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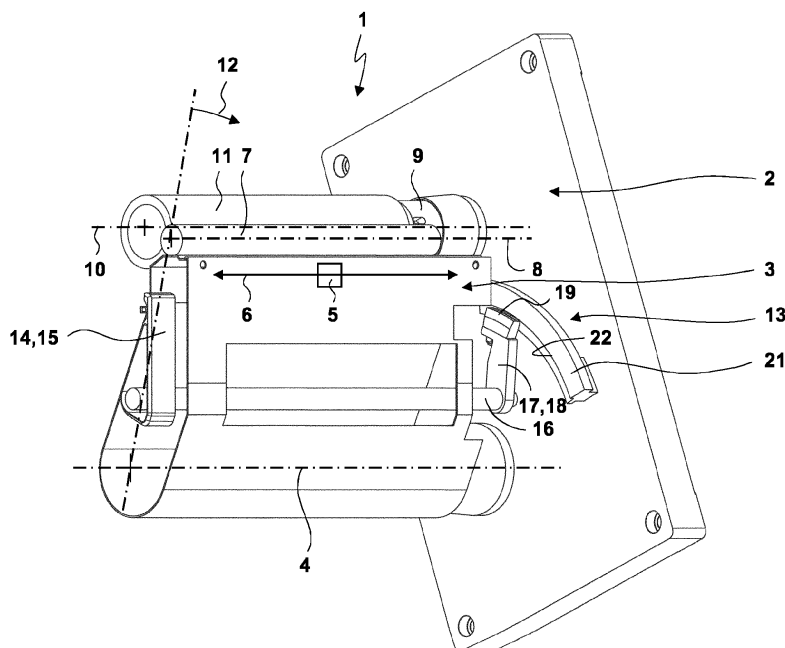
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25.08.2023 IN 202344056995(54) **WINDING MACHINE, TRAVERSE MECHANISM CARRIER STOP DEVICE AND METHOD FOR OPERATING A WINDING MACHINE**

(57) The invention relates to a winding machine (1). The winding machine (1) comprises a spindle (9), a traverse mechanism carrier (3), a pressure roller (7) and a machine housing (2). A starting pivot angle of the traverse mechanism carrier (3) is defined by a stop element in a way such that a defined gap is established between the outer surface of a sleeve (11) arranged on

the spindle (9) and the pressure roller (7).

The invention proposes that the stop element comprises a stop element contour with at least two stop element contour subsections which define different starting pivot angles of the traverse mechanism carrier (3). The stop element is in particular embodied as a manually rotatable cam disc.

**Fig. 1****EP 4 477 592 A1**

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a winding machine. The winding machine comprises a spindle. The spindle can be rotated by a motor. A winding sleeve can be arranged on the spindle and fixed on the spindle against rotation by a suitable fixing mechanism. When driving the winding sleeve via the spindle by the motor a winding product (in particular a tape, a thread, a yarn or a filament) can be wound to a bobbin. The winding machine comprises a traverse mechanism carrier. The traverse mechanism carrier carries a traversing guide which guides the product to be wound onto the winding sleeve. The traversing guide is moved back and forth in an oscillating fashion in axial direction of the and parallel to the winding sleeve for positioning the winding product on the winding sleeve. The number of revolutions of the spindle and the movement pattern and movement velocity of the traversing guide are coordinated for creating a desired winding pattern on the winding sleeve resulting in well-formed bobbin. The winding machine comprises a pressure roller and a machine housing. The pressure roller could also be denominated as contact or bail roller. The traverse mechanism carrier is supported for being pivoted about a pivot axis by the machine housing. The traverse mechanism carrier supports the pressure roller for being rotated about a rotational axis. The pressure roller is configured for establishing a rolling contact with the outer surface of the windings wound on the winding sleeve. In the contact area between the pressure roller and the outer circumference of the winding the winding product is positioned and pressed onto the winding. The traverse mechanism carrier and the pressure roller are pressed onto the winding by weight, e.g. by its own weight, and/or by an actuator and/or by the frictional counterforce of a braking device against a movement of the pressure roller with an increasing diameter of the winding. The traverse mechanism carrier is pivoted about the pivot axis when the diameter of the winding increases during the winding process.

[0002] Furthermore, the invention relates to a winding apparatus, a traverse mechanism carrier stop device and a method for operating a winding machine.

PRIOR ART

[0003] The applicant sells a winding machine "staco-FIL 200XE". In winding machines of this type the pressure roller does neither contact the winding sleeve nor the initially establishing winding on the winding sleeve. Instead, at the beginning of the winding process the traverse mechanism carrier is supported by a stop element. The stop element is positioned such that the traverse mechanism carrier is positioned at a starting pivot angle. The starting pivot angle is chosen such that a defined gap (in particular of 0.8 mm to 1 mm) between the empty

winding sleeve and the pressure roller is established. The winding process is started with said gap so that the first windings are positioned on the winding sleeve without a contact of the pressure roller with the winding sleeve and the first windings wound thereon. In a first winding process phase the gap between the pressure roller and the outer surface of the established windings successively reduces. When the gap has reduced to zero, the pressure roller establishes contact with the outer surface of the winding. The diameter of the winding further increases in a subsequent second winding process phase wherein the traverse mechanism carrier is no longer supported by the stop element. Instead, with the increasing diameter of the winding the traverse mechanism carrier - due to its contact with the surface of the winding - is moved away from the stop element and the pivot angle of the traverse mechanism carrier increases from the starting pivot angle.

[0004] The instruction manual "Bedienungsanleitung Präzisions-Spulmaschine stacoFIL 200 XE" of the applicant includes instructions on how to position the stop element for defining the starting pivot angle of the traverse mechanism carrier. The stop element is embodied as a screw screwed to a bracket held on the machine housing. This stop screw comprises an end portion with a buffer element on which the traverse mechanism carrier is supported during the first winding process phase. In order to adjust the position of the stop element and to adapt the starting pivot angle the operator has to reach the screw, which is - also in other prior art devices/winding machines - uneasy to access, and has to reach the front face of the screw in order to being able to manually rotate the screw by a tool for moving the front face of the screw in a linear direction parallel to the front side of the housing; i.e. for altering the screw-in angle of the screw into its desired/required new position.

OBJECT OF THE INVENTION

[0005] It is the object of the invention to propose a winding machine which is in particular improved with respect to

- a simplification of the operation and/or
- the operational precision and safety and/or
- the quality of the created winding and bobbin.

[0006] Furthermore, it is the object of the invention to propose an improved method for operating a winding machine and a winding apparatus and an improved traverse mechanism carrier stop device.

SOLUTION

[0007] According to the present invention the object of the invention is solved by the features of the independent claims. Additional preferred embodiments according to the invention are to be seen in the dependent claims.

DESCRIPTION OF THE INVENTION

[0008] The invention in particular bases on the findings that it is cumbersome and time-consuming for the operator to adjust the starting pivot angle of the traverse mechanism carrier on prior art winding machines. First of all, in order to achieve a large adjustment of the starting pivot angle it might be required to turn the stop screw by a multiple of 360°. Further, for smaller changes the operator has to carefully manipulate and control the starting pivot angle which requires an iterative change of the rotation of the screw and inspecting the starting pivot angle resulting therefrom. The inspection might include a measurement of the resulting gap between the pressure roller and the outer surface of the winding sleeve. The precision of the gap at the start of the winding process depends on the care taken by the operator. When spending the required care, the adjustment of the stop screw takes more than 30 seconds of work undertaken by one operator for each winding machine. In practice, operators very often skip the adjustment process in order to save time. Following therefrom the same position of the stop screw is used for different winding processes and/or for winding sleeves having different diameters. This results in an inadequate screwing angle (screw-in angle) of the stop screw in that the gap is too small or there even might be no gap at all. This leads to defects, even to damages, in any case to out-of-roundness of the winding sleeve(s) yielding in undesired biases of the pressure roller, of the traverse mechanism carrier as well as of the bearings used for supporting the pressure roller. Furthermore, in the beginning of the winding process the winding product only covers subsections of the winding sleeve. If the gap between the pressure roller and the surface of the windings is too small or even inexistent, irregular, unwished biases of the pressure roller, of the machine housing and of the related bearings are inevitable. On the other hand, if the gap is too large due to an inadequate screwing angle of the stop screw, the first winding process phase takes longer than required so that for quite an extensive time the winding is wound without any contact pressure of the pressure roller resulting in an undesired winding pattern which highly reduces the quality of the produced bobbin.

[0009] On the basis of these findings the invention proposes that the stop element comprises a stop element contour. The stop element contour has at least two stop element contour subsections. The stop element contour subsections define different starting pivot angles of the traverse mechanism carrier. This provides for the possibility to implement easy and flexible manipulation in order to alter the gap between pressure roller and the winding sleeve and the windings, respectively.

[0010] According to the invention the stop element is supported for being moved into different positions. Here, the movement is not a screwing motion as being the case for the screw stop known from the prior art. Instead, the movement of the stop element in particular is a translational movement or a rotational movement. In the differ-

ent positions to which the stop element is movable, the different stop element contour subsections can be activated so that in said different positions the different starting pivot angles are defined. In this, simple manipulation for an adjustment of a specific starting pivot angle is provided.

[0011] With respect to one of the designs of the stop element contour and, here, the two stop element contour subsections it is possible to precisely define the different starting pivot angles. The operator does not have to adjust the screw stop used in the prior art winding machines. Instead, he/she simply moves the stop element into the different positions for activating the stop element contour subsections. Here, activating a stop element contour subsection in particular means that the stop element contour subsection is brought into a position wherein this specific stop element contour subsection defines the starting pivot angle which is e.g. provided by a contact of the stop element contour subsection with a counter stop element.

[0012] Within the frame of the invention the stop element contour subsections serve to support any counter stop element which is (directly or indirectly) linked to the traverse mechanism carrier so that the contact of the counter stop element with one of the stop element contour subsections defines the starting pivot angle of the traverse mechanism carrier. In one embodiment, the traverse mechanism carrier comprises a counter stop element which is supported by one of the stop element contour subsections at the start of a winding process.

[0013] The stop element contour and the stop element contour subsections may have any shape and curvature. It is generally possible that at least one stop element contour subsection in the contact area with the counter stop element has a surface normal which is inclined against the direction of movement of the counter stop element and, in that, inclined against the contact force applied by the counter stop element. However, in one proposal of the invention the aforementioned surface normal is parallel to the direction of movement of the counter stop element held by the traverse mechanism carrier. In this case the direction of movement of the counter stop element can be more or less tangential to the pivot axis of the traverse mechanism carrier. For this orientation of at least one stop element contour subsection the contact force applied by the counter stop element is fully supported by a normal force of the stop element contour subsection, whereas any inclination might lead to an undesired kind of downhill-slope force. Any downhill-slope force at the contact area would bias the stop element for being moved out of its position. Additional securing forces or a securing mechanism ensuring that the stop element does not move out of its position may be required.

[0014] The stop element can be moved by any mechanism, actuator or motor for activating the different stop element contour subsections. In one embodiment of the invention the stop element is a manually moveable

stop element.

[0015] The stop element may have any degree of freedom. It is e.g. possible that the stop element is moved in a translatory degree of freedom for activating the various stop element contour subsections. However, in a preferred embodiment of the invention the stop element is a rotatable stop element of any design.

[0016] According to one proposal of the invention the rotatable stop element comprises a cam disc. The radial outer surface of the cam disc forms the stop element contour with the at least two stop element contour subsections. In this case the at least two stop element contour subsections have different radii from the rotational axis of the cam disc. The use of a cam disc for providing the stop element contour is a very simple but reliable solution for providing the stop element contour subsections.

[0017] In one particular embodiment of the inventive winding machine the stop element comprises an operation wheel which can be manually gripped and rotated by the operator. Furthermore, the stop element comprises the aforementioned cam disc. A shaft connects the operation wheel with the cam disc for providing that the cam disc rotates together with the manual operation wheel. In this case, the manual operation wheel and the cam disc can be arranged on different sides of the machine housing. If so, the shaft extends through the machine housing. It is possible that the shaft is supported in the machine housing. A sliding bearing or roller bearing may be provided for supporting the rotation of the shaft; the bearing may be positioned in the housing. In such a case, the manual operation wheel can be arranged on the front side of the winding machine (preferably, on the same side the traverse mechanism carrier, the pressure roller and the spindle are arranged). In that the manual operation wheel is easily accessible by the operator. The cam disc is, preferably, arranged on the rear side of the machine housing. Thus, the cam disc is invisible for the operator and the risk of injury of the operator upon manipulation of the machine is minimized, e.g. an injury due to the operator's finger being clamped between the cam disc and the counter stop element. In addition, the cam disc and/or the counter stop element are prevented to interfere with the winding product.

[0018] Securing the various positions of the stop element in which the respective stop element contour subsection cooperates with the counter stop element is basically not necessary. However, a securing may be provided by any means or any measures, e.g. by the friction which counteracts any movement of the stop element. In one proposal of the invention the winding machine comprises a latching device which secures a position of the stop element.

[0019] The latching device may be embodied as a locking device which blocks any movement of the stop element (in case forces are applied (on) to the stop element in direction of its movement). The locking device may be unlocked by additionally unlocking a locking

element.

[0020] However, the latching device may be a snap-in-connection which secures the stop element against movement when applying forces in the direction of movement below a threshold force. When applying forces on the stop element above the threshold, the snap-in-connection automatically - without any additional measures - leaves the securing position. A snap-in-connection can e.g. comprise a snap-in-sphere (ball) or a snap-in-pin which is pressed into a snap-in-groove or snap-in-recess by a snap-in-spring. In this case the snap-in groove or recess has an inclined edge which creates a force component of the force applied by the operator, the force component counteracting the force of the snap-in spring.

[0021] The stop element contour may have a linear dependency of the positions of the stop element contour subsections from the movement of the stop element. In case of a rotated cam disc, the outer radius of the cam disc along its circumference (or at least at specific positions along the circumference) may increase linearly dependent on the circumferential angle. However, any other shape of the stop element contour and any other dependency may be used.

[0022] The stop element may be adjusted in steps correlating with specific stop element contour subsections or may be adjusted continuously.

[0023] In one embodiment of the invention the stop element or the cam disc comprises position indicators. These position indicators may e.g. indicate the correlated distances of the pressure roller from the rotational axis of the spindle. In another or cumulative embodiment the position indicators may indicate the positions of the stop element correlating with a specific type or outer diameter of a winding sleeve. According to a non-limiting example the winding machine may be used for specific winding sleeves having a diameter of 38 mm, 40 mm, 42 mm, 45 mm, 47 mm and 49 mm. In this case the position indicators may indicate the positions of the manual operation wheel or cam disc defining the desired gap for use of the aforementioned specific winding sleeve diameters.

[0024] The counter stop element may be rigidly coupled and fixed to the traverse mechanism carrier in any way and design.

[0025] According to one embodiment of the inventive winding machine the winding machine comprises a braking device. The braking device when actuated and in an applied state supports the traverse mechanism carrier on the machine housing by a braking torque generated by the braking device.

[0026] In this case the braking device can be actuated by an actuation shaft. The actuation shaft can be supported for being rotated by the traverse mechanism carrier. A rotation of the actuation shaft may rotate a brake element and may increase a contact force pressing the brake element against a counter brake element held by the machine housing for creating the braking torque. In this case it is possible that the actuation shaft carries or comprises the counter stop element. In the simplest case

one end portion of the actuation shaft forms the counter stop element which is used for supporting the traverse mechanism carrier on the respective stop element contour subsection. In this case the actuation shaft can be used in a multifunctional way which leads to a reduction of costs and to a very compact design.

[0027] In another aspect of the invention the winding machine comprises a motor which is actuated by a switch mechanism. In this case, the braking device applies a braking torque (brake momentum) on the traverse mechanism carrier about the pivot axis as described above. It is e.g. possible that the switch mechanism of the motor is any switch directly operated by the operator, the switch being arranged on a manually accessible front side of the winding machine. The switch can e.g. be arranged at the front side of the machine housing and/or on the front side of the traverse mechanism carrier. In embodiments known from the prior art a switch mechanism is formed by the fixing mechanism for fixing the winding sleeve on the sleeve by aid of spreading elements. In these embodiments it is further known to automatically actuate the motor for driving the spindle by manually actuating the fixing mechanism.

[0028] One embodiment of the invention proposes that the switch mechanism for activating the motor for driving the spindle is actuated by the braking device. This switch mechanism can be the only switch mechanism for actuating the motor or there may be at least one additional switch mechanism. This embodiment of the invention is based on the finding that the start of the winding process necessarily requires the braking device to be released. Accordingly, the actuation for releasing the braking device can be used for automatically actuating the switch mechanism for the motor. This embodiment leads to an increased safety because it is avoided that the motor is actuated when the braking device has not been released. An automatic actuation of the motor upon release of the braking device is beneficial at any process stage of the winding machine or apparatus, especially after an exchange of a fully wound winding sleeve (bobbin) by a new winding sleeve being arranged onto the spindle and/or after a malfunctioning of the winding process, e.g. by a rupture of a yarn or an unwished winding, has been corrected. It may be particularly preferable in cases where a start-up of the winding machine is to be initiated, e.g. after first installation of the machine or the apparatus or after maintenance work. Nevertheless, the braking device can be used in multifunctional ways which leads to a simplified and compact design of the winding machine.

[0029] The braking device may be actuated in a lot of different ways. In one proposal of the invention the braking device is a manually actuatable braking device. In one embodiment the manually actuated braking device comprises a manual actuation element. In this case the switch mechanism can sense a position of the manual actuation element. This (sensed) position may be an absolute position. However, in another proposal of the invention

the switch mechanism senses a position of the manual actuation element relative to the traverse mechanism carrier. It is preferable, that at least one sensor element is provided for this purpose.

[0030] It is e.g. possible that the switch mechanism comprises two sensor elements. One sensor element can be arranged (with)in or on the manual actuation element, whereas the other sensor element can be appropriately positioned (with)in or on the traverse mechanism carrier. The sensor elements are arranged such that upon movement of the manual actuation element the distance of the sensor elements changes. The two sensor elements may form a mechanical switch which changes its switching state when a specific distance of the sensor elements is reached or passed. The sensor elements may be sensors continuously measuring the distance and/or may be based on any other sensor principle. The displacement measured by the sensor elements may be a translational displacement, a rotational displacement or any other displacement along a curved path.

[0031] In one embodiment the manual actuation element is a manual actuation lever.

[0032] The switch mechanism may comprise any type of sensor for sensing the relative position of the manual actuation element and the traverse mechanism carrier. According to a simple embodiment of the invention the sensor is a hall sensor. The hall sensor is based on the hall sensor effect in which the presence and magnitude of a magnetic field is detected. An output voltage of the hall sensor is proportional to the strength of the detected magnetic field. Hall sensors are available on the market for sensing a displacement or a rotational angle, wherein a hall sensor can be combined with a threshold detection to act as a binary switch. If a hall sensor is used, either the manual actuation element or the traverse mechanism carrier comprises or holds a permanent magnet. In case the permanent magnet is positioned (with)in or on the manual actuation element, the traverse mechanism carrier comprises or holds the sensor element which senses the magnetic field created by the permanent magnet. In the alternative, the magnet may, as a matter of course, be positioned (with)in or on the traverse mechanism carrier, whereas the manual actuation element carries the sensor element.

[0033] However, instead of a hall sensor any type of sensor including inductive sensors may be used.

[0034] The signal of the sensor may be processed in a continuous way or in a binary fashion; the two binary switching states being defined by a threshold. In this case, the actuation of the motor may be triggered by any value or outcome of the switch mechanism or sensor. Accordingly, the motor may be switched for any braking torque of the braking device. In one embodiment of the invention the two functions of the braking device, that is providing the braking torque, on one hand, and triggering the actuation of the motor for driving the spindle, on the other hand, are separated: the manual actuation element

comprises an actuation region defined by the stroke or movement path of the manual actuation element. One embodiment of the invention proposes that the actuation region comprises a first actuation subregion wherein the position of the manual actuation element correlates with the created braking torque. Accordingly, in the first actuation subregion the operator is able to define the desired braking torque by/upon actuation of the manual actuation element. In a second actuation subregion, which does not overlap with the first actuation subregion, the braking torque is constant and/or zero. In the second actuation subregion a change of the position of the manual actuation element switches the switch mechanism, thus, triggers the operation of the motor for driving the spindle.

[0035] Another solution of the object of the invention is a method for operating a winding machine as described above. The method comprises the following method steps:

- The traverse mechanism carrier is pivoted about the pivot axis to an exchange pivot angle. Preferably, at the exchange pivot angle the pressure roller supported by the traverse mechanism carrier has the maximum distance from the spindle. At the exchange pivot angle, it is possible to remove a finished wound bobbin from the spindle. At this stage the driving means for rotating the spindle are inactivated and the spindle stands still. In an alternative situation, such as after installation of the machine or the apparatus or after maintenance work, there may be no winding sleeve arranged on the spindle. In this case, the pressure roller may rest in a position in close or medium distance to the spindle. In such a situation in order to start the winding process, i.e. the present inventive method, the traverse mechanism carrier is pivoted about the pivot axis to said exchange pivot angle.
- The operator selects one stop element contour subsection of the at least two stop element contour subsections. For this selection the operator may use a position indicator provided on the stop element or cam disc. The operator selects the position indicator or stop element contour subsection specifically for a particular winding process or for a particular winding sleeve. For different (variable) winding processes or for different winding products, different gaps at the start of the winding process, hence, different stop element contour subsections may be required. Alternatively, or cumulatively, the use of winding sleeves having different diameters may require the use of different corresponding stop element contour subsections. The operator selects the suitable stop element contour subsection so that the respective required gap is established.
- The stop element is moved into a position wherein the selected stop element contour subsection is

effective, i.e. its effect is induced by a contact of the selected stop element contour subsection and the counter stop element held/carried by the traverse mechanism carrier.

- Before or after these steps the operator arranges a winding sleeve on the spindle; in particular a specific winding sleeve correlating with the selected stop element contour subsection.
- The traverse mechanism carrier is pivoted about the pivot axis from the exchange pivot angle to the starting pivot angle. The starting pivot angle is defined by the stop element, in particular a contact of the counter stop element held by the traverse mechanism carrier with the selected stop element contour subsection. When the traverse mechanism carrier is pivoted into the starting pivot angle defined by the stop element contour subsection, the pressure roller establishes a defined gap with the outer surface of the winding sleeve arranged on the spindle.
- The winding process is then started. In a first winding process phase the traverse mechanism carrier is supported by the stop element. In the first winding process phase the outer diameter of the winding on the winding sleeve increases and the gap between the pressure roller and the outer surface of the winding decreases to zero. In a subsequent second winding process phase the outer diameter of the winding further increases (in a continuous manner). The traverse mechanism carrier is no longer supported by the stop element. Instead, the traverse mechanism carrier, in particular the counter stop element, moves away from the stop element. Accordingly, in the first winding process phase the pressure roller does not apply a contact force on the outer surface of the winding, whereas in the second winding process phase the pressure roller compresses the winding and presses the winding product onto the outer surface of the winding.

[0036] In a particular embodiment of the inventive method the winding process, in particular the first winding process phase and the driving operation of the motor for driving the spindle, is started by an actuation of the braking device (cp. the above explanations on the manually actuated braking device, the manual actuation element, the switch mechanism sensing a position of the manual actuation element and a position of the manual actuation element relative to the traverse mechanism carrier, the embodiment of the manual actuation element as a manual actuation lever, the use of a hall sensor and the providing of an actuation region of the manual actuation element comprising a first actuation subregion and a second actuation subregion).

[0037] Another solution of the object of the invention proposes a traverse mechanism carrier stop device. The

traverse mechanism carrier stop device can be used in a winding machine for defining a starting pivot angle of a traverse mechanism carrier at the start of the winding process. The inventive traverse mechanism carrier stop device comprises a stop element and a counter stop element. The stop element comprises a stop element contour with at least two stop element contour subsections. The stop element contour subsections define different starting pivot angles of the traverse mechanism carrier. The stop element is supported for being moved into different positions for activating the different stop element contour subsections and for defining the corresponding different starting pivot angles. At the start of the winding process the counter stop element is supported by one of the stop element contour subsections for defining the corresponding different starting pivot angle.

[0038] The winding machine according to the invention may be arranged on a winding machine apparatus having a plurality of winding machines according to the invention arranged e.g. in a serial manner.

[0039] Another solution of the object of the invention is provided by a winding apparatus comprising a plurality of winding machines which can be operated simultaneously for winding a plurality of winding spools or bobbins at the same time.

[0040] Advantageous developments of the invention result from the claims, the description and the drawings.

[0041] The advantages of features and of combinations of a plurality of features mentioned at the beginning of the description only serve as examples and may be used alternatively or cumulatively without the necessity of embodiments according to the invention having to obtain these advantages.

[0042] The following applies with respect to the disclosure - not the scope of protection - of the original application and the patent: Further features may be taken from the drawings, in particular from the illustrated designs and the dimensions of a plurality of components with respect to one another as well as from their relative arrangement and their operative connection. The combination of features of different embodiments of the invention or of features of different claims independent of the chosen references of the claims is also possible, and it is motivated herewith. This also relates to features which are illustrated in separate drawings, or which are mentioned when describing them. These features may also be combined with features of different claims. Furthermore, it is possible that further embodiments of the invention do not have the features mentioned in the claims which, however, does not apply to the independent claims of the granted patent.

[0043] The number of the features mentioned in the claims and in the description is to be understood to cover this exact number and a number greater than the mentioned number without having to explicitly use the adverb "at least". For example, if an element is mentioned, this is to be understood such that there is exactly one element or there are two elements or more elements. Additional

features may be added to these features or these features may be the only features of the respective product.

[0044] The reference numbers contained in the claims are not limiting the extent of the matter protected by the claims. Their sole function is to make the claims easier to understand.

BRIEF DESCRIPTION OF THE DRAWINGS

[0045] In the following, the invention is further explained and described with respect to preferred exemplary embodiments illustrated in the drawings.

Fig. 1 is a three-dimensional top view of a winding machine.

Fig. 2 is a three-dimensional view of components of a winding machine of Fig. 1, namely a pressure roller, a spindle, a winding sleeve, a braking device and a traverse mechanism carrier stop device.

Fig. 3 is a different three-dimensional view of the components of the winding machine of Fig. 2.

Fig. 4 is a three-dimensional view of components of a braking device of a winding machine of Fig. 1.

Figs. 5 to 10 show the winding machine of Fig. 1 in a front view for different operational states.

Fig. 11 is a schematic block diagram of a method for operating a winding machine with the different operational states of Figs. 5 to 10.

Fig. 12 shows a winding machine comprising a traverse mechanism carrier stop device secured in a selected position by a latching device, wherein the latching device is in an unlatched state.

Fig. 13 shows the traverse mechanism carrier stop device and the latching device of the winding machine of Fig. 12 in a detail XIII.

Fig. 14 shows a winding machine of Fig. 12, wherein the latching device is in an unlatched state.

Fig. 15 shows the stop element and the latching device of the winding machine of Fig. 14 in a detail XV.

DESCRIPTION OF THE DRAWINGS

[0046] Fig. 1 shows a winding machine 1 in a three-dimensional top view. The winding machine 1 comprises a stationary machine housing 2 used for supporting the components of the winding machine 1. It further comprising a frame, struts, a housing plate, a covering plate and/or decorative elements.

[0047] The machine housing 2 supports a traverse mechanism carrier 3. The carrier 3 is pivotable about a pivot axis 4. The traverse mechanism carrier 3 supports a traversing guide 5. During the winding process the traversing guide 5 guides the winding product for executing an oscillating traversing movement 6.

[0048] The traverse mechanism carrier 3 supports a pressure roller 7 for its rotation about a rotational axis 8.

[0049] A spindle 9 is driven by a motor (not shown) which spindle 9 is rotatable about a spindle axis 10 having an orientation parallel to the traversing movement 6 and the pivot axis 4. A winding sleeve 11 is arranged on the spindle 9. The winding sleeve 11 is fixed against rotation on the spindle 9 by a fixing mechanism known in the art, such as a spreading mechanism. The winding product, in particular a tape, a thread, a yarn and/or a filament, is positioned on the outer surface of the winding sleeve 11 by aid of the traversing guide 5 and the pressure roller 7, in that a winding (not shown) is established on the winding sleeve 11. Due to the contact force between the pressure roller 7 and the outer surface of the winding during the winding process a pivot angle 12 of the traverse mechanism carrier 3 about the pivot axis 4 increases with an increasing diameter of the winding.

[0050] The winding machine 1 comprises a braking device 13. The braking device 13 comprises a manual actuation element 14, in the embodiment shown formed by a manual actuation lever 15. The manual actuation element 14 is fixedly connected to a first end of a brake actuation shaft 16. The second end of the brake actuation shaft 16 is fixedly connected to a brake actuation element 17, here, embodied as a brake actuation lever 18 with a brake pad or brake chock 19 arranged in the outer end portion of the brake actuation lever 18 (cp. Fig. 4). The manual actuation element 14 is arranged at the front side of the traverse mechanism carrier 3. The brake actuation shaft 16 extends through the traverse mechanism carrier 3, the traverse mechanism carrier 3 supporting the brake actuation shaft 16 for its rotation about a shaft axis 20. The shaft axis 20 has an orientation parallel to the pivot axis 4 and is arranged with an offset to the pivot axis 4. The brake actuation element 17 is arranged on the rear side of the traverse mechanism carrier 3 between the traverse mechanism carrier 3 and the machine housing 2.

[0051] The machine housing 2 carries a brake ring segment 21. The brake ring segment 21 provides a brake surface 22 which in an applied state of the braking device 13 establishes a friction contact with the brake chock 19. A rotational movement of the shaft axis 20 can be induced

by the operator by actuating the manual actuation lever 15 which leads to a pivoting movement of the brake actuation lever 18. Due to the offset of the pivot axis 4 and the shaft axis 20 and/or an offset of the center of the cylindrical brake surface 22, pivoting the manual actuation lever 15 from a released position, in which the brake chock 19 does not contact the brake surface 22, to an applied position, in which the brake chock 19 is pressed against the brake surface 22, leads to an actuation of the braking device 13 and to an establishment of a brake force and, thus, to a braking torque.

[0052] A minimum pivot angle 12 being a starting pivot angle 39 of the traverse mechanism carrier 3 is defined by a traverse mechanism carrier stop device 23 (cp. Fig. 2).

The traverse mechanism carrier stop device 23 comprises a stop element 24 fixable in its selected operational state on the machine housing 2 and a counter stop element 24 held by the traverse mechanism carrier 3. At the starting pivot angle 39 the counter stop element 24 rests on the stop element 24.

[0053] The stop element 24 is, in the embodiment shown, embodied as a cam disc 26 (cp. Fig. 3). For changing the operational state of the cam disc 26 the cam disc 26 can be rotated about a rotational axis 27 of the traverse mechanism carrier stop device 23. The cam disc 26 has a radial outer surface which provides a stop element contour 28. The stop element contour 28 comprises a plurality of stop element contour subsections 29a, 29b, ... The stop element contour subsections 29 have different/several radii which are different from the rotational axis 27. In the embodiment shown, the stop element contour 28 additionally has a wavy curvature such that the stop element contour subsections 29 are each arranged in a wave trough so that adjacent stop element contour subsections 29 are separated from each other by wave elevations.

[0054] The counter stop element 25 is - according to the embodiment shown - embodied as a journal (a pin or a stud) 30 of the second end of the brake actuation shaft 16. In the embodiment shown the cam disc 26 is arranged on the rear side of the machine housing 2 and the journal 30 extends through an elongated opening or recess 31 of the machine housing 2 to the rear side of the machine housing 2. The elongated opening 31 has a curved shape with a semicircular longitudinal axis having its center on the pivot axis 4. The journal 30 is supported by one of the selected stop element contour subsections 29. The change of the selected stop element contour subsection 29, on which the journal 30 rests, leads to a change of the starting pivot angle 39. In this position the selected stop element contour subsection 29 is effective with regard to an appropriate (stop) angle possible for the transfer mechanism carrier 3 in correspondence to the diameter of the winding sleeve 11 used.

[0055] Figs. 5 to 10 show different operational states of the winding machine 1. A method for operating a winding machine 1 is shown in Fig. 11 by way of a schematic block diagram referring to the figures and

operational states of Figs. 5 to 10:

In step 32 of Fig. 11 the traverse mechanism carrier 3 is being pivoted about the pivot axis 4 to a certain pivot angle 33, a - in this embodiment - so-called exchange pivot angle 33, wherein the pressure roller 7 has a maximum distance from the spindle 9. The braking device 13 is in an applied state. In this operational state of the winding machine 1 it is possible to remove a completed bobbin (not shown) from the spindle. The exchange pivot angle 33 may be reached by the winding being wound-up in a desired thickness on the winding sleeve 11, i.e. a completed bobbin, and/or, may be reached manually.

In step 34 of Fig. 11 a new winding sleeve 11 is positioned on the spindle 9 and fixed thereon by a suitable fixing mechanism for transferring a future rotational movement of the spindle 9 to the winding sleeve 11.

In step 35 the traverse mechanism carrier stop device 23 is adjusted according to the specific type of winding sleeve 11 used. In the example shown in Fig. 5 the specific winding sleeve 11 has an outer diameter 47 mm. For the required adjustment the cam disc 26 is rotated such that the indicator 46, in this example, the indication "47", is visible for the operator through the elongated opening 31 of the machine housing 2. In this position of the cam disc 26 a stop element contour subsection 29j is arranged in a projection (vertical to the drawing plane of Fig. 5) behind the elongated opening 31. The rotation of the cam disc 26 can be induced by the operator by rotating a manual operation wheel 37 arranged on the front side of the machine housing 2.

[0056] In a next step 38 the braking device 13 is released and the operator pivots the traverse mechanism carrier 3 from its position at the exchange pivot angle 33 to a starting pivot angle 39 as shown in Fig. 6. When arriving the starting pivot angle 39, the journal 30 contacts the stop element contour subsection 29j so that a stop is provided which makes a further reduction of the pivot angle 12 impossible. At the starting pivot angle 39 a gap 40 is established between the outer surface of the winding sleeve 11 and the pressure roller 7.

[0057] In the next step 41 the winding product is transferred to the spindle 9 or to the winding sleeve 11 and fixed thereto. It is possible that the braking device 13 is released and the spindle 9 is rotated together with the winding sleeve 11 by triggering the start of the motor (cp. Fig. 7). A first winding process phase begins. During the first winding process phase the winding product is wound on the winding sleeve 11 thereby establishing the first windings. The gap 40 successively reduces. At the end of the first winding process phase the outer surface of the winding contacts the pressure roller 7 (cp. Fig. 8).

[0058] Due to this contact the contact force between the journal 30 and the stop element contour subsection 29j decreases so that the first winding process phase ends and the second winding process phase initiates. In the second winding process phase the outer diameter of the winding further increases so that a contact force applied to the pressure roller 7 biases the traverse mechanism carrier 3 towards an increase of the pivot angle 12. As shown in Figs. 9 and 10 the pivot angle 12 further increases until - at the end of the second winding process phase (see Fig. 10) - the winding of the bobbin has been completed.

[0059] Figs. 12 to 15 show in greater detail the design of the traverse mechanism carrier stop device 23 and that of a latching device 42 securing the traverse mechanism carrier stop device 23 in a selected position. The traverse mechanism carrier stop device 23 and the latching device 42 are shown in details XIII, XV of Figs. 13, 15.

[0060] The stop element 24 comprises a manual operation wheel 37 which can - by the operator - be pushed in axial direction and rotated about the rotational axis 27. The manual operation wheel 37 is fixedly connected with a shaft 43 (which extends through the machine housing 2) to the cam disc 44. On the side facing the rear side of the machine housing 2, the cam disc 26 comprises a protrusion 44. The machine housing 2 has recesses 45a, 45b, ... corresponding to the protrusions 44. Recesses 45a, 45b, ... are arranged along the circumference about the rotational axis 27 at positions corresponding with the desired rotational positions of the stop element 24, where the selected stop element contour subsection 29 interacts with the journal 30. In Fig. 13 the stop element 24 is pushed by the user against the bias of a spring 46 so that the protrusion 44 disengages from the recess 45. In this way, the operator is able to rotate the stop element 24 for selecting a different adjustment and operating state. When releasing the axial force from the manual operation wheel 37, the protrusion 24 enters into one of the recesses 45 due to the force applied by the spring 46 (cp. Fig. 15).

[0061] In case the protrusion 44 establishes a contact surface with the recess 45 being perpendicular to the circumferential direction of the rotational axis 27, it is necessary to push the manual operation wheel 37 in axial direction along the rotational axis 27 for allowing a rotation of the stop element 24. In this case, the latching device 42 is a locking device according to the above definition.

[0062] Instead, when the contact surface is inclined, any rotational torque applied by the user on the manual operation wheel 37 will create a downhill-slope force which biases the spring 46 towards a compression. Accordingly, by dimensioning the inclination angle, the radius of the protrusions 44 from the rotational axis 27 and the stiffness of the spring 46 it is possible to design the rotational torque that has to be applied by the operator for allowing a change of the rotational angle of the stop element 24 and for unlatching the protrusion 44 from

the recess 45j. In this case, the latching device 42 is a snap-in connection according to the above definition.

[0063] It is possible that the initiation of the driving operation of the motor for rotating the spindle 9 with the winding sleeve 11 can be triggered by a switch mechanism 47 which is actuated by the braking device 13. According to the embodiment shown the switch mechanism 47 comprises a sensor 48. The sensor 48 comprises sensor elements 49, 50. The sensor element 49 is attached to the manual actuation lever 15, whereas the sensor element 50 is attached to the transverse mechanism carrier 3 (cp. Figs. 3, 5, 8, 9 and 10). The sensor may e.g. be embodied as a hall sensor 51. In this case, one of the sensor elements 49, 50 is a permanent magnet, whereas the other sensor element 50, 49 is an electric circuit sensing the magnetic field of the permanent magnet.

[0064] When the starting pivot angle 39 of the transverse mechanism carrier 3 has been induced, it is possible to pivot the manual actuation lever 15 from the applied state of the braking device 13 (Fig. 6) into the position corresponding to the released state of the braking device 13 (cp. Fig. 7).

[0065] In this way, the distance of the sensor elements 49, 50 is reduced. If a control unit controlling the motor detects the distance of the sensor elements 49, 50 becoming smaller than a threshold, this detection can be used for triggering the start of the motor, thus, for the start of the first winding process phase.

[0066] Preferably, the braking device 13 is always and also during the winding process applied for establishing the brake torque which supports the travers mechanism carrier 3 during the winding process. However, of course, the braking device 13 is put in a released state in order to manipulate the travers mechanism carrier 3 for changing its pivoting angle about the pivot axis 4.

[0067] The European patent EP 2 436 632 B1 of the applicant discloses a winding material suction gun which can be used for capturing and transferring a continuous winding material, in particular a continuous winding yarn or thread, i.a. from a first (fully wound) spindle/winding sleeve/bobbin on a winding station of a winding machine to a second (empty) spindle/winding sleeve of the winding machine. During the winding process the winding material suction gun is parked (in particular arranged in or stored) in a holding device which is arranged close to the winding machine. The disclosure of the patent EP 2 436 632 B1 in particular relating to

- the winding material suction gun,
- the holding device,
- the use of the winding material suction gun for transferring the winding material and
- the different method steps for taking up the winding process after the transfer

is incorporated by reference into the present patent application.

[0068] In one embodiment of the present invention the actuation of the motor for driving the spindle does not only depend on the actuation of the brake device. For the actuation of the motor a winding material suction gun and a holding device, such as the ones described in EP 2 436 632 B1, may be used, in particular in situations while the machine/apparatus is in operation and running and a completed (wound) bobbin is to be exchanged by a winding sleeve on which the yarn is to be wound. The motor of the spindle can be actuated as soon as a respective gun is removed from the holding device. The holding device and/or the winding material suction gun may comprise a sensor which senses the presence, in that also the removal, of said winding material suction gun in/from the holding device. The signal of the sensor is transferred to the control device of the motor (driving the spindle). In this case the motor is only actuated by the switch mechanism when the brake device is actuated and, when the aforementioned sensor sends the signal that the winding material suction gun is and/or has been removed from the holding device.

[0069] In another embodiment without the use of a winding material suction gun and the associated holding device, it is (alternatively or cumulatively) possible that the winding machine, e.g. on the front side of a machine frame or even on the traverse mechanism carrier, comprises an additional manual switch to actuate the motor in order to drive the spindle and/or to deactivate the motor so that by manual actuation of the additional manual switch by the user it is possible to bypass the switching of the motor by the actuation of the brake device.

[0070] Nevertheless, in usual cases, whether to initiate the winding process of the machine/the apparatus and/or whether after an exchange of the winding sleeve to produce a new bobbin and/or whether after correcting an erroneous winding or a malfunctioning of the winding process during a winding process, e.g. due to a rupture of a yarn or an unwished winding, the braking device, preferably the manual actuatable device, and/or the switch mechanism is used for actuating the motor for the spindle. It goes without saying that the braking device in connection with the switch mechanism works vice versa, i.e. the braking device when manipulated (by an operator), thereby actuating the switch mechanism, slows down/stops the motor driving the spindle, which may be done at any process stage of the winding machine and/or apparatus, i.a. for the purposes just mentioned.

LIST OF REFERENCE NUMERALS

[0071]

- | | |
|---|----------------------------|
| 1 | winding machine |
| 2 | machine housing |
| 3 | traverse mechanism carrier |
| 4 | pivot axis |
| 5 | traversing guide |
| 6 | traversing movement |

7	pressure roller	
8	rotational axis	
9	spindle	
10	spindle axis	
11	winding sleeve	5
12	pivot angle	
13	braking device	
14	manual actuation element	
15	manual actuation lever	
16	brake actuation shaft	10
17	brake actuation element	
18	brake actuation lever	
19	brake pad or chock	
20	shaft axis	
21	brake ring segment	15
22	brake surface	
23	traverse mechanism carrier stop device	
24	stop element	
25	counter stop element	
26	cam disc	20
27	rotational axis	
28	stop element contour	
29	stop element contour subsection	
30	journal	
31	elongated opening	25
32	method step	
33	exchange pivot angle	
34	method step	
35	method step	
36	indicator	30
37	manual operation wheel	
38	method step	
39	starting pivot angle	
40	gap	
41	method step	35
42	latching device	
43	shaft	
44	protrusion	
45	recess	
46	spring	40
47	switch mechanism	
48	sensor	
49	sensor element	
50	sensor element	
51	hall sensor	45

Claims

1. A winding machine (1) comprising

- a) a spindle (9),
- b) a traverse mechanism carrier (3),
- c) a pressure roller (7) and
- d) a machine housing (2),
- e) the traverse mechanism carrier (3) being supported for being pivoted about a pivot axis (4) by the machine housing (2), the traverse mechanism carrier (3) supporting the pressure

roller (7) for being rotated about a rotational axis (8), the pressure roller (7) being configured for establishing a rolling contact with a winding wound on a winding sleeve (11) arranged on the spindle (9), and the traverse mechanism carrier (3) being pivoted about the pivot axis (4) when the diameter of the winding increases during the winding process,

f) wherein a starting pivot angle (39) of the traverse mechanism carrier (3) is defined by a stop element (24),

characterized in that

g) the stop element (24) comprises a stop element contour (28) with at least two stop element contour subsections (29) defining different starting pivot angles (39) of the traverse mechanism carrier (3) and the stop element (24) is supported for being moved into different positions for activating the different stop element contour subsections (29) and for defining the corresponding different starting pivot angles (39).

2. The winding machine (1) as claimed in claim 1, **wherein** the traverse mechanism carrier (3) comprises a counter stop element (25) which is supported by one of the stop element contour subsections (29) at the start of a winding process, wherein in particular a supporting force of the counter stop element (25) on the stop element contour subsection (29) has an orientation perpendicular to the stop element contour subsection (29).

3. The winding machine (1) as claimed in one of the preceding claims, **wherein**

- a) the stop element (24) is a manually moveable stop element (24) and/or
- b) the stop element (24) is a rotatable stop element (24).

4. The winding machine (1) as claimed in claim 3 with variant b), **wherein** the rotatable stop element (24) comprises a cam disc (26), the radial outer surface forming the stop element contour (28) with the at least two stop element contour subsections (29), wherein the at least two stop element contour subsections (29) have different radii from the rotational axis (27) of the cam disc (26).

50 5. The winding machine (1) as claimed in claim 4, **wherein** the stop element (24) comprises

- a) a manual operation wheel (37),
- b) the cam disc (26) and
- c) a shaft (43) connecting the manual operation wheel (37) and the cam disc (26),

wherein the manual operation wheel (37) and the

cam disc (26) are arranged on different sides of the machine housing (2) and the shaft (43) extends through the machine housing (2).

6. The winding machine (1) as claimed in one of the preceding claims, **wherein** a latching device (42) is provided which secures a position of the stop element (24). 5
7. The winding machine (1) as claimed in one of the preceding claims, **wherein** the stop element (24) or cam disc (26) comprises position indicators (36). 10
8. The winding machine (1) as claimed in one of the preceding claims, **wherein** 15
 - a) a braking device (13) is provided which in an applied state supports the traverse mechanism carrier (3) on the machine housing (2) by a braking torque, 20
 - b) the braking device (13) is actuated by an actuation shaft (16) and
 - c) the actuation shaft (16) carries or comprises the counter stop element (25). 25
9. The winding machine (1) as claimed in one of the preceding claims, **wherein** 30
 - a) a motor is provided which is actuated by a switch mechanism (47) and
 - b) a braking device (13) is provided,
 - c) the braking device (13) applies a braking torque on the traverse mechanism carrier (3) about the pivot axis (4) and
 - d) the switch mechanism (47) is actuated by the braking device (13). 35
10. The winding machine (1) as claimed in claim 9, **wherein** the braking device (13) is a manually actuable braking device (13), the braking device (13) preferably comprising a manual actuation element (14) and the switch mechanism (47) sensing a position of the manual actuation element (14), wherein in particular the switch mechanism (47) senses a position of the manual actuation element (14) relative to the traverse mechanism carrier (3). 40 45
11. The winding machine (1) as claimed in claim 10, **wherein** the manual actuation element (14) is a manual actuation lever (15). 50
12. The winding machine (1) as claimed in one of the preceding claims, **wherein** the switch mechanism (47) comprises a hall sensor (51). 55
13. The winding machine (1) as claimed in claim 10 or 11, **wherein** the manual actuation element (14) comprises an actuation region with

- a) a first actuation subregion wherein the position of the manual actuation element (14) correlates with the created braking torque and
- b) a second actuation subregion wherein braking torque is zero or constant and the change of the position of the manual actuation element (14) switches the switch mechanism (47).

14. The winding machine (1) as claimed in claim 9 or one of claims 10 to 13 directly or indirectly referring back to claim 9, **wherein**

- a) the winding machine (1) comprises a winding material suction gun which is parked in a holding device,
- b) a sensor is provided which senses a removal of the winding material suction gun from the holding device and
- c) the switch mechanism (47) is only actuated by the braking device (13) when the sensor signals that the winding material suction gun is absent from the holding device.

15. A winding apparatus comprising a plurality of winding machines (1) as claimed in one of the preceding claims.

16. A method for operating a winding machine (1), in particular a winding machine (1) as claimed in one of claims 1 to 14, the method comprising the following method steps:

- a) pivoting a traverse mechanism carrier (3) about a pivot axis (4) to an exchange pivot angle (33);
- b) selecting one stop element contour subsection (29j) of a at least two stop element contour subsections (29), the selected stop element contour subsection (29j) being specific for a specific winding process or a specific winding sleeve (11);
- c) moving a stop element (24) into a position wherein the selected stop element contour subsection (29j) is effective;
- d) arranging a winding sleeve (11) on a spindle;
- e) pivoting a traverse mechanism carrier (3) about the pivot axis (4) from an exchange pivot angle (33) to a starting pivot angle (39), the starting pivot angle (39) being defined by the stop element (24) wherein when the traverse mechanism carrier (3) is pivoted into the starting pivot angle (39) a pressure roller (7) establishes a defined gap (40) with an outer surface of the winding sleeve (11),
- f) starting the winding process wherein

- fa) in a first winding process phase the traverse mechanism carrier (3) is supported

on the stop element (24) and the outer diameter of the winding increases whereas the gap (40) between the pressure roller (7) and the winding reduces to zero and
fb) in a subsequent second winding process 5
phase the outer diameter of the winding further increases and the traverse mechanism carrier (3) is no longer supported on the stop element (24) but the traverse mechanism carrier (3) moves away from the stop 10
element (24).

17. The method as claimed in claim 16, **wherein** the winding process is started by an actuation of a braking device (13). 15

18. A traverse mechanism carrier stop device (23) useable in a winding machine (1) for defining a starting pivot angle (39) of a traverse mechanism carrier (3), the traverse mechanism carrier stop device (23) 20
comprising

a) a stop element (24) which comprises a stop element contour (28) with at least two stop element contour subsections (29) defining different 25
starting pivot angles (39) of the traverse mechanism carrier (3), the stop element (24) being supported for being moved into different positions for activating the different stop element contour subsections (29) and for defining the 30
corresponding different starting pivot angles (39) and
b) a counter stop element (25) which is supported by one of the stop element contour subsections (29) at the start of the winding process 35
for defining the corresponding different starting pivot angle (39).

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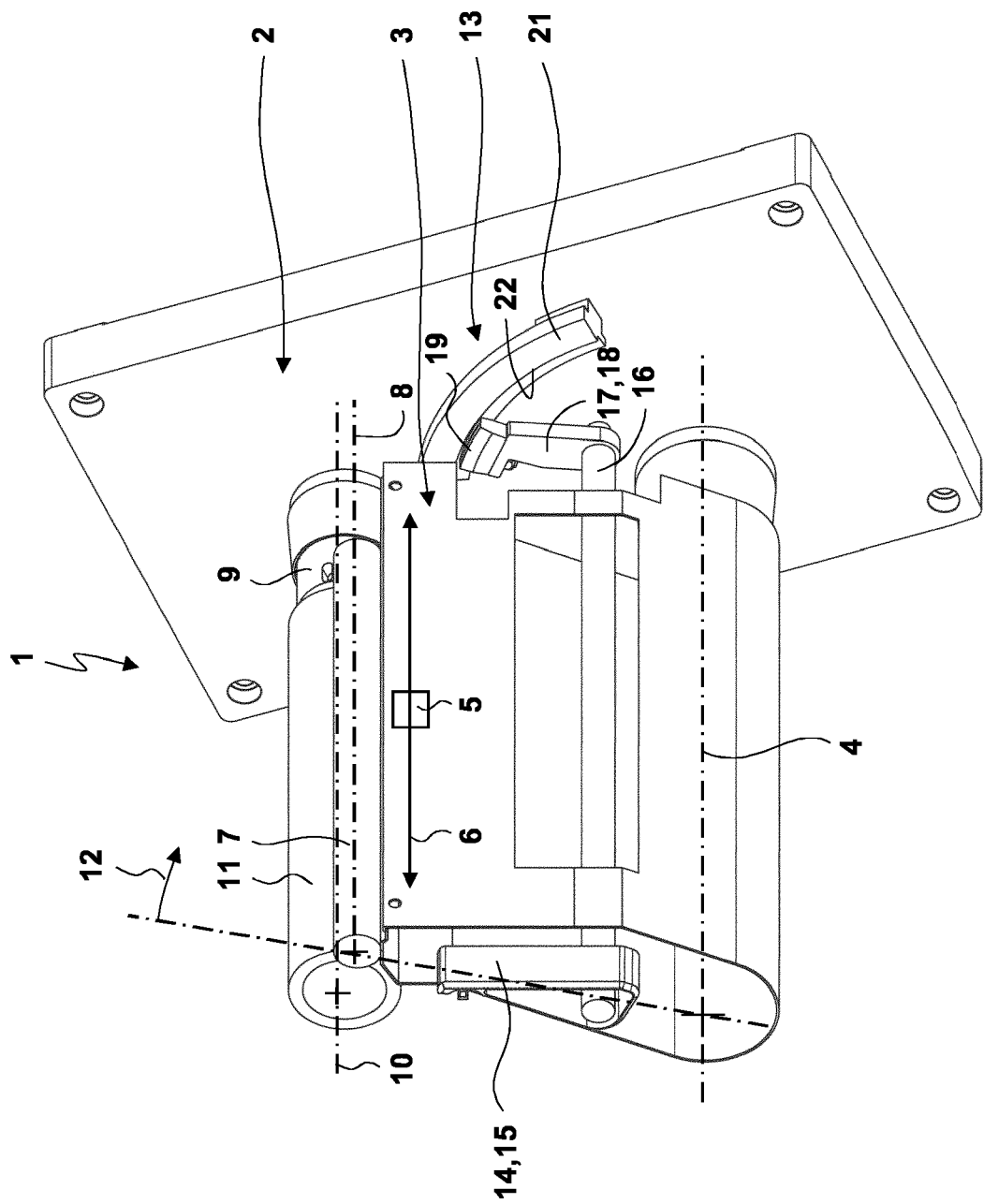


Fig. 1

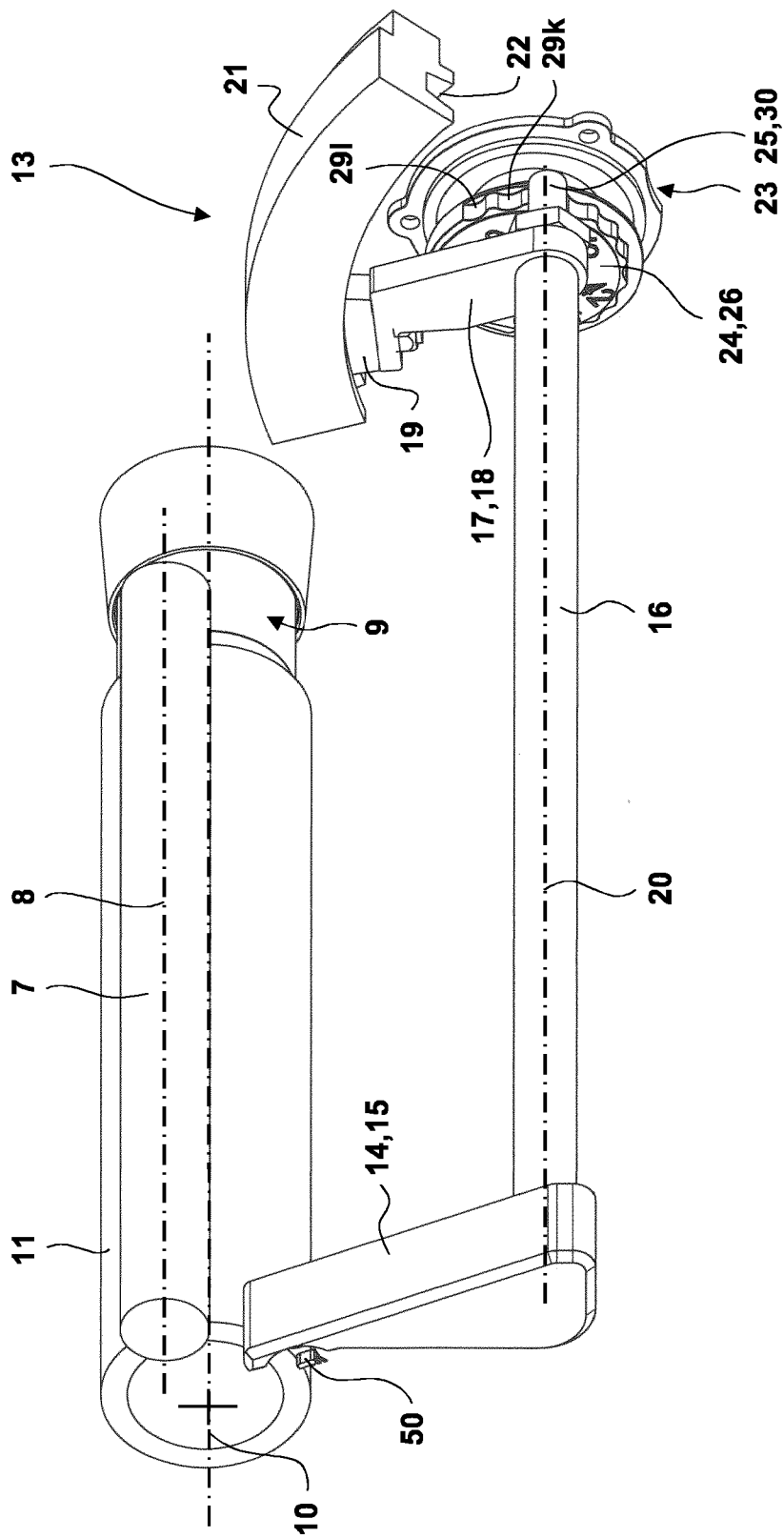


Fig. 2

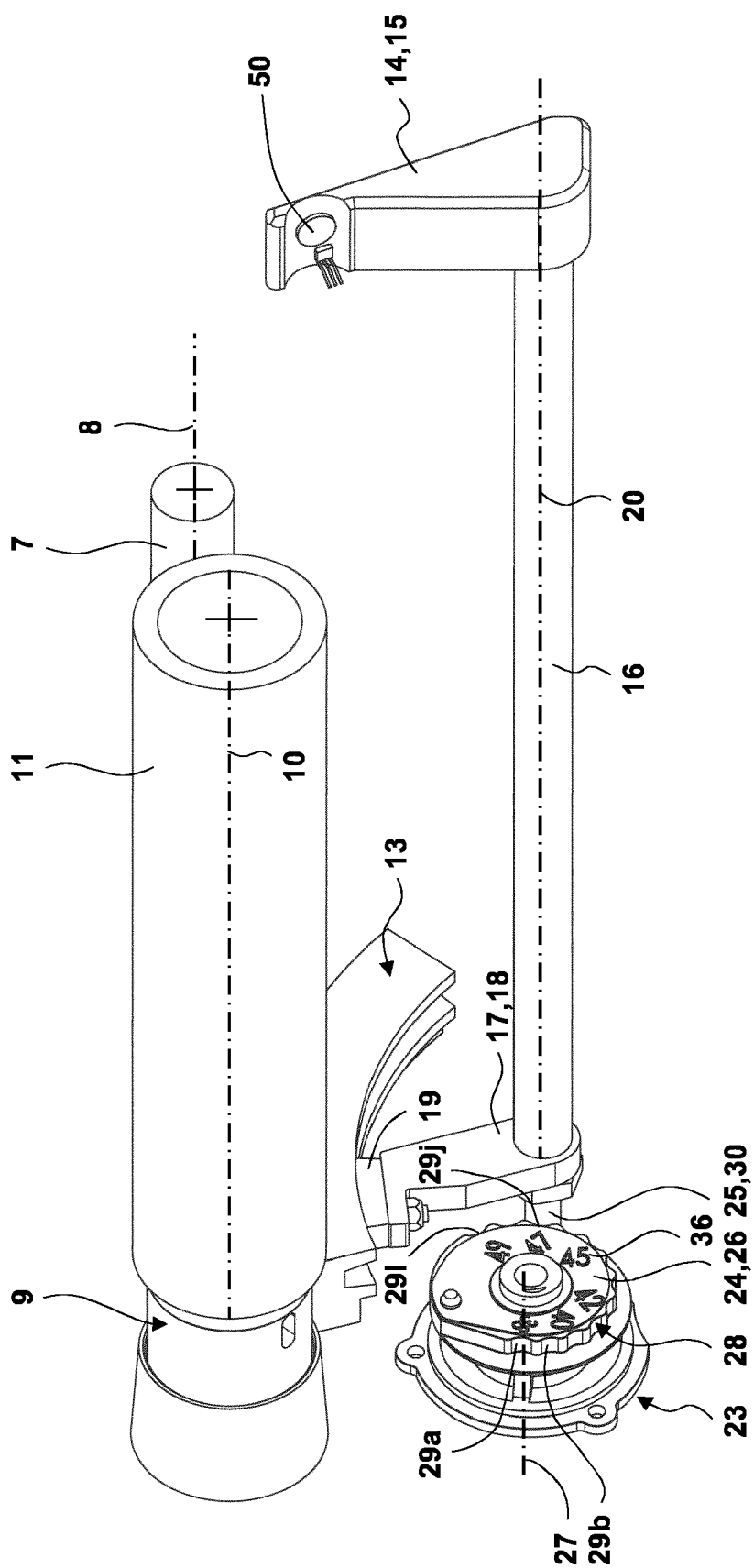


Fig. 3

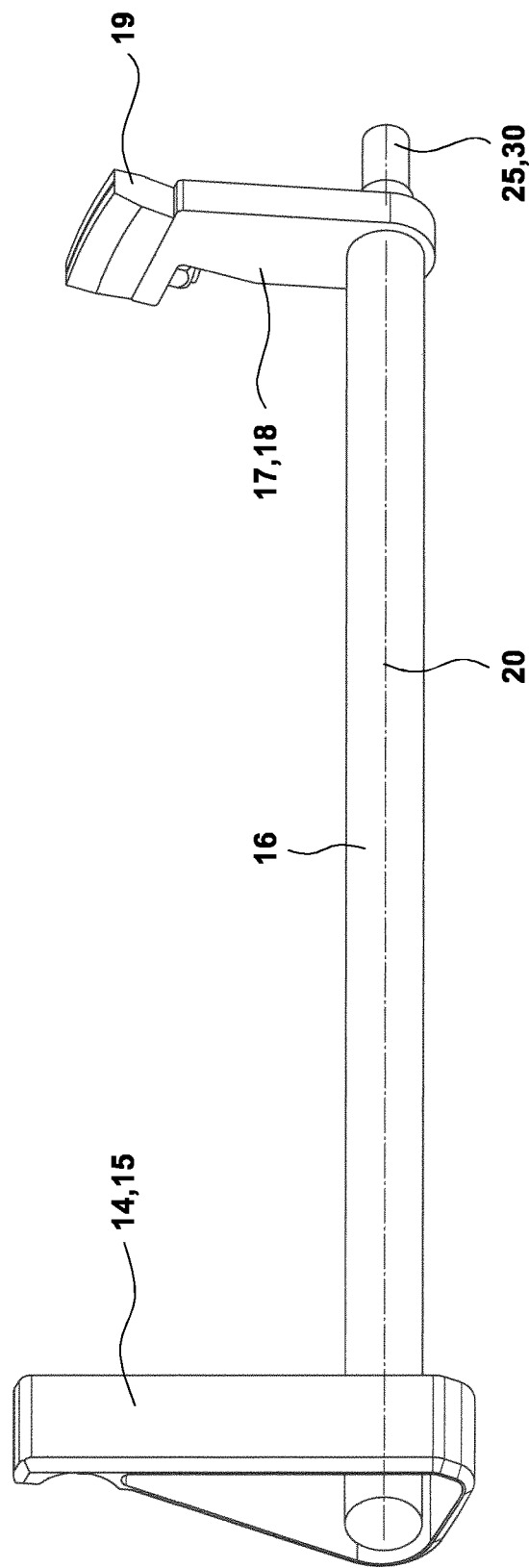


Fig. 4

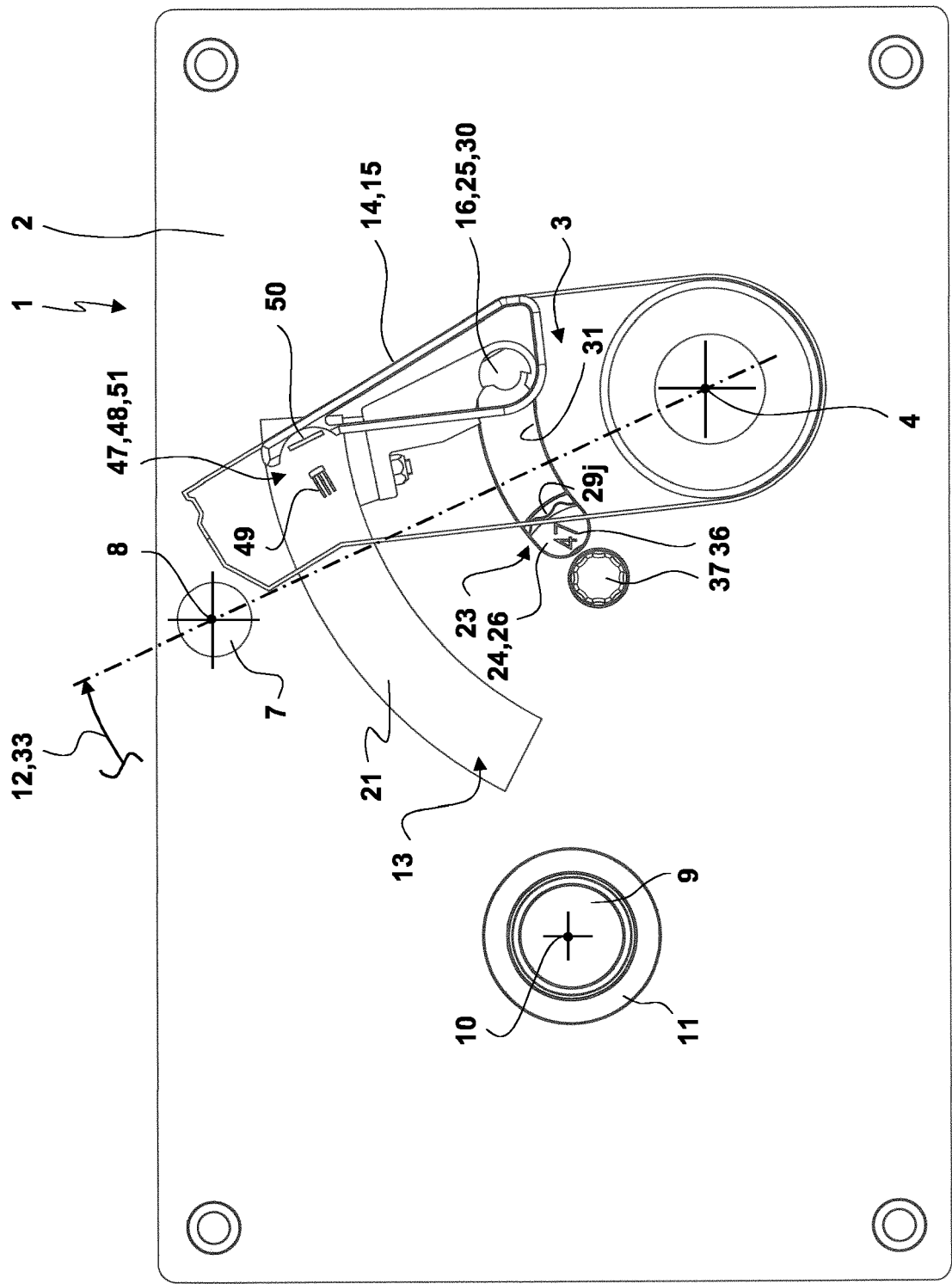


Fig. 5

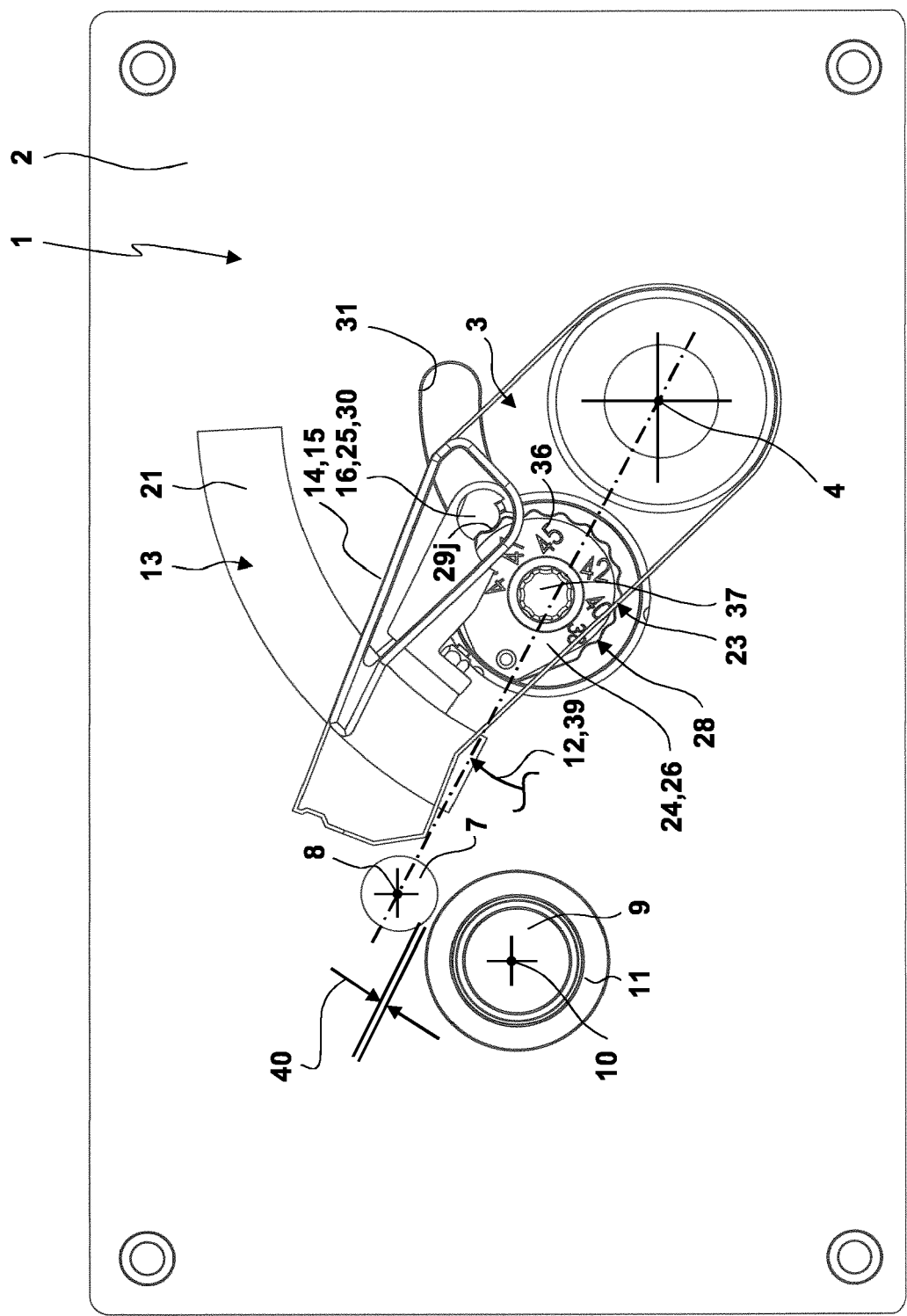


Fig. 6

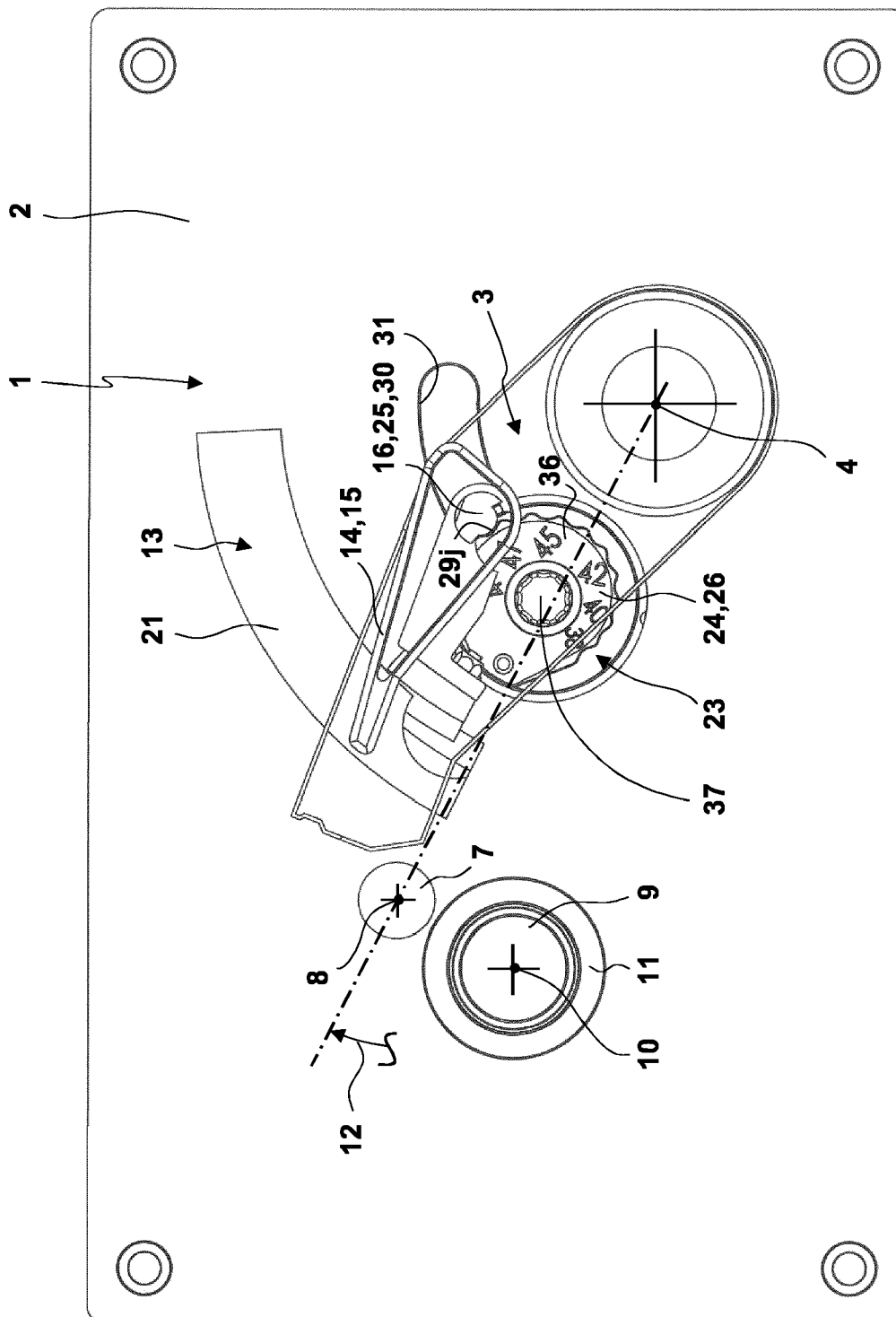


Fig. 7

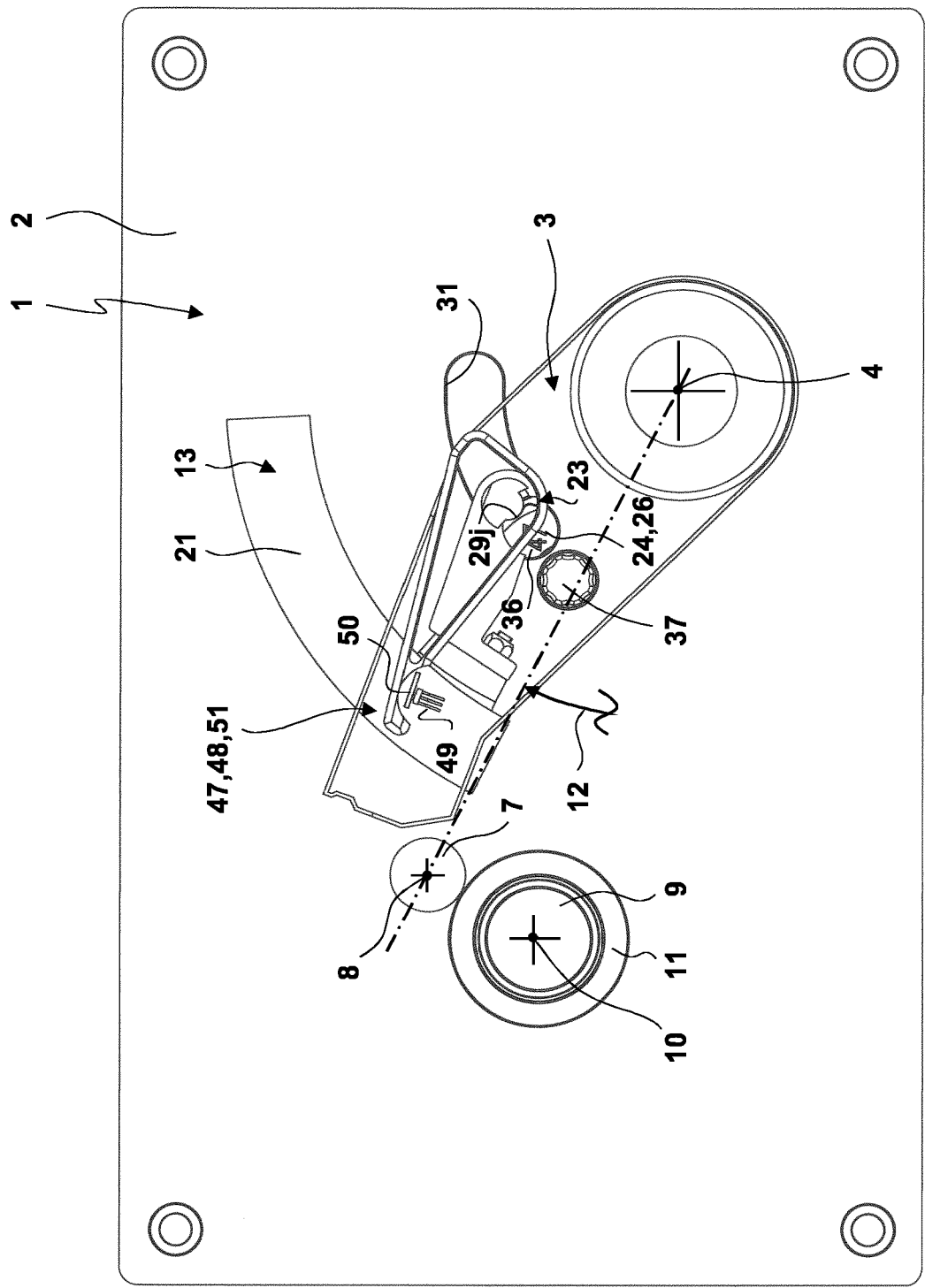


Fig. 8

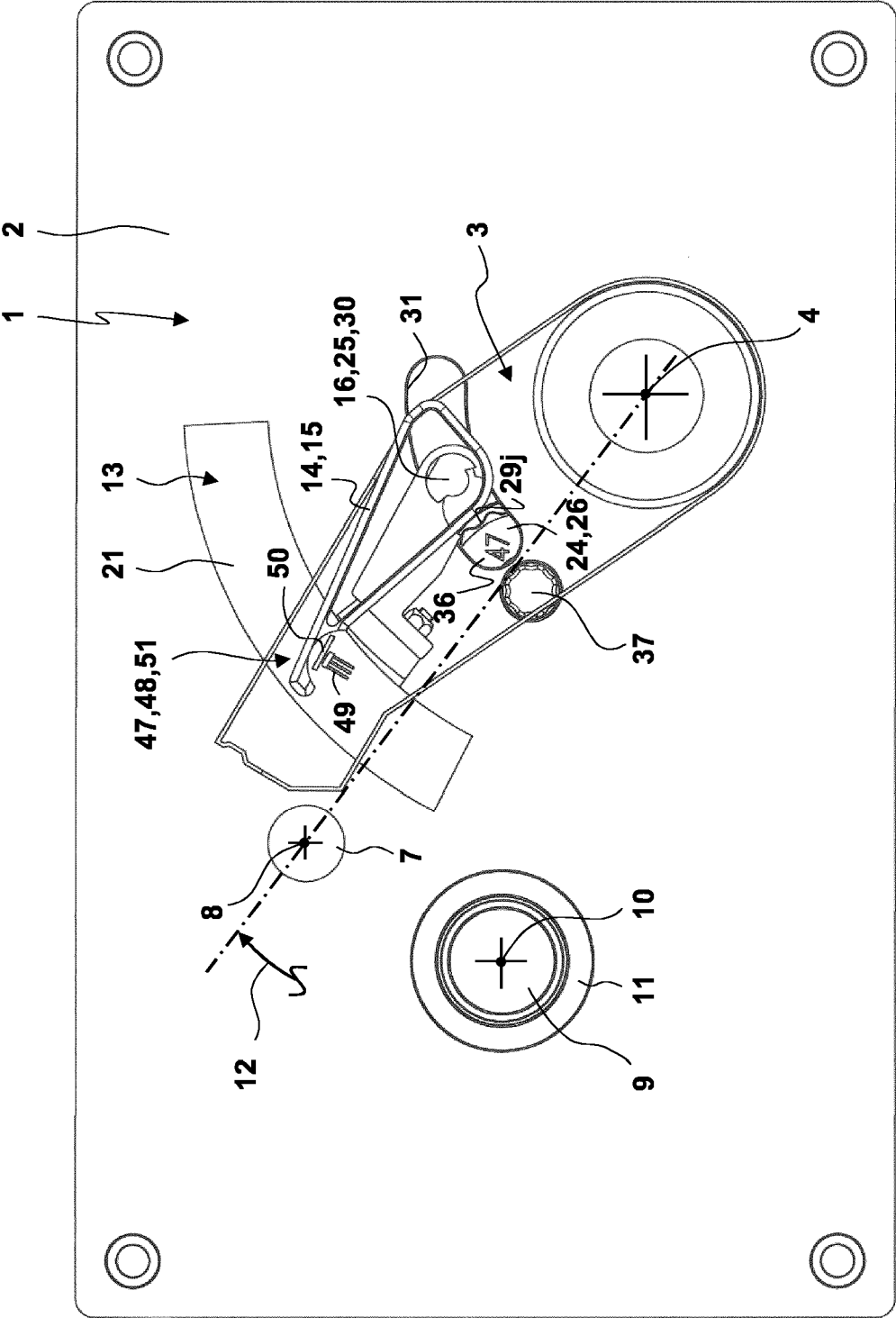


Fig. 9

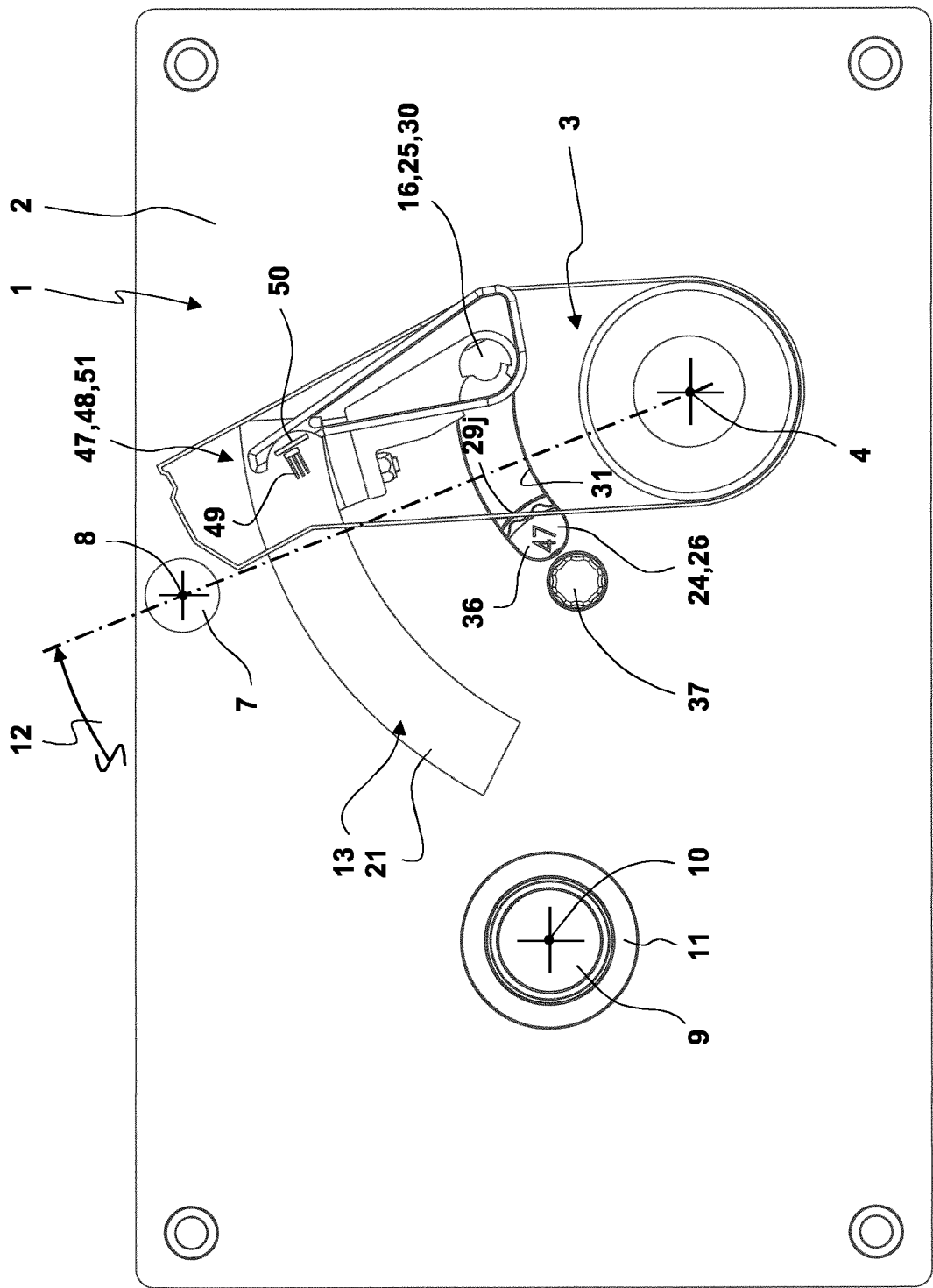


Fig. 10

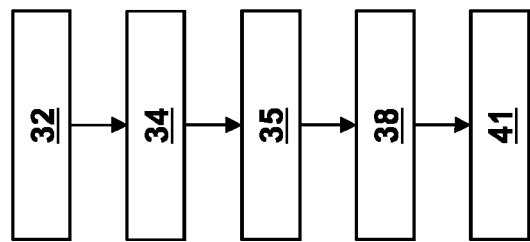


Fig. 11

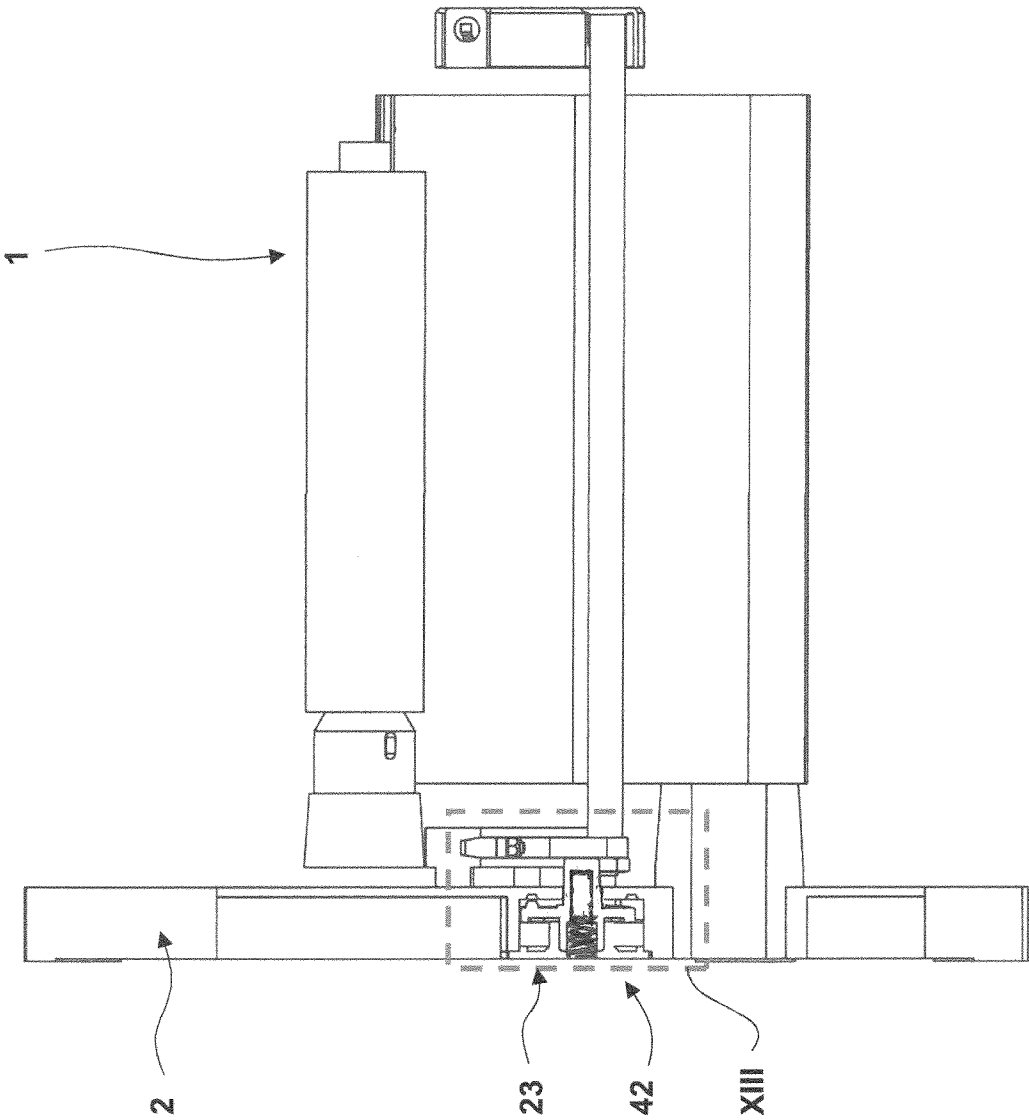


Fig. 12

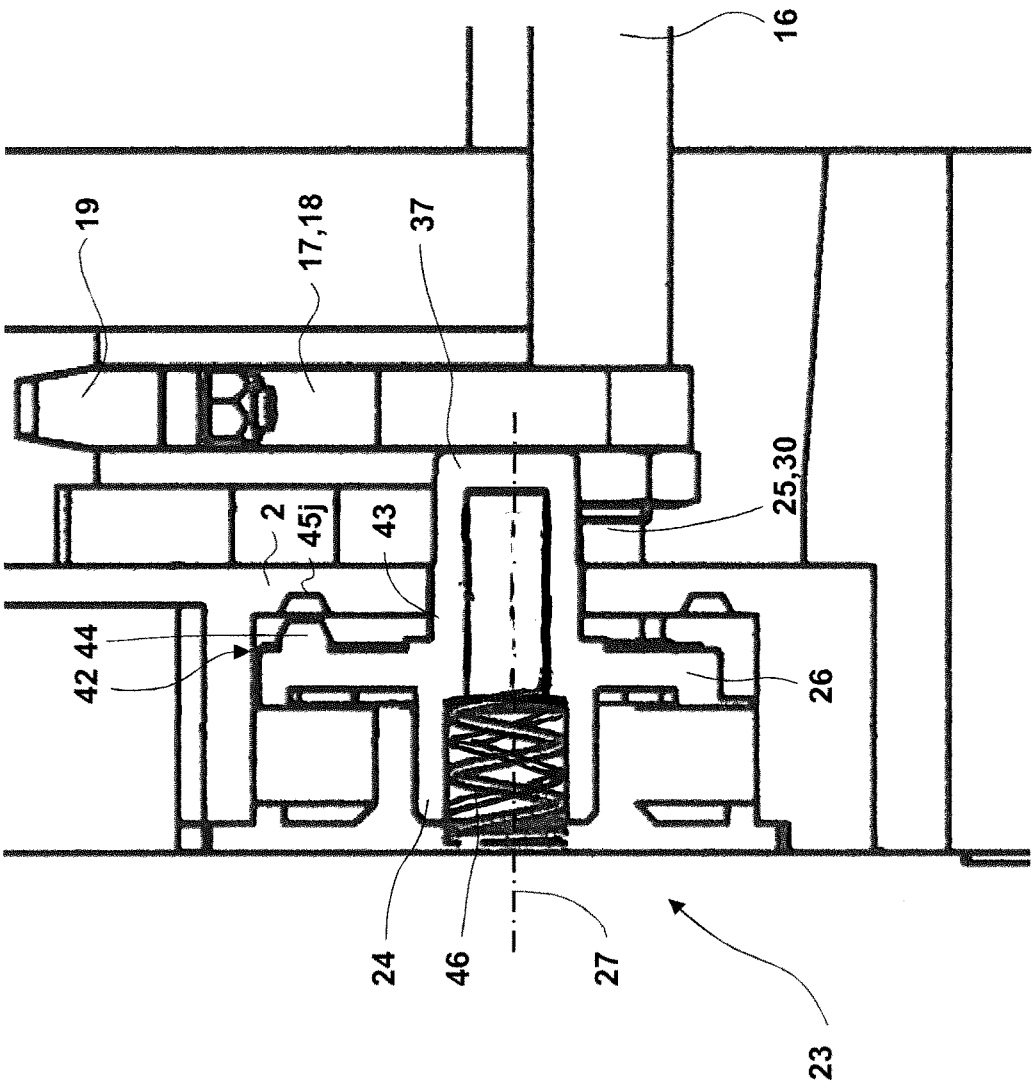


Fig. 13

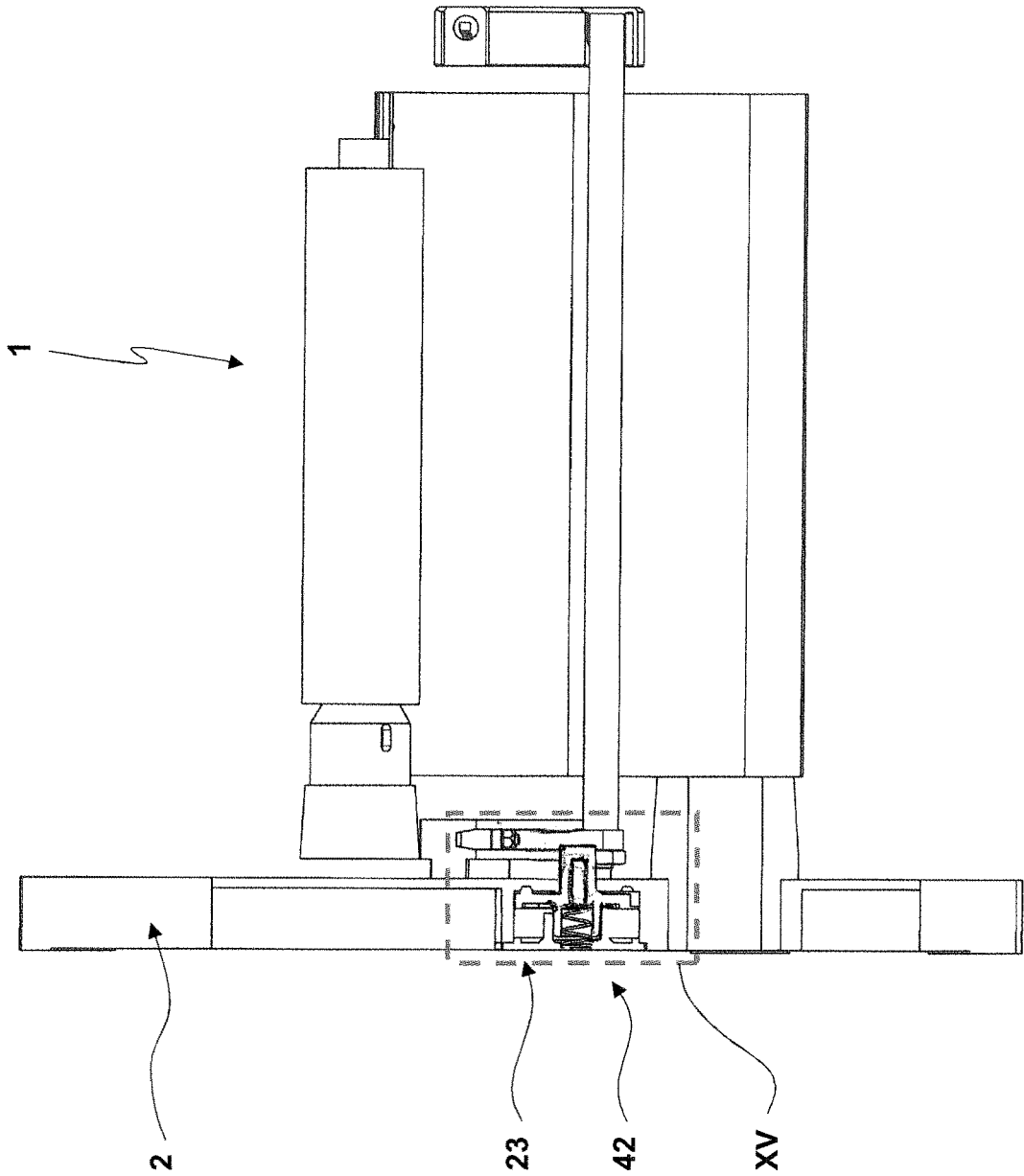


Fig. 14

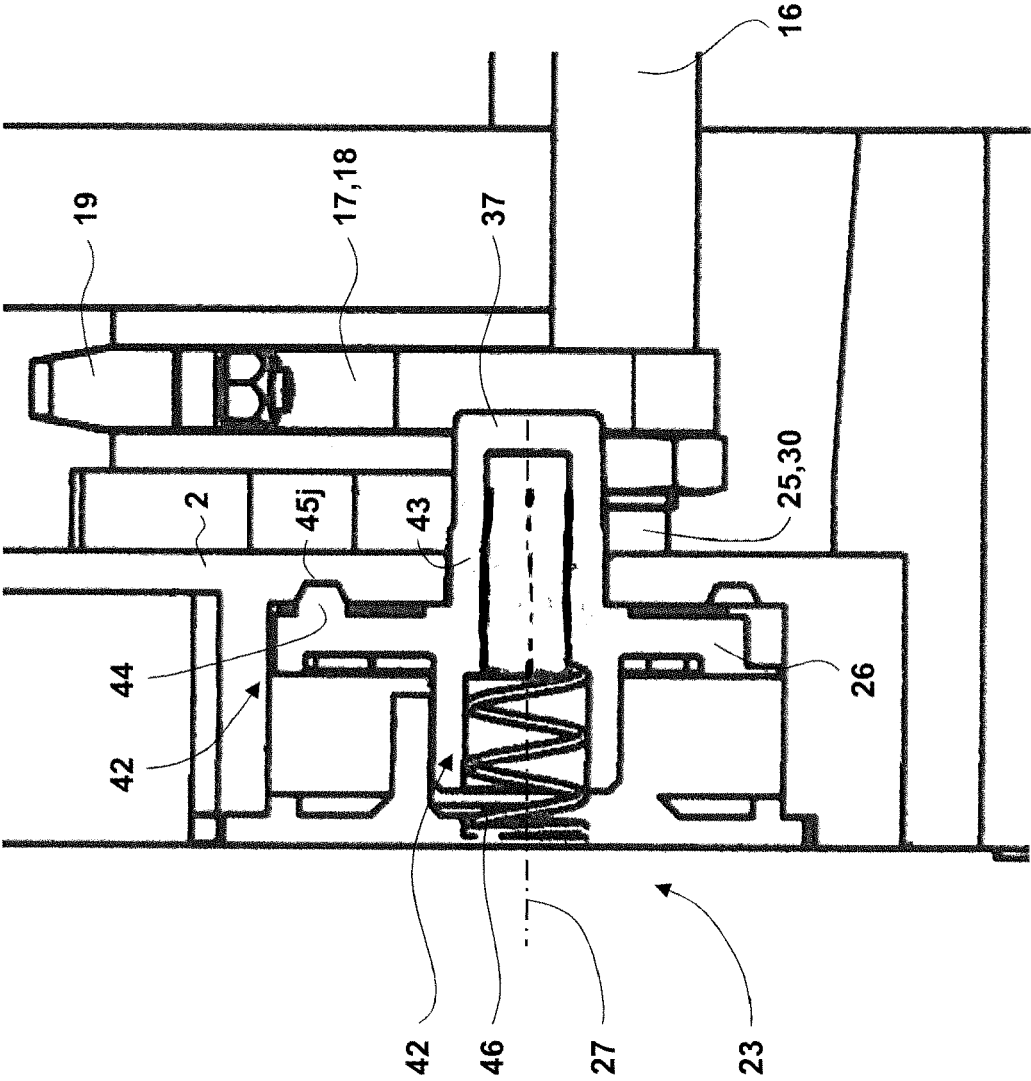


Fig. 15



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Application Number

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 October 2024	Examiner Guisan, Thierry
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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