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(54) Feeder for a tufting device

(57) A device (1) for feeding an apparatus for applying tufting straps (P) to a mattress (M) with disks (D1, D2) for backing the tufting straps, the device comprising a support (2), a channel (3) which is formed in the support for guiding at least one tape (N) unwound from a reel in order to form the backing elements of the tufting straps of the mattress, the channel (3) having an outlet connected to the apparatus, an advancement element (3a) for the advancement of the tape along the channel (3) by a preset step, and a cropping element (37) for cropping the tape at each step and forming disks (D1, D2) whose length (L) substantially matches the step.

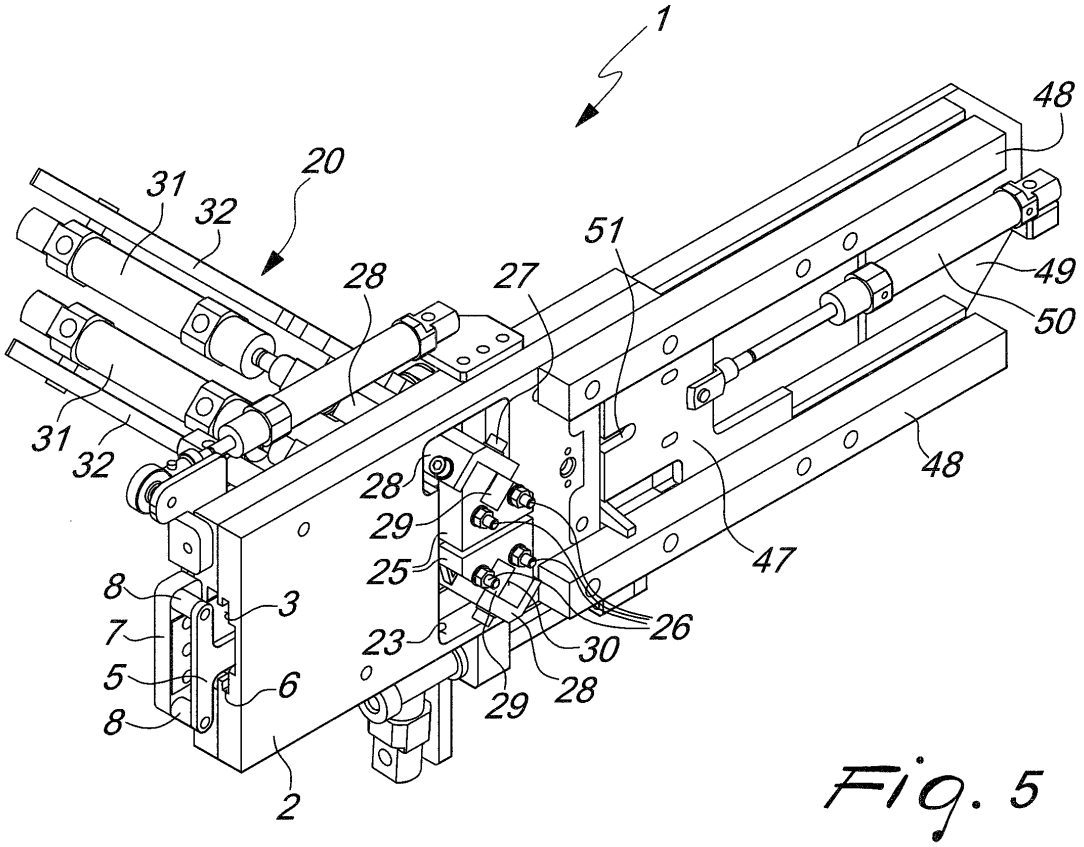

Fig. 5

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Description

[0001] The present invention relates to a device for feeding an apparatus for applying tufting straps to a mattress with disks for backing said tufting straps.

[0002] As is known, mattresses, in order to prevent excessive swelling caused by the pressure of the internal springs on the surface filling layers, are kept flat by a plurality of retention elements (termed "tufting straps" hereinafter for the sake of convenience in description), one of which is shown for the sake of clarity in Figure 1 of the accompanying drawings.

[0003] In said figure, the tufting strap is designated by the reference letter P and comprises a tension element T, which consists of a tape provided, at its ends, with two tags S1, S2. Tufting straps of this type are known for example from British patents 903,464, 910,253, 1,474,241, and 1,541,077 and from publications WO 98/04495 and EP-1,167,279.

[0004] The tufting straps are inserted through the mattress by means of suitable manually-actuated needles, as disclosed in the cited British patent 903,464 and in publication WO 98/04495, or by means of automatic devices, such as the ones disclosed in EP-844,210 and EP-1,253,107 in the name of the same Applicant.

[0005] In these devices, the needle performs a stroke for penetrating through the mattress, by means of which it draws with it the tension element T and a tag S1. When, at the end of the stroke, the tag S1 exits, it is released by the needle so that the two tags rest against the opposite faces of the mattress.

[0006] In order to prevent the mattress from tearing or being damaged by the friction of the tags thereon during use, protective elements constituted by disks, often termed "tufts" and acting as backing elements, are arranged between the tags and the surfaces (outer cover) of the mattress. These disks have various shapes (circular, polygonal, annular, and so forth) and are mostly made of felt or other suitable material.

[0007] In known apparatuses, the disks are arranged in a pack within a container and are taken individually by means of appropriate devices designed so as to transfer individual disks in alignment with the needle, which passes through them when it is actuated in order to apply the tufting straps in the mattress.

[0008] Known devices for feeding disks have substantial drawbacks. First of all, the containers of the disks have a limited capacity and must be replaced frequently with other full ones. This entails loading times which have a negative effect on the production process.

[0009] Further, known devices are unable to superimpose a plurality of disks in order to provide more complex backing elements.

[0010] The aim of the present invention is to provide a device which is capable of obviating the above-mentioned operating limitations of the ones currently in use, i.e., has an incomparably longer disk feeding period without stops for refilling.

[0011] Within this aim, an object of the present invention is to provide a device which operates reliably and is highly flexible in use as regards the possibility to feed disks of various sizes.

[0012] This aim and this and other objects which will become better apparent hereinafter are achieved with a device for feeding an apparatus for applying tufting straps to a mattress with disks for backing said tufting straps, characterized in that it comprises a support, a channel which is formed in said support for guiding at least one tape unwound from a reel in order to form the backing element of the tufting straps of the mattress, said channel having an outlet connected to said apparatus, means for the advancement of said tape along said channel by a preset step, and means for cropping said tape at each step and forming disks whose length substantially matches said step.

[0013] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of a preferred embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective, schematic view, showing a tufting strap as it is applied to a mattress;
Figure 2 is a perspective view of a tape and of the disks cut from said tape in order to form the backing elements of the tufting straps of a mattress;
Figure 3 is a perspective view of the device, taken from one side;
Figure 4 is a perspective view of the device, taken from the opposite side with respect to Figure 3;
Figure 5 is a bottom perspective view of the device of Figures 3 and 4;
Figure 6 is a sectional side elevation view;
Figure 7 is an enlarged-scale view of a detail of the device in an operating step which follows the cropping of a disk and directly precedes the insertion of a tufting strap through said disk;
Figure 8 is a sectional view, taken along the line VIII-VIII of Figure 6; and finally
Figure 9 is a schematic view of a variation of the device.

[0014] With reference to Figure 1, the reference signs D1 and D2 designate two disks, which after a tension element T has been inserted through a mattress M, are arranged between the respective tags S1 and S2 and the adjacent opposite faces of the mattress, so as to perform their function of protecting and backing the region against which the tags rest.

[0015] The disks D1 and D2 are obtained, by means of two respective devices according to the present invention, from respective tapes of felt material or the like unwound from feeder reels. For the sake of brevity in description, with reference to Figures 1-8, only the device designed to form and feed the disks D1 is described, the other device designed to form the disks D2 being sub-

stantially identical.

[0016] Further, it is assumed that said device, generally designated by the reference numeral 1 in Figures 3-6, is arranged on the side of the mattress on which the tufting strap insertion apparatus is installed. Said apparatus is not illustrated and described because it is not relevant to the present invention and is in any case known from the cited EP publications of the Applicant.

[0017] In the illustrated example, the tape for forming the disks D1 is designated by the reference letter N and is composed of two tapes N1 and N2, taken from respective reels and mutually superimposed longitudinally, one at the center of the other, so that the edges of the tape N2 protrude laterally from the edges of the tape N1.

[0018] The device 1 according to the invention imparts to the tape N a stepwise advancement motion in the direction A toward the apparatus for inserting tufting straps. During this movement, the device, by means of appropriate cutting elements, described in greater detail hereinafter, forms on the edges of the tapes N1 and N2 pairs of mutually opposite V-shaped notches R at which an appropriately provided cropping blade then cuts the disks D1, so that said disks have the substantially square shape with beveled corners shown in Figure 2.

[0019] The disks may of course be shaped in any manner depending on the shape of the cutting elements which form the notches R.

[0020] The device 1 (see Figures 1-7) is composed of a base plate 2, which acts as a support for all the components of the device. The plate 2 is provided with a channel 3 (see Figure 6), which is open upward and lies along the direction A and has a cross-section which is complementary to the cross-section of the tape N, i.e., composed of a portion having a cross-section which is complementary to the cross-section of the tape N1 and a portion which is complementary to the cross-section of the tape N2. The channel 3 constitutes the guide along which the tape N is fed toward the tufting strap insertion apparatus by means 3a for advancement in the direction A.

[0021] A slider 4 can slide in the channel 3 and is composed of a laminar sliding block 5, which is guided in grooves 6 (see Figure 5) of the channel 3, and of a block 7, which is fixed to one end of the sliding block 5 with the interposition of spacers 8. The block 7 is provided with a portion 7a which lies within the channel 3 parallel to the laminar sliding block 5. A plate 9 and respectively an elastic lamina 10, which adheres below the portion 7a, are fixed above and below the block 7. The distance between the lamina 10 and the sliding block 5 is such as to form a longitudinal passage 8a, along which the tape N can advance. The elastic lamina 10 cantilevers out from the block 7 to which it is fixed with one end, so that it can flex with its other end 11 until it touches the sliding block 5.

[0022] An L-shaped element 12 is fixed above the plate 9, and a pneumatic jack 13 is mounted vertically thereon. The stem 14 of the jack 13 protrudes downward, passing through a slot 15 of the plate 2 and a hole 16 of the portion 7a of the block 7.

[0023] The stem 14, through the hole 16, can act on the elastic lamina 10 in order to push its end 11 on the tape N, so as to clamp it against the sliding block 5, allowing its traction when the slider 4 is actuated in order to produce the advancement of the tape N along the channel 3 toward the tufting strap insertion apparatus.

[0024] The slot 15 is elongated in the direction A of the channel 3 in order to allow the stem 14 to continue to act on the lamina 10 and keep the tape N clamped against the sliding block 5 during the advancement strokes of the slider 4.

[0025] The slider 4 is actuated with a back-and-forth motion along the channel 3 by means of a horizontal jack 17, in which the cylinder is rigidly coupled to a bracket 18 which is rigidly coupled to the base plate 2 and the stem is rigidly coupled to an arm 19 of the plate 9.

[0026] Downstream of the jack 13 there is a cutting assembly, generally designated by the reference numeral 20, which is intended to provide on the tape N mutually opposite notches R which form the contour of the disk D1. The cutting assembly 20 comprises a plate 21, which is fixed in a bridge-like manner by way of screws 22 (see Figures 3, 4) above a rectangular opening 23 of the base plate 2 and is provided with two lateral recesses 24 which give it an H-like shape. Two triangular bodies 25 are fixed below the H-shaped plate 21 by means of bolts 26, and two respective bars 28 which rise vertically through the opening 23 are rigidly coupled to said triangular bodies by means of screws 27. The bars 28 have a right-angled cross-section and form, with their internal faces, a sliding surface for two respective cutters 29 which have a rectangular cross-section.

[0027] The cutters 29 are guided not only by the bars 28 but also in through seats 30 of the triangular bodies 25 and are actuated with a reciprocating motion by way of respective vertical pneumatic jacks 31. The jacks 31 are rigidly coupled by means of their cylinders to the top of straps 32 which are fixed as an extension of the bars 28.

[0028] As shown more clearly in Figure 7, the cutters 29 have, along one edge, recesses 33, which form two cutting profiles 34 arranged at 90° and opposite each other. The cutters 29 cooperate with stationary complementary cutters 35, which are fixed above the triangular bodies 25. The complementary cutters 35 have cutting profiles which are arranged at 90° and are suitable to produce a scissor-like effect together with the cutting profiles 34 of the cutters 29 when they are lowered so as to form the V-shaped cuts which form the notches R.

[0029] It should be noted, as shown more clearly in Figure 7, that the channel 3 for the advancement of the tape N is aligned between the cutting profiles 34 of the cutters 29 and the cutting profiles of the complementary cutters 35, and that the distance of the cutters 29 and the complementary cutters 35 with respect to a longitudinal centerline plane Z of the device can be adjusted by moving the triangular bodies 25 along the slots 36 (see

Figures 3, 4) through which the screws 26 that fix the triangular bodies 25 to the H-shaped plate 21 are driven.

[0030] Downstream of the cutting unit 20 there are, in series, the unit 37 (see Figures 3, 4, 6) intended to crop the disks D1 from the remaining part of the tape N and the unit 38 (see Figures 5, 6) which acts as a contrast element in order to allow the disks D1, D2 to be crossed by the needle which must physically apply the tufting straps to the mattress M.

[0031] The cropping unit 37 is composed of a movable blade 39 and a stationary blade 40. The movable blade 39 is fixed to the end of a lever 41, which oscillates on a plane which is perpendicular to the advancement direction A of the tape N. The lever 41 is articulated about a pivot which is supported by two bodies 42, which cantilever out from the plate 2 to which they are fixed. An L-shaped arm 43 is rigidly coupled to the lever 41 and is normal thereto, and blade actuation means comprising the stem of a jack 44 is pivoted to the top of said arm, the cylinder of said jack being rigidly coupled to an L-shaped element 45, which is fixed to the body 42.

[0032] The stationary blade 40 is fixed to the outlet of the channel 3 and, in order to provide perfect functional contact with the movable blade 39, the lever 41 has a certain axial play about its articulation pivot, which is sufficient to allow the movable blade 39 to adhere to the stationary blade 40 by means of elastic means comprising a pusher spring 46.

[0033] The contrast unit 38 (which more specifically is functionally associated with the tufting strap insertion apparatus) is composed of a slider 47, which can slide in a pair of guides 48 which are fixed in a cantilevered arrangement under the plate 2 and lie parallel to the direction A. The ends of the guides 48 are mutually connected by a plate 49, below which the cylinder of an actuation jack 50 is rigidly coupled, its stem being connected to the slider 47 so as to be able to give it a back-and-forth motion.

[0034] The slider 47 is provided with a slot 51 and can be moved, by means of the jack 50, between an extended position, which lies below an opening 52 of the plate 2, and a retracted position. The opening 52 is designed to allow the passage in the direction B of the piercing needle 53 (see Figure 7) for the insertion of the tufting straps P through the mattress and of the tag S1 to be positioned on the disk D1. In the extended position, the slider 47 acts as a support for the disk D1 and as a contrast element for the needle 53, which once it has been lowered through the opening 52 can pierce the disk D1, already cropped by the blades 39, 40 and then move the tag S1 to engage the disk D1 and draw it until it is retained against the surface of the mattress M. In the retracted position, instead, the slider 47 allows the tufting strap P, after disengaging from the needle, to disengage from the slider 47 through the slot 51 and remain applied to the mattress.

[0035] The operation of the described device is intuitive from the provided description.

[0036] The tape N, taken from the reels of the two tapes N1 and N2 that compose it, is inserted between the elastic lamina 10 and the sliding block 5.

[0037] The advancement of the tape N along the channel 3 is achieved by way of the combined action of the jacks 13 and 17. In particular, the activation of the jack 13 produces the flexing of the lamina 10, which clamps with the end 11 the tape N against the sliding block 5. Once the tape N has been gripped, the jack 17 is activated and imparts to the slider 4 a back-and-forth stroke whose step is substantially equal to the length L of the disks D1.

[0038] Therefore, the tape N advances in successive strokes through the cutting unit 20, which at each stop is activated, producing the lateral notches R by means of the cutters 29, 35.

[0039] Since the distance between the cutters 29 and the blades 39 and 40 is a multiple of the length L of the disks D1, the blades 39, 40, every time the slider 4 stops, crop the disks D 1 simultaneously with the formation of the notches R.

[0040] At this point, the cropped disk D 1 is positioned on the opening 52 of the contrast unit 38, where the tufting strap insertion apparatus inserts in the direction B through said disk the needle 53 for applying the tufting straps. After passing through the disk D 1 and the mattress M, the disk D2 arranged on the opposite side of the mattress is applied. The disk D2 is fed by a device which is mirror-symmetrical to the one described above, from which it differs only in that the slider 47 and the opening 52 are in reversed positions with respect to the channel 3. Advantageously, the edge of the opening 52 tapers in a conical shape in order to eliminate any deviations which the needle may undergo during its passage through the mattress.

[0041] The described device therefore achieves the proposed aim and object.

[0042] In particular, it is noted that the disks can have a contour which is diversified depending on the cutting profile of the cutters 29 and of the complementary cutters 35 and of their mutual distance H (see Figure 8), which is adjusted by moving the triangular bodies 25 on the plate 21 transversely to the advancement direction A, i.e., moving them away with respect to the centerline plane Z, by acting on the bolts 26.

[0043] In the practical embodiment of the invention, numerous modifications and variations are possible according to requirements. Thus, for example, an auxiliary needle 54 is associated with the needle 53 for piercing the mattress M (see Figure 9) and is arranged between the cutters 29 so as to provide, in the region of the tape N from which the disk D1 or D2 will be cropped, a preliminary hole suitable to facilitate the subsequent penetration of the needle 53.

[0044] The disclosures in Italian Patent Application No. BO2004A000767 from which this application claims priority are incorporated herein by reference.

[0045] 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 device (1) for feeding an apparatus for applying tufting straps (P) to a mattress (M) with disks (D1, D2) for backing said tufting straps, **characterized in that** it comprises a support (2), a channel (3) which is formed in said support for guiding at least one tape (N) unwound from a reel in order to form the backing elements of the tufting straps of the mattress, said channel (3) having an outlet connected to said apparatus, means (3a) for the advancement of said tape along said channel (3) by a preset step, and means (37) for cropping said tape at each step and forming disks (D1, D2) whose length (L) substantially matches said step.

2. The device according to claim 1, **characterized in that** said means (3a) for the advancement of the tape (N) comprise a slider (4), which is composed of a sliding block (5), which can slide in said channel (3), and of an elastic lamina (10), which is fixed on said sliding block at such a distance as to form a passage (8a) which allows said tape to pass between said lamina (10) and said sliding block (5), first actuation means (17) in order to impart to said slider (4) an advancement stroke toward said cropping means (37) and a return stroke, and second actuation means (13), which are fitted on said slider (4) and act on said elastic lamina (10) in order to flex it against said sliding block (5) and clamp said tape (N) against said sliding block during the advancement stroke of said slider, so as to draw said tape toward said cropping means.

3. The device according to claim 2, **characterized in that** it comprises a block (7) which is fixed at a distance from said sliding block (5) and is guided in said channel (3), one end of said elastic lamina (10) being rigidly coupled to said block and cantilevering out toward said cropping means (37) and forming, with said sliding block, said passage (8a) for said tape (N), a first fluid-operated actuator (27), which acts between said block (7) and said support (2) parallel to said channel (3), and a second fluid-operated actuator (13), which is mounted on said block (7) and acts on said elastic lamina (10).

4. The device according to one of claims 1-3, **characterized in that** said cropping means (37) comprise a stationary blade (40) and a movable blade (39), which is mounted so that it can oscillate on said support on a plane which is perpendicular to said channel (3), and actuation means (44) in order to actuate said movable blade (39) between a position in which it is spaced from said stationary blade (40), in order to allow the advancement of the tape (N), and a lowered position for cropping a disk (D1) from said tape, elastic means (46) being provided in order to retain the stationary and movable blades in functional contact.

5. The device according to one of claims 1-4, **characterized in that** downstream of said cropping means (37) there is a cutting unit (20) for forming notches (R) on the sides of said tape (N) at the cropping line of the disks (D1, D2).

6. The device according to claim 5, **characterized in that** said cutting unit (20) comprises two cutters (29), which are perpendicular to said channel (3) and are arranged mirror-symmetrically with respect to a centerline plane (Z), said pair of cutters (29) cooperating with a respective pair of complementary cutters (35), which are located so as to crop the lateral edges of said tape (N) and form mutually opposite notches (R) at said cropping line of the disks (D1).

7. The device according to claim 6, **characterized in that** said pair of complementary cutters (35) is fitted on respective bodies (25), which are fixed to a plate (21), which is rigidly coupled to said base plate (2), members (28, 32) which form guides for said cutters (29) being fixed to said bodies.

8. The device according to claim 7, **characterized in that** said cutters (29) are actuated by means of respective fluid-operated actuators (31), which act between said cutters (29) and said members (28, 32).

9. The device according to one of claims 6-8, **characterized in that** said cutters (29) have recesses (33), which form cutting profiles (34) which cooperate with cutting profiles of said complementary cutters (35).

10. The device according to one of claims 6-9, **characterized in that** said bodies (25) can be adjusted on said plate (21) with respect to said centerline plane (Z).

11. The device according to one of the preceding claims, **characterized in that** it comprises a contrast unit (38) downstream of said cropping means (37), said unit comprising a slider (47) provided with an open slot (51), which can slide in guides (48) of said base plate (2) and can move by means of a fluid-operated actuator (50) between an advanced position for supporting a disk (D1) cropped by said cropping unit (37) and for contrasting the needle (53) for the insertion of the tufting straps (P) and a release position, which

allows the tufting strap inserted through the disk (D1) in the mattress to disengage from said slider (47) by means of said open slot (51).

12. The device according to one of the preceding claims, **characterized in that** an auxiliary needle (54) is associated with the mattress piercing needle (53) and is arranged between said cutters (29) so as to provide a preliminary hole in the region of said tape from which the disk (D1) will be cropped.

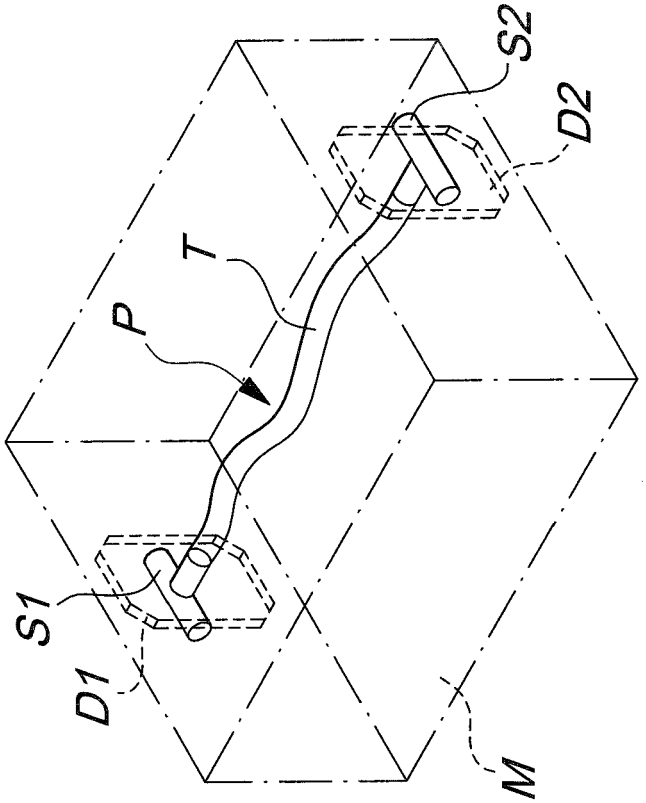

Fig. 1

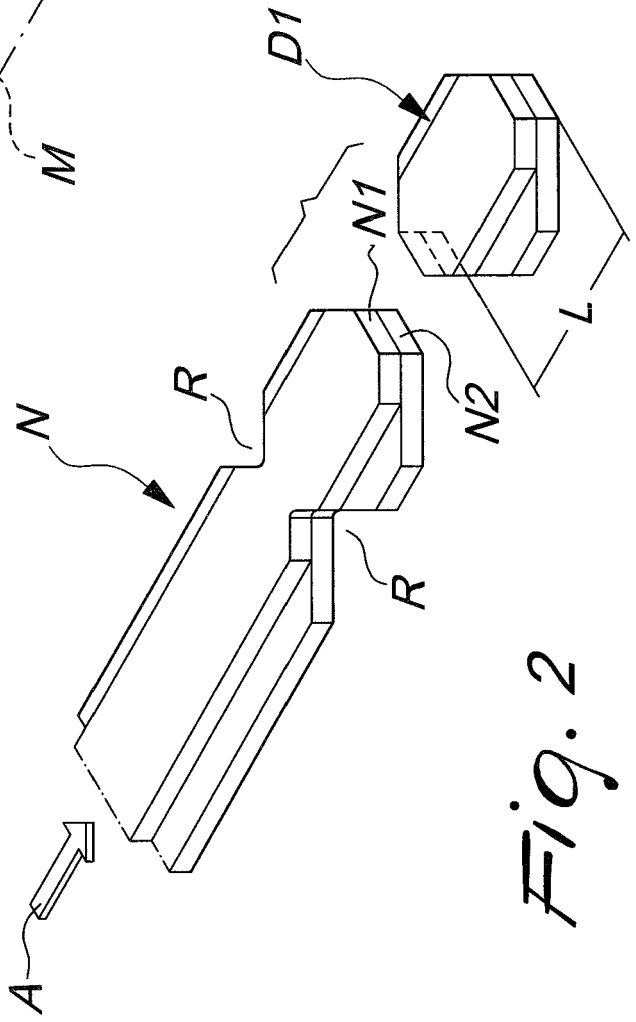

Fig. 2

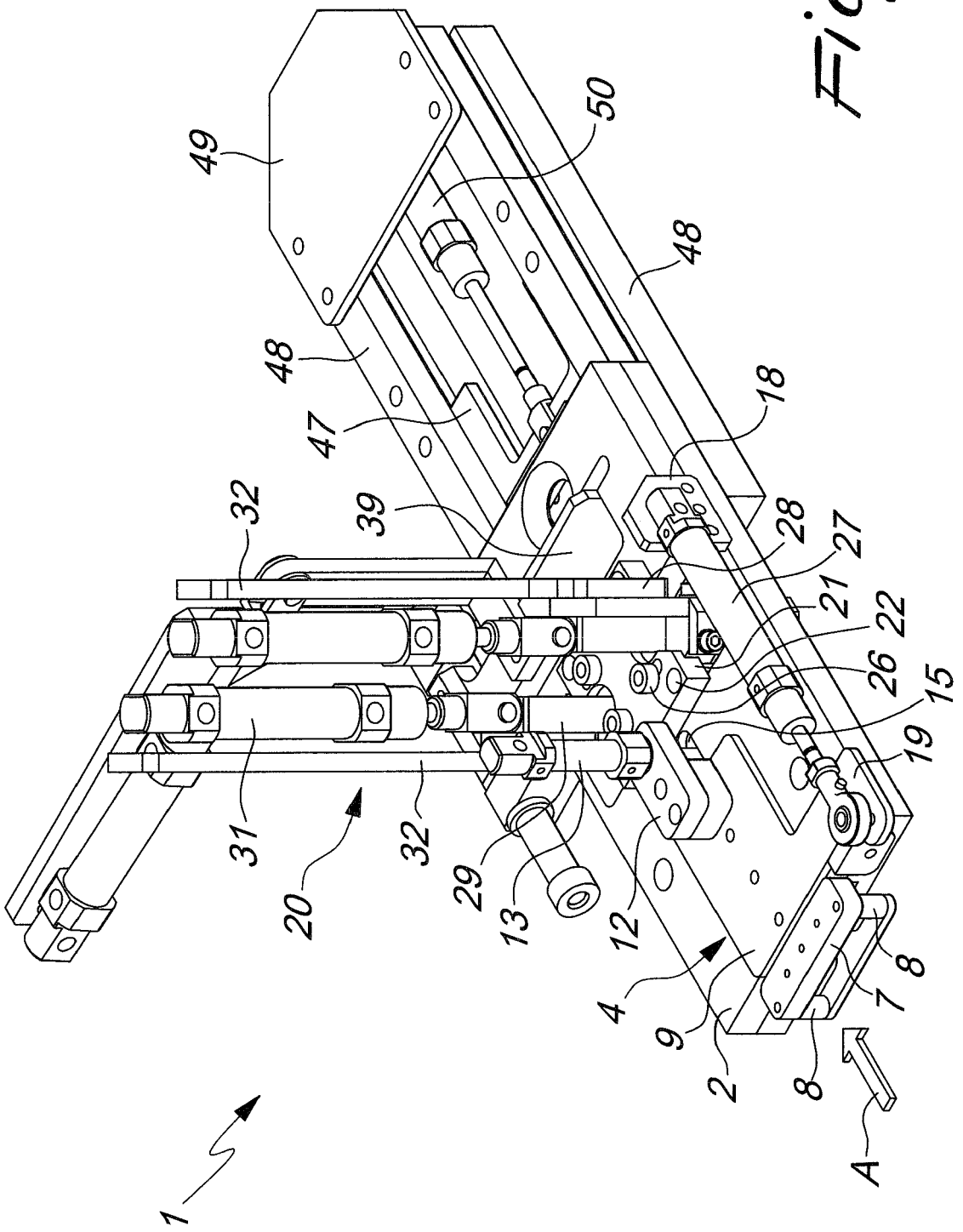
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Fig. 3

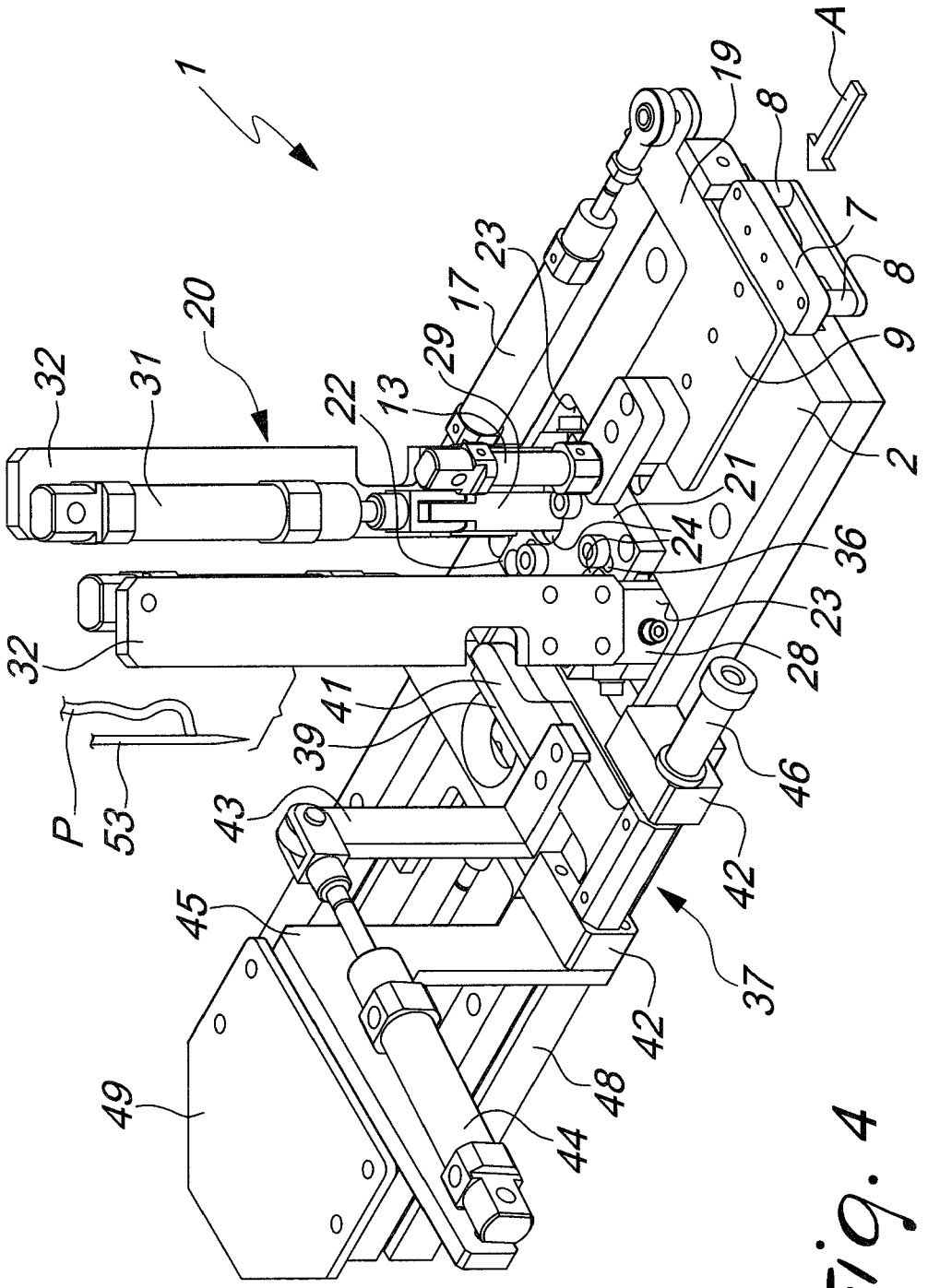
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Fig. 4

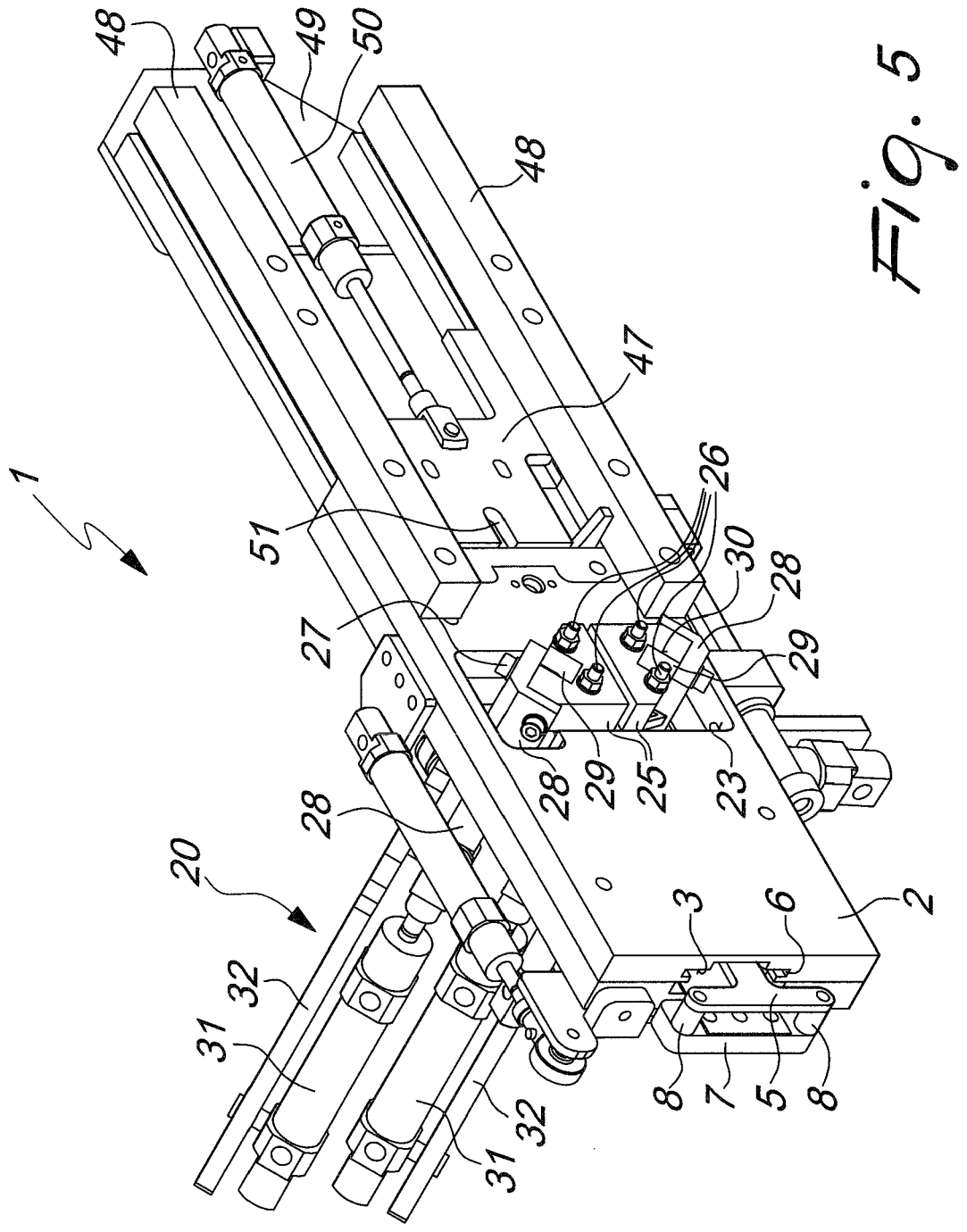
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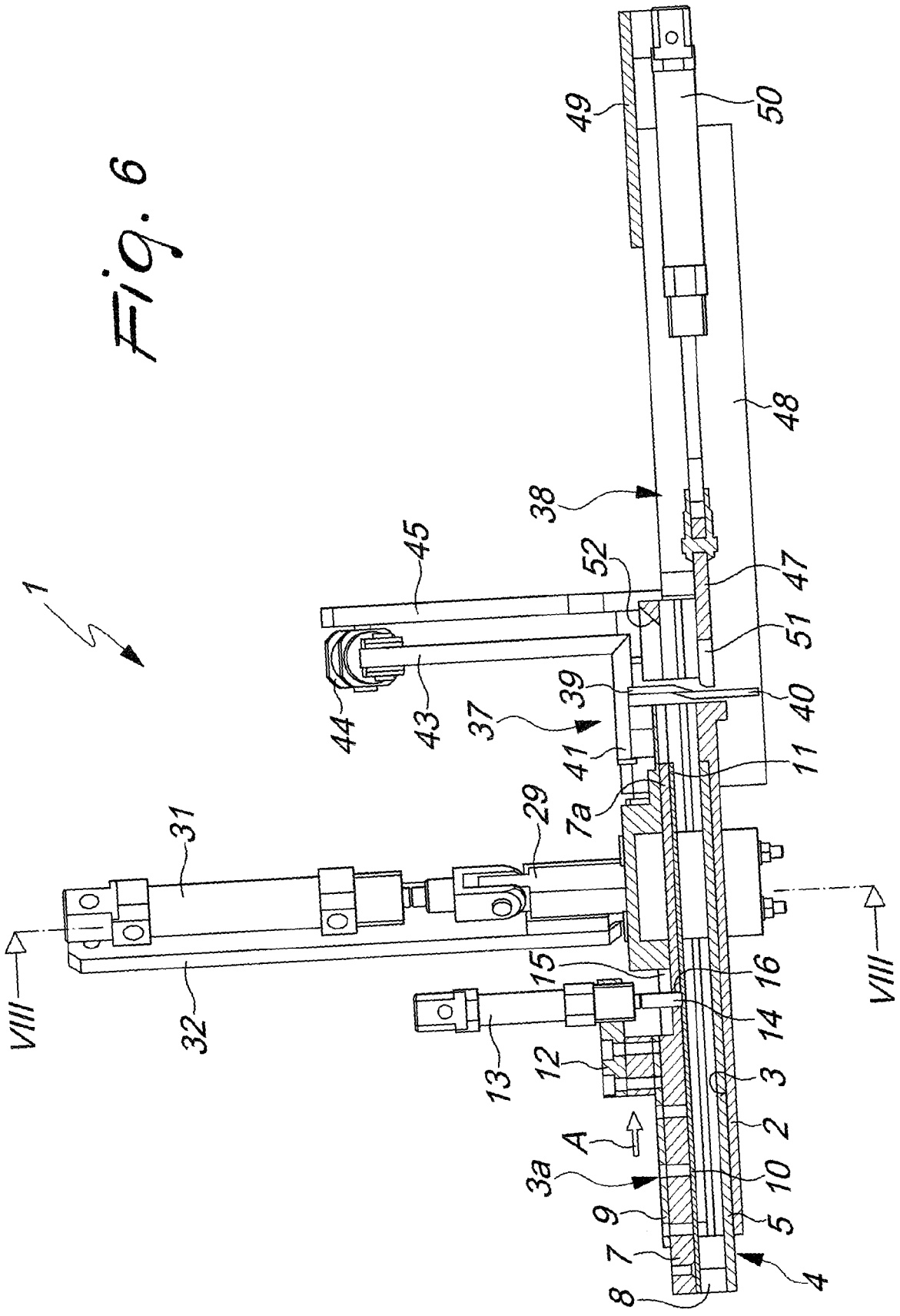
Fig. 5

Fig. 6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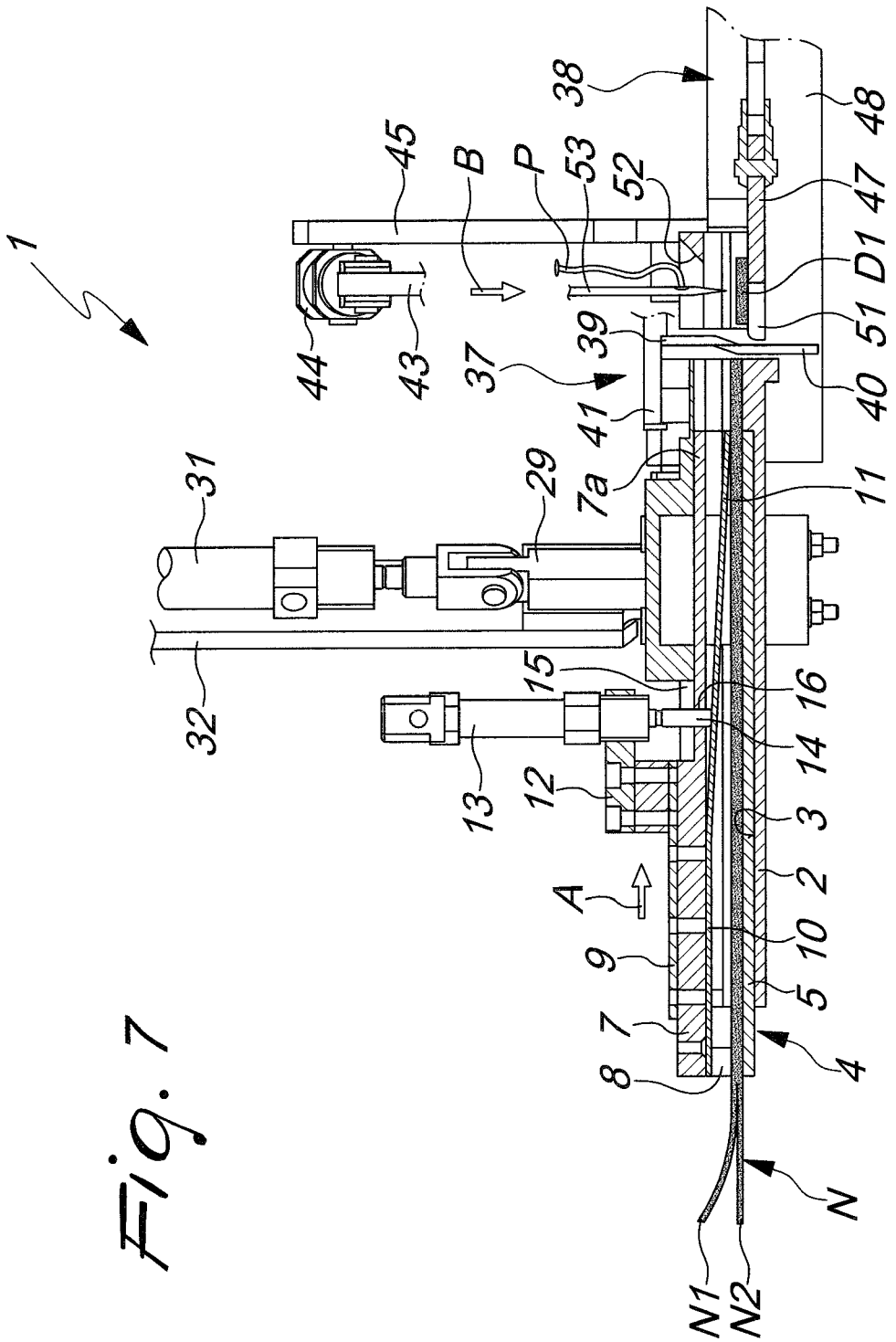
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Fig. 7

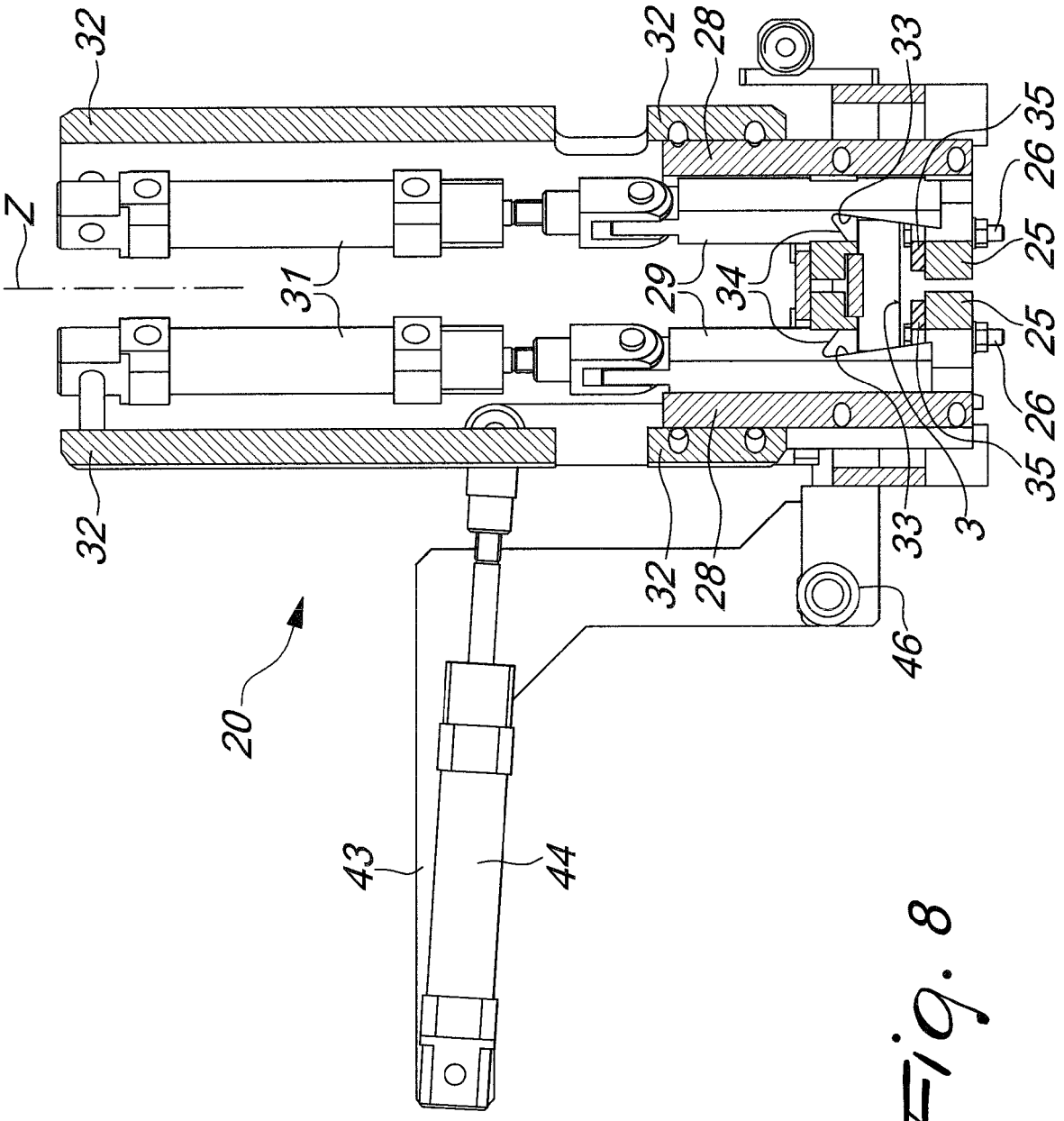
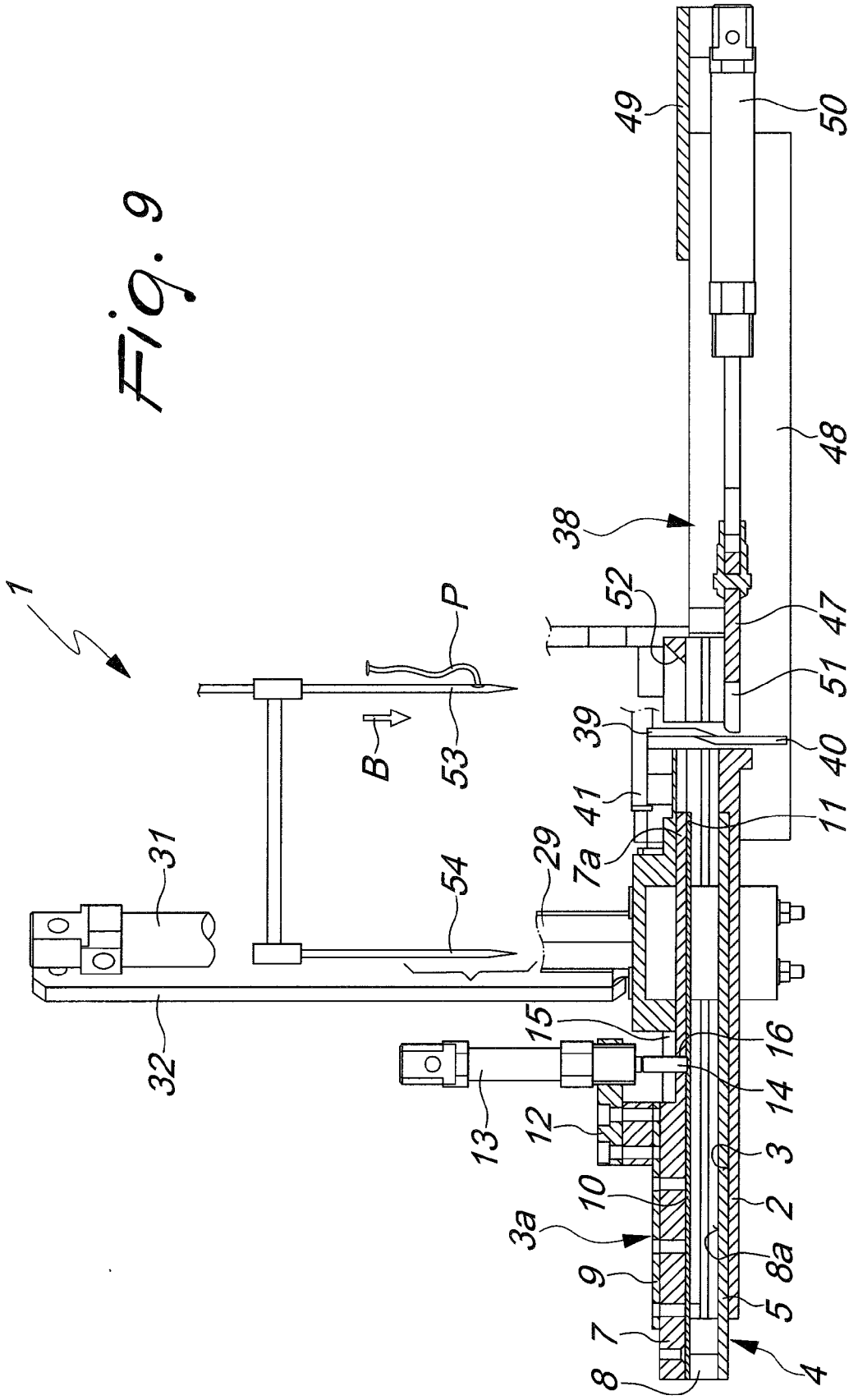


Fig. 8

Fig. 9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