orifice 930 of the drive air nozzle 93 is directed to the gap 95 between the inner wall of the ring 3 and the outer circumference of the package 60 on the bobbin, substantially tangentially to the bobbin in the direction of the motion of the traveller 4 during threading the yarn end 7 (see Fig. 14). In an unillustrated exemplary embodiment, the positioning means 92 is provided in addition to the drive air nozzle 93 with an auxiliary air nozzle 94, which is positioned in principle in the same manner as the drive air nozzle 93 except that the outlet orifice 940 of this auxiliary air nozzle is directed to the gap 95 between the inner wall of the ring 3 and the outer circumference of the package 60 on the bobbin, but in the opposite direction tangentially to the bobbin than the outlet orifice 930 of the drive air nozzle 93.

[0039] In an unillustrated exemplary embodiment, the assembly of the carrier 9, the holder 90, the working arm 91 and the positioning means 92, etc., is provided with sensors for detecting initial and/or working positions, or, if appropriate, with a sensor for detecting the vertical position of the ring bench 1, etc.

[0040] The rigid connection of the body of the positioning means 92, the positioning elements 921, 922, the drive air nozzles 93, 94 and the drive of the positioning means 92 ensures mutually consistently identical and accurate positioning relative to the ring 3 and its flange 30, as well as the reliable setting of the yarn end 7 by the positioning elements 921, 922 with respect to the ring 3 and its flange 30, which contributes to the reliability of the threading of the yarn end 7 into the traveller 4.

[0041] To thread the yarn end 7 into the traveller 4, it is first necessary to prepare the yarn end 7 by putting it into a suitable threading position, since the yarn after break is wound on the bobbin and the traveller 4 stops on the flange 30 of the ring 3 in a previously undefined position. The drive spindle 5 is disconnected from the drive and stops rotating together with tube 5 with the package 6 placed on it. The yarn end 7 is detected on

the bobbin, e.g., by raising the tube 5 with the package 6 by an unillustrated lifting device up to a position in which the whole conical face 60 of the package 6 is above the level of the flange 30 of the ring 3 on the ring bench 1 which moves reversibly vertically and by moving an unillustrated detecting device of the yarn end 7 on the conical face 60 of the package 6. The detected yarn end 7 is subsequently passed to the handling device, which consists of a vacuum tube A mounted spatially displaceably relative to the spinning station of the machine.

[0042] Before starting the operation of threading the yarn end 7 into the traveller 4, the yarn end 7 is drawn by the vacuum tube A in the direction away from the bobbin at the level of the flange 30 of the ring 3 towards the area before the bobbin, or before the ring 3. Subsequently, the positioning elements 921, 922 or 923 are tilted down above the yarn end 7 thus tensioned, thereby creating vertical means for being wrapped afterwards by the yarn end 7 in the horizontal direction for subsequent formation of an oblique threading section N of the yarn end 7 before the ring 3, whereby the inclination of the oblique threading section N to the horizontal direction is up to 15°, ideally less than 10°. At the same time, the positioning elements 921, 922 or 923 are wrapped by the yarn end 7 in such a manner that the yarn holds on these positioning elements 921, 922 or 923 in collaboration with the suction of the yarn end 7 into the vacuum tube A. For example, when using the pair of positioning elements 921 and 922 arranged next to each other, the yarn end 7 is wrapped around the elements 921, 922 in such a manner that it is guided out of the cop to the outer side of one of the elements 921, 922, then it is wrapped around a part of the circumference of this element 921 or 922 and continues moving towards the other from of the pair of elements 922, 921 and wraps it from the side of the cop (bobbin 6) on the outer side of the other element 922 or 921 and then is further guided to the vacuum tube A, as shown, for example, in Fig. 14. When using one positioning element 923, the yarn end 7 is guided out of the cop to the outer side of this element 923, is wrapped around a part of its circumference and moves on towards the vacuum tube A, which sucks in the yarn end 7.

[0043] The created oblique threading section N is subsequently placed adjacent to the ring 3 so that the yarn end 7 tangentially rests on the ring 3 or it closely approaches the ring 3, namely in the area of the lower side of the flange 30 of the ring 3, ideally in the region of transition of the flange 30 into the cylindrical part of the ring 3, see Fig. 8, whereby one end of the oblique threading section N of the yarn end 7 is situated slightly above the level of the lower edge 300 of the flange 30 of the ring 3 (distance Z1 in Fig. 8), whereby the other end of the oblique threading section N of the yarn end 7 is situated slightly below the level of the lower edge 300 of the flange 30 of the ring 3 (distance Z2 in Fig. 8). In the embodiment according to Figs. 1 to 3, the oblique threading section N of the yarn end 7 is formed between the vertical part 9230 of the positioning element 923 and the mouth A0

of the vacuum tube A. In the embodiment according to Figs. 4 to 14, the oblique threading section N of the yarn end 7 is formed between the positioning elements 921, 922 on the positioning means 92, which after tilting down above the yarn end 7 turns in the horizontal plane by 180°, thereby tensioning the yarn end 7 between the conical pins constituting the positioning elements 921, 922 and at the same time the yarn end 7 between the elements 921, 922 is situated substantially transversely to the original direction, or between the elements 921, 922 it is situated in the direction along the machine, i.e. along the row of the spinning stations (Fig. 6). At the same time, during this turning of the positioning means 92, the yarn end 7 is slightly pulled out from the vacuum tube A, whereby the yarn end 7 is still tensioned by the vacuum.

[0044] The above-mentioned displacement of the oblique threading section N of the yarn end 7 towards the ring 3 is carried out either by the vacuum tube A moving past the standing vertical end 9230 of the positioning element 923, see Figs. 2 and 3, or it is carried out by the concurrent motion of the vacuum tube A and the vertical end 9230 of the positioning element 923, see Fig. 1c, or it is performed by ejecting the positioning means 92 with the positioning elements 921, 922 slightly turned and with the oblique threading section N of the yarn end 7 situated between them, see Fig. 10, Fig. 7 and Fig. 14, i.e., by the concurrent motion of both the positioning elements 921, 922.

[0045] As soon as the oblique threading section N of the yarn end 7 is situated at the ring 3, or at its flange 30, or even more specifically, near the lower edge of the flange 30 of the ring 3, compressed air from the drive air nozzle 93 is introduced into the space 95 between the package 60 and the inner wall of the ring 3, by which means the traveller 4 is set into motion on the flange 30 of the ring 3 in the direction of the ascent of the oblique threading section N, as indicated by the arrow B e.g. in Fig. 14, whereby the traveller 4 moves on the oblique threading section N of the yarn end 7, catches it and thus it is put onto the yarn end 7 (see Figs. 2, 3, 11, 12, 13). After putting the traveller 4 onto the oblique threading section N of the yarn end 7, the yarn end 7 is gradually unthreaded from the positioning elements 921, 922, 923 (Figs. 12 and 13) and these return to their initial position. Thus, the process of threading the yarn into the traveller 4 is terminated, whereby the yarn end 7 is still sucked in the vacuum tube A, which continues handling the yarn end 7 to finish the process of resumption of spinning the yarn at a respective spinning station of the machine.

[0046] When driving the traveller 4 with a compressed air flow fed into the space 95 between the package 60 and the inner wall of the ring 3, it is possible according to the embodiment in Figs. 1 to 3 to improve the positioning of the traveller 4 on the flange 30 of the ring 3 by means of an auxiliary air nozzle 94, which is aligned with the drive air nozzle 93, except that the outlet orifice 940 of the auxiliary air nozzle 94 faces the gap 95 between the inner wall of the ring 3 and the outer circumference

of the package 60 on the bobbin in the opposite direction, than to which is directed the outlet orifice 930 of the drive air nozzle 93. It may happen that the traveller 4 on the flange 30 of the ring 3 gets stuck on the yarn end 7 and then it cannot be put onto the oblique threading section N of the yarn end 7 which is placed near the flange 30 of the ring 3 or it may be necessary to guide the traveller 4 first into a predetermined position on the circumference of the flange 30 of the ring 3. Therefore, according to the invention, it is possible to set the traveller 4 into motion by the auxiliary air nozzle 94, which is in the opposite direction to the threading direction B e.g. in Fig. 14, and only after that set the traveller 4 by the drive air nozzle 93 into motion in the threading direction B. In connection with this, in one embodiment, the traveller 4 on the flange 30 of the ring 3 can be stopped purposefully at a required point, namely either by simultaneous engagement of both drive air nozzles 93, 94, when the traveller 4 stops on the opposite side of the flange 30 of the ring 3, or it is possible to stop the traveller 4 purposefully by pushing a mechanical stopper (not shown) to the desired point of the circumference of the flange 30 of the ring 3. As a result, the traveller 4, whether driven by the drive air nozzle 93 or by the auxiliary air nozzle 94, is halted by this mechanical stopper (not shown). After retraction of the mechanical stopper, the traveller 4 can be normally set into motion by the drive air nozzle 93 in a required direction needed for threading the yarn end 7.

Reference numbers

[0047]

1	Ring bench
2	Holder
3	Ring
30	Flange
300	Lower edge
4	Traveller
5	Drive spindle, mandrel
6	Tube
60	Package
600	Conical portion
7	Yarn end
8	Vertical linear guide
9	Carrier
91	Working arm
92	Positioning means
921	Positioning element
9210	Diameters
922	Positioning element
9220	Diameters
923	Positioning element
9230	Capturing pin
93	Drive air nozzle
930	Outlet orifice
94	Auxiliary air nozzle
940	Outlet orifice

95 Gap

α angle

A Vacuum tube

A0 Suction mouth

B Arrow

N Threading section

R Vertical axis

Y Distance

Z1 Distance

Z2 Distance

Claims

1. A method of threading a yarn end (7) into a traveller (4) on a ring (3) with a flange (30) at a spinning station of a ring spinning machine,

- in which the yarn end (7) is sucked into a vacuum tube (A), by which the yarn end (7) is positioned with respect to a bobbin (6) and, subsequently,
- an oblique threading section (N) of the yarn end (7) is created and positioned at the flange (30) of the ring (3), wherein said oblique threading section (N) of the yarn end (7) is inclined by angle α with respect to the horizontal plane;
- the traveller (4) is set into motion by compressed air so that it is put onto the yarn end (7) and the yarn end (7) is threaded into the traveller (4) in the area of the oblique threading section (N),

characterized in that

the oblique threading section (N) of the yarn end (7) is created and positioned at the flange (30) of the ring (3) by at least one vertically situated positioning element (921, 922, 923).

2. The method according to claim 1, **characterized in** the steps of forming the oblique threading section (N) of the yarn end (7) between a vertically situated capturing pin (9230) of the positioning element (923) and the vacuum tube (A) by putting the positioning element (923) from the top over the yarn end (7) stretched between the bobbin (6) and the vacuum tube (A), and moving the vacuum tube (A) or the positioning element (923) and the vacuum tube (A) so that the oblique threading section (N) of the yarn end (7) moves towards the flange (30) of the ring (3) and the ring traveller (4) subsequently slips over the yarn end (7).
3. The method according to claim 1, **characterized in** forming the oblique threading section (N) of the yarn end (7) by wrapping the yarn end (7) between the

bobbin (6) and the vacuum tube (A) around a pair of vertically situated spaced-apart positioning elements (921, 922), and in the concurrent motion of both positioning elements (921, 922) so that the oblique threading section (N) of the yarn end (7) moves towards the flange (30) of the ring (3) and the ring traveller (4) is subsequently put onto the yarn end (7).

4. The method according to claim 3, **characterized in** turning the positioning elements (921, 922) around one vertical axis (R) so that the oblique threading section (N) of the yarn end (7) between the bobbin (6) and the vacuum tube (A) is formed.

5. The method according to any of claims 1 to 4, **characterized in that** the oblique threading section (N) in the position adjacent to the flange (30) of the ring (3) before slipping over by ring traveller (4) passes just below the flange (30) of the ring (3) in the region of the transition between a cylindrical portion of the ring (3) to the flange (30).

6. The method according to claim 4, **characterized in that** turning of the positioning elements (921, 922) around the vertical axis (R) is performed by compressed air or by an electromotor with a controllable torque.

7. The method according to any of claims 1 to 6, **characterized in** positioning of the ring traveller (4) is done by compressed air on the flange (30) of the ring (3) before threading the yarn end (7) into the ring traveller (4) in the direction opposite the direction of the ring traveller (4) motion during threading of the yarn end (7) into the ring traveller (4).

8. The method according to claim 7, **characterized in that** intentional stopping of the ring traveller (4) on the flange (30) is done by compressed air and/or by a mechanical stopper.

9. The method according to any of claims 1 to 8, **characterized in that** positioning elements (921, 922, 923) are positioned on a working arm (91), which moves between the vertical and horizontal position by a holder (90), whereby the holder (90) moves horizontally reversibly linearly on a carrier (9) and the carrier (9) is vertically slidable on a linear guide (8).

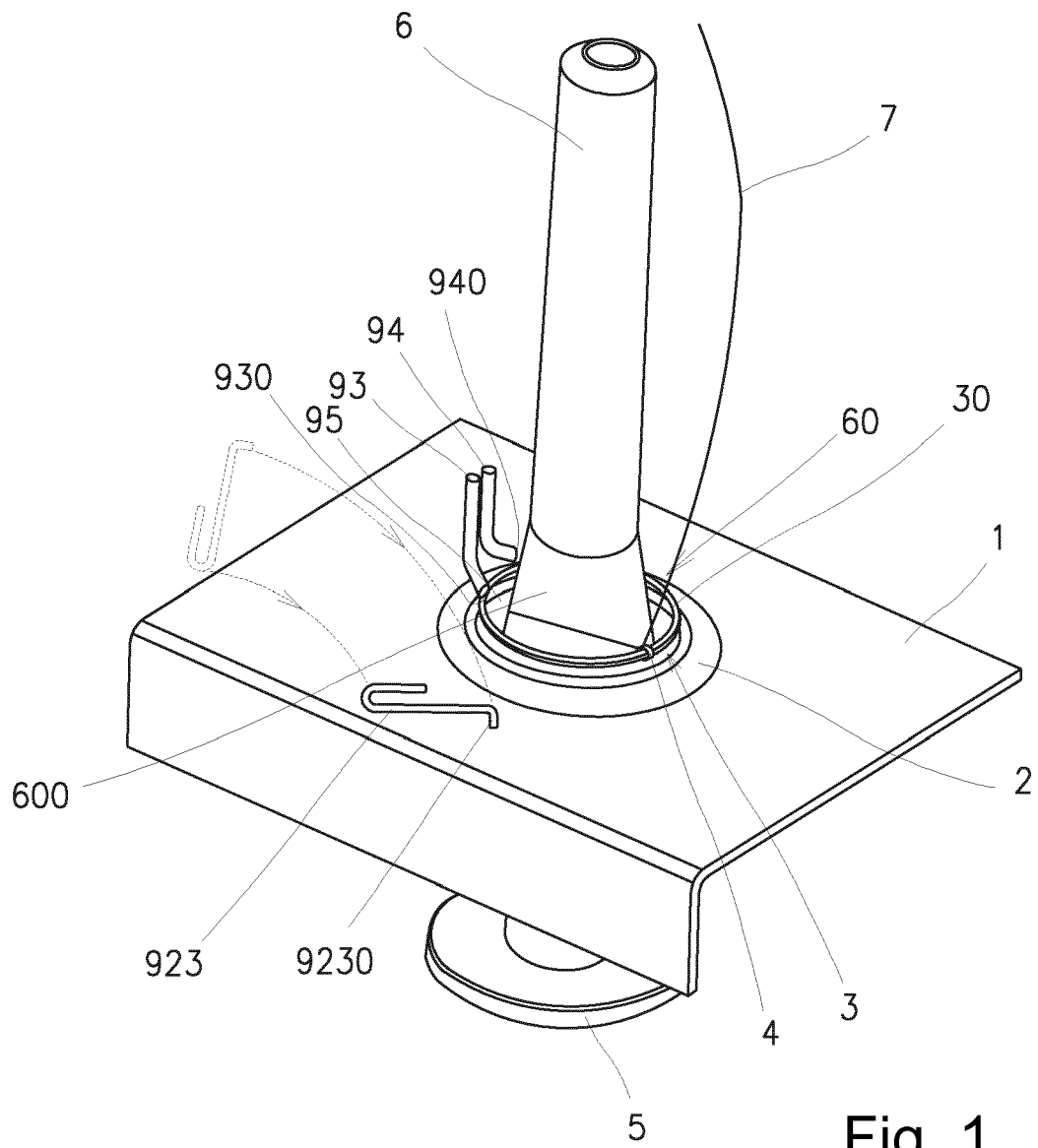
10. A device for threading a yarn end (7) into a ring traveller (4) on a ring (3) having a flange (30) at a spinning station of a ring spinning machine, which comprises a vacuum tube (A) mounted displaceably on a handling means with respect to the spinning station, whereby the device further comprises at least one positioning means for positioning the yarn end (7) and the device comprises at least one drive air nozzle (93) for deliberate motion of the ring traveller (4) on

the flange (30) of the ring (3),
characterized in that

- the positioning means are provided with at least one vertical positioning element (921, 922, 923) for wrapping the yarn end (7) in the horizontal direction and for forming an oblique threading section (N) of the yarn end (7), whereby the positioning means of the yarn end (7) and/or the vacuum tube (A) are displaceable towards the ring (3) to a position in which the oblique threading section (N) of the yarn end (7) is situated at the flange (30) of the ring (3), and
- the at least one drive air nozzle (93) directed in the direction of the oblique threading section (N) of the yarn end (7) is assigned to the space (95) between the package (60) and the inner surface of the ring (3).

11. The device according to claim 10, **characterized in that** the positioning element (923) is provided with a capturing pin (9230), which is situated vertically in the position positioned towards the path of the yarn end (7) between a bobbin (6) and the vacuum tube (A), whereby the positioning element (923) and/or the vacuum tube (A) are reversibly displaceable towards the flange (30) of the ring (3).
12. The device according to claim 10, **characterized in that** the positioning elements (921, 922) comprise a pair of spaced-apart positioning pins for forming the oblique threading section (N) of the yarn end (7), the positioning pins are in the position positioned towards the path of the yarn end (7) between a bobbin (6) and the vacuum tube (A) situated vertically, whereby the path of the yarn end (7) between the bobbin (6) and the vacuum tube (A) passes between the vertically positioned positioning pins and these positioning pins are mounted on a common rotatable means, which is in this vertical position reversibly rotatable about a vertical axis (R) and is reversibly slidable towards the ring (3).
13. The device according to claim 12, **characterized in that** the common rotatable means of the positioning elements (921, 922) is composed of a movable part of a rotatable pneumatic cylinder or of an electromotor with a controllable torque.
14. The device according to any of claims 12 to 13, **characterized in that** the positioning pins have a pair of oppositely inclined conical surfaces (hyperboloid), whereby the line connecting the smallest diameters (9210, 9220) of both positioning elements (921, 922) is oblique with respect to the horizontal plane of the flange (30) of the ring (3) in the position of the positioning elements (921, 922) adjacent to the ring (3).

15. The device according to claim 10 to 14, **characterized in that** adjacent to the air nozzle (93) is mounted an auxiliary air nozzle (94), which is directed to the space (95) between the package (60) and the inner surface of the ring (3) in the opposite direction of the drive air nozzle (93).
16. The device according to any of claims 12 to 15, **characterized in that** the positioning elements (921, 922, 923) for positioning the yarn end (7) are tiltable from a top position to a bottom position near the path of the yarn end (7) between the package (60) and the vacuum tube (A).
17. The device according to any of claims 12 to 16, **characterized in that** the common rotatable means of the positioning elements (921, 922) is mounted on a positioning device (92), which is mounted on a working arm (91), which is arranged reversibly tiltable between the vertical and horizontal position on a holder (90), the holder (90) being mounted reversibly horizontally slidably on a carrier (9), which is mounted vertically slidably on the linear guide (8).



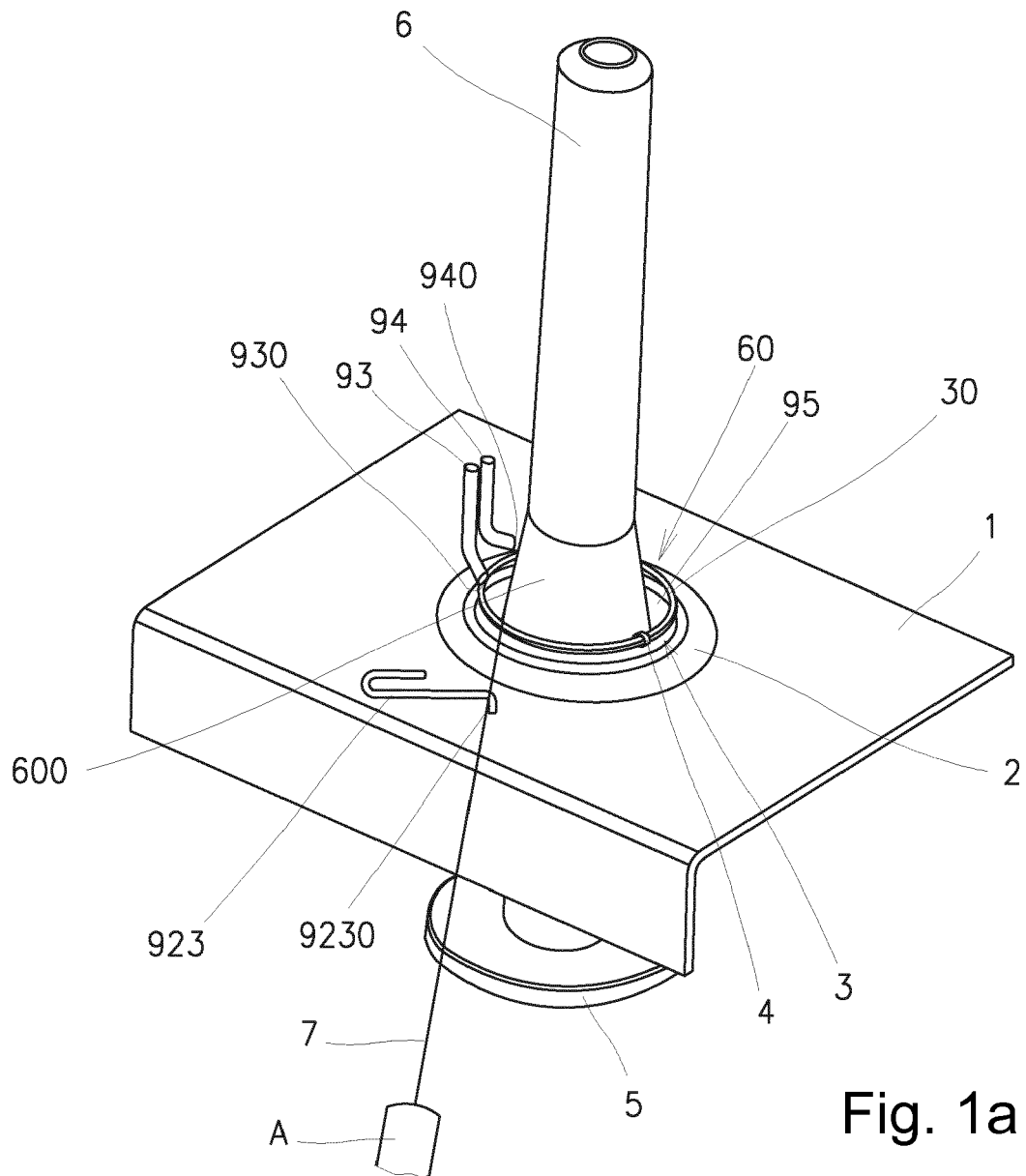
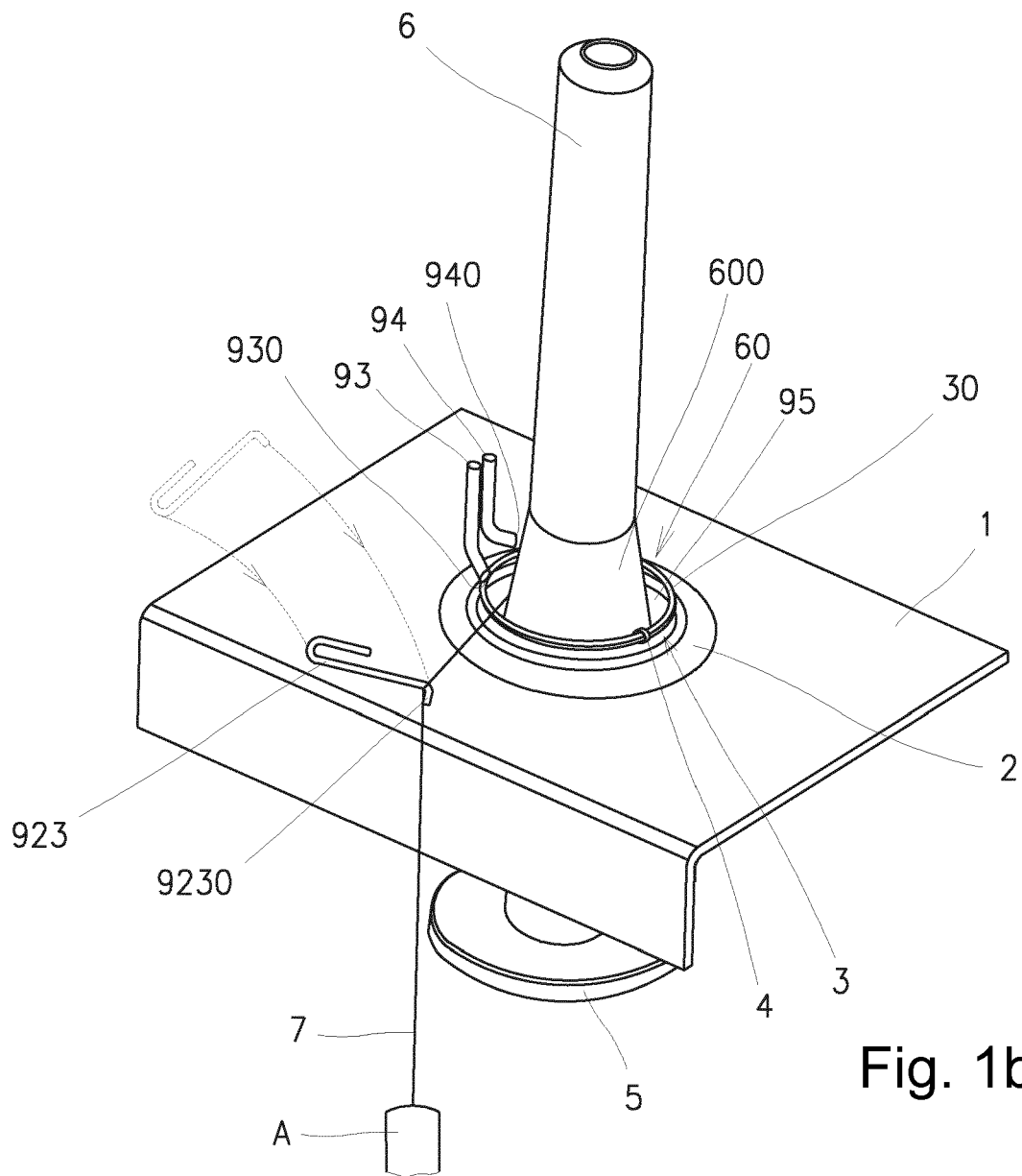
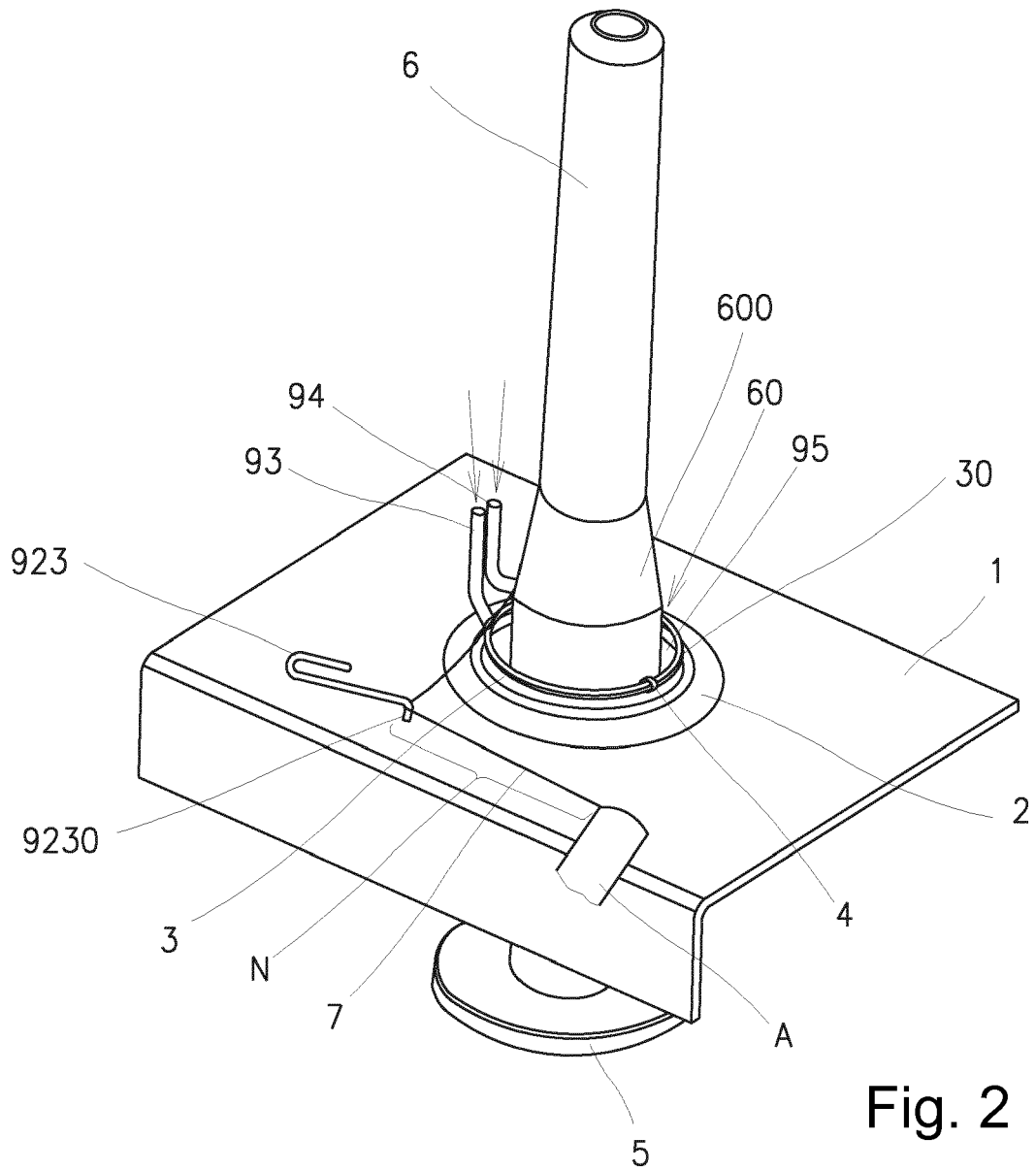
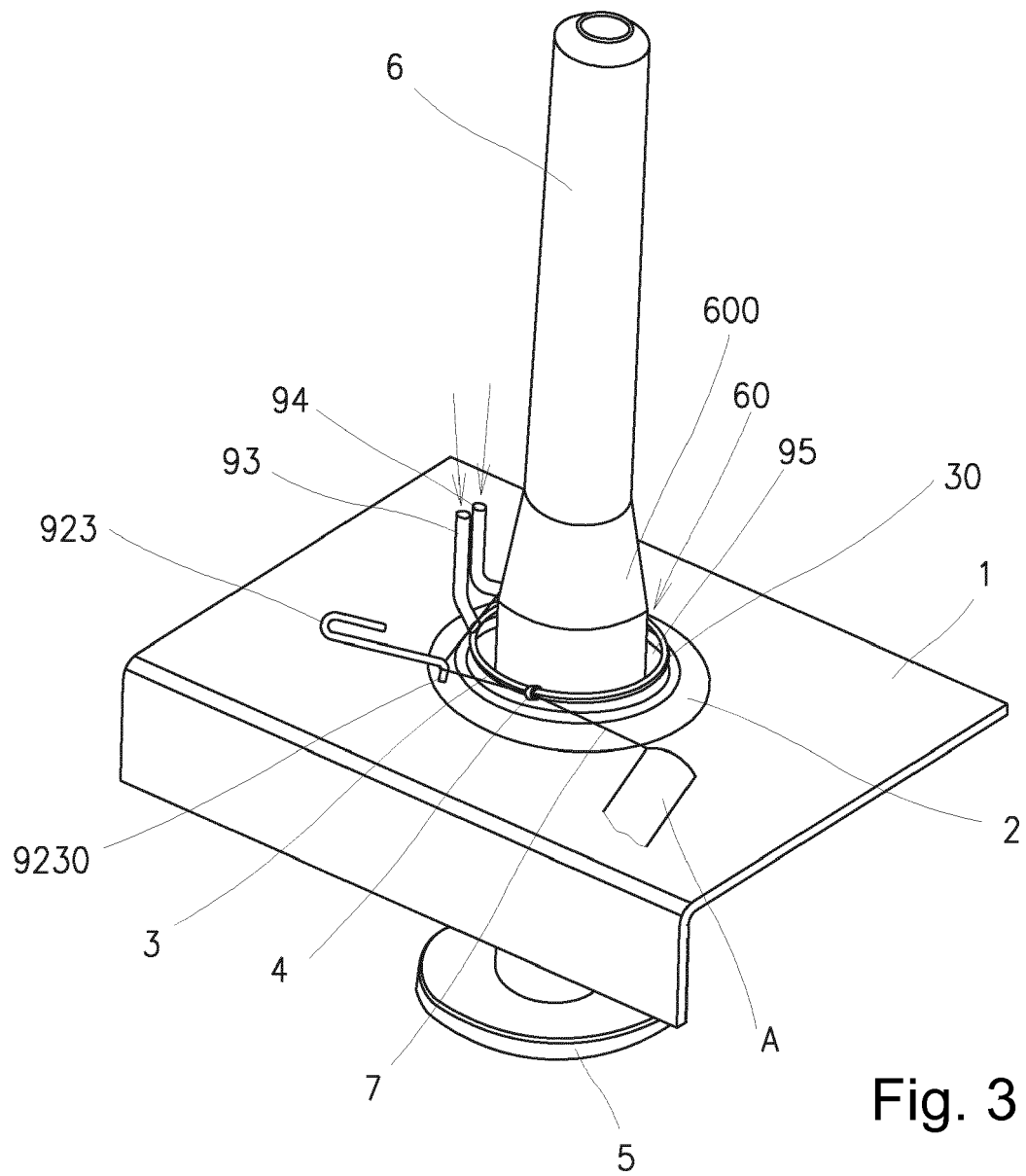


Fig. 1a







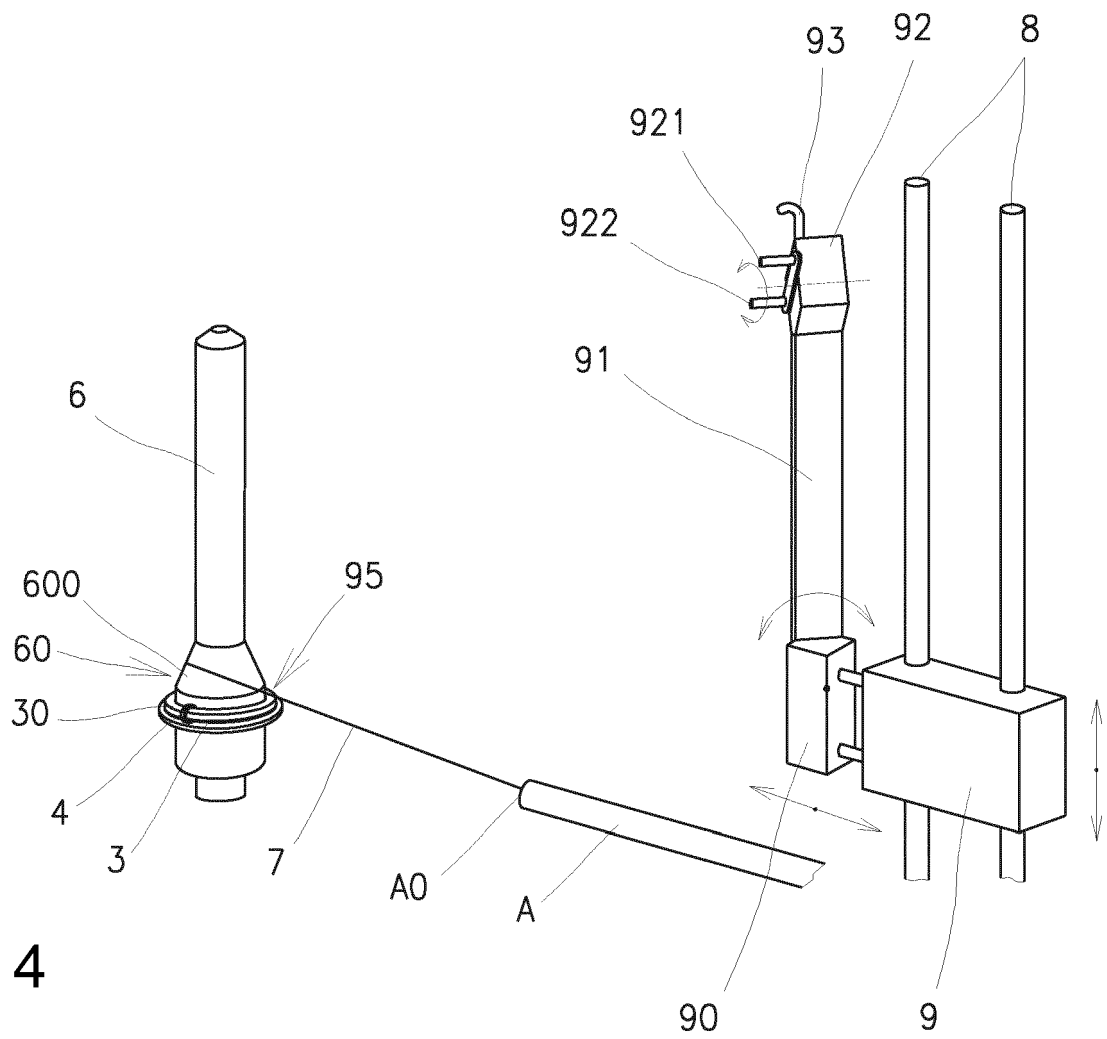


Fig. 4

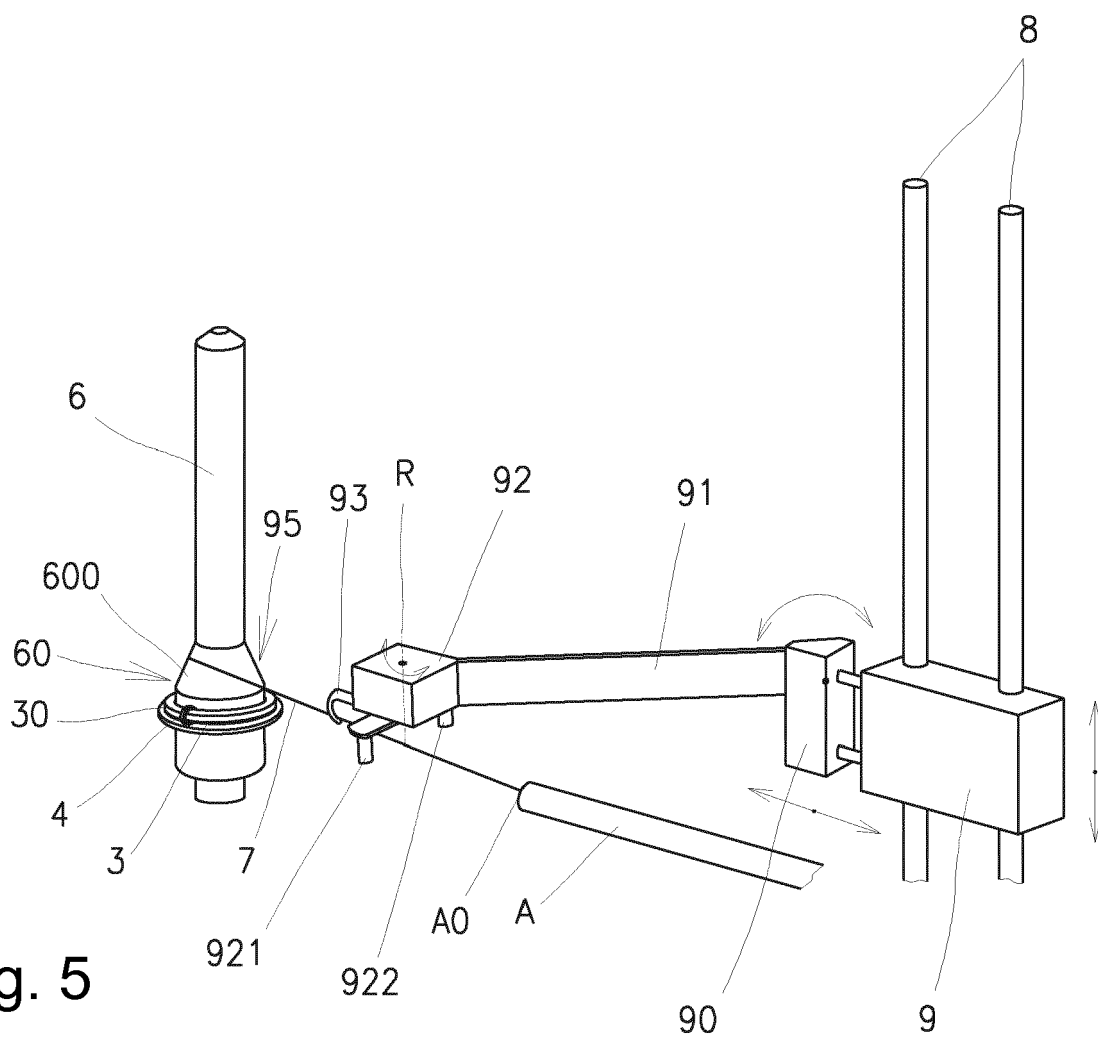


Fig. 5

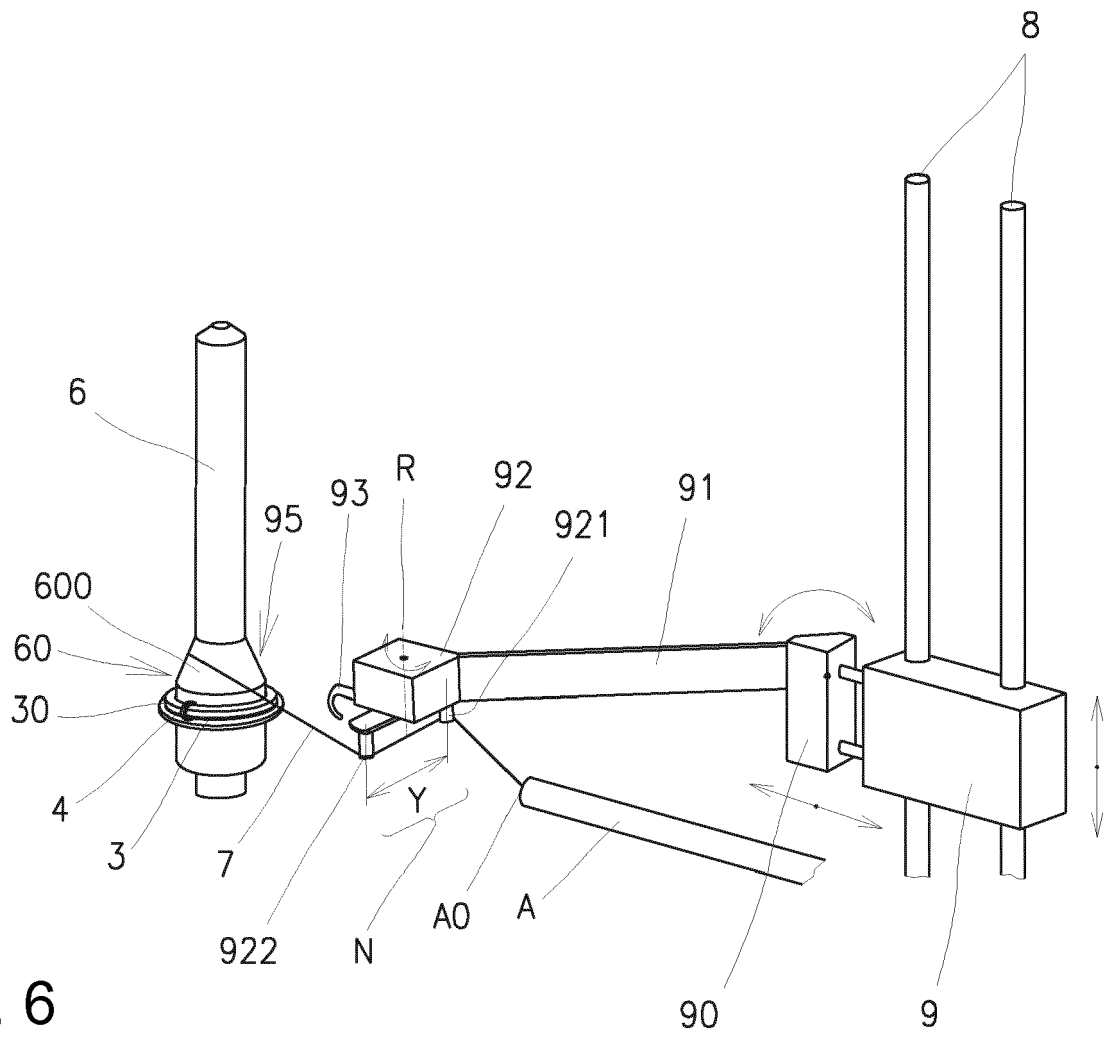
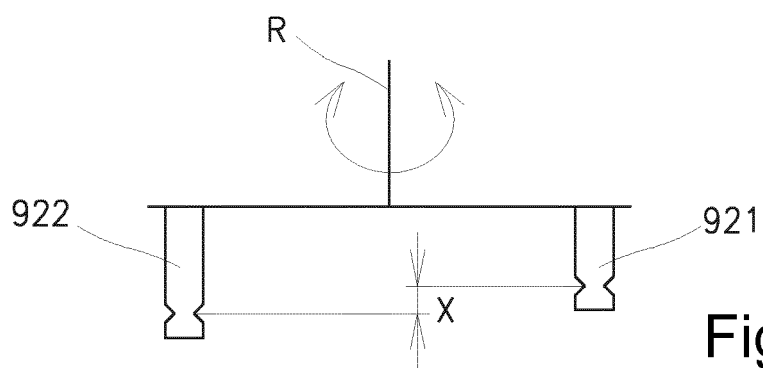
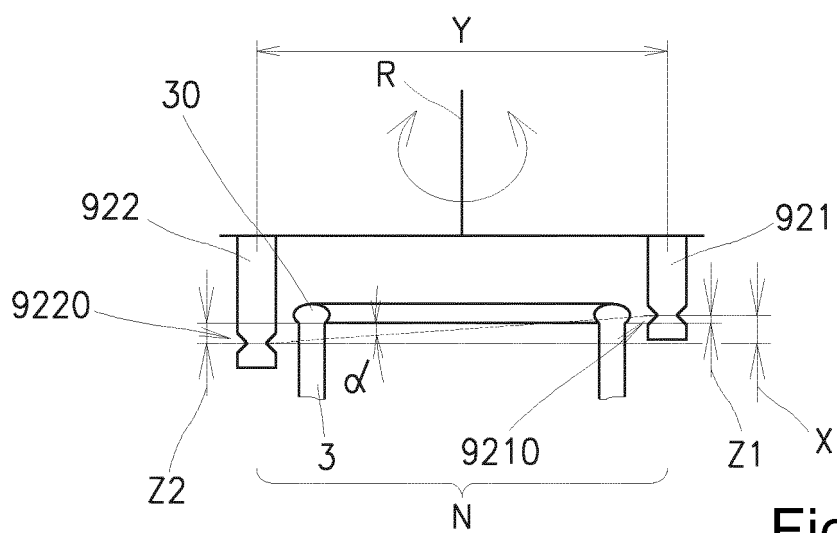
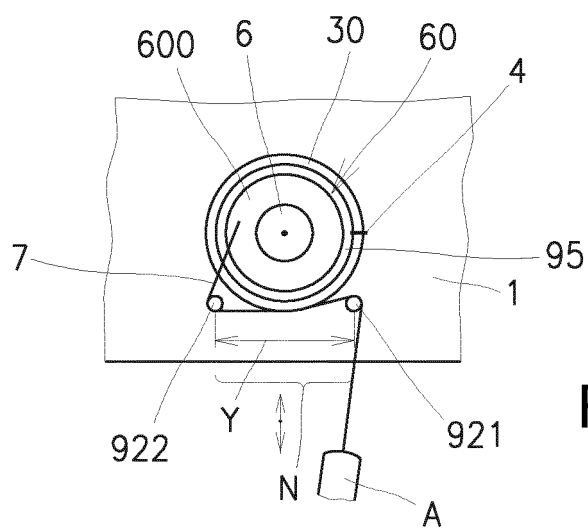


Fig. 6



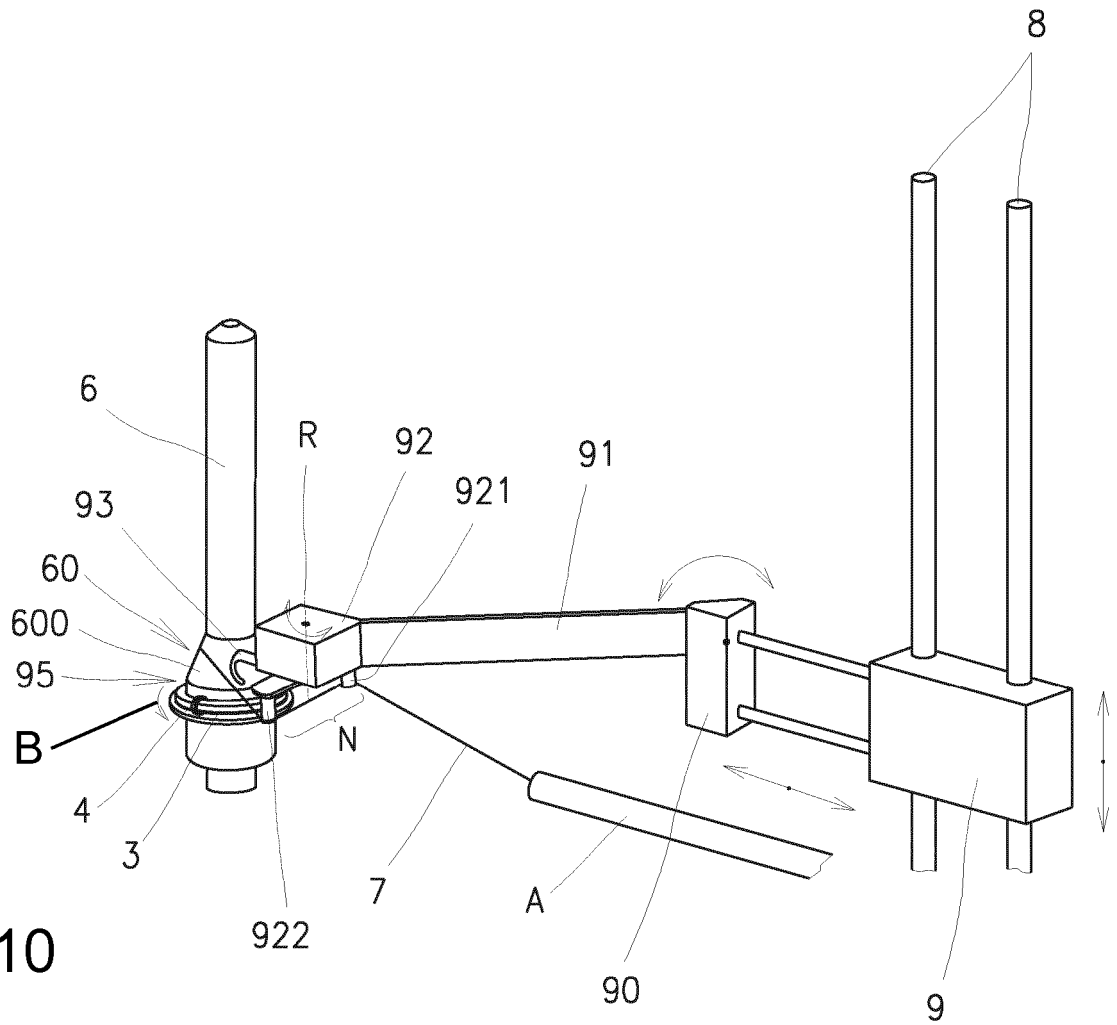


Fig. 10

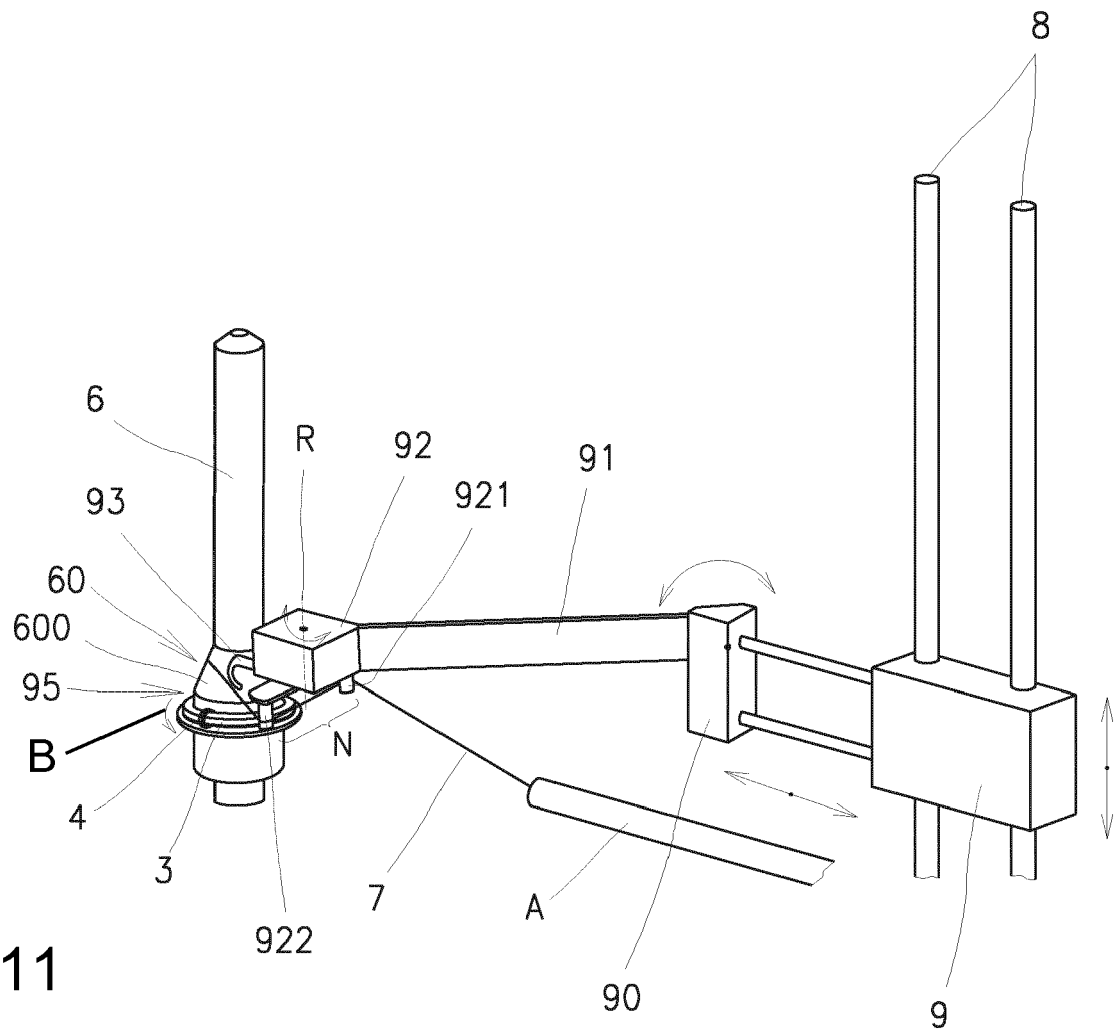


Fig. 11

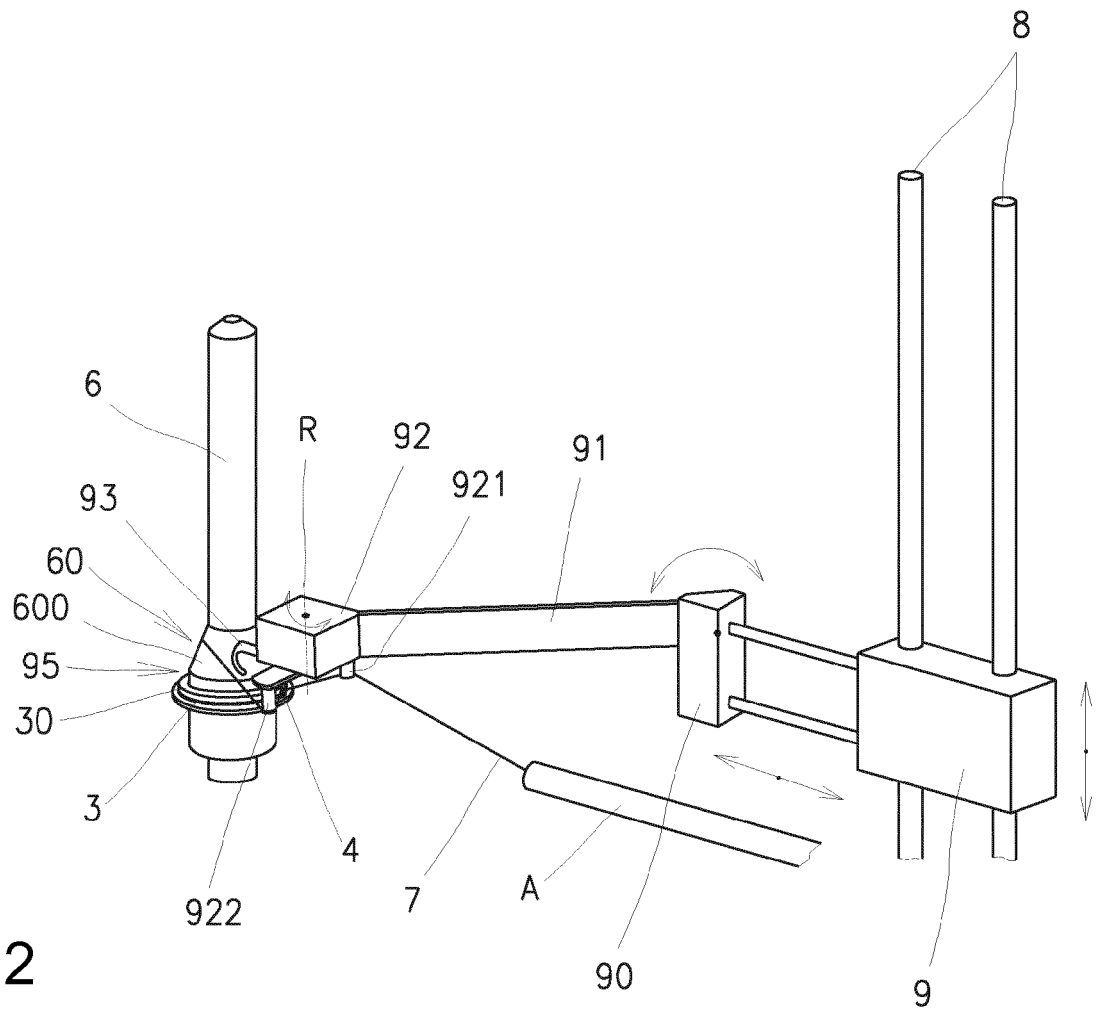


Fig. 12

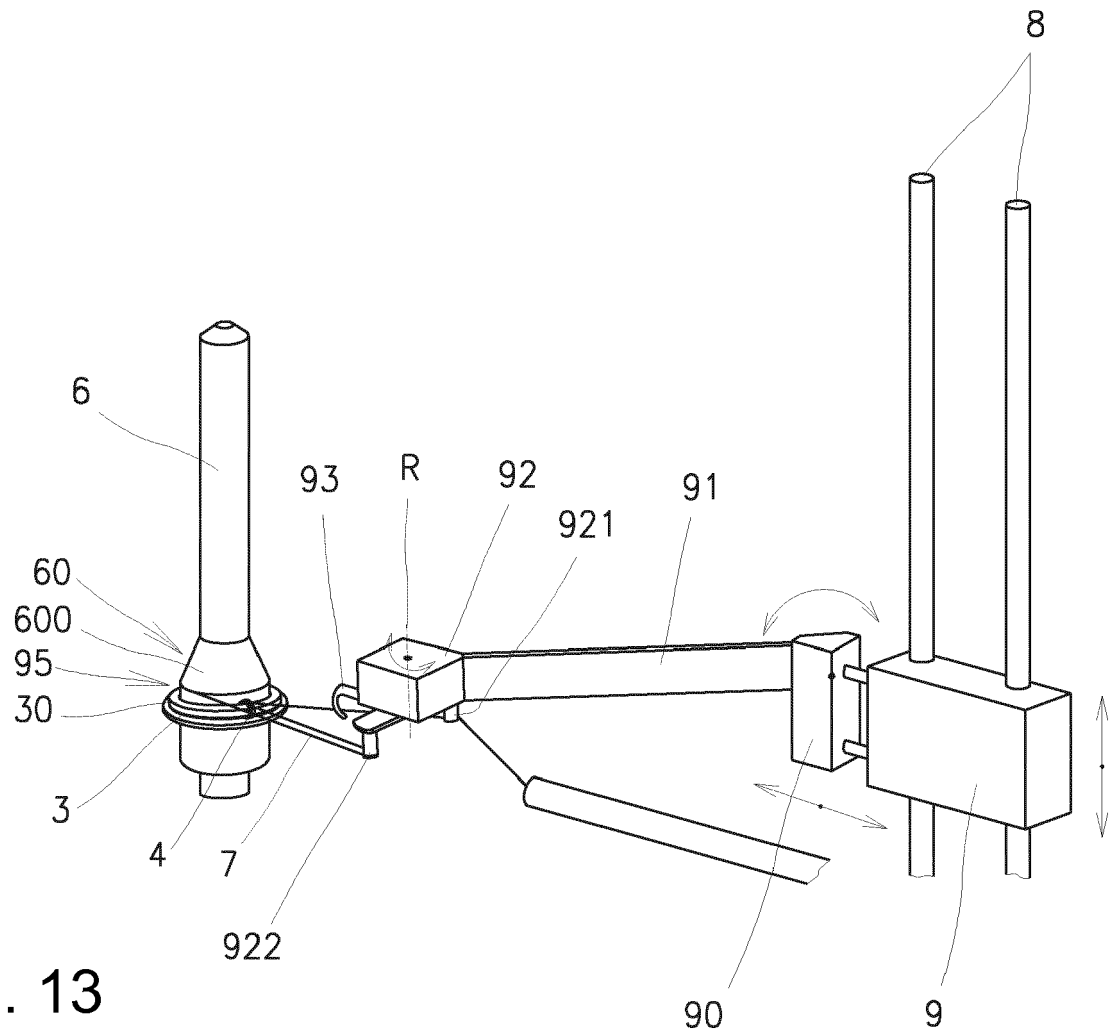


Fig. 13

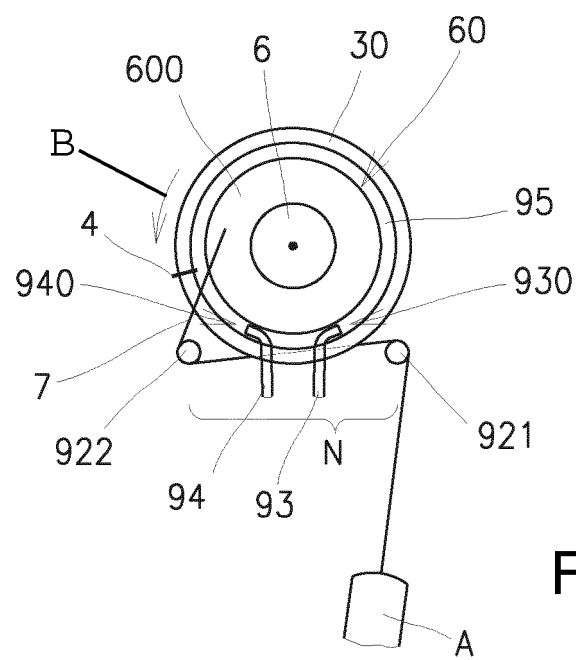


Fig. 14



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