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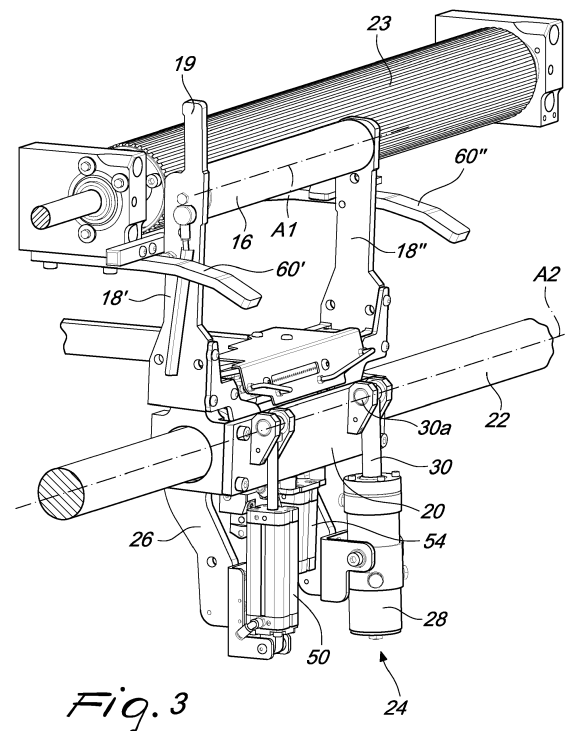
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(54) **FINISHING DEVICE FOR SPINNING PROCESS PROVIDED WITH A ROVING-WINDING ASSEMBLY**

(57) Finishing means (12, 13a, 13b, 14a, 14b) convert a ribbon of fibers (F) into a roving (S). A rotating drum (16) winds the roving (S) onto itself and is supported by a frame (20) which rotates from a first operative position to a second operative position, in contrast against yielding biasing means (24), in relation to the progressive filling of the drum (16). The biasing means (24) comprise a support (28) which is connected to a supporting structure (26), a stem (30) which is supported slideably by the support (28) and has an operative end (30a) connected to the frame (20), pressing means (32) which bias the stem (30) in a configuration that is extended with respect to the support (28), a collar (34) which is fitted over the stem (30) and is axially integral with it, and a guide (36) which is provided on the collar (34) and is engaged by an engagement element (38) which is integral with the support (28), the guide being contoured so as to lock/release the frame (20) with respect to a maintenance position when the operator pulls the frame (20) toward them, with the collar (34) rotating in steps.



Description

[0001] The present invention relates to a finishing device with spools for combed spinning processes, provided with a roving-winding assembly.

[0002] The device according to the present invention is designed for processing fibers of natural origin, such as flax, hemp, silk, cashmere wool, or wool-cut synthetic fibers such as acrylic, polyester and the like.

[0003] As is known, in a generic combed spinning process, the function of the finishing device is to convert a ribbon of fibers, originating from a previous combing process, into a ribbon-like product, called "roving", which has a relatively low weight, e.g., comprised between 0.15 and 1.5 grams per linear meter.

[0004] In particular, during the combing process the textile material being worked is ennobled, eliminating the residual impurities from the fibers and also removing any fibers that are shorter than a minimum set length and rendering the fibers parallel along a direction that facilitates subsequent finishing operations.

[0005] During the finishing operations, the ribbon is subjected to processes of drawing and rubbing that convert it to a roving that has the above mentioned characteristics.

[0006] Usually, the finishing device comprises more than one working unit, and usually two ribbons of fibers enter each unit and from these ribbons two respective rovings are obtained which are then wound, in a roving-winding assembly, on a same drum which has a first horizontal axis, so as to form a spool.

[0007] The spool is supported rotatably between the free ends of two parallel arms connected to a frame. The frame is pivoted to a supporting structure about a second horizontal axis which is parallel to the first.

[0008] In automatic finishing devices, the frame and the supporting structure are periodically overturned, under centralized control, about the second axis in order to unload the full spools.

[0009] During the overturning of the supporting structure, the rovings pass through a comb which is made up of a row of metallic needles, with a corresponding movement that causes the tearing of the rovings by shredding caused by the comb.

[0010] The spool can be biased in abutment against a motorized roller, which makes the spool rotate, by yielding pressing means, e.g., pneumatic or elastic means, which act between the supporting structure and the frame. The yielding nature of the pressing means makes it possible for the spool to increase in diameter as it fills up, while remaining correctly in abutment against the motorized roller.

[0011] In the event of accidental breakage of the rovings and subsequent machine shutdown, an operator intervenes by manually moving the spool away from the motorized roller, in contrast with the force exerted by the pressing means.

[0012] In conventional solutions, once a position of

equilibrium is reached wherein the force exerted by the pressing means is compensated by the weight of the spool and of the structure that supports it, the arms are positioned stably in a position rotated by approximately 90° with respect to the working position. This enables the operator to carry out the operation with both hands free, without needing to support the spool.

[0013] A drawback of this solution is that, once the operation has been carried out, the operator has to bend over and lift the spool back to the point of equilibrium, and this operation can be awkward and laborious, to the point that it can lead to injury considering that the spool and the structure that supports it can have an overall weight of up to 10 kilograms.

[0014] Furthermore, it would be desirable to have greater flexibility in the adjustment of the force with which the spool is biased against the motorized roller, e.g., as a function of the type of material being processed and of the various operative parameters.

[0015] Conventional tearing systems of the type mentioned above also have some drawbacks.

[0016] In particular, during the manual operations to load/unload the spools, or during maintenance operations, the operator can easily get injured by knocking against the needles of the comb.

[0017] Furthermore, the comb tends to accumulate residues of fibers which need to be removed periodically, typically with manual maintenance interventions that, in addition to bringing the risk of injury, require shutdown of the machine with negative repercussions on productivity. In other cases, automated blowing systems are used, which however have limited efficacy and considerably increase the costs of manufacturing and energy consumption.

[0018] The aim of the present invention is to provide a finishing device with spools for combed spinning processes provided with a roving-winding assembly that makes maintenance operations on the spool more convenient and less laborious for the operator.

[0019] Within this aim, an object of the invention is to provide a finishing device with spools that makes it possible to adjust very flexibly the force with which the spool is biased against the motorized roller.

[0020] Another object of the invention is to provide a roving-tearing assembly that is capable of overcoming the limitations and the drawbacks described above of conventional systems, particularly in relation to safety and to maintenance and cleaning operations, while keeping manufacturing costs comparable to those of conventional systems.

[0021] This aim and these and other objects, which will become clear from the description that follows, are achieved by a finishing device with spools provided with a roving-winding assembly as defined in claim 1, while the dependent claims define other advantageous characteristics of the invention.

[0022] Now the invention will be described in greater detail, with reference to a preferred but not exclusive em-

bodiment thereof, which is illustrated for the purposes of non-limiting example in the accompanying drawings, wherein:

- Figure 1 is a front elevation view of a working unit of the finishing device with spools according to the invention;
- Figure 2 is a side view of the stretching/rubbing assembly of the working unit of Figure 1;
- Figure 3 is a perspective view of the roving-winding assembly of the working unit of Figure 1;
- Figure 4 is an axial cross-sectional perspective view of a component of the roving-winding assembly of Figure 3;
- Figure 5 is a plan view of the extension of an element of the component of Figure 4;
- Figure 6 is a side view of the roving-winding assembly according to the invention in a first operating configuration;
- Figure 7 is a side view of the roving-winding assembly according to the invention in a second operating configuration;
- Figure 8 is a side view of the roving-winding assembly according to the invention in a third operating configuration;
- Figure 9 is a side view of the roving-winding assembly according to the invention in a fourth operating configuration;
- Figure 10 is a front elevation view of a portion of support for the spool of the roving-winding assembly according to the invention in a first position;
- Figure 11 is a view similar to Figure 10, showing the portion of support for the spool of the roving-winding assembly in a second position;
- Figure 12 is a view similar to Figures 10 and 11, showing the portion of support for the spool of the roving-winding assembly in a third position;
- Figure 13 is a side view of a roving-winding assembly of the working unit of Figure 1, in a first operating configuration;
- Figure 13a is an enlarged-scale detail of Figure 13;
- Figure 14 is a view similar to Figure 13, showing the roving-winding assembly in a second operating configuration;
- Figure 14a is an enlarged-scale detail of Figure 14;
- Figure 15 is a view similar to Figure 13, showing the roving-winding assembly in a third operating configuration;
- Figure 16 is a view similar to Figure 13, showing the roving-winding assembly in a fourth operating configuration;
- Figure 17 is a perspective view of a component of the roving-tearing assembly according to the invention;
- Figure 18 is a plan view of the component of Figure 17;
- Figure 19 is a side view of the component of Fig. 17;
- Figure 20 is an upturned rear elevation view of the

component of Figure 17;

- Figure 21 is a view similar to Figure 17, showing the component in a different operating configuration.

[0023] With initial reference to Figures 1 and 2, a finishing device for spinning apparatuses can generally comprise more than one laterally adjacent working unit 10, each one of which is usually adapted to receive two ribbons of fibers F originating from a combing process with subsequent bonding and refining, and to convert them into respective rovings S using finishing means.

[0024] In the example described herein, in a way that is known per se, the two ribbons of fibers F are subjected first to a stretching process by passing through a stretching assembly 12 which comprises a series of rollers and counter-rotating annular belts, and then to a rubbing process in two stages by passing through two successive rubbing assemblies 13 and 14. In particular, each one of the rubbing assemblies 13 and 14 comprises a pair of counter-rotating annular belts 13a, 13b and 14a, 14b which also perform a mutually alternating motion that is transverse with respect to the advancement direction of the ribbon of fibers F. The purpose of the rubbing process is to apply a slight twist to the ribbon (also known as "false twist"), which will make the roving stronger during the step of feeding to the spinning machine.

[0025] In a roving-winding assembly 15, the two rovings S exiting from the stretching and rubbing processes are wound on a single drum 16 (also called a "tube" in textile jargon), which rotates about a first horizontal axis A1 so as to form a spool B.

[0026] During winding, the two rovings S entering the spool B are guided by a double-eyelet twisting roving-guide, which for the sake of simplicity is shown schematically in the drawings as an annular eyelet 17, which moves with an alternating motion in a direction parallel to the axis of the drum 16, so as to uniformly distribute the material over the whole length of the spool.

[0027] The eyelet 17 is fixed to a horizontal bar 17a which moves with alternating motion controlled by actuation means (not shown).

[0028] The drum 16 is supported rotatably between the free ends of two parallel arms 18', 18", which are connected to a frame 20 in a manner that will be described in more detail below.

[0029] Advantageously, at least one of the two arms, the arm 18' in the example described herein, has an extension that extends beyond the axis A1 to define a handle 19 for purposes that will be described in more detail below.

[0030] With reference now also to Figure 3, the frame 20 is mounted rotatably on a supporting bar 22 which extends along a second horizontal axis A2 parallel to the first. The supporting bar 22, in turn, is supported rotatably by a first supporting element 123a which is integral with the frame 123b which is illustrated overall only in Figure 16, which supports the finishing device 10. The supporting bar 22, controlled automatically, is periodically rotated

by approximately 170° in order to overturn the frame 20 in an unloading position, shown in Figure 14, wherein it releases the full spools onto a collection tub V. The collection tub V, in turn, unloads the spools B onto a chute SC, as shown in Figure 15. The rotation of the supporting bar 22 is transmitted to the frame 20 by an abutment (not visible in the figures) which is integral with the bar.

[0031] The spool B is biased in abutment against a motorized roller 23, which makes the spool rotate, by yielding biasing means 24 which are functionally interposed between the frame 20 and a supporting structure 26 that is integral with the supporting bar 22.

[0032] The yielding nature of the biasing means 24 makes it possible for the spool B to increase in diameter as it fills up, while it remains correctly in abutment against the motorized roller 23.

[0033] Therefore, during the work cycle, the frame 20 rotates from a first operative limit position shown in Figure 6 to a second operative limit position shown in Figure 7 as the drum 16 is progressively filled up from a minimum level to a maximum level respectively.

[0034] During the overturning of the frame 20 and of the drum 16 to the unloading position, the rovings S pass through a comb 132 which is connected to a second supporting element 123c which is integral with the frame 123b (Figure 16). As illustrated in detail in Figures 17-21, in this embodiment the comb 132 is made up of a row of metallic needles 134 which are fixed to a terminal board-like support 135. The relative movement of the rovings S with respect to the comb 132 causes the tearing of the rovings by shredding. The roving-tearing system will be described in more detail below.

[0035] With particular reference now to Figures 3-5, the biasing means 24 according to the invention comprise:

- a support 28 which is connected to the supporting structure 26,
- a stem 30 which is supported slideably by the support 28 and has an operative end 30a connected to the frame 20,
- pressing means 32 which are arranged in order to bias the stem 30 in a configuration that is extended with respect to the support 28,
- a collar 34 which is rotatably fitted over the stem 30 and is locked axially with respect to it,
- a guide 36 which is provided on the support 28 or on the collar 34 and is engaged slideably by an engagement element 38 which is integral with the other one of the support 28 and the collar 34,

the guide 36 being shaped so as to:

- block the retraction of the stem 30 with respect to the support 28 in an engagement position (shown in Figure 8),
- block the subsequent extension of the stem 30 with respect to the support 28 in an intermediate maintenance

position (shown in Figure 9) between the engagement position and the position assumed by the stem 30 with the frame 20 in the second operative position,

- block the subsequent retraction of the stem 30 with respect to the support 28 in a disengagement position which, in the example described herein, corresponds to the engagement position, and
- allow the return of the stem 30 to the position assumed with the frame 20 in the first operative position,

the collar 34 rotating by one step at each transition of the stem 30 from one position to the next by sliding engagement between the guide 36 and the engagement element 38.

[0036] With particular reference to Figure 4, in the embodiment described herein for the purposes of example the support 28 comprises a hollow cylinder 40 which is pivoted to the supporting structure 26 and has one end closed by a bottom 42 and an opposite end open. The stem 30 projects outwards from the open end of the hollow cylinder 40, with the interposition of an annular gasket G.

[0037] The stem 30 is advantageously hollow and is guided in its axial sliding by a shaft 43 which rises axially from the bottom 42 and is inserted slideably in the stem 30.

[0038] The collar 34 is inserted slideably in the hollow cylinder 40 and, therefore, it cooperates in guiding the axial sliding of the stem 30.

[0039] In this embodiment the pressing means 32 comprise a compression spring 44, advantageously a helical spring, which is functionally interposed between the bottom 42 and the collar 34.

[0040] Furthermore, in this embodiment the guide 36 comprises a contoured slot 46 which is provided on the outer wall of the collar 34, while the engagement element 38 comprises a pin 48 which is integral with the support 28 and which radially engages the contoured slot 46 with an internal end thereof.

[0041] In this embodiment, in particular, the pin 48 is inserted radially in the hollow cylinder 40.

[0042] Figure 5 is a plan view of the extension of the contoured slot 46. The latter has an upper sawtooth profile 46a opposite to a lower sawtooth profile 46b, with the crests 46a', 46b' of each one of the two profiles facing toward the troughs 46b'', 46a'' of the other profile in a slightly offset position. The troughs 46b'' of the lower sawtooth profile 46b alternate with rectilinear longitudinal slots 46b''' which extend up to the lower end of the collar 34.

[0043] When an operator manually pulls the frame 20 toward them to carry out maintenance operations, the stem 30 retracts into the hollow cylinder 40, with the pin 48 being inserted from below in one of the rectilinear longitudinal slots 46b'''. After this, the pin 48 engages one of the oblique sides of the upper sawtooth profile

46a, causing the rotation by one step of the collar 34, and settles in the adjacent trough 46a" of the profile. The stroke of the frame 20 therefore stops at the engagement position shown in Figure 8.

[0044] When the frame 20 is released, the compression spring 44 pushes the stem 30 out of the hollow cylinder 40. At this point, the pin 48 engages one of the oblique sides of the lower sawtooth profile 46b, causing the rotation by another step of the collar 34, and settles in the adjacent trough 46b" of the profile. In this manner the exit of the stem 30 is blocked, and the frame 20 remains correspondingly locked in the maintenance position shown in Figure 9.

[0045] At the end of the maintenance operations, to return the spool B to the working position the operator pulls the frame 20 toward them again, with the stem 30 retracting slightly in the hollow cylinder 40. At this point, the pin 48 engages the next oblique side of the upper sawtooth profile 46a, with the collar 34 rotating by another step, and settles in the adjacent trough 46a" of that profile. The stroke of the frame 20 therefore stops in the disengagement position which, in this embodiment, corresponds to the engagement position shown in Figure 8.

[0046] When the operator releases the frame 20, the compression spring 44 pushes the stem 30 out of the hollow cylinder 40. At this point the pin 48 engages one of the oblique sides of the lower sawtooth profile 46b, with the collar 34 rotating by a further step. After this, the pin 48 is inserted from above in the next longitudinal rectilinear slot 46b'" and exits from the lower end of the collar 34, so as to free the stem 30 and allow the frame 20 to return to the operative position.

[0047] In the stroke portion wherein the collar 34 is not engaged by the pin 48, the rotation of the collar 34 is prevented by a longitudinal needle 49 which is integral with the support 28, which is adapted to be inserted in a longitudinal hole 34a provided in the collar 34.

[0048] Furthermore, the hollow cylinder 40 is provided with a venting valve with filter 51 which is arranged proximate to the end from which the stem 30 projects and which makes it possible to prevent counter-pressures in the hollow cylinder 40, with the risk of leaks of grease through the annular gasket G and entry of dust originating from the working environment into the hollow cylinder 40.

[0049] According to an advantageous characteristic of the invention, the biasing means 24 further comprise a pneumatic cylinder 50 functionally interposed between the frame 20 and the supporting structure 26. The pneumatic cylinder 50 is preferably fed by a remotely-controlled pressure, in order to exert an additional thrust that can be adjusted as a function of the various operative parameters, e.g., the type of fiber being worked, the diameter and the weight of the spool, the feeding speed of the fibers, etc.

[0050] With particular reference to Figures 10-12, the arms 18', 18" can be advantageously splayed automatically in order to unload the spool B. To this end, the arms 18', 18" advantageously have mutually opposite L-

shaped profiles, and are pivoted to the frame 20 at the point where the two sides of the L meet about respective axes A3, A4 which are perpendicular to the first axis A1 and to the second axis A2.

[0051] The arms 18', 18" have respective rounded actuation ends 18e', 18e" opposite to the ends that support the drum 16, which converge to engage respective opposite sides of a guide 52.

[0052] The guide 52 can move, controlled by an actuator 54, along a plane perpendicular to the axes A3, A4 in a direction perpendicular to the first axis A1. The actuator 54 is preferably a fluid-operated actuator, more preferably a pneumatic actuator.

[0053] In particular, the guide 52 has two mutually opposite sliding seats 56', 56" which are engaged slideably by the actuation ends 18e', 18e" of the arms 18', 18". By virtue of the slideable engagement of the actuation ends 18e', 18e" in the sliding seats 56', 56", the translation of the guide 52 toward the drum 16 produces the opening of the arms 18', 18", while the translation in the opposite direction produces the closure of the arms 18', 18".

[0054] Advantageously, the actuator 54 is a single-acting actuator which is normally pushed in the retracted position, so as to determine the closure of the arms 18', 18", by a spring 58 (shown only schematically in the figures), but it can be actuated remotely in order to cause the opening of the arms against the return force exerted by the spring 58.

[0055] The finishing device is further provided with two lateral containment elements 60', 60" (Figure 3) which extend externally from the arms 18', 18" at a short distance from them in order to prevent their opening as long as the frame 20 is in an operative position.

[0056] In operation, the work cycle of the finishing device according to the invention is completely automated. In particular, the unloading of the full spools is achieved by rotating the supporting bar 22 so as to overturn the frame 20 about the second axis A2, from the operative limit position with the full spool, shown in Figure 13, to the unloading position shown in Figure 14. Once the unloading position is reached, the arms 18', 18" that hold the spool B are opened on command by the actuator 54, releasing the spool B onto the collection tub V, which in turn unloads it onto the chute SC as shown in Figure 15.

[0057] An operator needing to intervene on the spool for a maintenance operation, e.g., in the event of breakage of the roving of fibers, can pull the frame 20 toward them by acting on the handle 19, so as to move the spool B away from the motorized roller 23 until the stem 30 reaches the engagement position (Figure 8).

[0058] At this point the operator can release the frame 20, and the stem 30 will be locked in the maintenance position (Figure 9), in which the operator can easily access the spool.

[0059] Once the maintenance operation has been carried out, the operator pulls the frame toward them again, bringing the stem 30 to the disengagement position (Figure 8), and then releases it, and the spool B will return

to abut against the motorized roller 23.

[0060] By acting on the handle 19, the operator can also manually splay the arms 18', 18", when the frame 20 is in the maintenance position, against the force exerted by the spring 58. In fact, the mechanism to automatically open the arms 18', 18", which is made up of the guide 52 actuated by the actuator 54 and engaged by the actuation ends 18e', 18e" of the arms 18', 18", is reversible.

[0061] With reference now to Figures 13-21, according to an advantageous characteristic of the invention, the comb 132, instead of being stationary with respect to the frame 123b, is supported moveably with respect to it between a resting position, shown in Figures 13, 13a, 16 and 17-20, in which it does not interfere with the path taken by the rovings S during the overturning of the drum 16, and a working position, shown in Figures 14, 14a, 15 and 21, in which it interferes with the path of the rovings S, under the control of actuation means which are adapted to move the comb 132 from the resting position to the working position when the frame 20 is overturned to the unloading position, and vice versa when the frame 20 is returned to an operative position comprised between the first operative limit position and the second operative limit position.

[0062] For the sake of simplicity of illustration, in Figures 13, 14, 15 and 16 the biasing means 24 are schematically shown with a dotted line.

[0063] In the preferred embodiment shown here for the purposes of example, the comb 132 is slideably supported in a direction substantially perpendicular to the path of advancement of the rovings from a moveable plate 136 which is parallel to the plane defined by the needles 134.

[0064] In particular, a terminal board-like support 135 is fixed on a face of the moveable plate 136, while a T-shaped slider 138 is fixed on the opposite face (Figure 10). The slider 138 is slideably inserted in a C-shaped rectilinear guide 140, which is fixed to a fixed plate 142 which is integral with the second supporting element 123c.

[0065] According to an advantageous characteristic of the invention, a fixed protective wall 144 rises at right angles from the fixed plate 142 and is provided with a row of openings 146 which are aligned with the needles 134 and are adapted to be passed through by them during the displacement of the comb 132 from the resting position to the working position. The needles 134, in the resting position, are fully retracted with respect to the fixed protective wall 144.

[0066] Preferably, the openings 146 and the needles 134 are dimensioned so as to mutually engage with snug coupling, for purposes that will be made clear below.

[0067] The actuation means, in the embodiment described herein, preferably comprise motion transmission elements 148 (Figures 13a, 14a) that are operatively interposed between the moveable plate 136 that supports the comb 132 and an actuation element that rotates about

the second axis A2 integrally with the drum 16 during the overturning phase.

[0068] In this embodiment, the actuation element consists of the supporting bar 22.

5 **[0069]** With particular reference to Figures 13a, 14a and 17-21, the motion transmission elements 148 advantageously comprise an abutment 150 which is integral with the moveable plate 136 and which is adapted to be engaged in one of the two sliding directions of the moveable plate 136 by a pressing member 152 which is integral with the supporting bar 22, in contrast with elastic means 154 which act in the opposite direction.

10 **[0070]** In the embodiment described herein, the elastic means bias the comb 132 in the working position shown in Figures 14, 14a, 15 and 21.

15 **[0071]** As illustrated in detail in Figures 17-21, in this embodiment the elastic means 154 advantageously comprise a torsion spring that has a helically wound central portion 154a, which is fitted over a pin 156 which is integral with a bracket 158 fixed to the moveable plate 136, and two opposite rectilinear ends 154b, 154c which are in abutment on respective posts 160b, 160c which are integral with the fixed plate 142.

20 **[0072]** In the operation, when the finishing device 10 is in an operative position, the comb 132 is retained in the resting position by the pressing member 152, which pushes the abutment 150 away from the fixed protective wall 144 in contrast with the elastic means 154, as shown in Figures 13, 13a, 16 and 17-20. In the resting position, the needles 134 of the comb 132 are fully retracted with respect to the fixed protective wall 144, so as to prevent any risk of injury for any operator who, with the machine stopped, should access the operational area for a maintenance operation, e.g., in the event of accidental breakage of the rovings.

25 **[0073]** During rotation of the frame 20 from the operative limit position with a full spool to the unloading position, the pressing member 152 rotates together with the supporting bar 22, freeing the comb 132, which is then pushed in the working position by the elastic means 154.

30 **[0074]** In the working position the comb 132 interferes with the path taken by the rovings S during the overturning phase, so as to tear them by shredding in a manner that is per se known.

35 **[0075]** When the frame 20 returns to the operative limit position with an empty spool, the pressing member 152 again engages the abutment 150, pushing the comb 132 in the resting position, in contrast with the elastic means 154.

40 **[0076]** During the retraction stroke of the comb 132, any residues of fibers deposited on the needles 134 are retained by the fixed protective wall 144, owing to the snug coupling between the needles 134 and the openings 146. When the needles 134 are fully retracted, the residues of fibers fall by gravity, thus providing an automatic system for cleaning the comb 132 which, by intervening at the end of each cycle, always maintains the tearing action of the comb 32 in full efficiency.

[0077] In practice it has been found that the finishing device according to the invention fully achieves the set aims.

[0078] In fact, access to the spool B by the operator for any maintenance operations is easy and requires no effort, either during the step of moving the spool B away from the motorized roller 23 or during the step of repositioning the spool B against the motorized roller 23.

[0079] Furthermore, by adding the remotely-controlled pneumatic cylinder 50, according to one of the set aims, it is possible to adjust very flexibly the force with which the spool B is biased against the motorized roller 23.

[0080] The roving-tearing assembly provided as above is also improved with respect to conventional solutions both in terms of safety and in relation to cleaning and maintenance operations, while keeping manufacturing costs comparable to those of conventional systems

[0081] A preferred embodiment of the invention has been described, but obviously the person skilled in the art may make various modifications and variations all within the scope of the appended claims.

[0082] For example, the profile of the contoured slot can be varied, not least as a function of the size of the elements involved. In particular, the number, the length and the depth of the "teeth" of the saw-toothed profiles may be increased or reduced.

[0083] Furthermore, an inverted solution would obviously be possible, with the contoured slot provided on the support, e.g., on the internal wall of the hollow cylinder 40, and the engagement element 38 integral with the collar 34.

[0084] Moreover, the pneumatic cylinder 50 and/or the pneumatic actuator 54 may be substituted by hydraulic or electric actuators.

[0085] The device composed of support 28, stem 30 and compression spring 44 may also be substituted by a pneumatic cylinder, with suitable modifications that can be devised by the normal person skilled in the art.

[0086] Obviously, the configuration of the stretching assembly and of the rubbing assembly, and their number, is not covered in the aims of the invention and may be varied according to requirements and of the specific kinds of processing.

[0087] Furthermore, although usually finishing devices of the type to which the invention refers are made up of more than one working unit arranged side by side, it goes without saying that, in principle, the finishing device may also be composed of a single working unit.

[0088] Furthermore, again in principle, each working unit may receive a single ribbon and therefore generate a single roving.

[0089] Obviously, the arrangement of the biasing means may be reversed, with the support 28 connected to the frame 20 and the stem 30 connected to the supporting structure 26.

[0090] Furthermore, in an alternative embodiment the movement of the comb between the resting position and the working position may be controlled by actuation

means other than the mechanical transmission means described and illustrated as preferred here, e.g., electric, pneumatic, hydraulic actuators or other type.

[0091] Also, the comb, instead of executing a linear movement between the resting position and the working position, may execute a rotary movement.

[0092] Moreover, the elastic means and the actuation means may act in opposite directions with respect to the embodiment described and illustrated here, that is to say, the comb may be biased toward the resting position by the elastic means and toward the working position by the actuation means.

[0093] That notwithstanding, the slider 138 and the rectilinear guide 140 can be substituted by other, conventional guide means, e.g., bushings that slideably engage guide bars, and the like.

[0094] Furthermore, the needles that form the comb may be substituted by other cutting elements, e.g., cutter blades of various different cross-section.

[0095] The disclosures in Italian Patent Applications No. 102020000002620 and No. 102020000004417 from which this application claims priority are incorporated herein by reference.

[0096] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A finishing device for spinning processes, which comprises at least one working unit (10) which is provided with:

- a supporting structure (26),
- finishing means (12, 13a, 13b, 14a, 14b) adapted to convert at least one ribbon of fibers (F) into a respective roving (S),
- a drum (16) which is entrained in rotation by drive means (23) about a first horizontal axis (A1) in order to wind said roving (S) onto itself so as to form a spool (B), and which is supported rotatably by a frame (20) which is pivoted about a second horizontal axis (A2) which is parallel to the first so as to rotate from a first operative position to a second operative position in relation to the progressive filling of the drum (16) from a minimum level to a maximum level, respectively,
- yielding biasing means (24) functionally interposed between said frame (20) and said supporting structure (26) in order to bias said drum (16) toward said first operative position,

characterized in that said biasing means (24) com-

prise:

- a support (28) connected to either said supporting structure (26) or said frame (20),
- a stem (30) which is supported slideably by the support (28) and has an operative end (30a) connected to the other one of either said supporting structure (26) or said frame (20),
- pressing means (32) which are arranged in order to bias said stem (30) in a configuration that is extended with respect to the support (28),
- a collar (34) which is fitted over the stem (30) rotatably and is locked axially with respect to it,
- a guide (36) which is provided on either said support (28) or said collar (34) and is engaged slideably by an engagement element (38) which is integral with the other one of either said support (28) or said collar (34),

said guide (36) being shaped so as to:

- block the retraction of said stem (30) with respect to the support (28) upon reaching an engagement position,
- block the subsequent extension of the stem (30) with respect to the support (28) upon reaching an intermediate maintenance position between said engagement position and the position assumed by the stem (30) with the frame (20) in said second operative position,
- block the subsequent retraction of the stem (30) with respect to the support (28) upon reaching a disengagement position, and
- allow the return of the stem (30) to the position assumed with the frame (20) in said first operative position,

said collar (34) rotating by one step at each transition of the stem (30) from one position to the next by sliding engagement between said guide (36) and said engagement element (38).

2. The finishing device (10) according to claim 1, **characterized in that** said guide (36) comprises a contoured slot (46) which is provided on the outer wall of the collar (34), and said engagement element (38) comprises a pin (48) which is integral with said support (28) and radially engages said contoured slot (46) with an internal end thereof.
3. The finishing device (10) according to claim 2, **characterized in that** said contoured slot (46) has an upper sawtooth profile (46a) opposite to a lower sawtooth profile (46b), with the crests (46a', 46b') of each one of the two profiles facing toward the troughs (46b'', 46a'') of the other profile in a slightly offset position, and the troughs (46b'') of the lower sawtooth profile (46b) alternating with rectilinear longitudinal

slots (46b''') which extend up to the lower end of said collar (34).

4. The finishing device (10) according to claim 2 or 3, **characterized in that** it comprises a longitudinal needle (49) which is integral with said support (28) and is adapted to be inserted into a longitudinal hole (34a) provided in said collar (34) in order to prevent the rotation of the latter in the stroke portion in which it is not engaged by said engagement element (38).
5. The finishing device (10) according to one or more of claims 1-4, **characterized in that** said support (28) comprises a hollow cylinder (40) which has one end closed by a bottom (42) and an opposite end which is open and through which said stem (30) projects outwards, said pressing means (32) comprising a compression spring (44) which is functionally interposed between said bottom (42) and said collar (34).
6. The finishing device (10) according to claim 5, **characterized in that** said stem (30) is hollow and is guided in its axial sliding by a shaft (43) which rises axially from said bottom (42) and is inserted slideably in the stem (30).
7. The finishing device (10) according to one or more of claims 1-6, **characterized in that** said biasing means (24) further comprise a pneumatic cylinder (50) which is functionally interposed between said frame (20) and said supporting structure (26) and is fed by a controlled pressure in order to apply an adjustable additional thrust as a function of the various operating parameters.
8. The finishing device (10) according to one or more of claims 1-7, **characterized in that** arms (18', 18'') are pivoted to said frame (20) about respective pivoting axes (A3, A4) which are perpendicular to said first axis (A1) and to said second axis (A2), and have respective actuation ends (18e', 18e'') which converge so as to engage respective opposite sides of a guide (52) which can move, under the control of an actuator (54), along a plane that is perpendicular to the pivoting axes (A3, A4) in a direction that is perpendicular to said first axis (A1), so as to determine the opening or the closing of the arms (18', 18'') in relation to the translation of said guide (52) toward or away from the drum (16).
9. The finishing device (10) according to claim 8, **characterized in that** said guide (52) has two mutually opposite sliding seats (56', 56'') which are engaged slideably by said actuation ends (18e', 18e'') of the arms (18', 18'').
10. The finishing device (10) according to claim 8, **char-**

acterized in that said actuator (54) is a single-acting fluid-operated actuator which is normally pushed in the retracted position, so as to determine the closure of said arms (18', 18"), by a spring (58), and which can be operated remotely in order to cause the opening of said arms (18', 18") against the return force applied by said spring (58).

11. The finishing device (10) according to one of claims 5-10, **characterized in that** said hollow cylinder (40) is provided with a venting valve with filter (51) which is arranged proximate to the end from which said stem (30) projects in order to prevent counter-presures in said hollow cylinder (40).

12. The finishing device (10) according to one of claims 1-11, **characterized in that** said support (28) is connected to said supporting structure (26) and said operative end (30a) of the stem (30) is connected to said frame (20).

13. The finishing device according to one of claims 1-12, wherein said drum (16) is adapted to be periodically overturned to an unloading position to release said spool (B), a comb (132) provided with a row of needles (134) being arranged so as to interfere with the path of the roving (S), thereby causing it to tear, during the overturning of the drum (16), **characterized in that** said comb (132) is supported so that it can move with respect to a frame (123b) between a resting position, which does not interfere with the path assumed by the roving (S) during the overturning of the drum (16), and a working position, which does interfere with said path of the roving (S), under the control of actuation means which are adapted to move the comb (132) from said resting position to said working position when said drum (16) is overturned from said operative position to said unloading position, and vice versa.

14. The finishing device according to claim 13, **characterized in that** said comb (132) is supported slideably between said resting position and said working position in a direction that is substantially perpendicular to said path of the roving (S), by means of guide means (138, 140).

15. The finishing device according to claim 14, **characterized in that** said guide means comprise a T-shaped slider (138) which slideably engages a rectilinear guide (140).

16. The finishing device according to claim 15, **characterized in that** said slider (138) is integral with said comb (132) and said guide (140) is fixed to a fixed plate (142) which is integral with said frame (123b).

17. The finishing device according to one of claims

13-16, **characterized in that** it comprises a fixed protective wall (144) provided with a row of openings (146) which are aligned with said needles (134) and are adapted to be passed through by them during the movement of the comb (132) from said resting position to said working position, said needles (134), in the resting position, being completely retracted with respect to said fixed protective wall (144).

18. The finishing device according to claim 17, **characterized in that** said openings (146) and said needles (134) are dimensioned to mutually engage with a precise coupling.

19. The finishing device according to one of claims 1-18, **characterized in that** said actuation means comprise motion transmission elements (148) which are functionally interposed between said comb (132) and an actuation element (22) which rotates about said second axis (A2) integrally with the drum (16) during overturning.

20. The finishing device according to claim 19, **characterized in that** said actuation element consists of a supporting bar (22) which supports said drum (16).

21. The finishing device according to claim 19 or 20, **characterized in that** said motion transmission elements (148) comprise an abutment (150) which is integral with said comb (132) and which is adapted to be engaged by a pressing member (152) which is integral with said actuation element, in contrast with elastic means (154).

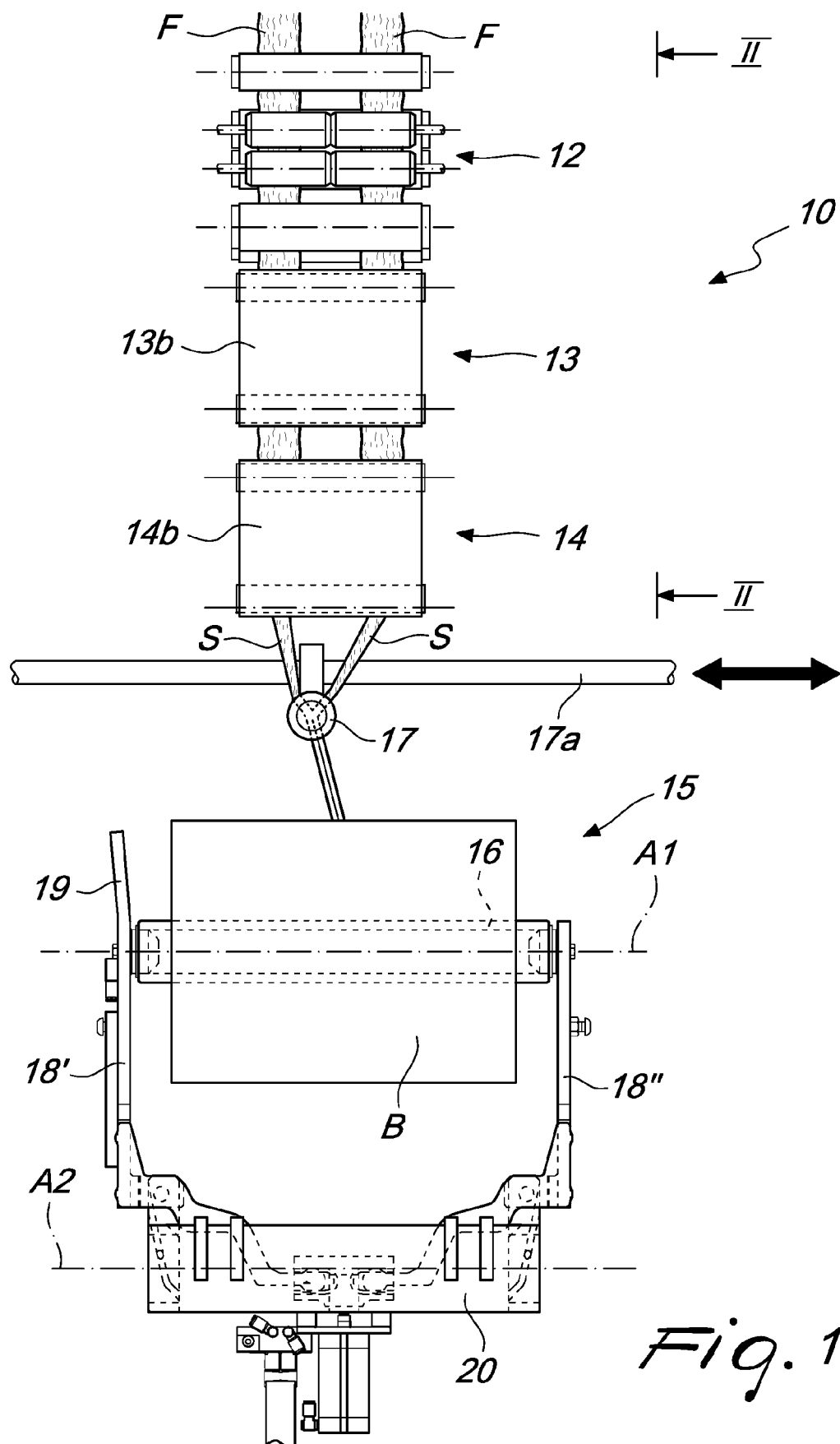
22. The finishing device according to claim 21, **characterized in that** said elastic means (154) are arranged to bias said comb (132) toward said working position.

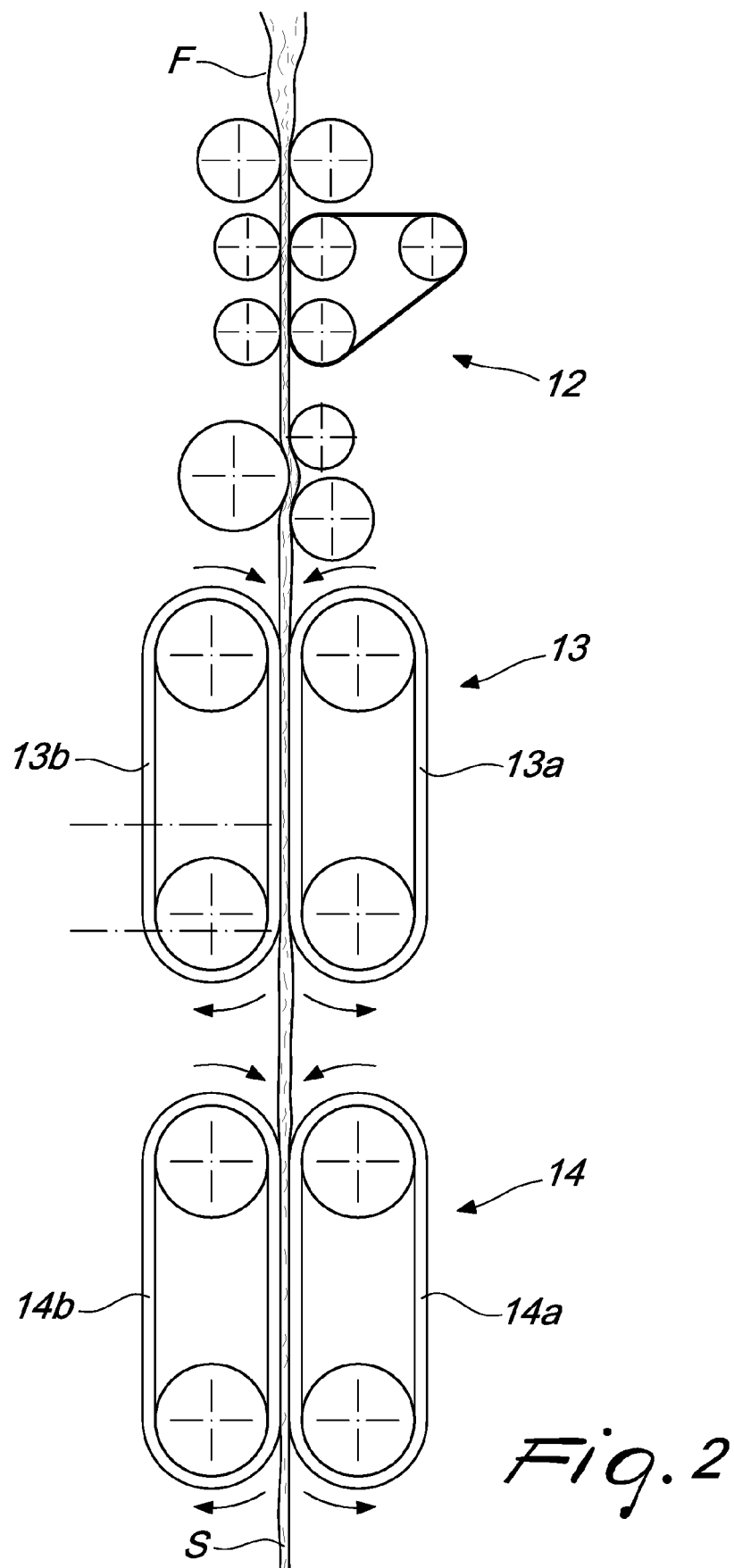
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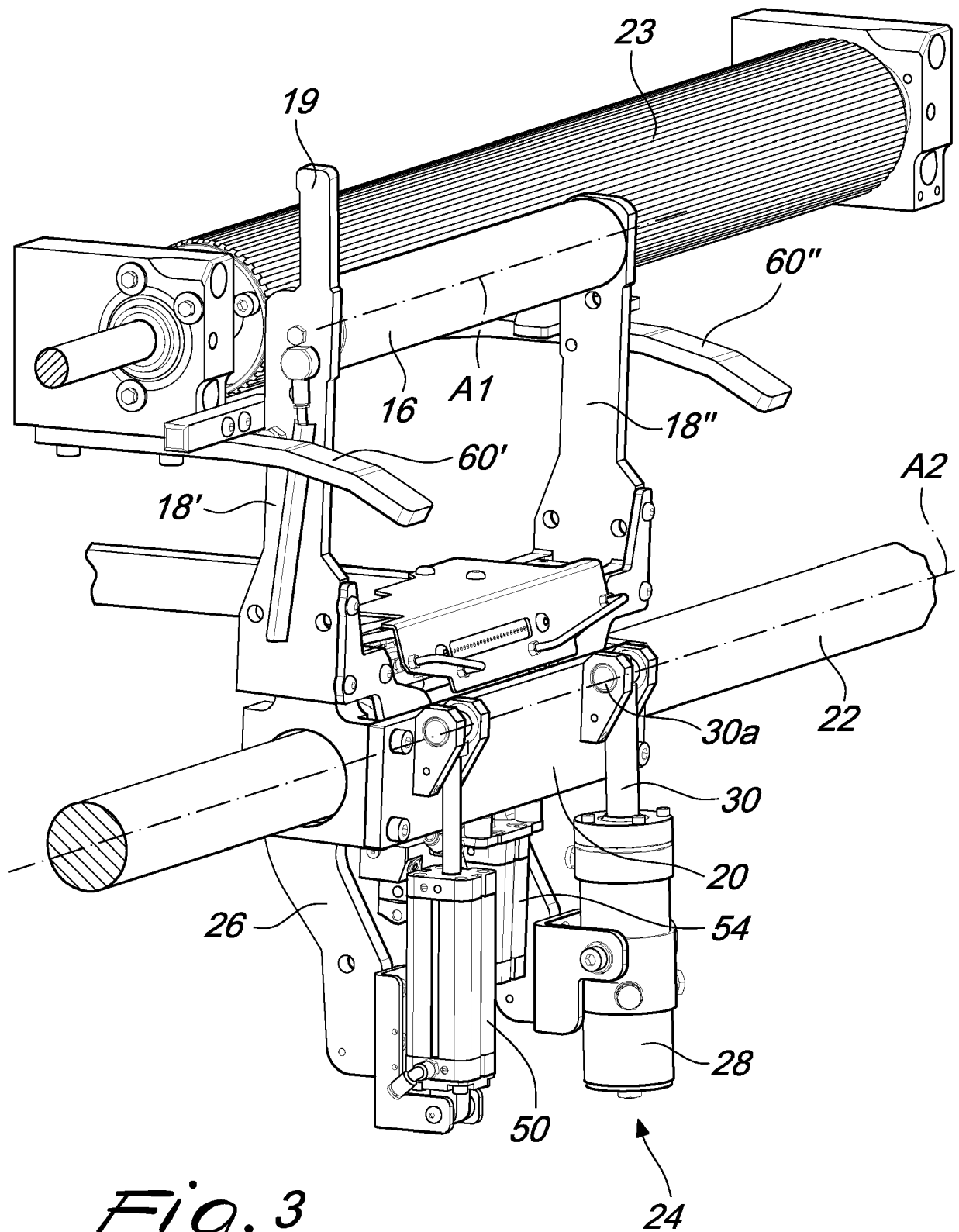


Fig. 3

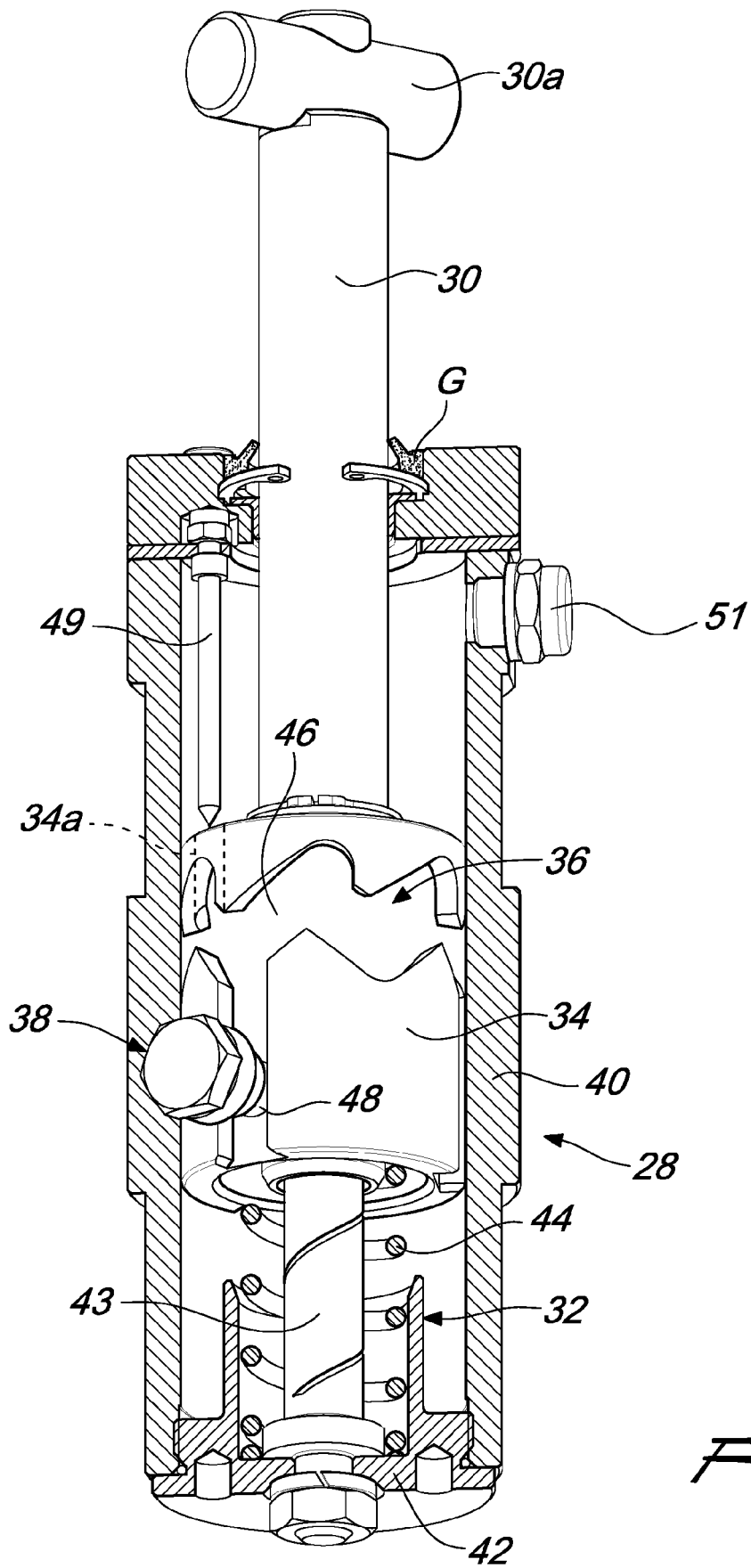


Fig. 4

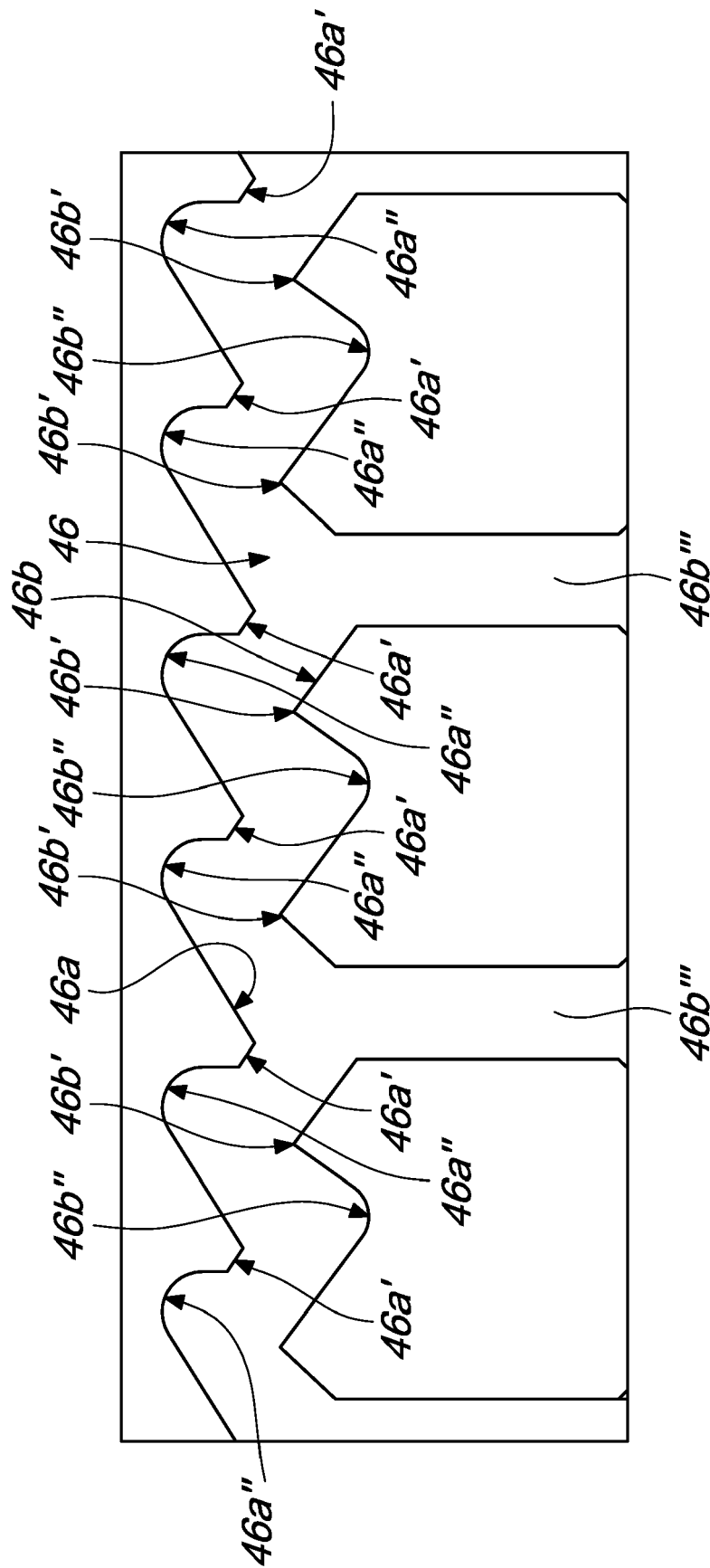
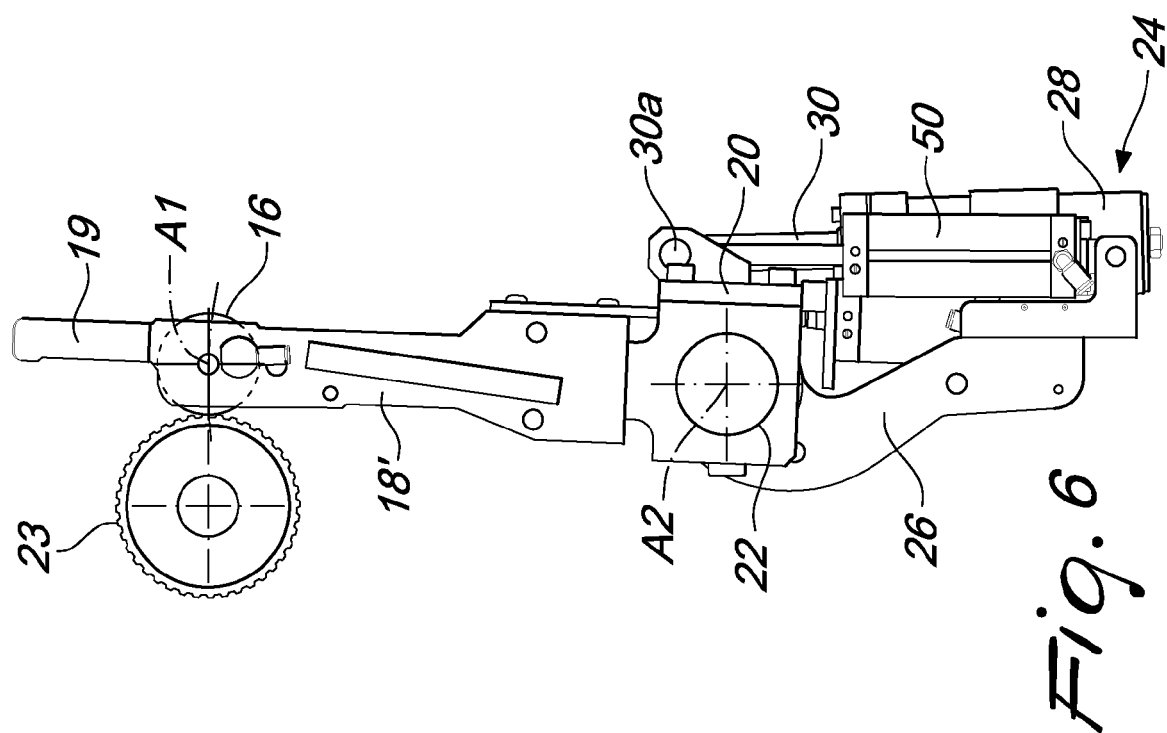
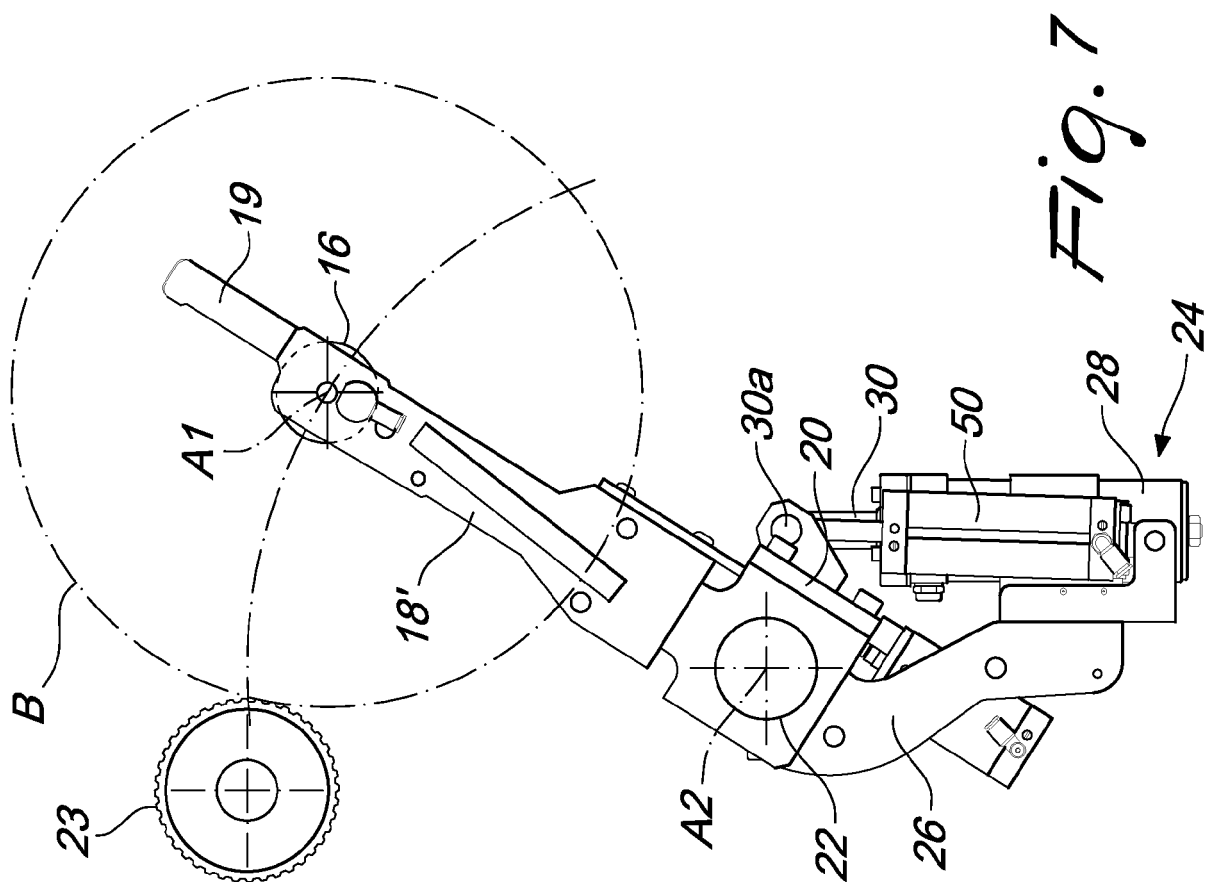
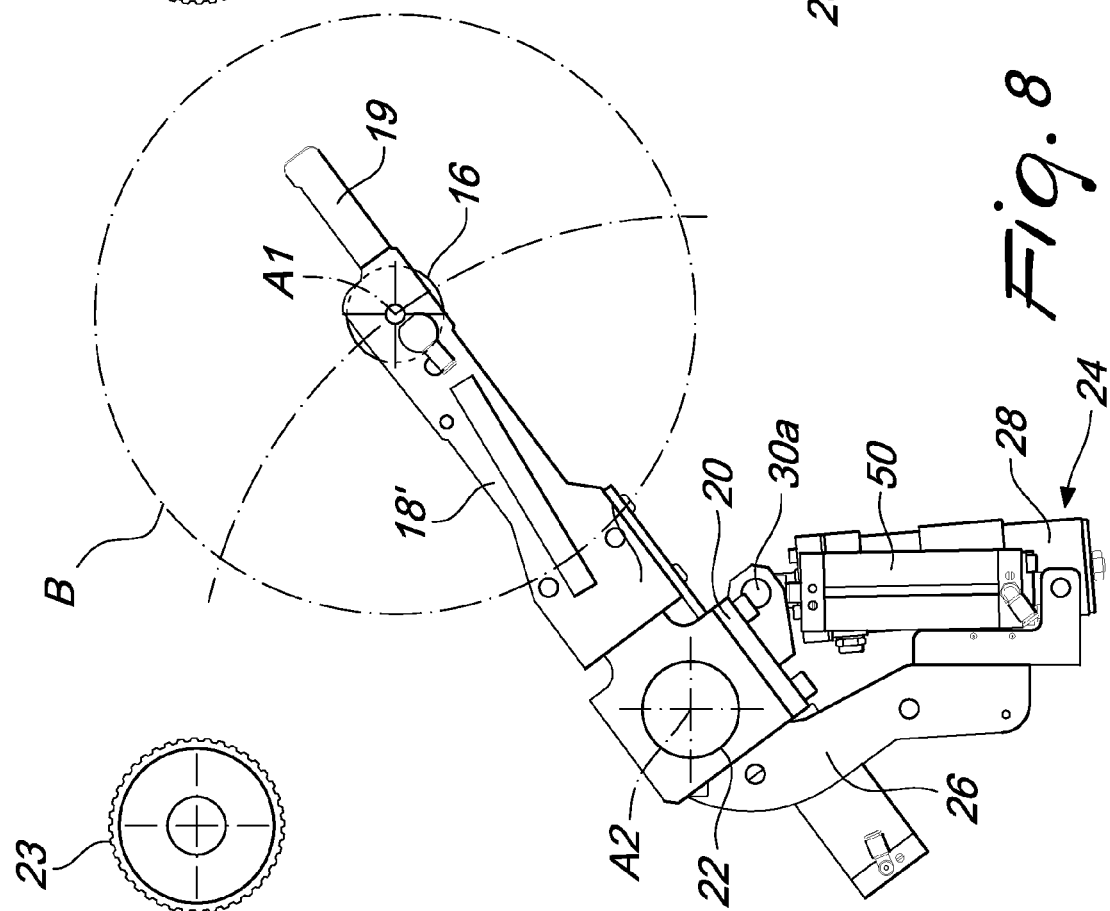
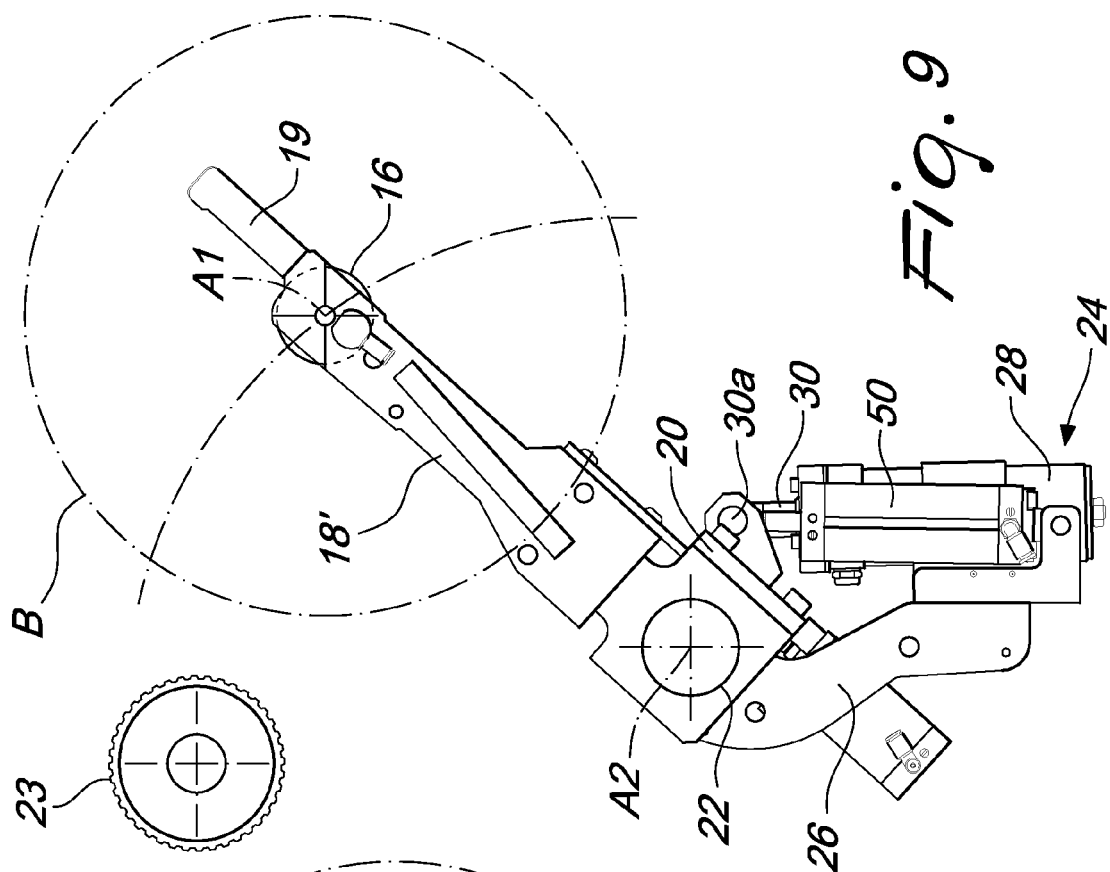


Fig. 5





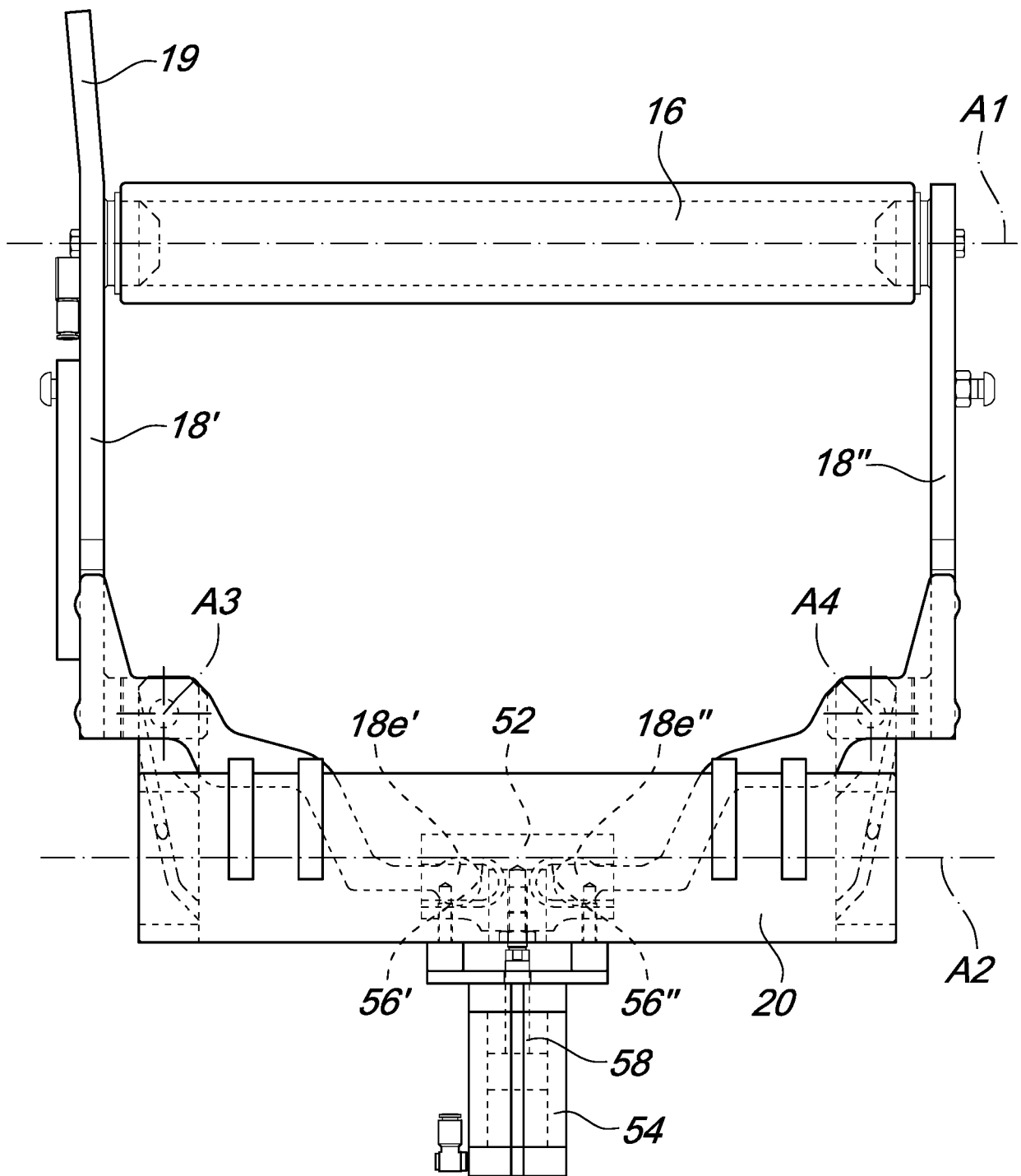


Fig. 10

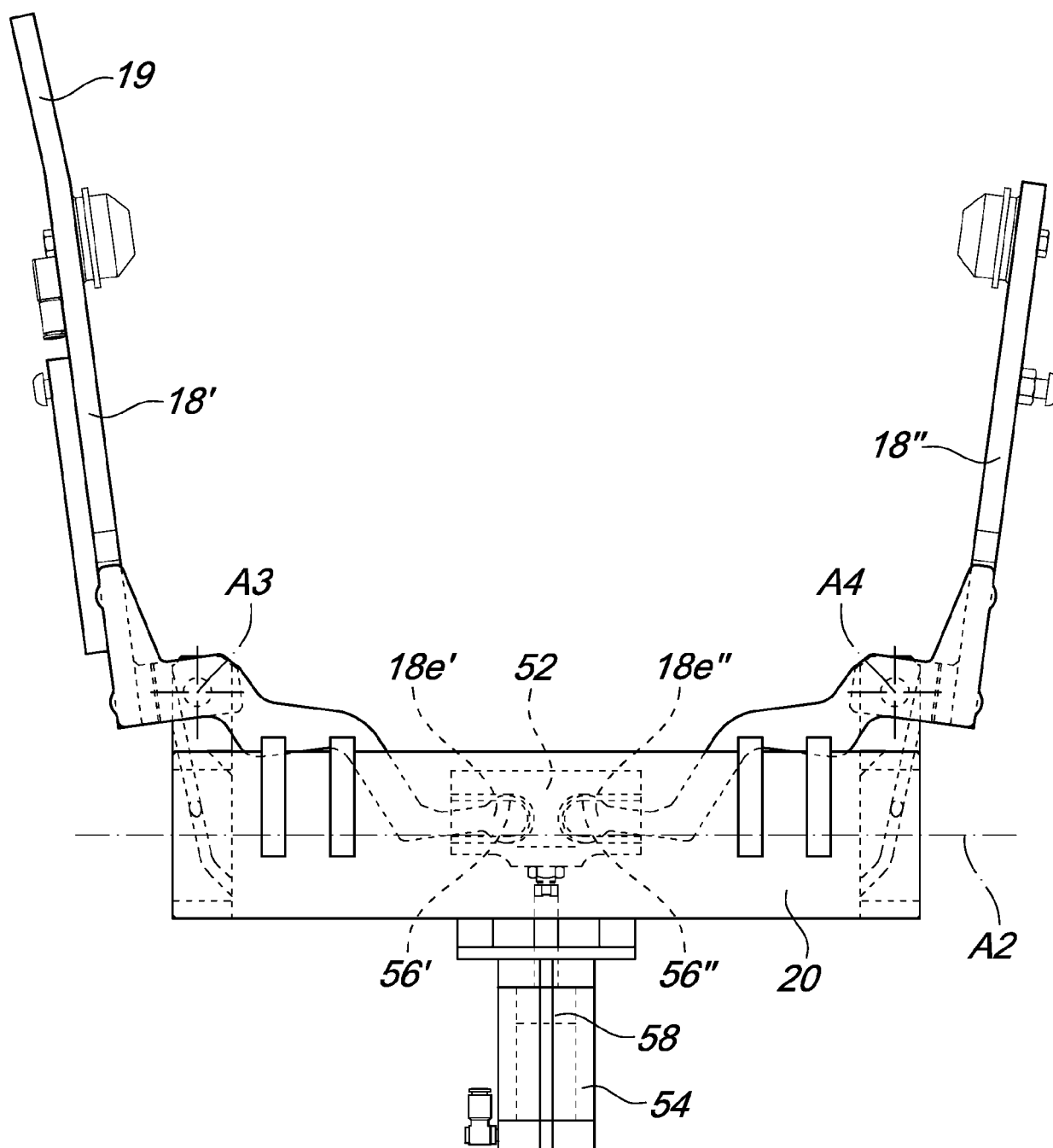


Fig. 11

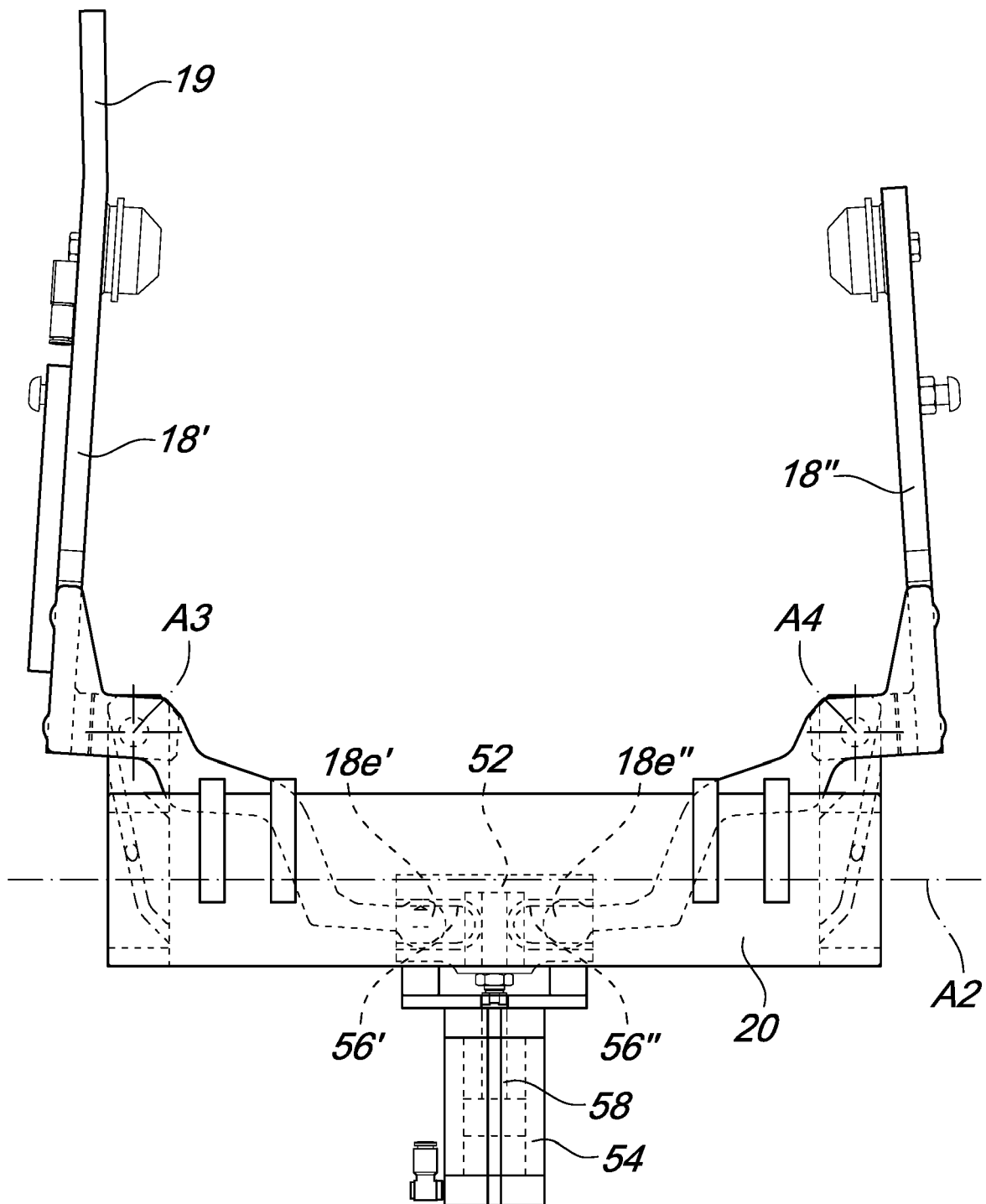


Fig. 12

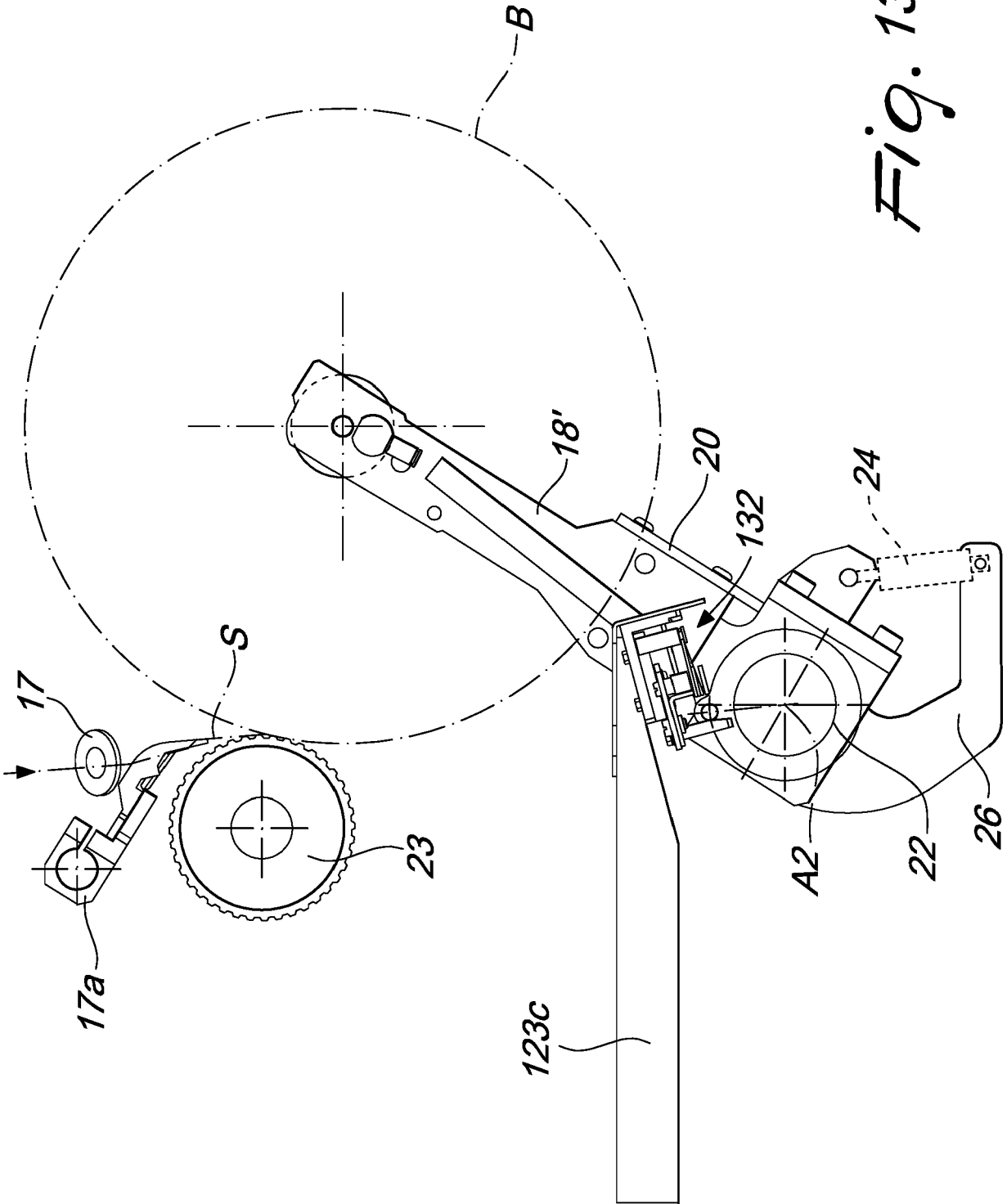


Fig. 13

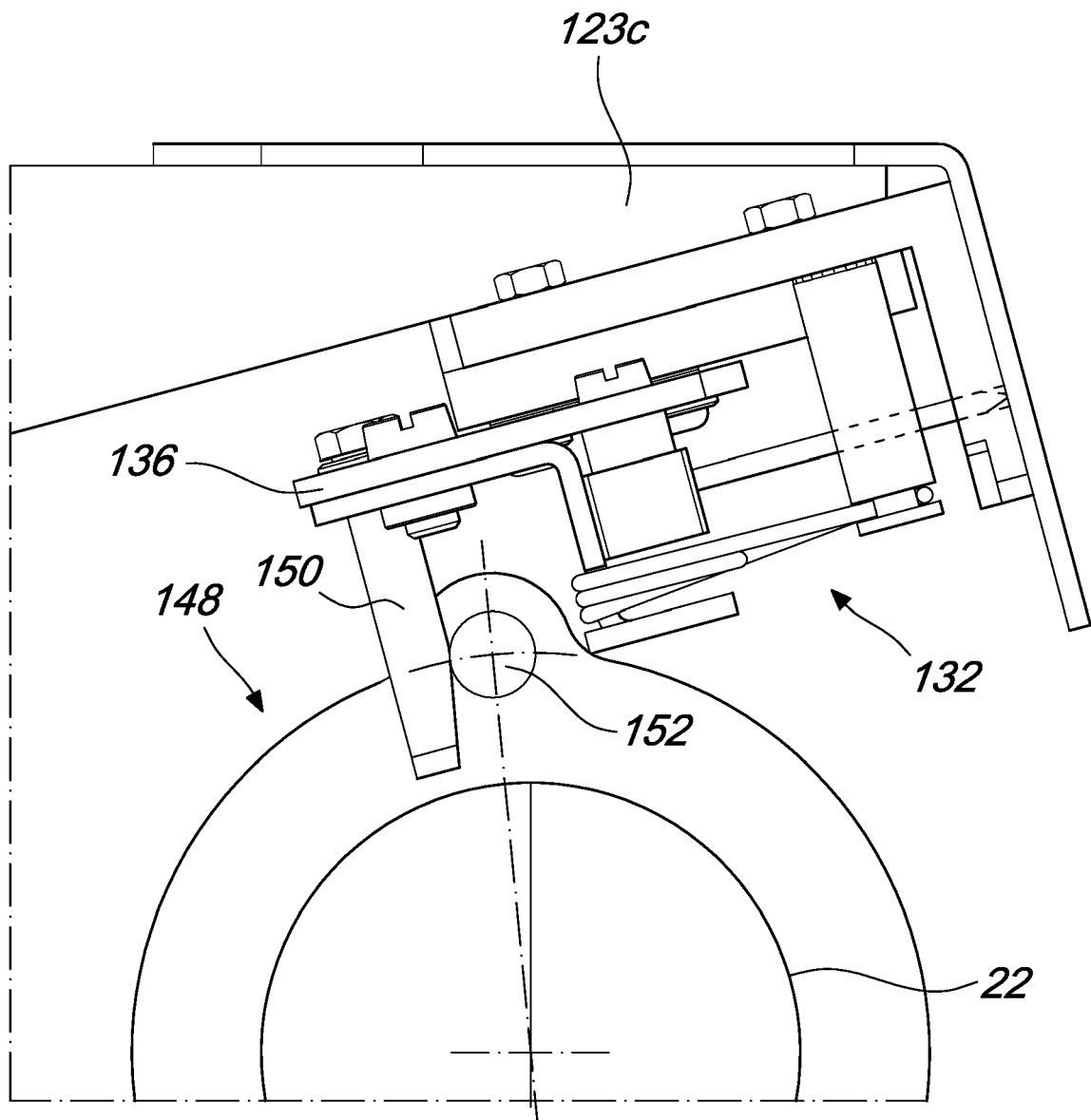


Fig. 13a

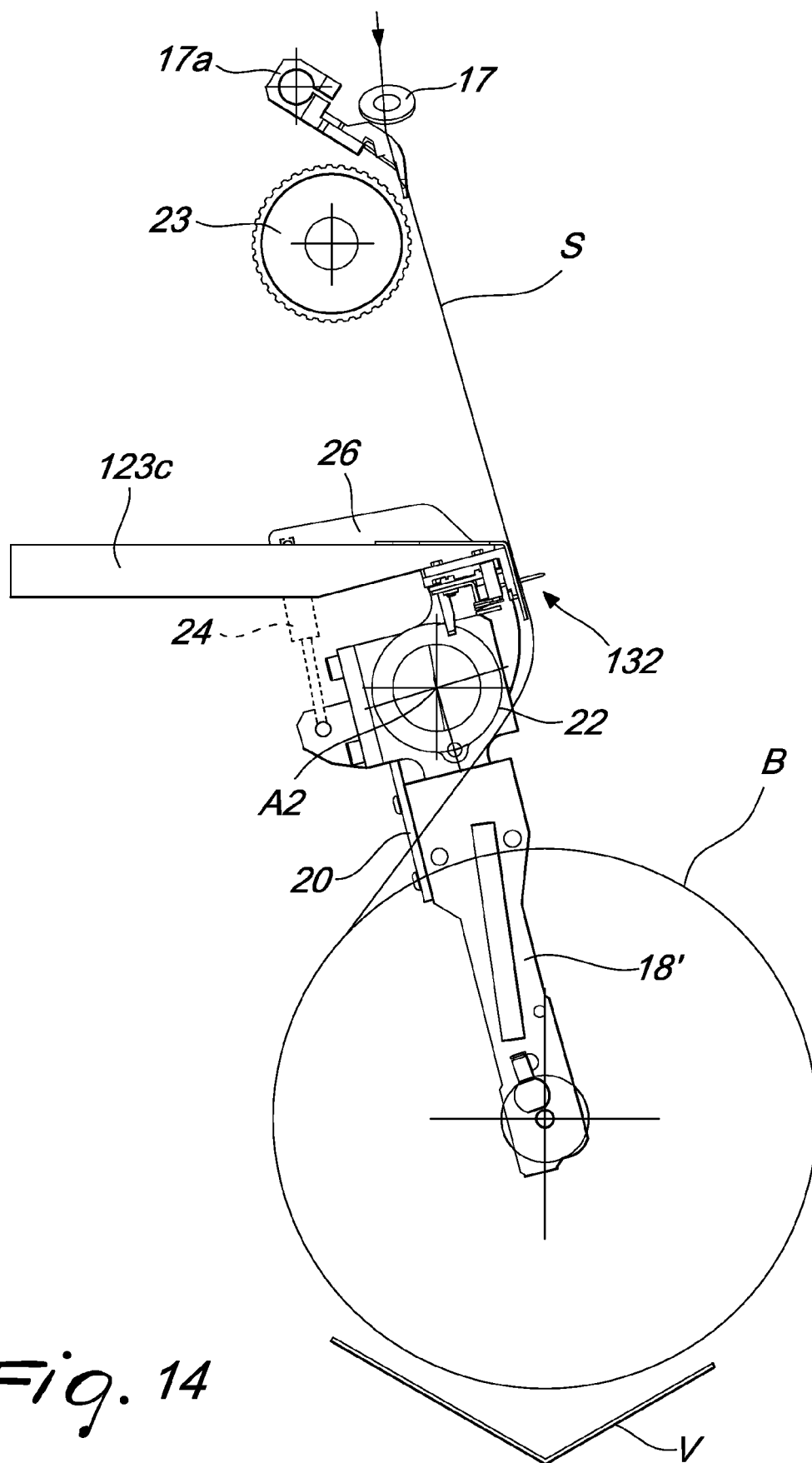


Fig. 14

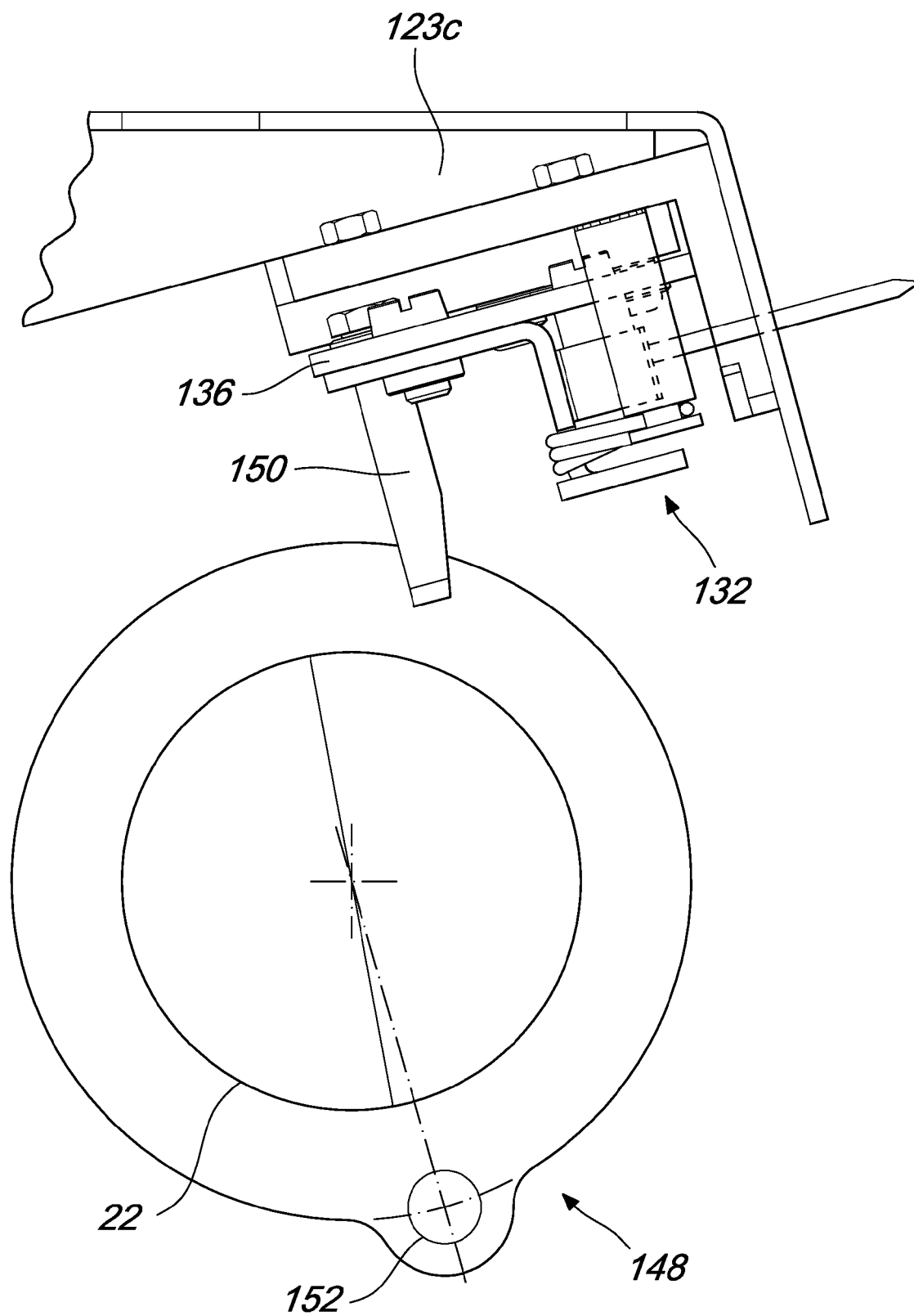


Fig. 14a

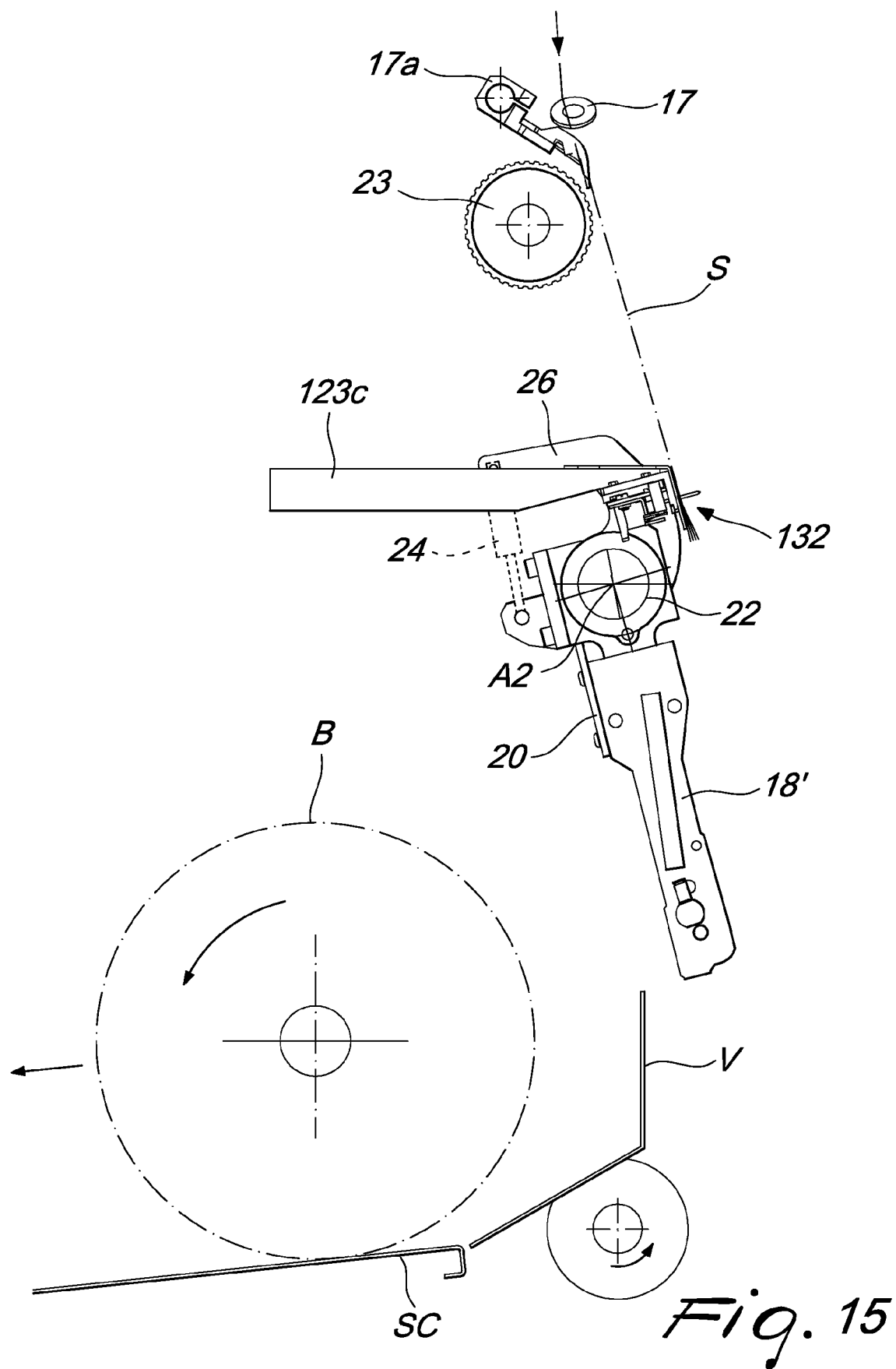


Fig. 15

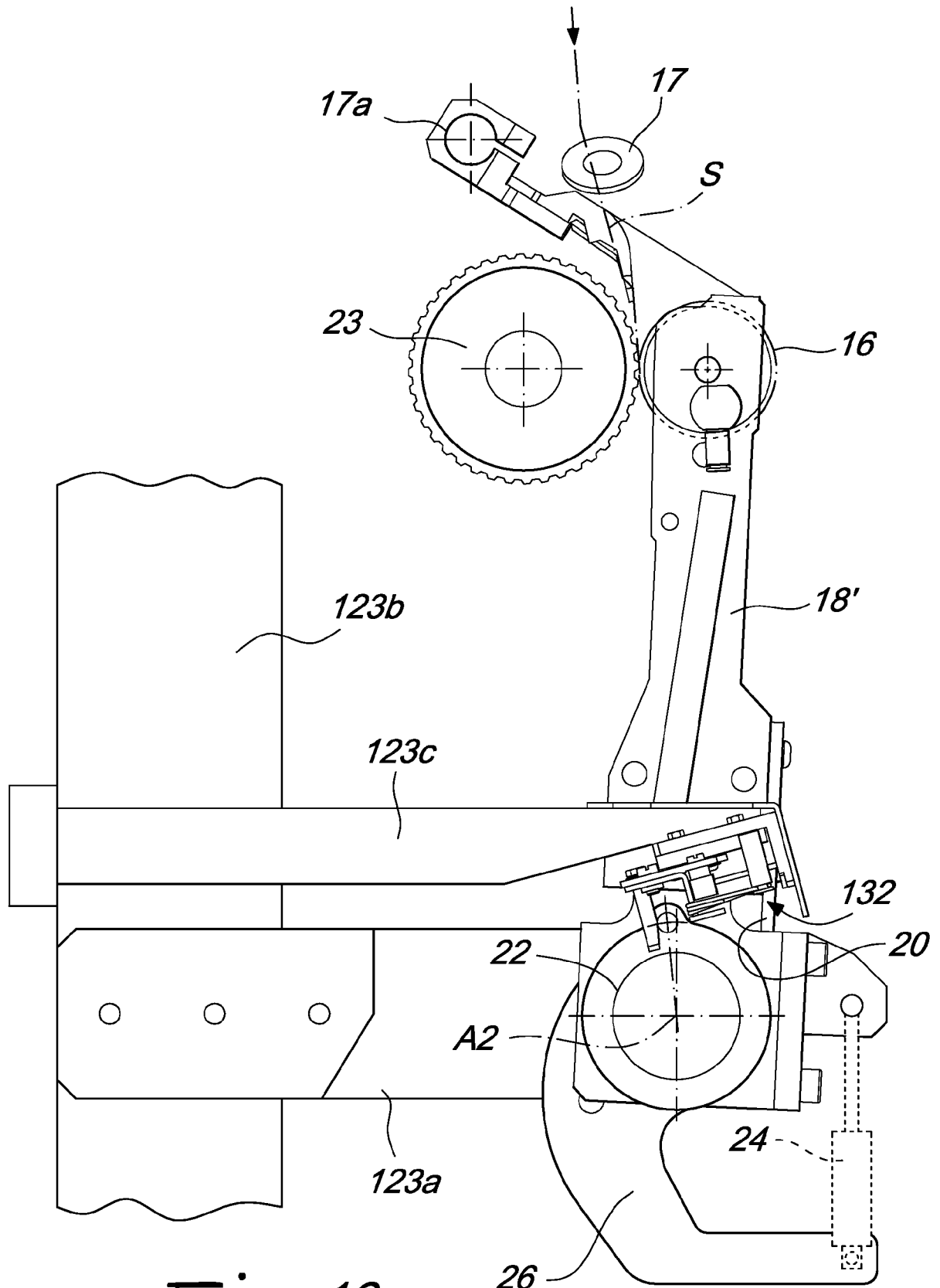


Fig. 16

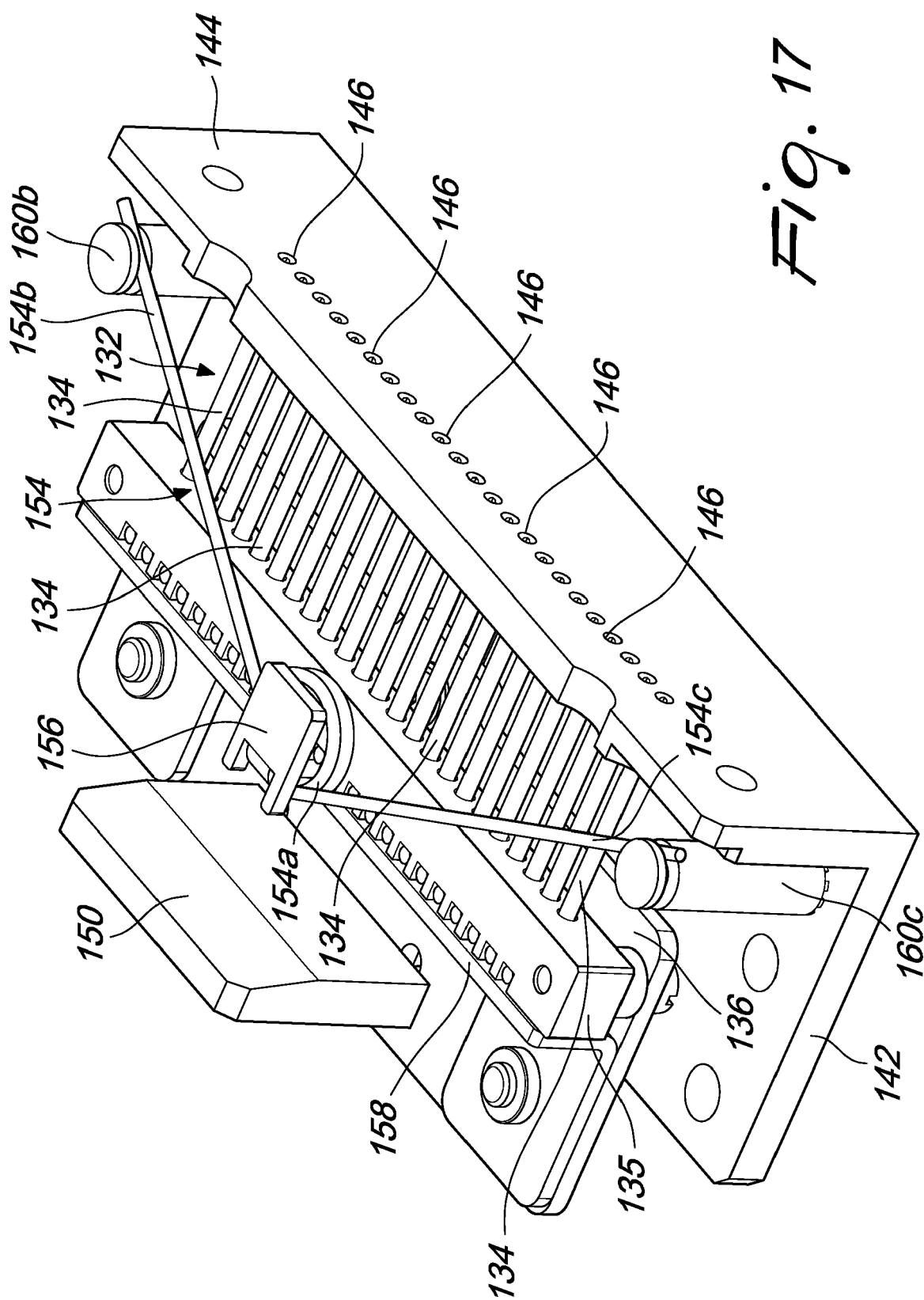
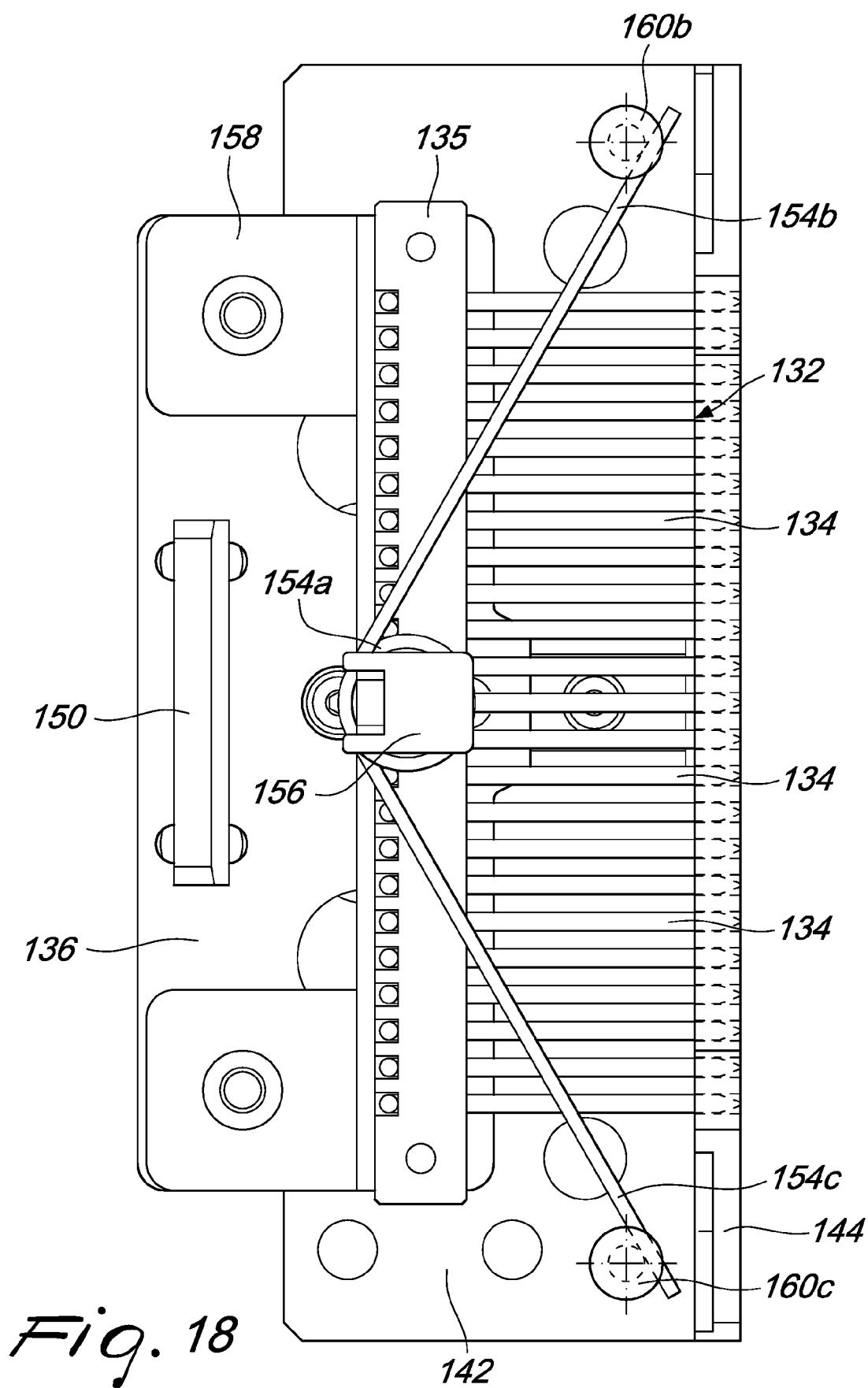
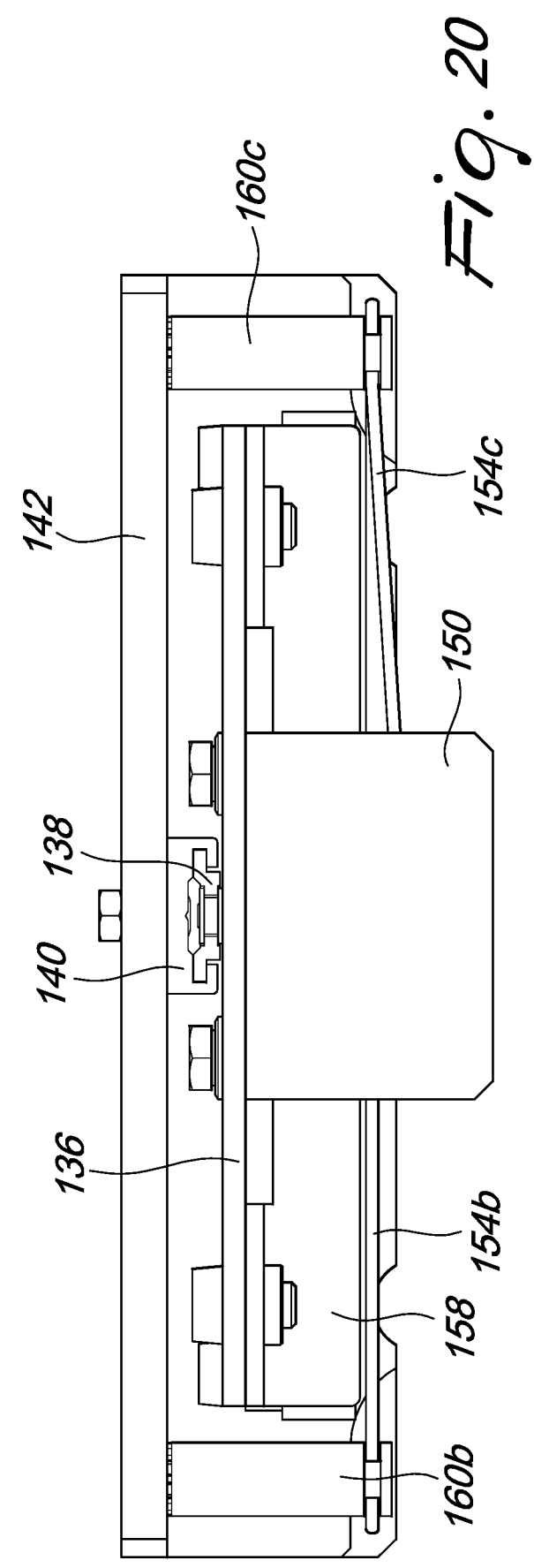
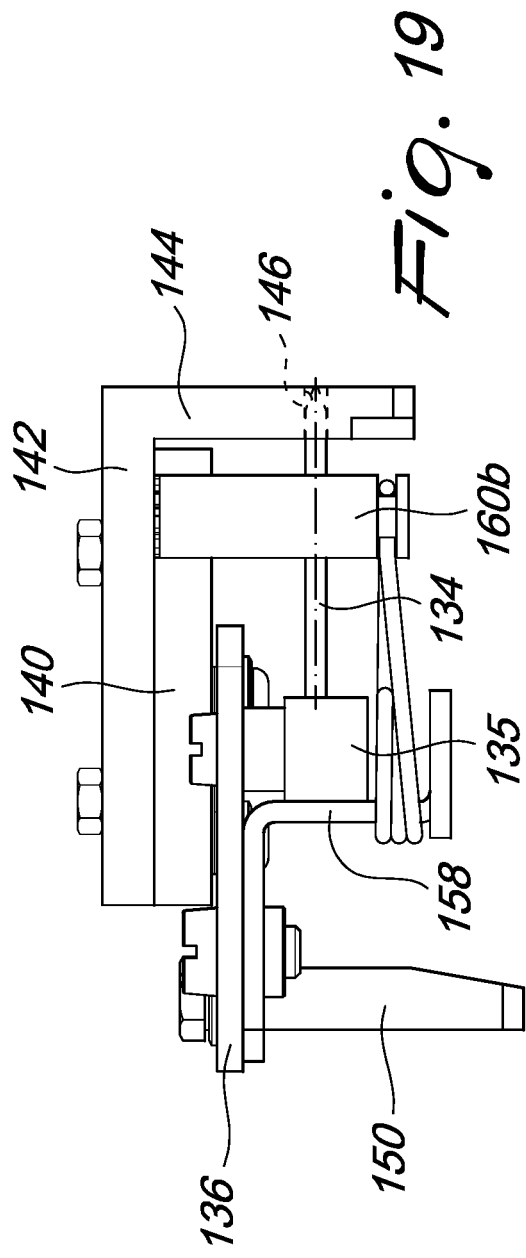


Fig. 17





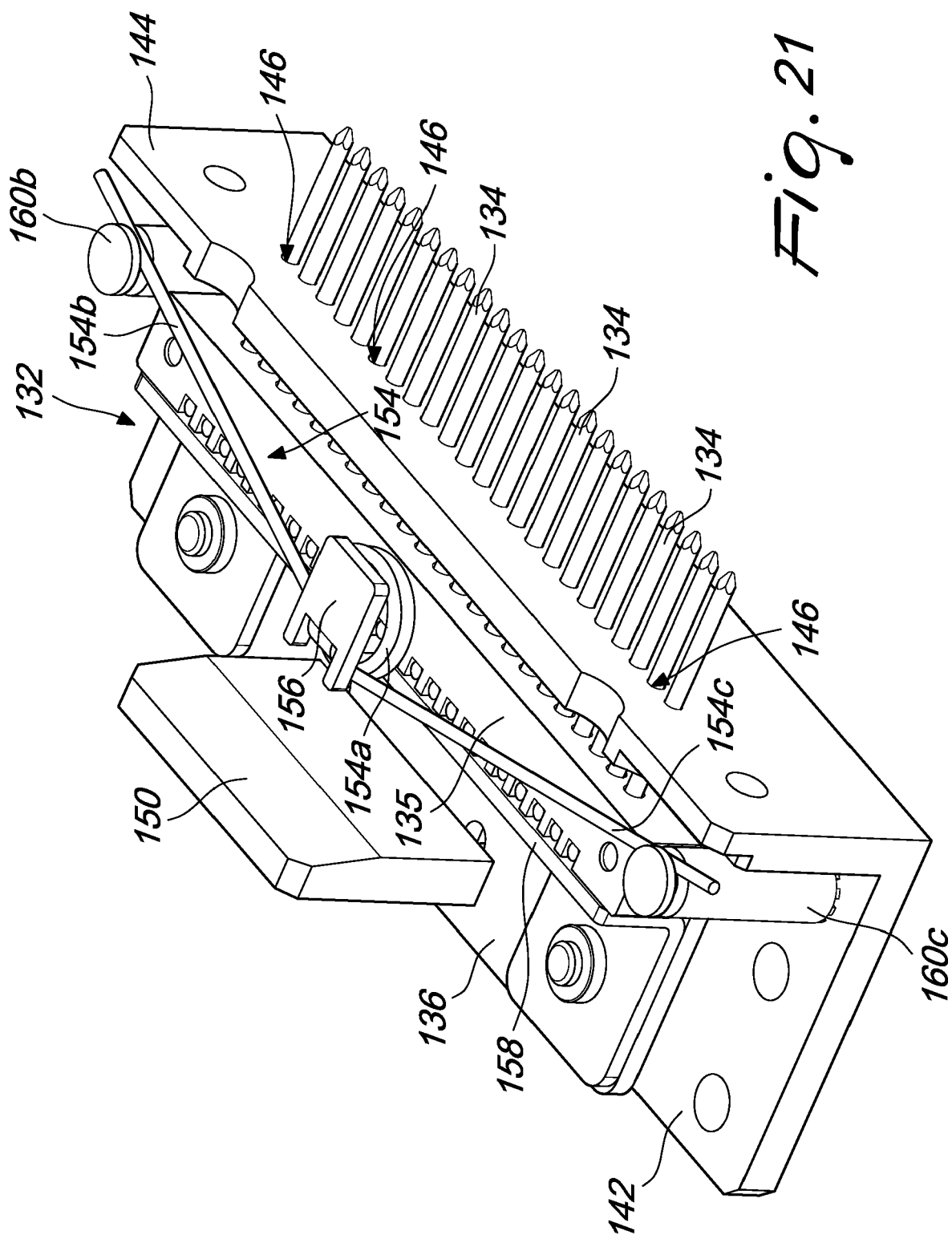


Fig. 21



EUROPEAN SEARCH REPORT

Application Number
EP 21 15 6092

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			D01H B65H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 May 2021	Examiner Todarello, Giovanni
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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