



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.12.2013 Bulletin 2013/51

(51) Int Cl.:
B65H 69/06 (2006.01)

(21) Application number: **13171365.3**

(22) Date of filing: **11.06.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **12.06.2012 IT MI20121019**

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(54) **Splicer device for splicing yarns and winding machine**

(57) Splicer device (6) for splicing yarns in a winding machine wherein the yarn (2) is fed from the bottom and wound from the top on a package (12) and comprising upper (24) and lower (25) clamping members and upper (28) and lower (29) shear members, wherein the upper clamp and shears are sequentially actuated by an upper actuator (50) which firstly closes the upper clamp and then actuates the upper shears, and wherein also the lower clamp and shears are sequentially actuated by a lower actuator (51) which firstly closes the lower clamp and then actuates the lower shears, said actuators being fed in parallel by a feeding device (76) which is common to the two actuators.

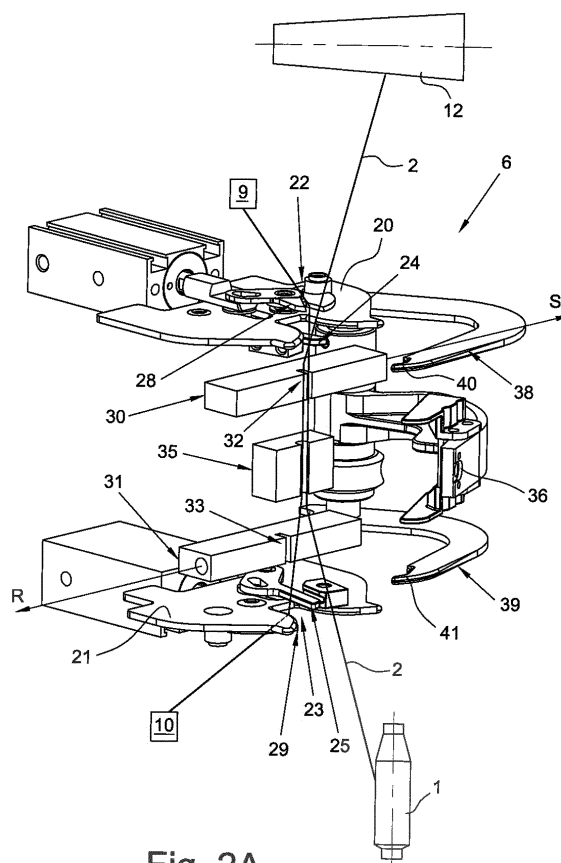


Fig. 2A

Description

[0001] The present invention relates to a splicer device for splicing yarns during the winding thereof on a tube in order to achieve the formation of collection packages of the yarn produced or processed by textile machines. The present invention relates to a winding machine comprising such a splicer device too. In the industrial practice it is widely predominant the yarn collection technique rotatably actuating a tube, idly carried by the spindles of a package-holder arm and drawing back the yarn coming from a follower to wind thereon. The package is thus formed by pulling and winding the yarn on the surface thereof, being rotatably dragged with an underlying motor-driven roller on which the package itself rests. In this way, the yarn may be wound at a constant linear speed, independent of the size taken by the package as the winding advances, and only as a function of the rotation speed of said actuating roller.

[0002] To further clarify both the technical problems addressed and solved by the present invention and its features and advantages as compared to the prior art, it will be described with reference to its application in a winding machine. As is well known, winding machines consist of a plurality of winding stations or units aligned along the front of the machine and provided with common service apparatuses.

[0003] The winding unit is shown in its essential components in Figure 1 which illustrates a front view thereof. The feeding bobbing 1 is unwound by drawing its yarn 2. The yarn 2 passes through the uncoiling assembly 3, which comprises yarn containment and driving members and a yarn detector, and thus through the yarn tensioner 5 which makes the path of the yarn 2 more or less tortuous and determines the tension thereof. After the yarn tensioner 5 the splicer 6 is found, to which the yarn ends are taken that have to be joined by suction inlets 9 and 10 from the feeding bobbing- and the package-side, respectively. The upper end processing positions of such inlets are shown with dashed lines 9' and 10', wherein inlet 9 takes the yarn end from the feeding bobbing-side to the splicer 6 and inlet 10 draws the yarn end upwards by drawing it from the package to take it downward and insert it in the splicer. Such inlets operate frequently, both upon yarn interruptions due to the breaking thereof or to the intervention of the following yarn clearer 11, which is located downstream of the splicer 6, and to the depletion of the feeding bobbing 1. The packaged yarn is collected into the package 12, which is rotatably actuated by the actuating cylinder 13, whereon it rests supported by the package-holder arm 14.

[0004] During its normal operation, each winding station depletes a large number of feeding bobbings to form greatly larger-sized packages. Generally, a feeding bobbing is depleted in a few minutes, while a package is completed in a little less than one hour. Each feeding bobbing depleted is replaced with a new feeding bobbing, then carrying the yarn 2 thereof to join with the yarn end

coming from the package. Still generally, in the lower part of the winding machine a feeding bobbing handling system is placed, which feeds the new feeding bobbings to be unwound and discharges the tubes of depleted feeding bobbings, handling even thousands of items per hour.

[0005] The yarn winding processing consists of the cleaning of the yarn by eliminating defective portions, which are detected and eliminated with the interventions of the yarn clearer 11, then by splicing or joining the two ends of the yarn with the splicer 6 and resuming the unwinding of the feeding bobbing 1. The quality of the yarn produced with the winding therefore depends on the selection carried out by the yarn clearer and the splicing achieved by the splicer 6. The requirements needed for the splicing carried out by the splicer are of a mechanical nature, in terms of splicing resistance, of an aesthetic nature, since the splicing should not be distinguishable along the yarn, and of reliability, in terms of performance consistency of the splicers which equip the winding units.

[0006] In prior art, different types of splicers based on different splicing techniques have been proposed. However, in automatic winders at present the most widespread type of splicer is the pneumatic splicer which processes and joins the two ends to be joined with compressed air blows, yielding a splicing with good mechanical, aesthetic and reliability features.

[0007] In its overall configuration, the pneumatic splicing process of the yarn consists of the followings stages:

[0008] - drawing of the two ends and their delivery to the splicer 6; the yarn the side of the feeding bobbing 1 is drawn with inlet 9 and the yarn on the side of the package with inlet 10,

[0009] - the two ends are clamped by the splicer 6 and cut to size for the splicing thereof,

[0010] - before the splicing the two ends are prepared with air blows to be refined eliminating a part of their fibers, so that the two ends to be superimposed are untwisted and their fibers are made parallel. Such operation is carried out in a conduit and by subjecting the yarn end to the action of compressed air blown in the direction consistent with the end of the yarn to be refined,

[0011] - the yarn ends are taken to the compressed air splicing chamber and superimposed to size by a predetermined length,

[0012] - with the splicing chamber closed, the two yarn ends are blocked and subjected to tangential air blows to twist them back together, in order to give back continuity to the yarn 2,

[0013] - the splicing chamber is open, the continuity of the yarn has been restored and the unwinding of the joined yarn 2 may be resumed.

[0014] In prior art, this pneumatic splicing technique is described in many patents. For example, IT patent 1,137,713 relates to the splicing chamber for yarns having an S- or Z-shaped torsion, IT patent 1,163,453, IT patent 1,172,414 and US patent 6,170,247 relate to the preparation of the yarn ends, US patent 5,154,131 relates to a splicing chamber having a partition, IT patent

1,252,634 discloses the above-mentioned splicing method with an additional cut on the already prepared yarn ends and before the splicing, IT patent 1,252,635 discloses a particular construction of the splicing chamber of the lid thereof for the splicing air outlets, US patent 4,437,299 discloses a pneumatic splicer which comprises control means of the splicing resistance, US patent 4,630,433 discloses the yarn end blocking in the splicing chamber, US patent 4,829,759 discloses a yarn end preparer provided with a vibrating tab. In IT patent 1,275,947 and US patent 5,680,751 the synchronism among the various members of the splicer is ensured by a cam pack rotatably actuated by a stepper motor.

[0015] US patent 6,199,360 discloses the actuation of the various members of the splicer with a piston valve which slides and sequentially distributes compressed air to the various members of the splicer. Patent applications WO 2006/42721 and 2007/76908 disclose coordinated actuating means of the pneumatic splicer.

[0016] In these patents, as well as in the currently available splicers, there may be found that the pneumatic splicing process of yarns is very complex and requires extremely complicated splicers. The various members of the splicer, which cooperate for the process described above, have to make precise movements both in terms of strokes and rotations, and in terms of synchronisms. Generally, the movements and functions of the splicer are carried out with a plurality of members driven by the control unit of the winding station.

[0017] The technical problem to which the present invention is directed is the controlled actuation of such movements of the splicer 6 in the various steps of the splicing process by simplifying both the device and the process in terms of movements and synchronisms.

[0018] The present invention, in its most general concept of splicer device, is defined in the first claim. Variations or preferred embodiments thereof are defined in the dependent claims.

[0019] Figure 1 shows the scheme - in front view - of the yarn collecting unit in a winder, wherein there are indicated the most significant members which take part in the package formation process and is illustrative of the technical problem. Figure 2 show the steps of the yarn splicing process with the splicer device according to the present invention, with reference to the exploded view of the essential components thereof.

[0020] Figure 2A shows the splicer device in the initial step 1, wherein the yarn ends are brought to the splicer from the package-side and feeding bobbing-side inlets, wherein the following items are shown in exploded view:

[0021] 20,21 upper and lower guiding plates of the yarn to the splicer, wherein there are made; according to an embodiment such upper and lower guiding plates 20,21 are fixed plates;

[0022] 22,23 upper and lower yarn guiding cavities,

[0023] 24,25 upper and lower clamping members, which receive and retain the yarn of the package 12 carried by inlet 10 and the yarn of the feeding bobbing 1

carried by inlet 9, respectively. Such clamping members are secured onto plates 20,21 and placed inside the gap between said plates,

[0024] 28,29 upper and lower shear members, which cut the yarn of the feeding bobbing 1 carried by inlet 9 and the yarn of the package 12 carried by inlet 10, respectively. Such shear members are secured onto plates 20,21 and placed outside the gap between said plates.

[0025] 30,31 upper and lower yarn end preparation chambers, for the preparation of the feeding bobbing-side yarn end and package-side yarn end, respectively. They consist of conduits wherein air is blown at high speed which refines the yarn end. Halfway of each conduit 30,31 a passage 32,33 is made for the input and output of the yarn end being processed. The upper preparer 30 processes the yarn end coming from the feeding bobbing 1 blowing to the right and discharging air according to arrow S. The lower preparer 31 processes the yarn end coming from the package 12 blowing to the left and discharging air according to arrow R.

[0026] 35 splicing chamber of the ends of the yarn 2; according to an embodiment said splicing chamber 35 performs pneumatic splicing of the yarn with compressed air; according to other embodiments of the present invention, the splicing chamber 35 performs yarn splice by other means;

[0027] 36 closing lid of the splicing chamber 35, which has to be closed before the splicing and opened back once the splicing has taken place,

[0028] 38, 39 yarn end introduction levers in the various steps of the splicing process.

[0029] 50, 51 clamp control means.

[0030] In the initial step 1 the inlets 9 and 10 take the two yarn ends to the splicer 6. The feeding bobbing-side inlet 9 carries the yarn end to enter, guided by the guiding slot 22, firstly the cavity of the splicing chamber 35 and then the open upper shears 28.

[0031] The package-side inlet 10 carries the yarn end to enter, guided by the guiding slot 23, firstly the cavity of the splicing chamber 35 and then the open lower shears 29.

[0032] Figure B shows the splicer device in step 2, wherein the yarn ends brought to the splicer from the package-side and feeding bobbing-side inlets are introduced in the clamps 24,25 with the clockwise rotation of levers 38 and 39, which with their end cavities 40 and 41 carry the two yarn ends to also enter, guided by the guiding slot 22, the clamps 24,25 still open. At the same time, also the lid 36 closes back. Therefore, the clamps 24,25 are closed with the two yarn ends still suctioned by inlets 9 and 10. In the following figures the lid 36 is not shown as completely closed in order to clearly show the position of the yarn ends being processed.

[0033] Figure 2C shows the splicer device in step 3, wherein the yarn ends are held by the clamps 24,25 and closed in the lid 36. Step 3 consists of the cut of the yarn ends with the shears 28 and 29: yarn segments are suctioned with the inlets 9 and 10. Once the yarn ends have

been cut, said inlets are no longer needed and may be taken to a stand-by position.

[0034] Figure 2D shows the splicer device in step 4, wherein the yarn ends are still held by the clamps 24,25 and closed in the lid 36. Step 4 consists of a second clockwise advance of the levers 38 and 39 to determine the yarn length to be introduced in the preparers 30 and 31.

[0035] Figure 2E shows the splicer device in step 5, wherein the yarn ends are still held by the clamps 24,25 and closed in the lid 36. Step 5 consists in the refining of the yarn ends untwisting them and eliminating the shortest part of their fibers, so that the processed yarn ends globally have the same number of fibers as the entire yarn, with modes *per se* well known to those skilled in the art. Such operation is carried out in the preparers 30 and 31 wherein compressed air is blown in the S and R directions. Upon initiation of such blowing, the two yarn ends are thus suctioned by the air stream and enter, with openings 32 and 33, their preparer 30 and 31, wherein they are processed by a determined length with step 4. Figure 2F shows the splicer device in step 6, wherein the yarn ends are still held by the clamps 24,25 and closed in the lid 36. Step 6 firstly consists of a third clockwise advance of the levers 38 and 39 to carry inside the splicing chamber the yarn end segments which have been prepared in step 5 and to determine the length of their superimposition in the splicing chamber 35. A proper splicing is therefore achieved by blowing compressed air in the chamber 35, with modes *per se* well known to those skilled in the art.

[0036] Figure 2G shows the splicer device once the operation is complete: all the assemblies return to a stand-by position. The clamps 24 and 25 as well as the shears 28 and 29 are open. The levers 38 and 39, as well as the lid 36, are rotated counterclockwise releasing the joined yarn 2, which exits the chamber 35 and cavities 22,23. Winding of the yarn 2 from the feeding bobbing 1 to the package 12 may be resumed.

[0037] The foregoing description shows how the process and splicer device are greatly simplified and reliable as compared to those of the prior art, in terms of control of movements and the synchronisms thereof.

[0038] A remarkable feature of the present invention lies in that the synchronism of the initial movements of clamping and cutting to size of the yarn ends is made possible by a single control for both yarn ends, as is shown with reference to the exemplary embodiment of figures from 3 to 5.

[0039] The foregoing description shows that the end of the yarn 2 coming from the feeding bobbing 1 is clamped from the lower clamp 25 and cut with the upper shears 28 and that, conversely, the end of the yarn 2 coming from the package 12 is clamped by the upper clamp 24 and cut with the lower shears 29. In order to ensure that the two yarn ends are safely cut when their clamps are safely closed, their control is carried out as follows.

[0040] Figure 3 shows the structure of the common actuating device of the clamps and shears of the splicer device according to the invention, with reference to the device installed onto the upper plate 20 and driven with the actuator 50, having the shears 28 placed over the plate and the clamp 24 under the plate. The same device is installed onto the lower plate 21 and driven with the actuator 51, but is made with a mirror construction, that is with the shears 29 placed under the plate and the clamp 25 over the plate. The relative position of the two clamping and cutting members may also be achieved in a different way, for example, conversely, with the clamps on the outside of the plates and the shears on the inside, or with the two members on the same side of the plate thereof. According to a possible embodiment, said actuators 50,51 comprise cylinders, for example pneumatic cylinders. Of course said cylinders may also be hydraulic cylinders. Moreover, said actuators 50,51 may comprise electric devices, for example electric motors and so on.

[0041] Figure 3A shows the actuating device in a stand-by condition, that is with the clamp and the shears open. According to a possible embodiment, the actuating device comprises a pneumatic cylinder 50 which extends and retracts a stem 53, which causes lever 55 to move pivoted on the lower face of the plate 20 with a fixed pin 56 and which can rotate according to arrow A. The end part of the stem 53 is pivoted on lever 55 with a moving pin 57. Lever 55 is installed under the plate 20 and its rotating end 59 makes up the moving part of the clamp 24 which corresponds to a fixed abutment anchor 60, mounted under the plate 20 with a support 61 and with the interposition of abutment springs 62.

[0042] The same stem 53, with the same moving pin 57, also causes a second lever 65 to move pivoted on the upper face of the plate 20 with a fixed pin 66 and which can rotate according to arrow B. The end part of the stem 53 with its moving pin 57 is connected to lever 65 with the insertion of such pin 57 in a slot or hole 68 made in the body of the second lever 65, so that the first part of the stroke of the stem 53 does not cause the rotation of lever 65 and that with the second part of the stroke the pin 57 reaches the bottom of the slot 68 and causes the rotation of the same lever according to arrow B. Lever 65 is installed above the plate 20 and its rotating end 69 makes up the cutting moving part of the shears 28 which corresponds to the abutment fixed part 70, mounted onto the plate 20.

[0043] Figure 3B shows the actuating device in a clamping step, that is with clamp 24 only closed, leaving the shears 28 open. In such step the pneumatic cylinder 50 extends the stem 53 by a first feed segment, which causes lever 55 to rotate according to arrow A. Its rotating end 59 rotates until it meets the fixed abutment anchor 60 and closes clamp 24, with the dampening from the springs 62. In this first feed segment, the end moving pin 57 of the stem 63 goes through the slot 68 and does not cause the rotation of lever 65 according to arrow B. The shears 28 remain open.

[0044] Figure 3C shows the actuating device in a cutting step of the yarn ends, that is also with the closing of the open shears 28. In such step the pneumatic cylinder 50 extends the stem 53 by a second feed segment, which causes lever 55 to further rotate according to arrow A. Its rotating end 59 rotates further against the fixed abutment anchor 60 and compresses the springs 62, still with clamp 24 closed. In this second feed segment, the end moving pin 57 of the stem 53 has completed its path in the slot 68 and rests at the bottom thereof, causing the rotation of lever 65 according to arrow B. The shears 28 close: their rotating end 69 rotates according to arrow B up to their fixed abutment part 70, mounted onto plate 20.

[0045] Said upper and lower actuators 50,51 are fed in parallel by a feeding device 76 which is common to the two upper and lower actuators 50,51 themselves.

[0046] According to a possible embodiment, pneumatic actuating cylinders 50 and 51 are fed in parallel with a feeding device 76, for example a feeding valve 76, which is common to the two upper and lower devices. The structure of the pneumatic actuating device - which anyway causes the clamping of the yarn end to take place before they are cut to size - ensures the control of their length during the following steps of the process. Of course if electric actuators 50,51 are used, the common feeding device 76 can be an electric feeding control unit.

[0047] According to an improved embodiment of the present invention, shown in Figures 4, a half-stroke by-pass conduit is interposed between the two pneumatic cylinders 50 and 51, to make sure that the cutting is only made when the two clamps are closed to block the yarn end thereof.

[0048] Figures 4A, B, C show the actuating scheme of the two upper and lower cylinders 50 and 51. Therein a piston 75 slides to which the stem 53 is connected which sequentially actuates clamps and shears. The piston 75 is shown in its three positions: in Figure 4a in initial standby position A, in Figure 4B in intermediate clamp closing position B and in Figure 4C in final yarn cutting position C. The piston 75 is pushed from left to right by the air blown with the three-way electrovalve 76. The return stroke from right to left after the yarn ends have been cut, and together with the release of pressure by the electrovalve 76, is instead carried out by a return spring 77, which is loaded in the advance stroke of the piston from left to right. Alternatively, a double effect actuation may be used and in this case the electrovalve may be of the five-way type.

[0049] Correspondingly to the arrival of the piston 75 in the intermediate position B, in the body of the two pneumatic cylinders 50 and 51 a connection 78 with a by-pass conduit is made, the opening thereof is uncovered when the piston reaches such position B. The by-pass conduit 78 is also shown, for example, in Figure 2C. In the final right part of the body of the two pneumatic cylinders 50 and 51 a compressed air discharge opening 80,81 is made.

[0050] Figure 5 shows the configuration of the actuat-

ing scheme of the two upper and lower cylinders 50 and 51 with one of the pistons 75 (the figure shows piston 75 of the upper cylinder 50) regularly sliding from left to right, while the other piston 65 is late for any reason. In this case the piston 75 of the upper cylinder 50, which has reached position B, uncovers the opening of the by-pass conduit 78 towards the lower cylinder 51, wherein the piston 75 is still in a retracted position: the inlet of the by-pass conduit 78 in the lower cylinder 51 is directly connected to the exhaust 81 thereof. In the case where the two pistons do not slide at the same time, the pressure of the gas fed with the electrovalve 76 exhausts from the exhaust 81 on the right. As a result of the push of its spring 77 the upper piston 75 then retracts until it closes the by-pass back and remains in this position until the lower piston also reaches position B. When both pistons 75 are in position B and have actuated both their clamps 24,25 in a closed condition, the by-pass 78 does not work in the exhaust step because it communicates the left-side spaces of the cylinders 50 and 51 which share the same pressure and does not communicate with the exhausts 80 and 81 in the right-side spaces. The two pistons 75 are pushed by the pressure of the air fed with the electrovalve 76 and may therefore continue their stroke to the right and actuate their shears 28 and 29.

[0051] As compared to yarn splicing devices of the prior art the device according to the present invention for integrally and concurrently actuating the clamps and shears of the yarns for the cutting thereof provides remarkable advantages in terms of simplicity, cost effectiveness and efficiency.

[0052] The control and actuation of the clamps and shears are carried out with a pair of pneumatic cylinders 50 and 51 which operate in parallel fed with only one electrovalve 76. The device according to the invention ensures that the yarn ends are safely cut when their clamps are safely closed, thus allowing to work on yarn ends of an accurately predetermined length in the following stages of the splicing process.

Claims

1. A splicer device (6) for splicing yarns in a winding machine wherein the yarn (2) is fed from the bottom and wound from the top onto a package (12) and comprising upper (24) and lower (25) clamping members, which receive and retain the yarn coming from the package (12) and the yarn (2) fed from the bottom, respectively, such clamps (24,25) being secured onto upper (20) and lower (21) plates, respectively, with respect to a splicer chamber (35) for yarn splicing, and further comprising upper (28) and lower (29) shear members, which cut the yarn (2) fed from the bottom and the yarn coming from the package (12), respectively, such shears (28,29) being secured onto upper (20) and lower (21) plates, respectively, **characterized in that**

the upper clamp (24), which retains the yarn coming from the package (12), together with the upper shears (28), which cut the yarn (2) coming from the bottom, are sequentially actuated by an upper actuator (50) which extends and retracts a stem (53), to first close the clamp (24) and then to actuate the shears (28), and

the lower clamp (25), which retains the yarn coming from the bottom, together with the lower shears (28), which cut the yarn (2) coming from the package (12), are sequentially actuated by a lower actuator (51) which extends and retracts a stem (53), to first close the clamp (25) and then to actuate the shears (29), said upper and lower actuators (50,51) being fed in parallel by a feeding device (76) which is common to the two upper and lower actuators (50,51).

2. A splicer device (6) for splicing yarns according to claim 1, wherein said splicer chamber (35) performs pneumatic yarn splicing.

3. A splicer device (6) for splicing yarns according to claim 1 or 2, wherein said upper actuator (50) is an upper pneumatic cylinder (50) and/or said lower actuator (51) is a lower pneumatic cylinder (51).

4. A splicer device (6) for splicing yarns according to claim 3, wherein said upper and lower pneumatic cylinders (50,51) are fed in parallel with compressed air by a feeding device (76) which is common to the two upper and lower cylinders (50,51).

5. A splicer device (6) for splicing yarns according to any one of the preceding claims, wherein the stem (53), which extends and retracts as a result of the action of its actuator (50,51), carries to its end a moving pin (57) which engages a lever (55) causing it to rotate according to arrow (A), the rotating end (59) of the lever (55) being the moving part of its clamp (24,25), and wherein the same stem (53), with the moving pin (57), causes a second lever (65) to rotate according arrow (B), a rotating end (69) of the second lever (65) being the cutting moving part of the shears (28,29),
the insertion of the pin (57) in the body of the second lever (65) being made by means of a slot (68), so that the first part of the stroke of the stem (53) does not cause the rotation of the lever (65) and that only the second part of the stroke of the stem (53) also causes the rotation of also the second lever (65).

6. A splicer device (6) for splicing yarns according to claim 5, wherein said moving pin (57) engages a lever (55) pivoted onto the plate (20,21) with a fixed pin (56).

7. A splicer device (6) for splicing yarns according to claim 5 or 6, wherein the rotating end (59) of the lever

(55) is the moving part of its clamp (24,25) which corresponds to a fixed abutment anchor (60), mounted onto the plate (20,21).

8. A splicer device (6) for splicing yarns according to any one of claims 5, 6 or 7, wherein the stem (53), with the moving pin (57), causes the second lever (65) to move pivoted onto the plate (20,21) with a fixed pin (66) causing it to rotate according arrow (B).

9. A splicer device (6) for splicing yarns according to any one of claims 5, 6, 7 or 8, wherein the rotating end (69) of the second lever (65) is the cutting moving part of the shears (28,29) which corresponds to the fixed abutment part (70), mounted onto the plate (20,21).

10. A splicer device (6) for splicing yarns according to any one of previous claims, wherein the feeding device (76) which is common to the two upper and lower cylinders (50,51) is a three-way valve.

11. A splicer device (6) for splicing yarns according to any one of the previous claims, wherein in the two upper (50) and lower (51) cylinders a piston (75) is provided to which the stem (53) is connected which sequentially actuates its clamp (24,25) and its shears (28,29), said piston (75) capable of taking three positions: (A) stand-by, clamp closing intermediate (B) and yarn cutting final (c), the piston (75) being pushed in its advance stroke by the air blown with the feeding device (76) and in its return stroke by a return spring (77), which is loaded in the advance stroke of the piston (75).

12. A splicer device (6) for splicing yarns according to claim 11, wherein between the two upper (50) and lower (51) cylinders a connection (78) with a by-pass conduit is made, the opening of which is uncovered with the piston reaches the intermediate position (B) and in that a compressed air exhaust opening (80,81) is made in the final part of the body of the two pneumatic cylinders (50) and (51).

13. Winding machine comprising a splicer device (6) according to any one of the preceding claims.

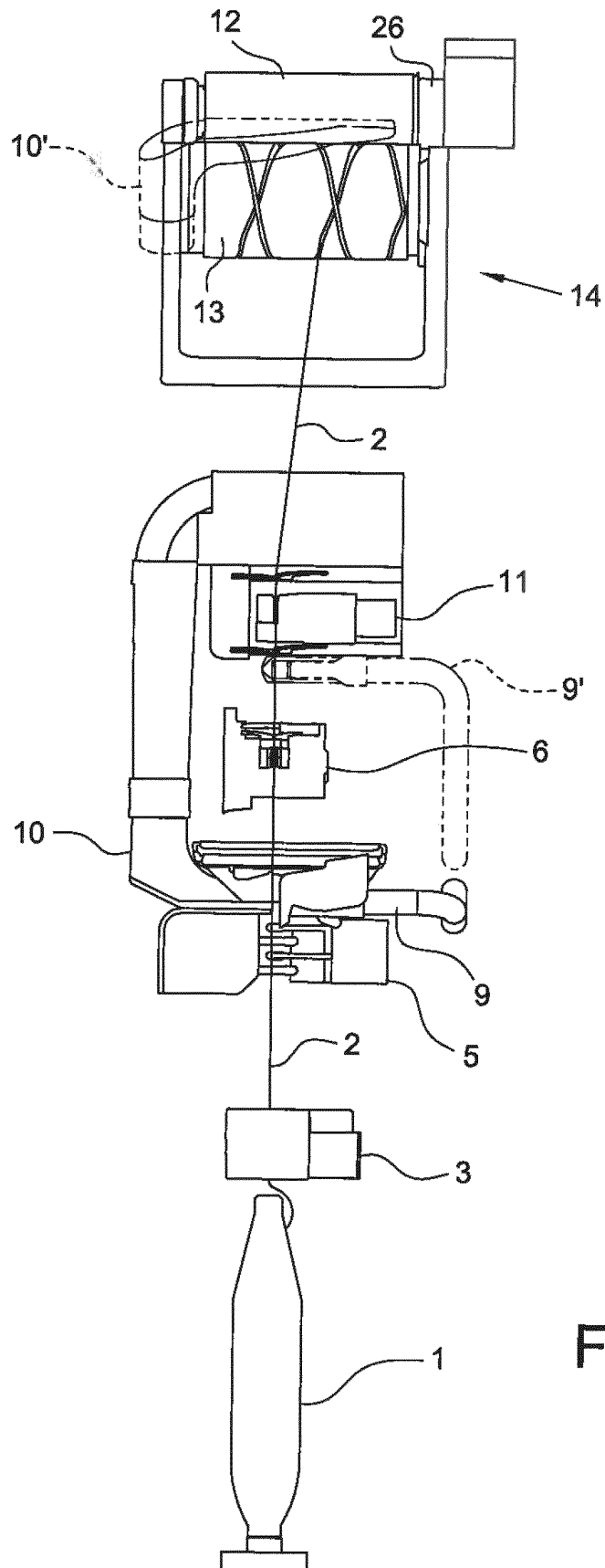


Fig. 1

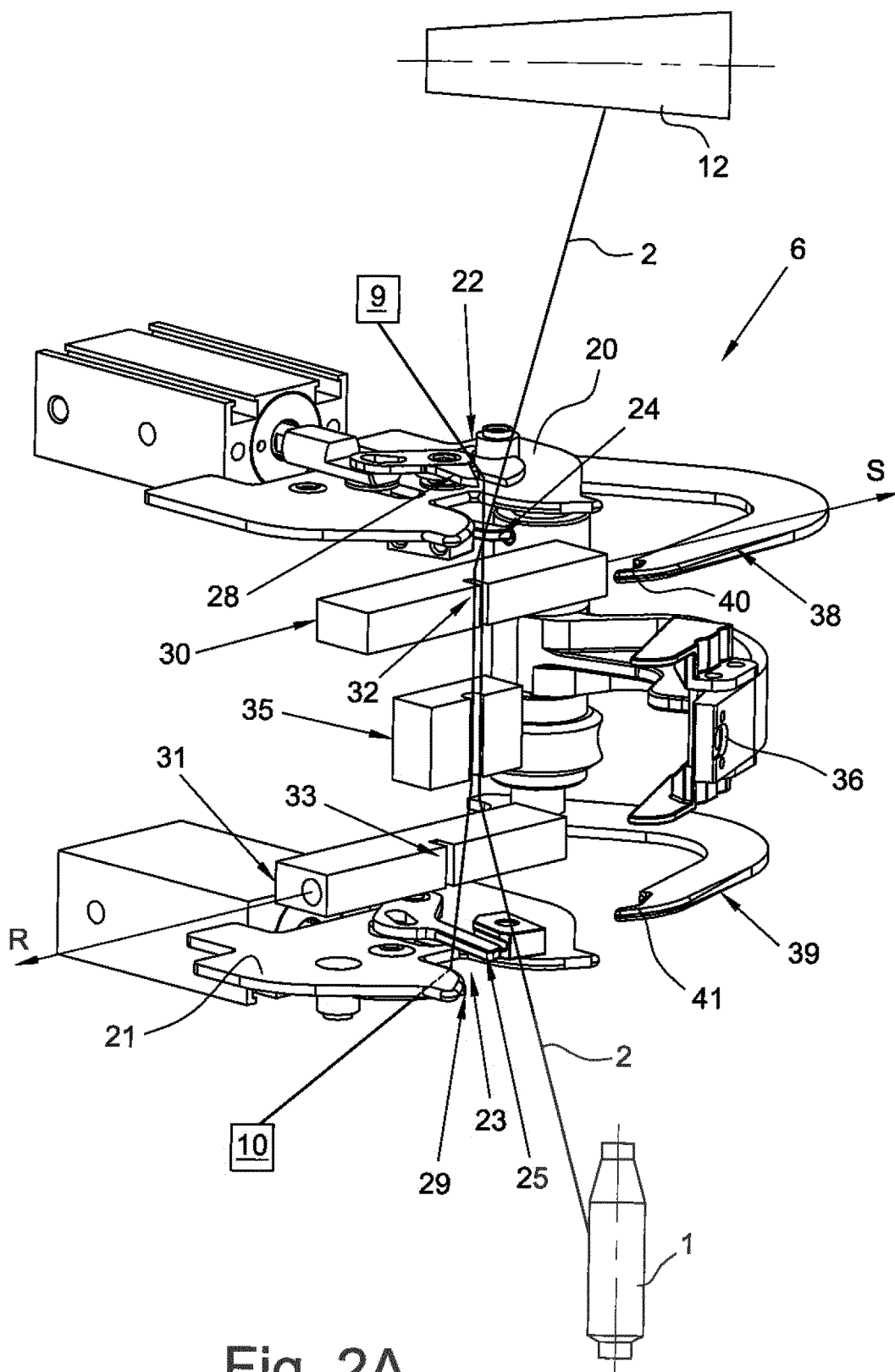


Fig. 2A

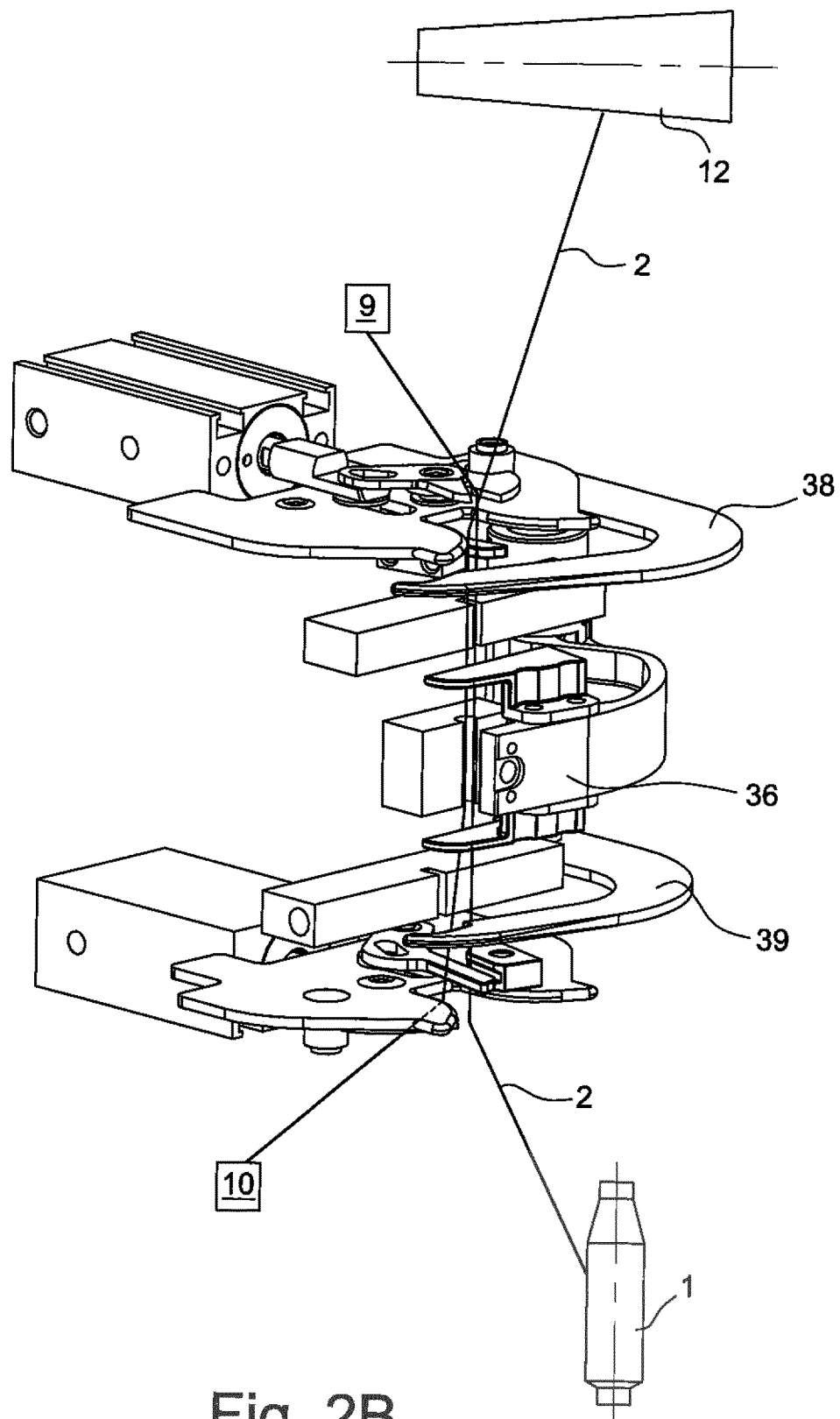


Fig. 2B

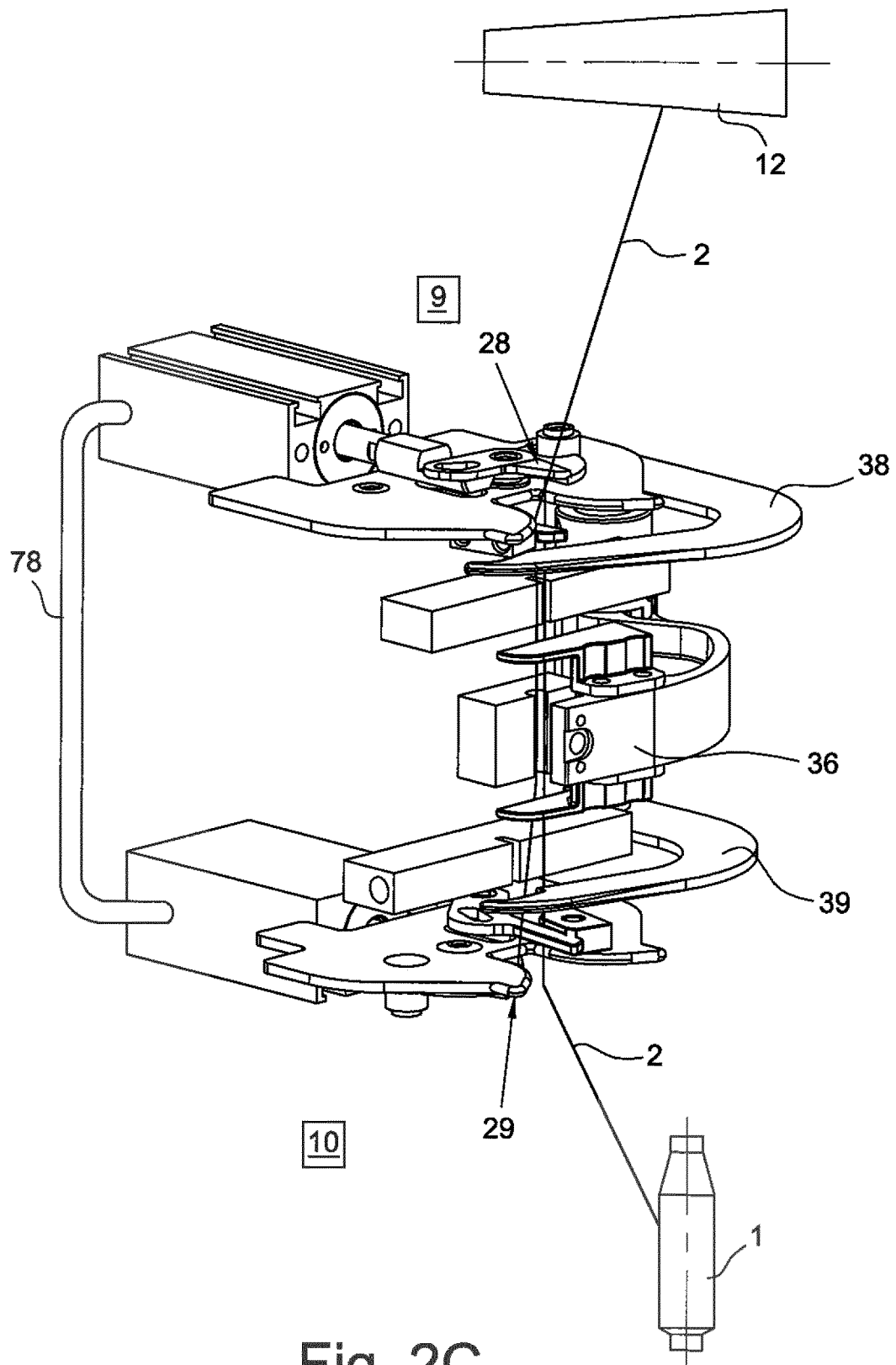


Fig. 2C

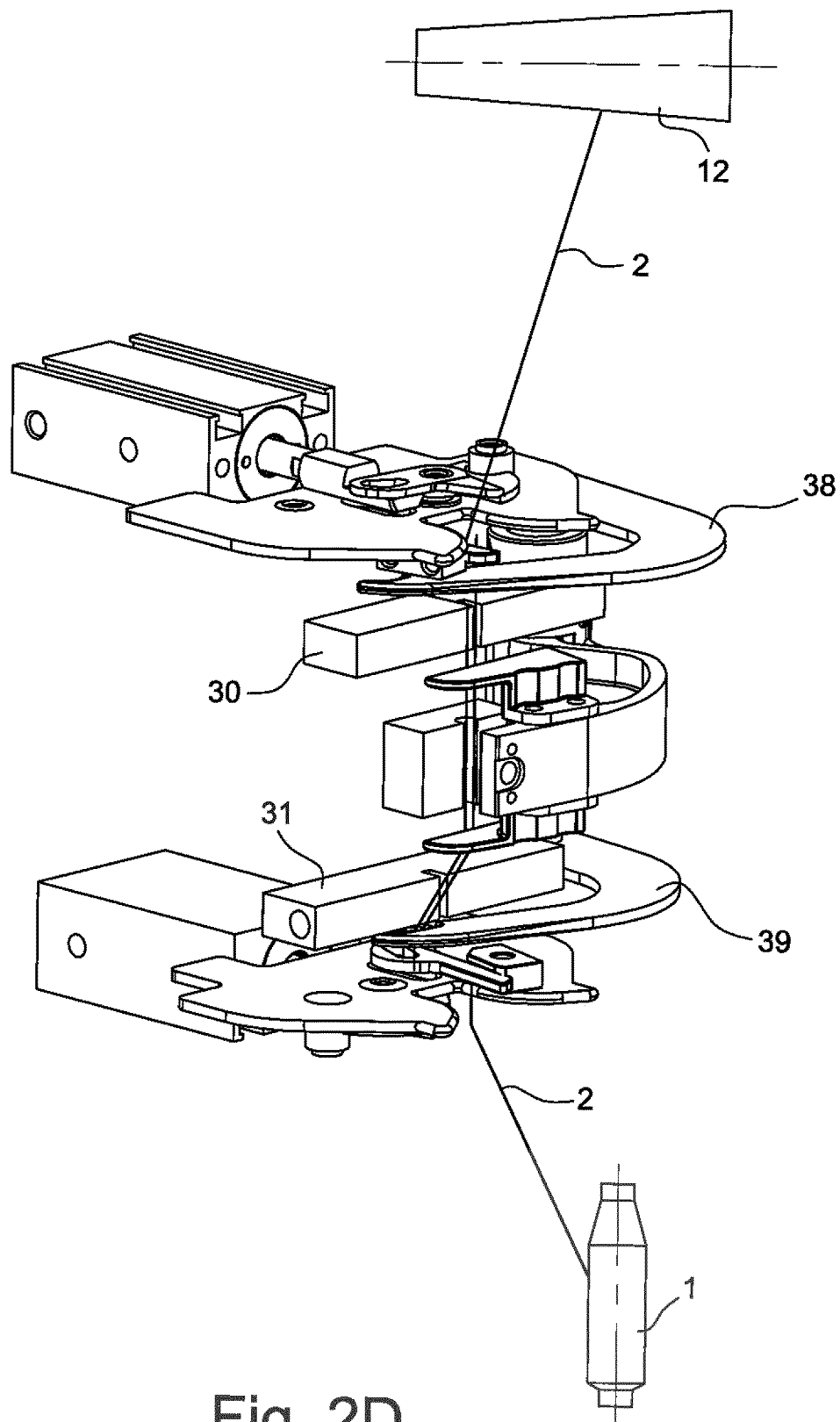


Fig. 2D

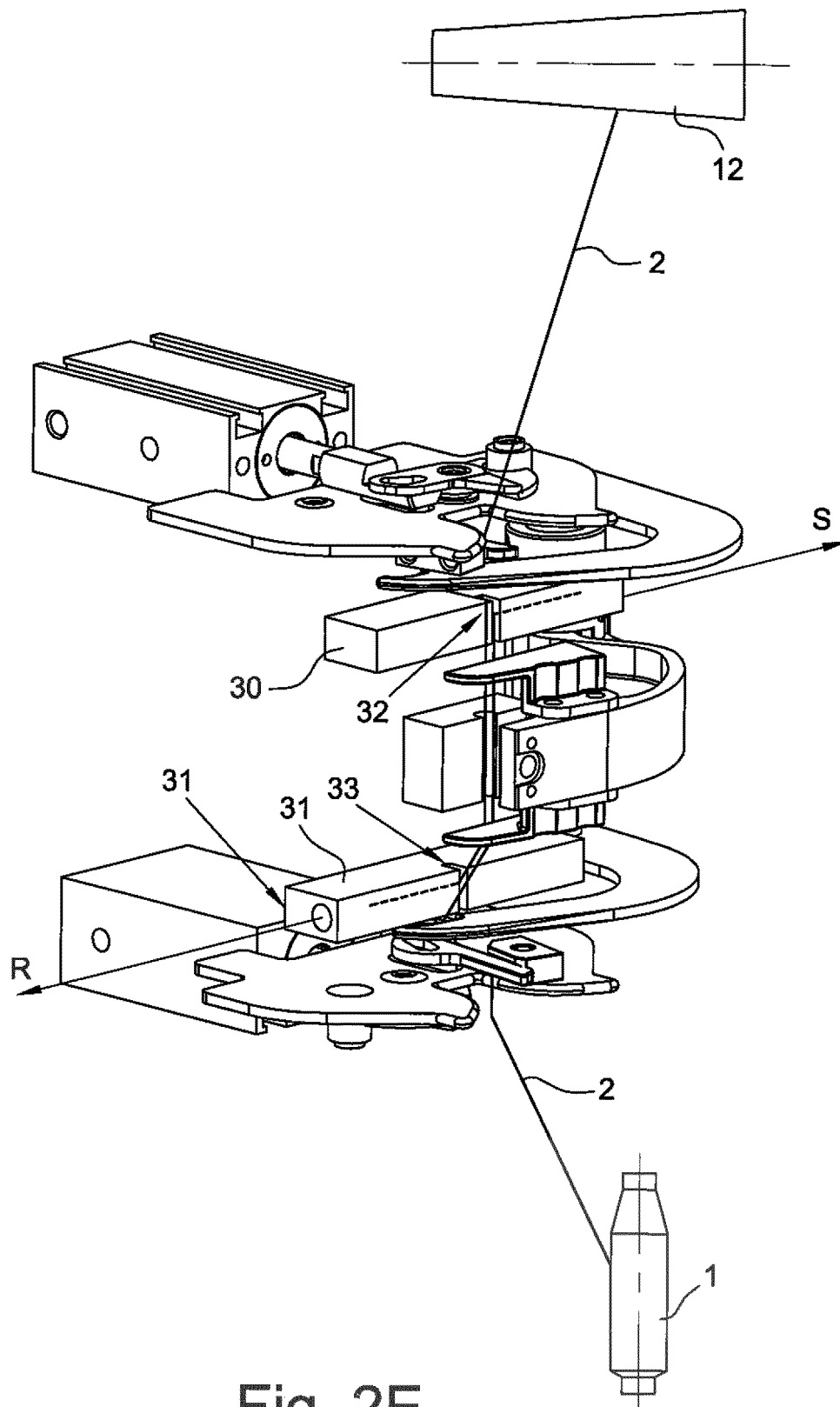


Fig. 2E

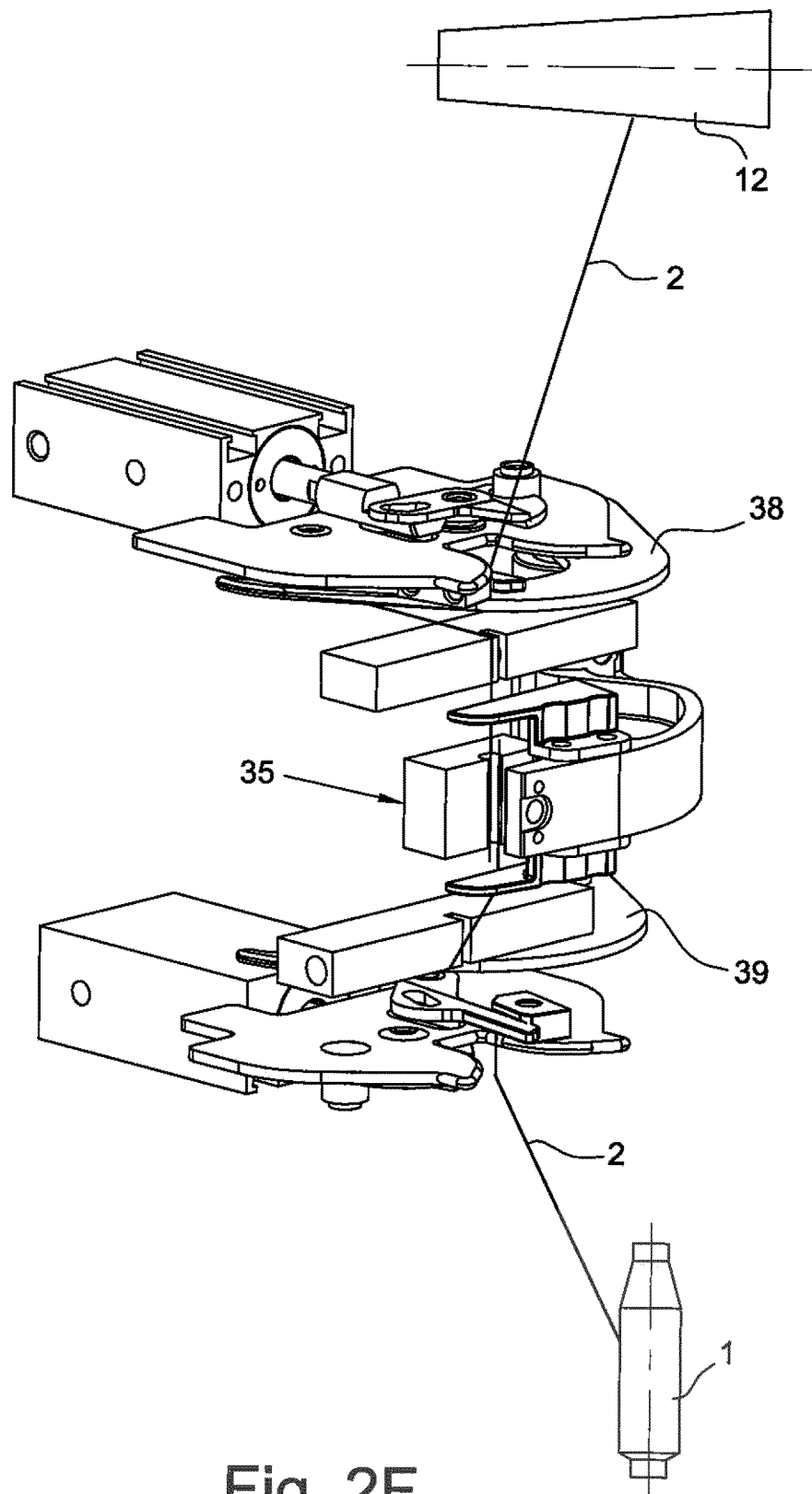


Fig. 2F

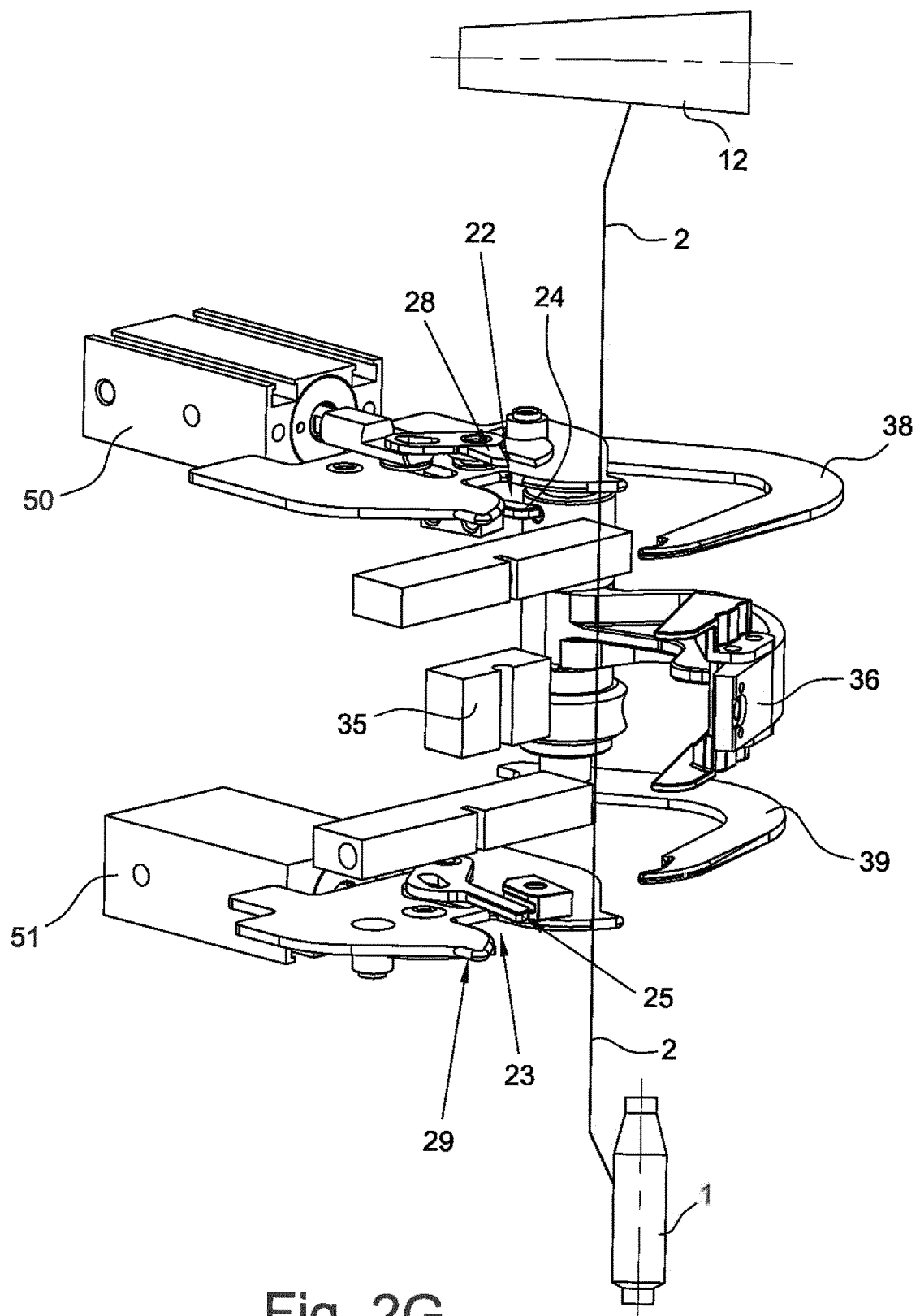
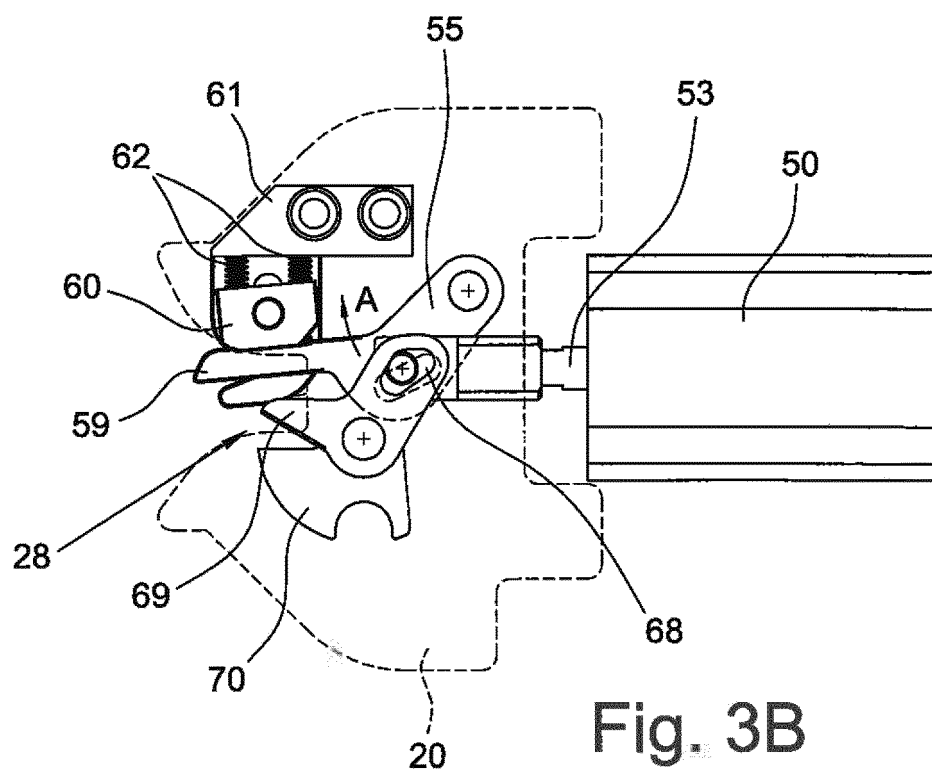
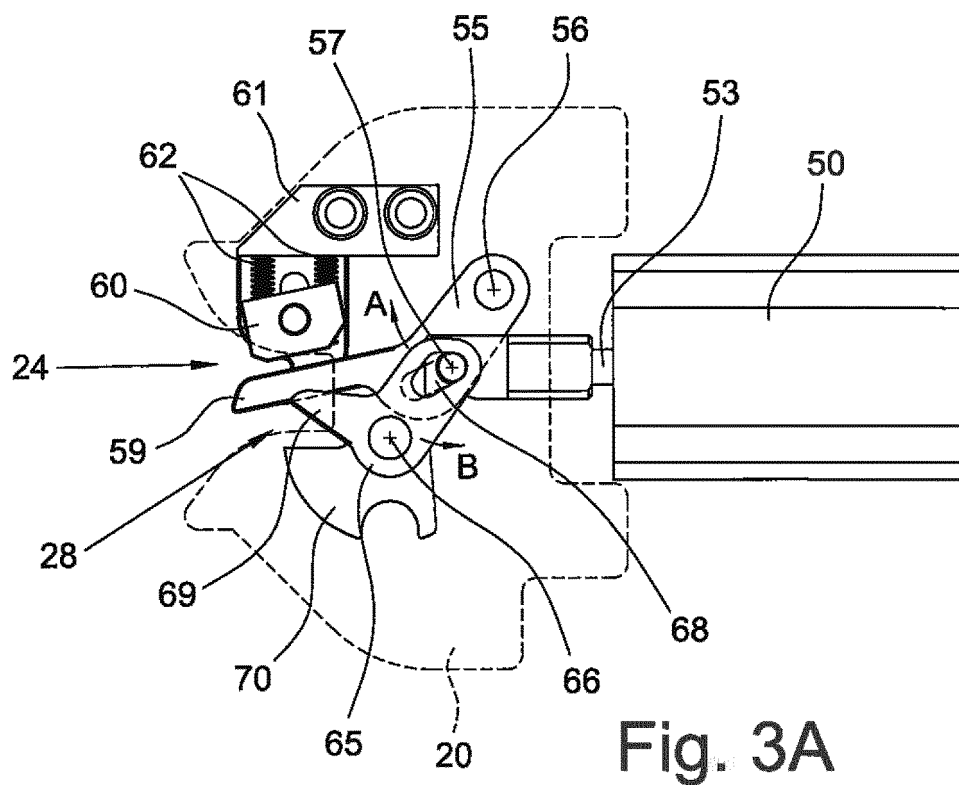
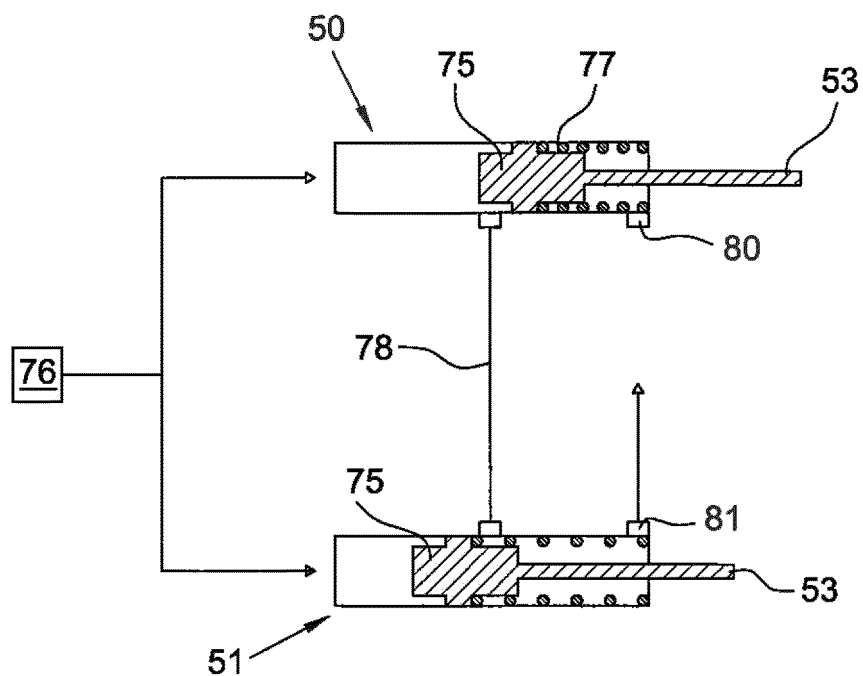
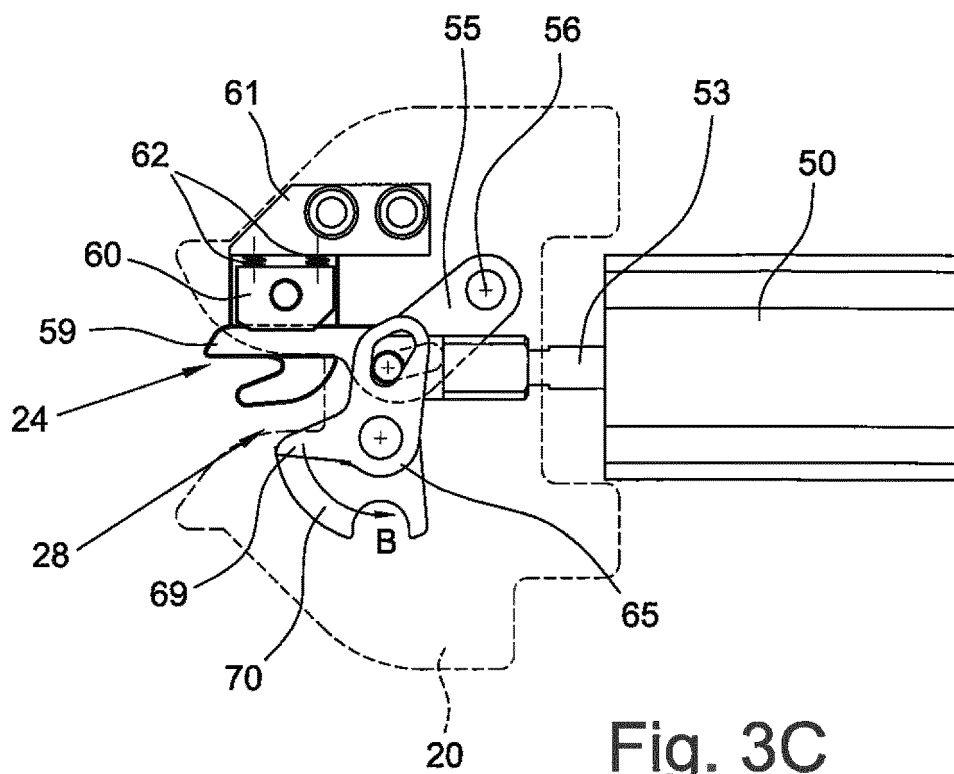
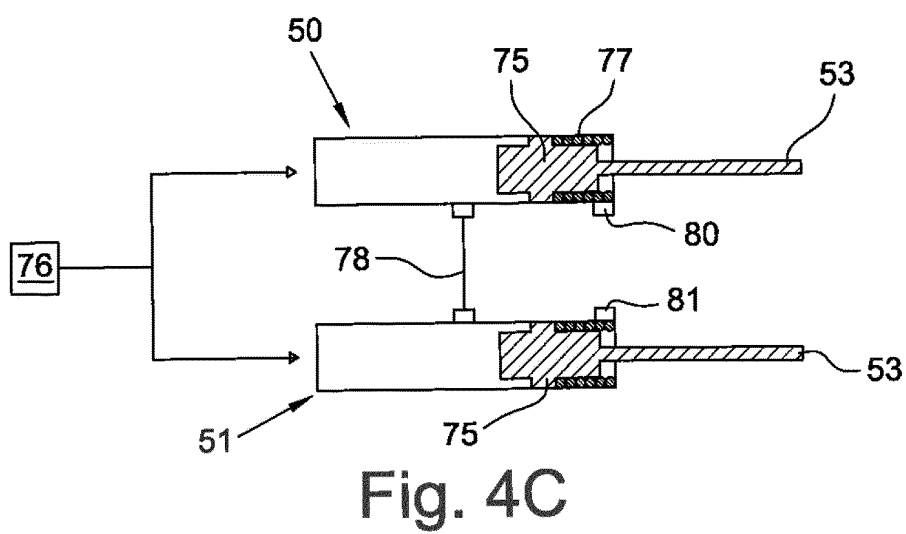
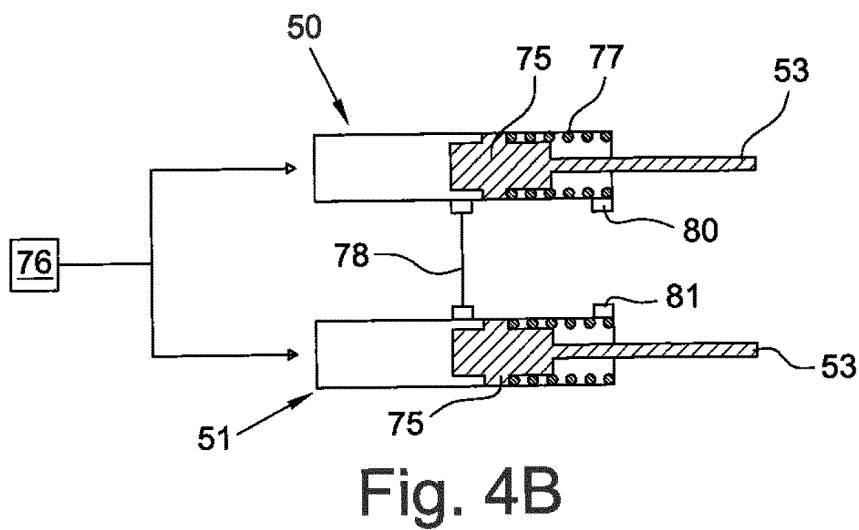
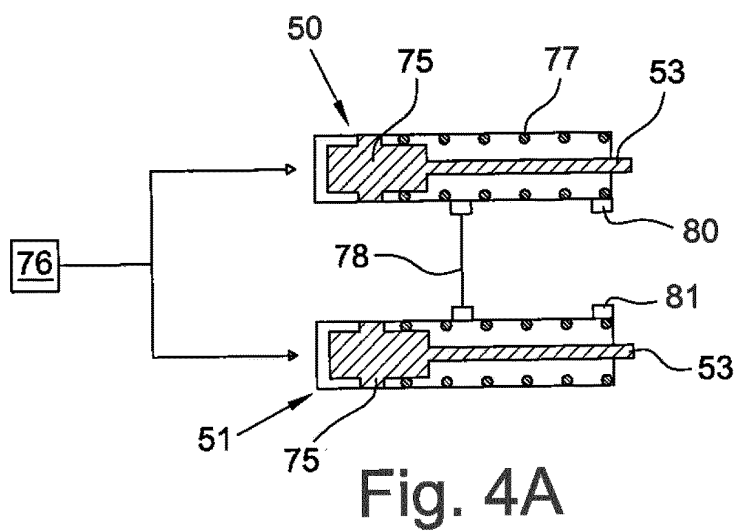


Fig. 2G









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Application Number
EP 13 17 1365

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Place of search The Hague		Date of completion of the search 28 August 2013	Examiner Guisan, Thierry
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